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joint royal colleges ambulance liaison committee

THE AMBULANCE SERVICE ASSOCIATION

UK Ambulance Service Clinical Practice Guidelines (2006)

Editors: Dr Joanne D Fisher, Dr Simon N Brown and Professor Matthew W Cooke

Department of Health, Social Services and Public Safety

NHS

NHS SCOTLAND

NHS WALES GIG CYMRU

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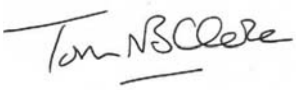
Dr Thomas Clarke

"Up-to-date, professional clinical care for best patient outcome"

The modernisation of the UK ambulance services heralds a new model for healthcare delivery with a much wider remit that has seen a shift away from the traditional role of simply transferring patients to further care. Today, the dedicated staff of the UK ambulance services work together, from the outset, to provide high quality, immediate, up-to-date, professional clinical care on which best patient outcome depends. Such care is reliant on clinical knowledge and expertise, and the Joint Royal Colleges Ambulance Liaison Committee Clinical Practice Guidelines are designed to support staff both during training and in the field.



Dr Thomas Clarke
Chairman Joint Royal Colleges Ambulance Liaison Committee

Dr Simon Brown

"Important new changes"

Professor Matthew Cooke

"Powerhouse of experience and expertise"

The Joint Royal Colleges Ambulance Liaison Committee (JRCALC) Clinical Practice Guidelines set the standard of care for ambulance practice in the UK. It is vitally important, given the rapidly changing nature of healthcare delivery in the ambulance service, that such changes are reflected in these guidelines. Importantly, the 2006 edition sees the introduction of a paediatric section, recognising that the management of children is frequently different from that of adults. In addition, the new guidance for cardiopulmonary resuscitation is incorporated, including the management of patients fitted with an implantable cardioverter defibrillator. Some sections included in previous editions have been removed, as they are now adequately covered in training manuals.

The multidisciplinary approach to the development of these guidelines not only enhances ownership but provides a 'powerhouse' of experience and expertise which feeds directly into the guidelines.

JRCALC is indebted to those who were responsible for previous editions and those who have produced guidelines, or have allowed their work to be directly reproduced, for this current edition.

Dr Simon Brown
Chairman, JRCALC Clinical Practice Guidelines Committee

Professor Matthew Cooke
Project Director, University of Warwick

To the UK ambulance service's best resource…its staff

The Joint Royal Colleges Ambulance Liaison Committee has made every effort to ensure that the information, tables, drawings and diagrams contained in Clinical Practice Guidelines issued July 2006 is accurate at the time of publication. However, the JRCALC guidance is advisory and has been developed to assist healthcare professionals, together with patients, to make decisions about the management of the patient's health, including treatments. It is intended to support the decision-making process and is not a substitute for sound clinical judgement. Guidelines cannot always contain all the information necessary for determining appropriate care and cannot address all individual situations; therefore individuals using these guidelines must ensure they have the appropriate knowledge and skills to enable appropriate interpretation.

The committee does not guarantee, and accepts no legal liability of whatever nature arising from or connected to, the accuracy, reliability, currency or completeness of the content of these guidelines.

Users of the guidelines must always be aware that such innovations or alterations after the date of publication may not be incorporated in the content. As part of its commitment to defining national standards, the committee will periodically issue updates to the content and users should ensure they are using the most up-to-date version of the guidelines; http://www.jrcalc.org.uk

Although some modification of the guidelines may be required by individual ambulance services, and approved by relevant local clinical committees, to ensure they respond to the health requirements of the local community, the majority of the guidance is universally applicable to NHS ambulance services. Modification of the guidelines may also occur when undertaking research sanctioned by a research ethics committee.

Whilst these guidelines cover the full range of paramedic treatments available across the UK they will also provide a valuable tool for ambulance technicians and other pre-hospital care providers. Many of the assessment skills and general principles will remain the same. Those not qualified to Paramedic level must practise only within their level of training and competence.

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ERRORS, OMISSIONS AND COMMENTS

Considerable effort has been taken to ensure the accuracy and consistency of these guidelines. If you find an error, omission, or would like to comment then contact us using the form below or on our website at www.warwick.ac.uk/go/jrcalcguidelines.

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Please comment in the box below

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The Wong-Baker FACES Pain Rating Scale used with permission from Mosby.

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Michael Colquhoun Andrew Marsden Michael Ward	*Recognition of Life Extinct by Ambulance Personnel*
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Steven Bland Iain McNeil	*Chemical, Biological, Radiological and Nuclear Incidents Sort Algorithm* *Chemical, Biological, Radiological and Nuclear Incidents (Special Agent) Triage Algorithm*
Graham Brown Iain Robertson-Steel	*JRCALC Drug Codes – July 2006*
Resuscitation Council (UK)	*Resuscitation Algorithms*
Howard Swanton Tom Quinn Mark Cooke Sue Dodd David Smith Fionna Moore Mark Whitbread Liam Penny Tom Evans Michael Langman	*Thrombolytics Protocol*

Update Analysis – Report of the Key Changes

Significant revisions have been made to the 2006-2008 edition of the clinical practice guidelines. Some sections have been removed as these are now adequately covered in training manuals, and other important areas of clinical practice have been included. Importantly, the paediatric section has been expanded recognising that the management of children is frequently different from that of adults. The Resuscitation Council's (UK) latest guidance for cardiopulmonary resuscitation (CPR) is incorporated, including a new guideline for the management of patients fitted with an implantable cardioverter defibrillator. All drug protocols now have administration tables including: age, dose, concentration, and volume. Drug dosages are no longer detailed within the guidelines and clinicians are referred to the specific drug protocol(s). In addition, standardised terminology relating to the administration of oxygen and fluid has been included. Each guideline also includes a list of the key points.

This report indicates where key changes have been made, and is a signpost to changes within the guidelines but is not a substitute for reading and assimilating the new guidance.

Ethical Issues	
Consent	The following aspects have been added to the existing guideline, each of which has become more prominent since the initial guideline was written: • An update on recent (2004, 2005) case law and good practice criteria. • Further analysis of existing references, in particular, 'Reference Guide to Consent for Examination' and 'Good Practice in Consent Implementation (DH)'. • The inclusion of a 'definitions' section, covering the major terms/phrases used in the guideline (valid consent, informed consent, duration of consent). • The inclusion of a paragraph outlining the 'three tests' for consent. • The inclusion of a paragraph explaining how to seek consent. • A complete rewrite of consent for young people. • The inclusion of a paragraph concerning consent versus duty of care versus human rights. • Inclusion of a paragraph concerning consent and research. • All other paragraphs underwent major rewriting.
Patient confidentiality	The following aspects have been added to the existing guideline, each of which has become more prominent since the initial guideline was written: • Definition of 'identifiable information'. • The relevance of the Data Protection Act (1998) to patient confidentiality. • The NHS Code of Practice on patient confidentiality. • Patient's rights of access to their health records. • Disclosure to non-NHS partners. • Involvement of research.

Update Analysis

Pain Management Guidelines	
Pain management in adults	A new guideline for the assessment and management of pain in adults. • Sections covering pharmacological and non-pharmacological methods of pain relief. • Methods of pain scoring.
Pain management in children	A new guideline for the assessment and management of pain in children. • Sections covering pharmacological and non-pharmacological methods of pain relief. • Methods of pain scoring.

Drugs

This edition sees the introduction of four new drug protocols: amiodarone, tetracaine, oral morphine sulphate solution and ibuprofen and the withdrawal of the nalbuphine hydrochloride protocol. The introduction of oral morphine sulphate solution further enhances pain management for patients and integrates care pathways between the ambulance service and other healthcare providers.

The dosages and administration section has been standardised across all drug protocols, with the inclusion of administration tables. Calculations have been based on either average weight or age range, with the volume rounded (volumes <1ml rounded to two decimal places and volumes >1ml rounded to 1 decimal place) and the dose calculated.

A caution has been added to relevant drug protocols warning that for patients likely to require thrombolysis intramuscular administration of any drug should be avoided.

A list of drug codes has been provided for **INFORMATION ONLY** and represents drugs that may be commonly encountered in the emergency/urgent care environment.

Drug introduction	• Drug route section now merged into the drug introduction section. • Guidance on the use of abbreviations has been included.
Adrenaline	• The dose for endotracheal administration has changed from 2 milligrams to 3 milligrams. The volume increased to 30 millilitres. • Caution added – severe hypertension may occur in patients on beta-blockers and half doses of adrenaline should be administered, unless there is profound hypotension. • Caution added – half doses of adrenaline should be administered for anaphylaxis for patients taking tricyclic anti-depressants.
Amiodarone	• A new protocol for use in refractory ventricular fibrillation or pulseless ventricular tachycardia. • Amiodarone has Prescription Only Medicine exemption for use in cardiac arrest, thus, a Patient Group Directive is not required and any suitably trained paramedic can give it. • A warning is included that amiodarone must be administered into a large vein as extravisation can cause burns. • A warning is included that amiodarone must never be administered via the endotracheal route.
Aspirin	• Anticoagulants now listed as a caution rather than a contra-indication. • Clinical or ECG evidence of myocardial infarction (MI) or ischaemia has been added as an indication so patients with ‘silent MI’ receive aspirin.

Atropine	• In children, administration of atropine is restricted to persistent bradycardia caused by vagal stimulation from suction or intubation or for organophosphate poisoning.
Benzylpenicillin (penicillin g)	Change in the indications for administration to: • *'indicated by the presence of a non-blanching rash and signs/symptoms suggestive of meningococcal septicaemia.* ***Some signs/symptoms may be absent and the order in which they appear may vary'***.
Diazepam (Diazemuls and Stesolid)	• Administration for eclampsia has been expanded to – *'initiate treatment if fit lasts >2-3 minutes or if it is recurrent'* • A note has been added – *'the earlier the drug is given the more likely the patient is to respond'.*
Entonox	• Labour pains have been added to the list of indications because entonox is the appropriate analgesia for administration during transfer to further care.
Glucagon (GlucaGen)	• The blood glucose level at which intervention is indicated has been increased to 4mmol/l. • Caution added – 'in a patient likely to require thrombolysis, intramuscular administration of any drug should be avoided'.
Glucose 10%	• The blood glucose level at which intervention is indicated has been increased to 4mmol/l.
Glucose Gel	• Name changed from hypostop to glucose gel. • Guidance provided on the dose required.
Glyceryl Trinitrate (GTN and Suscard)	• A note has been added to indicate that a tablet could be removed if side effects such as hypotension occurred. • Contra-indication added – unconscious patients.
Hydrocortisone	• Change in the indications for administration to include Addisonian Crisis. • Guidance has been included on dosage and information for patients with Addisonian Crisis. • **Adults –** hydrocortisone *'100mg intravenous (IV) (OR IM when IV access is impossible)-given by SLOW IV administration'*. • **Children –** 1 month to 11 years, administer the dosages as per anaphylaxis and asthma table. • A note has been added to indicate that it is better to administer hydrocortisone if there is any doubt about previous steroid status. • Caution added – 'in a patient likely to require thrombolysis, intramuscular administration of any drug should be avoided'. • The side effect of a burning and itching sensation in the groin is only when ***hydrocortisone sodium phosphate*** is administered too quickly. • Addition of Solucortef to the presentation section.
Ibuprofen	• New protocol for the relief of mild to moderate pain and/or high temperature and pain and inflammation of soft tissue injuries.

Lidocaine (lignocaine)	• Contra-indication added 'where amiodarone has already been administered'. • Removal of the ET route of administration for children. • Lidocaine as a local anaesthetic was removed as an action and information about its administration was added to the 'additional information section'.
Metoclopramide (Maxolon)	• Routine prophylactic administration prior to opiate analgesia no longer required. • Caution added – in a patient likely to require thrombolysis, intramuscular administration of any drug should be avoided. • Caution added – avoid in cases of drug overdose.
Morphine sulphate	• The caution section emphasises that morphine should not to be used 'routinely' for labour pains. • Paediatric dose of 0.1mg/kg can be repeated at 5-10 minute intervals titrated against pain relief to a maximum of 0.2mg/kg. Note added regarding the peak effect of each dose which may not occur until 10-20 minutes after administration. • It is also stressed that the appropriate dose of naloxone must be known before morphine has been administered so that it could be given if required. • Monoamine oxidase inhibitors and acute alcohol intoxication is now included as a caution and not a contra-indication, stressing that morphine should not be administered until the patient's drug information card has been checked.
Morphine sulphate oral solution	• A new protocol for administration of morphine in cases of severe pain.
Nalbuphine hydrochloride (Nubain)	• This protocol has been removed from the 2006-2008 edition because the manufacturers withdrew this product for commercial reasons. Morphine is the recommended alternative.
Naloxone hydrochloride (Narcan)	• This protocol now extends to ambulance technicians, with the appropriate education/training. Administration will be by the **IM** route to a patient in an emergency situation.
Sodium chloride 0.9%	• Caution is advised for the administration of fluids in the prehospital environment. • New table relating to the administration of fluid volumes for medical (20ml/kg) and trauma (5ml/kg) emergencies in children.
Sodium lactate, compound (Ringers lactate/Hartmann's solution)	• Caution is advised for the administration of fluids in the prehospital environment. • New table relating to the administration of fluid volumes for medical (20ml/kg) and trauma (5ml/kg) emergencies in children.
Tetracaine (AMETOP)	• A new protocol for the application of tetracaine, where venepuncture may be required, in the non-urgent situation or anticipated venepuncture for children and needle phobic patients.

Thrombolytics (reteplase, tenecteplase)	• Removal of Streptokinase. • Details referring to permissions for the administration of heparin, the mechanism of action and the legal aspects and response from JRCALC have been removed from this guideline. • The initial dose of heparin has been increased to 5,000U (except for patients <67kg receiving tenecteplase), this should be administered before thrombolysis. • If a heparin infusion has not been commenced within 45 minutes a second dose of heparin 1,000U is recommended. • Reteplase – a reminder that heparin and reteplase are incompatible and therefore either a separate cannula should be used or the cannula must be flushed well prior to administering reteplase. • Statement regarding heparin can be found.
Page for age charts (resuscitation and other emergencies in children)	• Redesigned with one page dedicated to each age range. • Each page lists the drugs for resuscitation and other emergencies in children. • Information indicating relevant airway sizes, joules for defibrillation and fluids are also included.
Drug codes	• A list of drug codes, that may be commonly encountered in the emergency/urgent care environment, has been provided. However, it should be noted that **ONLY** the drugs listed in the drug protocol section are for administration by registered paramedics; the remaining drugs are for administration by physicians or under patient group directions by paramedics who have undertaken extended training.
Cardiac Arrest and Arrhythmias The cardiac arrest and arrhythmias guidelines are based on the Resuscitation Council's 'resuscitation guidelines 2005' and are derived by international consensus. There is a new guideline detailing the management of patients fitted with implantable cardioverter defibrillators.	
Adult Basic Life Support (BLS)	Updated in line with 2005 UK Resuscitation Guidelines: • Circulation check removed. • Abnormal breathing is the indicator to initiate external chest compressions. • Compression:ventilation ratio now 30:2 with an emphasis on effective chest compressions minimising the time 'off the chest'. • Try to change person performing chest compressions every 2 minutes. • Inclusion of information explaining use of automatic external defibrillator.
Adult Advanced Life Support (ALS)	Updated in line with 2005 UK Resuscitation Guidelines: • All unwitnessed arrests to have 2 minutes CPR before attempting defibrillation. • Airway managed by any effective means. • Single shock sequence – 150-200J biphasic or 360J monophasic. • Recommence CPR immediately after defibrillating, do not wait to assess: CPR – analyse-drug-shock sequence. • ET drug route ineffective – IV and intraosseous (IO) superior.

Adult foreign body airway obstruction	Updated in line with 2005 UK Resuscitation Guidelines: • Renamed from Choking Guideline (Adult), updated in line with 2005 UK Resuscitation Guidelines. • Obstruction categorised as 'mild' or 'severe'. • Introduction of a flow chart.
Cardiac rhythm disturbance	Updated in line with 2005 UK Resuscitation Guidelines: **Broad complex tachycardia** Previously, IV lidocaine was advised in this situation, and a major difference from previous guidance is the drug is no longer recommended for the treatment of ventricular tachycardia outside hospital. The reasons are: • Evidence for its effectiveness in this situation is limited. • The negative inotropic effects of the drug, particularly in higher doses may seriously compromise cardiac output, particularly if the rhythm does not convert. Dramatic deterioration in the patient's condition may follow and lead to cardiac arrest. • Administration of the drug at an early stage may limit the choice of more effective treatment later in hospital. • Broad complex tachycardia may be caused by other arrhythmias that will not respond to lidocaine. Accurate diagnosis, particularly outside hospital is often very difficult and the patient's condition may suffer if treated inappropriately.
Implantable Cardioverter Defibrillators (ICD)	A new guideline for the assessment and management of patients fitted with an Implantable Cardioverter Defibrillator (ICD). • ICDs deliver tiered therapy with bradycardia pacing, anti-tachycardia pacing (ATP) and shocks for VT not responding to ATP, or VF. • ECG records, especially at the time that shocks are given, can be vital in subsequent patient management. A recording should always be made if circumstances allow. • Cardiac arrest should be managed according to normal guidelines. • Avoid placing the defibrillator electrode over or within 5 centimetres of the generator. • A discharging ICD will not harm a rescuer touching the patient or performing CPR. • An inappropriately discharging ICD can be temporarily disabled by placing a ring magnet over the generator.
Recognition Of Life Extinct for ambulance personnel (ROLE)	• Removal of the preamble and historical background. • Modification of the protocol to emphasise the desirability of making a paper trace of the monitor outlook as evidence of death. • Recognition of increasing acceptability of the patient's right to decide not to be resuscitated by the use of Living Wills/Advanced Directives. • Modification to appendix C to improve the documentation process and inclusion of the addition of another choice: 'patient in a terminal phase of illness'. This last choice will need very sensitive and careful handling by trainers and should be used with caution by the road staff. • Removal of appendix D as all ambulance services now have leaflets to hand out to bereaved relatives.

Traumatic cardiac arrest	This guideline recognises that traumatic cardiac arrest differs from the more usual medical cardiac arrest. Traumatic cardiac arrests are categorised as blunt or penetrating: • **Blunt (un-witnessed):** 5 minutes CPR to rule out reversible causes, if unsuccessful then resuscitative efforts may be terminated. • **Blunt (witnessed):** rapid evacuation to the emergency department for urgent surgical assessment/intervention – assess for reversible causes such as tension pneumothorax, without delaying transport. Provide pre-alert. • **Penetrating:** rapid evacuation to the emergency department for urgent surgical assessment/intervention – assess for reversible causes e.g. tension pneumothorax without delaying transport. Provide pre-alert. • If, after 20 minutes of advanced life support management, the patient is unresponsive, resuscitative efforts may be terminated as per the recognition of life extinct by ambulance clinician guidance.
Medical Emergencies	
Medical emergencies in adults – overview	• Information regarding "medic alert jewellery". • Guidance regarding assisted ventilation. • Recognition of the dangers of restraint (positional) asphyxia. • Insertion of blood glucose assessment. • Fluid therapy evidence inserted. • Guidance relating to the management of Addisonian Crisis. • Reminder regarding uncorrectable ABCD problems and pre alert.
Abdominal pain	Additional reference made to: • Ectopic pregnancy. • Pelvic inflammatory disease. • Presence of similar symptoms in others. • Elderly and confused patients. • Paediatric patients. • Appendicitis. • Immunosuppressed, HIV and alcoholic patients. • Fluid therapy evidence inserted. • Section considering analgesia (Entonox etc).

Decreased level of consciousness	• Change of title from unconsciousness to decreased level of consciousness. • Definition altered to include AVPU scale scoring. • Expansion on causes, with subheadings to group together related causes. • Note to check with bystanders or friends and relatives for history. • Note to check neurological signs. • Note to check blood glucose. • Expanded oxygen administration guidance (and for special cases e.g. COPD and laryngectomee patients). • Indications for supporting ventilation in severely compromised patients. • Instructions on looking for causes in the environment and on the patient – medic alert bracelets, warning stickers in the home and patients' warning cards, etc.
Dyspnoea	• Insertion of information regarding assisted ventilation. • Links to appropriate / relevant guidelines. • Omitted – section referring to children / with stridor.
Headache	• Insertion of links in history section to relevant guidelines specifically stroke/TIA, head injury and glycaemic emergencies. • Insertion of blood glucose assessment section. • Expanded oxygen and fluid administration guidance.
Mental disorder	• Additional section to emphasise that physical illness needs to be excluded as it can manifest as a mental health disorder. • Patients with a mental health disorder may still have the capacity to consent to assessment and treatment and so they may also decline this and their wishes should be respected. • Application for powers for compulsory assessment and treatment of patients under the Mental Health Act has different criteria and requirements from the capacity to consent. The law relating to this is under review in England and Wales. In Scotland it has already changed and comes under Mental Capacity legislation. • Recognition of the dangers of restraint (positional) asphyxia.
Non-traumatic chest pain/discomfort	• Acute coronary syndromes have been separated from the wider group of undifferentiated chest pain. • This guideline is intended to help differentiate the cause of chest pain. An important new inclusion is the recommendation that a 12-lead ECG is performed on all patients with chest pains. • For specific guidance on cardiac-related chest pain, the acute coronary syndrome guideline should be followed.

Specific Treatment Options	
Acute coronary syndrome	• The key change is the new, wider focus on 'acute coronary syndrome' rather than merely on acute ST elevation (MI). • The growing use of pre-hospital thrombolytic treatment and primary percutaneous coronary intervention (PCI) are highlighted. • The fact that cardiac networks will largely determine the appropriate reperfusion strategy in the context of locally available facilities is also discussed.
Anaphylaxis and allergic reactions in adults	• Common precipitants identified and their effect explained. • Precise definitions used to facilitate rapid diagnosis. • Mild reaction (allergy) linked with severe reaction (anaphylaxis) via a continuum, rather than two separate categories. • Mild presentations distinguished from severe presentations, along the continuum, to promote appropriate management. • Conforms to current UK Resuscitation Council's drug guidelines. • Additional reference made to adrenaline self administration (Epipen), MAOI/ tricyclic use, beta-adrenergic blocker use, biphasic response, removal of triggering source, O_2 administration, patient positioning, judicious use of crystalloid solution, brief explanation for the drugs used. • Inclusion of new EU peak flow charts and explanation of changes.
Asthma in adults	• Removal of references to the management of asthma in children. • Signs of severe and life-threatening asthma in adults are given.
Chemical, Biological, Radiological and Nuclear (CBRN)	• Assessment of degree of likelihood of Chemical, Biological, Radiological and Nuclear (CBRN) contamination when no cause is known. • Institute self-decontamination when appropriate. • CHALETS mnemonic for rapid incident assessment. • Surgical masks and gloves should be worn when dealing with infectious patients. • Advise that blast injury may be co-existent with radiological incidents. • Discussion of CBRN detection. • Redesigned CBRN triage sieve and SORT.
Chronic Obstructive Pulmonary Disease (COPD)	• Oxygen administration to be titrated to maintain an oxygen saturation of 90-92%. • A reminder for ambulance clinicians to check if patients carry an information card/treatment plan.
Convulsions in adults	• Removal of references to the management of convulsions in children.

Gastro Intestinal Bleeds (GI Bleeds)	• Common causes of upper and lower GI bleeding identified and discussed; including initiating factors, common presentations and potential risk factors. • Additional reference made to beta/calcium channel blocker use, consumption of iron tablets/foods and drink with red dye and alcohol abuse. • Guide to estimating quantity of blood loss. • Fluid therapy evidence inserted.
Glycaemic emergencies in adults	• New focus on the causes of hypoglycaemia. • Common symptoms replaces early and late stages. • Signs of infection as a factor to attend hospital following treatment of a hypoglycaemic attack.
Hyperventilation syndrome	• Change of title from hyperventilation to hyperventilation syndrome.
Hypothermia	• Introduction of a table of severity. • Inclusion of non-specific symptoms. • Information on cardiac arrest in hypothermia. • Fluid therapy evidence inserted.
Meningococcal septicaemia	• Information regarding assisted ventilation. • Evidence-based information regarding fluid therapy.
Overdose and poisoning in adults	• New section 'intentional overdose'. • Suicide assessment e.g. SAD PERSONS score inserted. • Reference to CS gas in common poisons. • New expanded table listing common poisons presentations and management. • New table format for illegal drugs and insertion of ecstasy.
Pulmonary embolism	• Link drawn between DVT and PE such that they can be thought of as two presentations of the same disease. • Wells criteria table added. • Expanded oxygen administration guidance.
Pulmonary oedema	• The pathophysiology of the condition has been expanded. • Addition of new symptoms. • Recent symptoms of MI added to highlight this as the most likely precipitant. • Contra-indications to continuous positive airway pressure added in line with the evidence.

Sickle cell crisis	• Change of description of red blood cell architecture from 'discoid' to 'bi-concave'. • Further explanation of serious sequelae of sickle cell disease – including Acute Coronary Syndrome (ACS). • Explanation of symptoms and signs of sickle cell disease – in particular those that might indicate ACS. • Management – the patient may be able to guide their own treatment and may even have an individualised treatment plan. • Guidance on obtaining ECG – particularly as only sign of ACS. • Guidance on the decreased need for initial fluids.
Stroke/Transient Ischaemic Attack (TIA)	Change of title from Stroke to Stroke/Transient Ischaemic Attack (TIA). • Guideline now includes TIA, but excludes subarachnoid haemorrhage (covered in head injuries guideline). • Strokes now referred to as intracranial haemorrhage or infarction (as opposed to ischaemic/embolic or bleed). • Insertion of explanation of TIA. • Change to provision of oxygen for all stroke patients, with emphasis now being on correcting hypoxia. • More detail to FAST assessment with terminology matching that of Stroke Association and Royal College of Physicians Stroke Guidelines Working. • Stress on not administering aspirin (reason – detrimental effect in haemorrhagic strokes and inability to assess swallowing function).
Trauma emergencies in adults – overview	• Change of title from trauma emergencies to trauma emergencies in adults. • New mnemonic for assessment of life threatening injury by neck signs. • New fluid management guidance based upon the presence and absence of the central and radial pulses. • Recognition of the dangers of restraint (positional) asphyxia.
Abdominal trauma	• Expanded oxygen administration guidance. • Guidance given on when to institute assisted ventilation. • Guidance given on how to supply fluids in trauma. • Algorithm provided for supplying fluids dependent on the presence of pulses. • Removal of supplementary information on gun shot wounds and stabbing.
Burns and scalds in adults	• Change of title from burns to burns and scalds in adults.
The immersion incident	• Change of title from drowning to the immersion incident. • New definitions of immersion and submersion. • Mechanical drainage of the lungs should not be carried out. • Guidelines on when to consider assisted ventilation.

Electrocution	• Guideline now emphasises the risk of c-spine injury in electrocution. • Hospital admission now not routinely required if electrocution is from domestic or low voltage source, with an asymptomatic patient with no injuries and normal 12-lead ECG.
Head trauma	• Allows a risk balance for airway manoeuvres that could move the cervical spine to open the airway. • Airway adjunctions are discussed, specifically the laryngeal mask airway and Combitube™. • Emphasis is placed on both oxygenation and ensuring the adequacy of ventilation with support if necessary. • The role of hypertonic saline and manitol is still unclear.
Limb trauma	• Fluids now only recommended with blood loss greater than 500mls, with fluid replacement commenced with a 250ml bolus of crystalloid. • New guidelines on fluid management based upon presence or absence of central and radial pulses.
Neck and back trauma	• The criteria for when patients do not need spinal immobilisation has been further developed with the publication of the Canadian and NEXUs guidelines. This allows more precise criteria for not immobilising and particularly de-emphasises the mechanism of injury as a predictor of serious injury. A new flow chart has been developed to assist this. • The new information from the Cochrane review of spinal immobilisation has been included, although this mainly stressed the lack of randomised controlled trials. • There is greater recognition of the hazards of immobilisation but little is known about the risk-benefits of various devices. • Recognition that most penetrating trauma does not require spinal immobilisation. Re-emphasis of: • Need for vacuum mattresses for long transfers. • Compromises that need to be adopted in restless patients and in emergency extrication.
Thoracic trauma	• Advice on patient transport – semi-recumbent/upright, if not otherwise contraindicated. • Expanded oxygen administration guidance oxygen (and for special cases – COPD and laryngectomee). • Advice given on when to institute assisted ventilation. • Guidance given on how to supply fluids in trauma. • Algorithm provided for supplying fluids dependent on the presence of pulses. • Advice on analgesia expanded.
Trauma in pregnancy	• Guidance on when to consider assisted ventilation. • New evidence noted on decreased survival in penetrating trauma with the routine use of IV fluids. • New guidelines on fluid management based upon the presence and absence of central and radial pulses.

Obstetrics and Gynaecology	
Birth Imminent (normal delivery and delivery complications)	Change of title from birth imminent to birth imminent: normal delivery and birth complications. • Initial section on normal stages of labour followed by expanded sections on acute birth complications affecting both mother and fetus (including postpartum haemorrhage). • Changes to transport destination related to gestation: – <20 weeks – transport to nearest ED Dept – 20-36+ weeks – transport to booked obstetric unit (previously up to 34 weeks) – 37 weeks – move on to next stage of assessment (previously 35-40 weeks). • Premature delivery changed to 'preterm' delivery (i.e. any delivery before 37 weeks). • Postpartum haemorrhage and abruption sections – general background expanded. • Shoulder dystocia management expanded and clarified.
Effects of pregnancy on maternal resuscitation	Change of title from normal pregnancy to effects of pregnancy on maternal resuscitation. • Difficulties and differences in maternal resuscitation are reviewed: – resuscitation of the mother will resuscitate the fetus – importance of 30 degrees left lateral tilt is emphasised – Susceptibility to acid regurgitation emphasised – need for early intubation in cardiorespiratory arrest. • IMPORTANCE OF CONSIDERING EMERGENCY PERIMORTEM CAESAREAN SECTION AFTER 5 MINUTES OF ACTIVE CPR is emphasised. The prime aim is to make the mother easier to resuscitate by emptying the uterus. It is not primarily done to save the baby (although rarely the baby may survive a maternal arrest). • Importance of informing the obstetric team early if admitting a pregnant woman undergoing active CPR. Ideally, senior obstetric staff should be waiting in ED when the patient is admitted (see perimortem section notes).
Haemorrhage during pregnancy (including miscarriage and ectopic)	Change of title from haemorrhage during pregnancy to haemorrhage during pregnancy (including miscarriage and ectopic). • Present edition concentrates on bleeding in EARLY pregnancy (miscarriage and ectopic) and LATE pregnancy (placenta praevia and placental abruption). • Postpartum haemorrhage is now contained in the chapter 'birth imminent: normal delivery and birth complications'. • The difference between 'revealed' and 'concealed' haemorrhage is emphasised. • Need for awareness of how pregnant women react to increasing haemorrhage. They may exhibit no symptoms and signs until late (i.e. after loss of 30% blood volume) and then present with sudden collapse. Importance of establishing early, large bore venous access is noted.

Pregnancy induced hypertension (including eclampsia)	• Clearer definitions and explanations of different types of hypertension in pregnancy: – PIH – pregnancy-induced hypertension (without proteinuria) – PIH (with proteinuria) = pre-eclampsia. • Expanded discussion about severe pre-eclampsia and eclampsia. • Emphasise the danger of overzealous IV fluid administration (which can lead to pulmonary oedema). • Describe in detail the TIME CRITICAL symptoms that may be associated with severe disease. • In eclampsia: a) fits can occur with minimally-raised blood pressure; b) management of a single fit should be 'supportive' with avoidance of routine diazemuls (magnesium sulphate will be used in hospital). Diazemuls is still recommended for repeated fits.
Vaginal bleeding – gynaecological causes (including abortion)	Change of title from vaginal bleeding (non obstetric causes) to vaginal bleeding – gynaecological causes (including abortion). • The newer methods of terminating a pregnancy are described (i.e. medical = non-surgical). • A short review of colposcopy is also included.
Treatment and management of assault and abuse	
Safeguarding children	References included reflecting recent legislation and guidelines relating to child protection issues, including: Every Child Matters: Change for Children, 2003. Working Together to Safeguard Children 2006. National Service Framework for Children, Young People and Maternity Services, 2004. The Victoria Climbié Inquiry: Report of an Inquiry, 2003.

Emergencies in children This edition sees the introduction of a paediatric section, recognising that the management of children is frequently different from that of adults.	
Medical emergencies in children – overview	Change of title from recognition and management of the seriously ill child to medical emergencies in children – overview. • Airway – discussion of the relevance of stridor and stertor. • Omitted – over 12 years from respiratory rate table. • Enhanced discussion of recession (including pathophysiology) in respiratory distress. • Added – table of effects of respiratory inadequacy on other body systems. • Heart rate assessment – indication of bradycardia as a peri-arrest sign. • Omitted – over 12 years from heart rate table. • Blood pressure – not necessary as part of prehospital assessment – especially when it may delay definitive care. • Extension of basic neurological assessment. • Inclusion of a table of the impact of effect of cerebral inadequacy on other body systems. • Increased explanation of airway management – ET intubation and needle cricothyroidotomy. • Expansion of advice on breathing management. • Expansion of advice on circulation management – peripheral access – IV, IO, etc., and fluid administration algorithm. • Reminder to address immediately treatable conditions e.g. convulsions, opiate poisoning, meningococcal septicaemia.
Trauma emergencies in children – overview	• Fluid administration is now 5ml/kg boluses titrated to response in trauma emergencies.
Anaphylaxis and allergic reactions in children	A new guideline for the assessment and management of anaphylaxis and allergic reactions in children. • Discussion about common precipitants. • Physical signs and environmental indicators – alert bracelets, warning stickers in the home and patient warning cards. • Guidance relating to hydrocortisone administration. • Discussion of possible sequelae.

Asthma in children	A new guideline for the assessment and management of asthma in children. • Signs of severe and life-threatening asthma in children are given. • The use of ipratropium is included. • Infants <one year of age may be given more than one salbutamol nebuliser if needed, *if they respond well* to the first one. • Parenteral adrenaline should **NOT** now routinely be used in children however severe the asthma (change of guideline).
Burns and scalds in children	A new guideline for the assessment and management of burns and scalds in children. • Additional details regarding special burns may be found in the adult section.
Convulsions in children	A new guideline for the assessment and management of convulsions in children.
Glycaemic emergencies in children	A new guideline for the assessment and management of glycaemic emergencies in children. • Description of diabetes mellitus in children with emphasis on a number of differences from adults. • There is a heavy emphasis on the dangers of administering intravenous fluid to children and adolescents because of the risk of cerebral oedema and death. • Fluid should only be given if there are significant signs of circulatory failure (shock), **NOT** in pure dehydration. • A description of hypoglycaemia in children and the differences from adults. • Glucagon, whilst it works effectively in diabetic hypoglycaemia in children, is relatively discouraged (i.e. use GlucoGel) as it makes children vomit.
Overdose and poisoning in children	• A new guideline written for children and outlining the types of overdose (ingestion) that may occur. • General principles of management are discussed. • Management of some specific, commoner poisons are discussed in more depth. • New expanded table listing common poisons presentations and management. • The risk of deliberate overdose in young people and need for transfer to hospital for assessment even if the overdose is not dangerous is emphasised.

Child Basic Life Support (BLS)	Updated in line with 2005 UK Resuscitation Guidelines: • Lone rescuers witnessing or attending paediatric cardiac arrest will use a ratio of 30 compressions to 2 ventilations. • They will start with 5 rescue breaths and continue with the 30:2 ratio as taught in adult BLS. • Two or more rescuers will use the 15:2 ratio in a child up to the onset of puberty. It is inappropriate and unnecessary to establish the onset of puberty formally; if the rescuer believes the victim to be a child then they should use the paediatric guidelines. • In an infant (less than 1 year) the compression technique remains the same: two-finger compression for single rescuers and two-thumb encircling technique for two or more rescuers. • Above one year of age, there is no division between one- or two-hand technique. The one or two hands technique may be used according to rescuer preference. • AED may be used in children above one year of age. Attenuators of the electrical output are recommended between 1 and 8 years of age.
Child Advanced Life Support (ALS)	Updated in line with 2005 UK Resuscitation Guidelines: • Endotracheal intubation should be avoided unless more basic measures fail to provide adequate ventilation. • The laryngeal mask airway is an acceptable initial airway device for providers experienced in its use. • Hyperventilation is harmful during cardiac arrest, the ideal tidal volume should achieve modest chest wall rise. • When defibrillating, a dose of 4 J kg^{-1} (biphasic or monophasic waveform) should be used for all shocks. • Ventricular fibrillation/pulseless ventricular tachycardia (VF/VT) should be treated with a single shock, followed by immediate resumption of CPR (15 compressions to 2 ventilations). • Do not reassess the rhythm or feel for a pulse. • After 2 min of CPR, check the rhythm and give another shock (if indicated). • Give adrenaline 10 micrograms kg^{-1} IV if VF/VT persists after a second shock. • Repeat adrenaline every 3-5 min thereafter if VF/VT persists. • Asystole or pulseless electrical activity (PEA) should be treated with adrenaline 10 micrograms kg^{-1} IV or IO and repeated every 3-5 min.
Child foreign body airway obstruction	Updated in line with 2005 UK Resuscitation Guidelines: • Renamed from Choking Guideline (Child), obstruction categorised by ability to cough. • Attempt five rescue breaths. • In the absence of response, proceed to chest compressions without further assessment of the circulation. • Perform 1 minute CPR inspecting the airway before each cycle of ventilation. Remove any visible obstructions. • Introduction of new flow chart.

Neonatal resuscitation	Updated in line with 2005 UK Resuscitation Guidelines: • Protect the baby from heat loss. • Ventilation: an initial inflation for 2-3 seconds must be given for the first few breaths to promote lung expansion. • Suctioning meconium from the baby's nose and mouth before delivery of the baby's chest (intrapartum suctioning) is not useful and no longer recommended.
Page for age charts (resuscitation and other emergencies in children)	• Paediatric dosages are shown as exact weight calculations. It is appreciated that where small volumes are involved an exact amount will be difficult to draw up; in these instances approximate as closely as possible to the stated dose.
Methodology	
Guideline development methodology	A new section outlining the methodology adopted by the guidelines development sub-committee.

The **procedure section** including the following guidelines: airway management, assisted ventilation, blood glucose level testing, blood pressure measurement, clinical records, clinical waste and sharps, defibrillation, ECG, equipment to scene, hospital alert / information call, infection control, intraosseous infusion, intravenous cannulation, intravenous fluid therapy, longboard, needle cricothyroidotomy, needle thoracocentesis, professional standards, street safety, peak flow readings, pulse oximetry, scene assessment, splintage, temperature taking and transportation have been removed from the 2006-2008 edition as this material is now covered in training manuals.

The glossary of terms listed below is designed to assist reading ease and is **NOT** provided as a list of short hand terms. The Joint Royal Colleges Ambulance Liaison Committee reminds the user that abbreviations are not to be used in any clinical documentation.

AAA	Abdominal Aortic Aneurysm
ACPO(TAM)	Association of Chief Police Officers (Terrorism and Allied Matters)
ACS	Acute Coronary Syndrome
AED	Automated External Defibrillation
AHTPS	Alder Hey Triage Pain Score
ALS	Advanced Life Support
APGAR	**A** – Airway **P** – Pulse **G** – Grimace **A** – Appearance **R** - Respiration
ARDS	Acute Respiratory Distress Syndrome
ASHICE	**A** – Age **S** – Sex **H** – History **I** – Injuries Or Illnesses **C** – Current Condition **E** – Estimated Time/Mode of Arrival
ASW	Approved Social Worker
ATLS	Advanced Trauma Life Support
ATO	Ammunition Technical Officer
ATP	Anti-Tachycardia Pacing
ATSAC	Acpo(Tam) Strategic Advice Centre
AVPU	**A** – Alert **V** – Responds to voice **P** – Responds to pain **U** – Unresponsive
AWE	Atomic Weapons Establishment
bd	Twice Daily
BLS	Basic Life Support
BM	BM Stick Measures Blood Sugar
BP	Blood Pressure
BR	Breech
BSA	Body Surface Area
BVM	Bag-Valve-Mask
CABG	Coronary Artery Bypass Grafting
CAC	Central Ambulance Control
CALD	Chronic Airflow Limitation Disease
(CB)IED	(Chemical or Biological) Improvised Explosive Device
CBRN	Chemical, Biological, Radiological and Nuclear
CCC	Civil Contingencies Committee
CCCG	Chief Constable's Co-Ordinating Group
CD	Controlled Drug
CEPH	Cephalic
CHD	Coronary Heart Disease
CMLO	Consequence Management Liaison Officer
CNS	Central Nervous System
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COAD	Chronic Obstructive Airways Disease
COBR	Cabinet Office Briefing Room
COLD	Chronic Obstructive Lung Disease
COPD	Chronic Obstructive Pulmonary Disease
CPAP	Continuous Positive Airway Pressure
CPP	Cerebral Perfusion Pressure
CPR	Cardiopulmonary Resuscitation
CRT	Capillary Refill Test
CRT	Cardiac Resynchronisation Therapy
CSF	Cerebrospinal Fluid
CT	Computerised Tomography
CVA	Cardio Vascular Accident
DIC	Disseminated Intravascular Coagulation
DKA	Diabetic Ketoacidosis
DM	Diabetes Mellitus
DNA	Deoxyribonucleic Acid
DNAR	Do Not Attempt Resuscitation Order
DST	Defence, Science and Technology Laboratory
DVT	Deep Vein Thrombosis
E	Ecstasy
EC	Enteric Coated
ECG	Electrocardiograph
ED	Emergency Department
EDD	Estimated Date of Delivery
EHO	Environmental Health Officer
EMS	Emergency Medical Services
EOD	Explosives Ordnance Disposal
ET	Endotracheal

ETA	Expected Time of Arrival
ETT	Endotracheal Tube
FCP	Forward Control Point
FMC	Forward Military Commander
FSC	Forward Scientific Controller
G	Gravida
g	Grams
GCS	Glasgow Coma Scale
GI	Gastrointestinal
GL	General Sales List
GLO	Government Liaison Officer
GLT	Government Liaison Team
GP	General Practitioner
GSW	Gunshot Wounds
GTN	Glyceryl Trinitrate
HazMat	Hazardous Material
HIV	Human Immunodeficiency Virus
HONK	Hyperosmolar Non-Ketotic Syndrome
IBS	Irritable Bowel Syndrome
ICD	Implantable Cardioverter Defibrillator
ICP	Intracranial Pressure
IHD	Ischemic Heart Disease
IM	Intramuscular
IO	Intra-Osseous
IPE	Individual Protective Equipment
IPPV	Intermittent Positive Pressure Ventilation
IV	Intravenous
JHAC	Joint Health Advisory Cell
JIG	Joint Intelligence Group
JMC	Joint Military Commander
JVP	Jugular Vein Pressure
KED	Kendrick Extraction Device
kg	Kilogram
LA	Left Atrium
LMA	Laryngeal Mask Airway
LMP	Last Menstrual Period
LMW	Low Molecular Weight
LOC	Level of Consciousness
LSD	Lysergic Acid Diethylamide
LVF	Left Ventricular Failure
MACA	Military Aid to the Civil Authorities
MACC	Military Aid to the Civil Community
MACP	Military Aid to Civil Power
MAGD	Military Aid to Government Departments
MAOI	Monoamine Oxidase Inhibitor antidepressant
MAP	Mean Arterial Pressure
MCD	Maximum Cumulative Dose
mcg	Microgram
MDMA	Methylene Dioxymethamphetamine
mg	Milligram
MI	Myocardial Infarction
MIMMS	Major Incident Medical Management and Support
ml	Millilitre
mmHG	Millimetres of Mercury
mmol	Millimoles
mmol/l	Millimoles per Litre
MOI	Mechanisms of Injury
MR	Modified Release
MSC	**M** – Motor **S** – Sensation **C** - Circulation
NARO	Nuclear Accident Response Organisation
Neb	Nebulisation
NP	Nasopharyngeal
NSAID	Non-Steroidal Anti-inflammatory Drug
NSAP	Non-Specific Abdominal Pain
O_2	Oxygen
OP	Oropharyngeal
P	Parity
PCO_2	Measure of the Partial Pressure of Carbon Dioxide
PE	Pulmonary Embolism
PEA	Pulseless Electrical Activity
PEF	Peak Expiratory Flow
PHTLS	Pre-hospital Trauma Life Support
PIC	Police Incident Commander
PID	Pelvic Inflammatory Disease
PIH	Pregnancy Induced Hypertension
PMBS	Police Main Base Station
PO	Pulmonary Oedema
POLSA	Police Search Adviser
POM	Prescription Only Medicine
PPCI	Primary Percutaneous Coronary Intervention
PPE	Personal Protective Equipment
pr	Per Rectum

prn	When Required
qds	Four Times a Day
Rh^{+ve}	Rhesus Positive
Rh^{-ve}	Rhesus Negative
ROLE	Recognition Of Life Extinct
RSI	Rapid Sequence Intubation
RTC	Road Traffic Collision
RVP	Rendezvous Point(S)
SaO_2	Oxygen Saturation Of Arterial Blood
SAH	Subarachnoid Haemorrhage
SAS	Special Air Squadron
SBP	Systolic Blood Pressure
SBS	Special Boat Squadron
SC	Subcutaneous
SCI	Spinal Cord Injury
SF	Special Forces
SIO	Senior Investigating Officer
SMC	Senior Military Commander
SO13	Metropolitan Police Anti-Terrorist Squad
SpO_2	Oxygen Saturation Measured With Pulse Oximeter
SSA	Senior Scientific Authority
SSRIs	Selective Serotonin Re-Uptake Inhibitors
STEMI	ST Segment Elevation Myocardial Infarction
STEP	Safety Triggers For Emergency Personnel
SVT	Supraventricular Tachycardia
T	Term
TAG	Technical Assessment Group
tds	Three Times a Day
TIA	Transient Ischaemic Attack
TKVO	To Keep Vein Open
TRF	Technical Response Force
UTI	Urinary Tract Infection
VAS	Visual Analogue Scale
VF	Ventricular Fibrillation
VT	Ventricular Tachycardia
VTE	Venous Thromboembolism

INTRODUCTION

Patients have fundamental legal and ethical rights in determining what happens to their own bodies.[1] Valid consent to treatment is, therefore, absolutely central to all forms of healthcare, from providing personal care to more invasive interventions.[2] Seeking consent is also a matter of common courtesy between health professionals and patients.

It is not uncommon in pre-hospital situations for patients to refuse care or treatment. Although patients may refuse, there is still, in certain circumstances, an ongoing moral duty and legal responsibility for Ambulance Clinicians to provide further intervention,[3] particularly if life-threatening risk is involved. This procedure provides guidance on how these situations should be managed.

The Department of Health (DH)[1,2] and the Welsh Assembly Government[4] have issued guidance documents on consent, which may be consulted for good practice and legal guidance.

This guideline is applicable within England and Wales only. There are a number of laws and Acts in Ireland and Scotland that have a direct bearing on this guideline.

CONTENTS

DEFINITIONS

Valid Consent – the voluntary and continuing permission of a patient to be given a particular examination, treatment, operation or examination. Consent is only valid when it is given by an appropriately *informed* person who has the *capacity* to consent to the intervention in question.

Informed Consent – a patient's consent to a clinical procedure (or to participation in a clinical study) after being advised of all relevant facts and all risks involved (***see below***).

Capacity to Consent – the ability to comprehend and retain information material to the decision, especially as to the consequences of having or not having the intervention in question, and ability to believe it and to use and weigh this information in the process used by a person in making a decision about whether to consent or to withhold consent.

Duration of Consent – the length of approval gained by valid consent being given. This generally remains valid unless it is withdrawn by the patient, however new information must be given to patients as it arises, and consent regained.

SEEKING CONSENT.

Before you examine, treat or care for patients you must obtain their consent. Valid consent can only be given by a patient, (or, where relevant, someone with parental responsibility for a child or young person – ***see Section 5***) or a validly appointed proxy (for adults without capacity, ***see Section 4***). Consent by a proxy is only valid if a fully completed Health Care Directive can be produced at the time.

Patients can change their minds and withdraw consent at any time. If there is any doubt, you should always check that the patient still consents to your caring for or treating them. Consent must be continuous, if previously unexplained treatment is recommended to be carried out, further consent must be gained beforehand.

Three basic tests are used[5] to ensure that consent is valid:

a. **Does the patient have capacity? –** is the patient able to comprehend and retain information material to the decision, believe it and use that information in making a decision while bearing the full consequences in mind?

b. **Is the consent given voluntarily?** – consent is only valid[6] if given freely, with no pressure or undue influence to accept or refuse treatment.

c. **Has the patient received sufficient information?** – the patient must understand, in broad terms, the nature and purpose of the procedure as well as the potential consequences of consenting to it or refusing to consent. Failure to provide all relevant information may render the carer liable to an action for negligence.[7]

The type of information that needs to be given by the ambulance clinician will vary depending on circumstance and urgency, but the following is a useful guide to the type of information the patient should receive prior to treatment:

- description and method of treatment, transport and ongoing care
- purpose and reason for treatment, transport and ongoing care
- possible complications and side-effects of treatment
- treatment options, including the option not to treat and the likely consequences
- explanation of likely benefits of treatment
- a reminder that the patient can change their mind about consent at any time.

In practice, patients also need to be able to communicate their decision. Care should be taken not to underestimate the ability of a patient to communicate, whatever their condition.[8,9] Many people with learning disabilities have the capacity to consent if time is spent explaining the issues in simple language, using visual aids. Ambulance Clinicians should take all steps that are reasonable in the circumstances to facilitate communication with the patient, using interpreters or communication aids as appropriate, while allowing for the urgency of the situation.

Adults are presumed to have capacity, but where any doubt exists, the ambulance clinician should assess the capacity of the patient to take the decision in question. This assessment and the conclusions drawn from it should be recorded in the clinical record.

Refusal and Withdrawal of Consent

If an adult with capacity makes a voluntary and appropriately informed decision to refuse treatment, or decides to withdraw their consent *at any time*, their decision must be respected. A patient is entitled to withdraw consent at any time. The ambulance clinician should stop the procedure, establish the patient's concerns, and explain the consequences of withdrawal. If, however, stopping a procedure at that point may reasonably be seen to put the patient's life at risk, then the ambulance clinician may continue until such risk no longer applies.

Withholding or withdrawing *treatment* is not an option for Ambulance Clinicians unless consent is withdrawn, as *duty of care* and the patient's *human rights* would be jeopardised (***see Section 7***).

Patients often refuse treatment and remain at the location, as is their right. There is, however, a responsibility to provide treatment against a patient's wishes in specific circumstances.

ADULTS WITHOUT CAPACITY

Adults who usually have capacity may, especially in emergency situations, become temporarily incapable of having the three tests (Section 2) applied. In such circumstances it is permitted to apply treatments that are necessary and no more than is reasonably required in the patient's best interests pending the recovery of capacity. This includes any action taken to preserve the life, health or well-being of the patient, and can include wider social, psychological or welfare considerations.[10] Where possible, a general practitioner (GP) or professional carer should be fully involved if there is doubt concerning the patient's capacity.

A clinical record should be completed detailing advice and guidance given to the patient, or any referral to specialist staff, ideally signed by the patient (although this simply confirms their presence) and witnessed by a third party.

CHILDREN AND YOUNG PEOPLE

The legal position concerning consent and refusal of treatment by those under the age of 18 is different from the position for adults, in particular where treatment is being refused. Scotland and Ireland have different laws covering these areas.

Under the Children Act 1989, young people aged 16 and 17 years are presumed to have sufficient understanding and intelligence to be able to consent to their own medical treatment.[11] As with adults, Ambulance Clinicians must ensure that the consent of younger people of this age is valid, i.e. given voluntarily by an appropriately informed patient who is capable of consenting to the particular intervention. It is, however, good practice to involve the young person's family in the decision-making process, unless the young person specifically wishes to exclude them.[11]

Critical situations involving children and young persons involving a life threatening emergency may arise when consultation with either a person with parental responsibility is impossible, or the persons with parental responsibility refuse consent despite such emergency treatment appearing to be in the best interests of the child to prevent grave and irreversible mental or physical harm. **In such cases the Courts**

have stated that doubt should be resolved in favour of the preservation of life and it will be acceptable for all carers to undertake treatment to preserve life or prevent serious damage to health.[12] Section 3(5) of the Children Act 1989 also provides for emergency situations involving minors when a person with parental responsibility is not available.

With patients under the age of 16, those who have sufficient understanding and intelligence to understand fully what is proposed also have the capacity to consent to the intervention.[11] This means that the level of capacity of children varies with the complexity of the treatment/refusal and its consequences. There is no particular age when a child gains capacity to consent. In emergency care, consequences of non-treatment are usually evident, but must be fully explained to ensure that a refusal to give consent is fully informed.

Where possible, the child or young person should be given the opportunity to express their wishes. If this is not possible or feasible, Ambulance Clinicians should obtain consent from any person with parental responsibility.

If *valid*, *informed* consent is given by a young person, a parent or guardian cannot over-ride the decision.

As is the case where patients are giving consent for themselves, those giving consent on behalf of young patients must have the capacity to consent to the intervention in question, be acting voluntarily, and be appropriately informed and be acting in the best interests of the child.[12] In the absence of a person with parental responsibility and a child without capacity, Ambulance Clinicians must act in the child's *wider* best interest.[3] Again, Section 3(5) of the Children Act 1989 provides for these situations.

DUTY OF CARE, CONSENT AND HUMAN RIGHTS

There is professional, legal and moral consensus about the clinical duty to obtain valid informed consent. Patients may, however, have cognitive and emotional limitations in understanding clinical information. Social and economic variations are also important variables in understanding the practical difficulties in obtaining informed consent.[13] It is the duty of Ambulance Clinicians to act in a patient's best interest by overcoming such difficulties so that the patient has a clear, unbiased and informed view of the care that is being proposed.

- 'Duty of Care' may be defined as:

'The absolute responsibility of a healthcare professional to treat and care for a patient with a reasonable degree of skill and care'.

Negligence arises when that duty is breached and 'reasonably foreseeable harm' arises as a result. A lack of valid consent does not automatically absolve the carer of their duty of care, or risk of negligence.[14]

- The European Court of Human Rights has ruled that:

'Treatment without consent, invasive treatment contrary to a patient's best interest, and withholding medical care' can all be deemed 'inhuman or degrading treatment' in extreme cases.

This means that any carer who does *not* treat a needy patient because valid consent was not gained, could be deemed to be negligent if a genuine effort was not made to gain such consent.

ADVANCE REFUSALS OF TREATMENT

Patients may have a 'living will' or 'advance directive' although it is not legally necessary for the refusal to be made in writing or formally witnessed (check your service's policy in this area). This specifies how they would like to be treated in the case of future incapacity. Case law is now clear that an advance refusal of treatment that is made voluntarily by an appropriately informed person with capacity *and applicable to subsequent circumstances in which the patient lacks capacity*, is legally binding.[15,16] Ambulance Clinicians should respect the wishes stated in such a document.

In a pre-hospital emergency environment, there may be situations in which there is doubt about the validity of an advance refusal. If Ambulance Clinicians are not satisfied that the patient had made a prior and specific request to refuse treatment, they should continue to provide all clinical care in the normal way.

SELF-HARM

Cases of self-harm present particular difficulties for health professionals. Where the patient is able to communicate, an assessment of their mental capacity should be made as a matter of urgency. If the patient is judged not to have capacity, they may be treated on the basis of temporary incapacity, as outlined above. Similarly, patients who have attempted suicide and are unconscious should be given emergency treatment in all circumstances.[17]

In a pre-hospital setting, an instance of self-harm may require urgent intervention, such as in the case of a toxic drug overdose. If the patient refuses treatment, and the delay caused to clinical intervention is tolerable, the patient's GP should be urgently requested to attend the patient and fully assess their level of capacity. If the incident is more critical and there is insufficient time to arrange the attendance of additional healthcare professionals, crews currently overcome most situations with commendable determination to act in the best interests of the patient. These practices should continue, but strict determination of the patient's capacity must be made.

Ambulance Clinicians usually act intuitively to assess whether they perceive a patient is at risk of suicide. An assessment tool is provided in the ***mental disorder guideline*** (in Scotland this is part of the Mental Health First Aid programme). It should be realised that this is only an **additional** support, designed to assist in identifying specific areas to be aware of when deciding to leave a patient on scene. It must be noted that this advice must be used in conjunction with, and adherence to, the Mental Health Act 1983, the various sections of which must be understood and applied appropriately.

CLINICAL PHOTOGRAPHY AND CONVENTIONAL OR DIGITAL PHOTOGRAPHY

Any type of photography of a patient is not permitted unless it is directly to benefit the patient's treatment. It is, therefore, seen as 'treatment' in itself, and requires valid consent. Photographs should be retained in the patient's hospital file and no other copies are permissible. Once taken, these photographs form part of the patient's hospital record.

EXCEPTIONS TO THE PRINCIPLE OF CONSENT

An unborn foetus has no rights under consent case-law. A pregnant mother has every right to refuse treatment for herself or her foetus, irrespective of the potential harm that may arise to the foetus.[16,18]

The Public Health (Control of Disease) Act 1984 provides that, on an order made by a magistrate or sheriff, persons suffering from certain notifiable infectious diseases can be medically examined, removed to, and detained in a hospital without their consent. Similarly, Section 47 of the *National Assistance Act 1948 (or similar legislation in Scotland and Ireland)* provides for the removal to suitable premises of persons in need of care and attention without their consent. Such persons must either be suffering from grave chronic disease or be aged, infirm or physically incapacitated and living in unsanitary conditions. These situations are extremely rare and Ambulance Clinicians should request a sector officer to attend such incidents.

If a patient refuses decontamination treatment, for example following a chemical, biological radiological or nuclear incident, responsibility lies with the Ambulance Officer in charge of the incident, in liaison with the Police, Health Protection Agency and Public Health Laboratories to decide on an appropriate course of action. Powers lie within these groups to take action for the public good.

Treatment involving mentally disordered patients is covered by the Mental Health Act 1983, provided that the patient is formally detained under that Act. Exceptions under the Act only relate to treatment for the mental disorder itself, and not for other illnesses or conditions.[19] This means that any patient detained under the Mental Health Act has every right to impart and deny consent for treatment for physical disorders that are not directly related to his/her mental illness.[20] It is very likely that specialist nursing advice will be available in such circumstances.

CONSENT AND RESEARCH

Research Governance procedures should be in place in each service, and these should include guidance on consent.

As a very brief guide, research subjects must enter a study voluntarily, be informed about risks and benefits, and understand the difference between experiment and treatment.[21] Post-decision questionnaires should be developed, adapted to individual studies, and used to assess the voluntariness and understanding of all research subjects.[22] Applications to Research Ethics Committees must include evidence of valid consent for every research subject.

Key Points – Consent

- Gaining valid consent is central to all forms of healthcare.
- Patients can change their minds and withdraw consent at any time.
- Consent is only valid if it is given freely by a person who has all the relevant facts, is able to assimilate them, and can fully understand the implications of their decision.
- Young persons who have the intelligence to fully understand the proposed treatment also have the capacity to consent to such treatment.
- The rules of consent do not absolve clinicians of their duty of care, nor do they affect the human rights of patients.

REFERENCES

[1] Department of Health. Reference guide to consent for examination or treatment. London: HMSO, 2001.

[2] Department of Health. Good practice in consent implementation guide: consent to examination or treatment. London: HMSO, 2001.

[3] Airedale N.H.S. Trust -v- Bland *[1993] 2 WLR* 316: House Of Lords, 1993.

[4] Welsh Assembly Government. Reference Guide to Examination or Treatment: Welsh Assembly Government: Available from: http://www.wales.gov.uk/subihealth/content/keypubs/pdf/refguide-e.pdf, 2002.

[5] Agre P, Rapkin B. Improving informed consent: a comparison of four consent tools. *IRB* 2003;25(6):1-7.

[6] Brooke PS. Signed under duress? *Nursing* 2004;34(6):24.

[7] Mazur DJ. Influence of the law on risk and informed consent. *BMJ* 2003;327(7417):731-4.

[8] Bridson J, Hammond C, Leach A, Chester MR. Making consent patient centred. *BMJ* 2003;327(7424):1159-61.

[9] Sugarman J, McCrory DC, Hubal RC. Getting meaningful informed consent from older adults: a structured literature review of empirical research. *J Am Geriatr Soc* 1998;46(4):517-24.

[10] Griffiths R. Consent to Examination & Treatment: The Incapable Adult Patient. *Nurse Prescribing* 2004;2(5):217-8.

[11] Gillick v. West Norfolk and Wisbech Area Health Authority: AC, 112, 1986.

[12] British Medical Association. *Consent, rights and choices in health care for children and young people*. London: BMJ Books, 2001.

[13] Sidaway v Board of Governors of Bethlem Royal Hospital AC, 871, 1985.

[14] Messer NG. Professional-patient relationships and informed consent. *Postgraduate Medical Journal* 2004;80(943):277-83.

[15] Kassutto Z. Informed Decision Making and Refusal of Consent. *Clinical Paediatric Emergency Medicine* 2002;4(4):285-291.

[16] British Medical Association. Report of the consent working party: Incorporating consent toolkit. London: British Medical Association, 2001

[17] Hassan TB, MacNamara AF, Davy A, Bing A, Bodiwala GG. Lesson of the week: Managing patients with deliberate self harm who refuse treatment in the accident and emergency department. *BMJ* 1999;319(7202):107-109.

[18] Network UCE. Refusal of Treatment. http://www.ethox.org.uk/Ethics/econsent.htm#refusal, 2003.

[19] Bluglass R, Beedie MA. Mental Health Act 1983. British Medical Journal (*Clinical research ed*) 1983;287(6388):359-60.

[20] British Medical Association. *Assessment of Mental Capacity*. London: BMJ Books, 1995.

[21] Wendler D. Can we ensure that all research subjects give valid consent? *Archives of internal medicine* 2004;164(20):2201-4.

[22] Flory J, Emanuel E. Interventions to improve research participants' understanding in informed consent for research: a systematic review. *JAMA : the Journal of the American Medical Association* 2004;292(13):1593-601.

METHODOLOGY

Refer to methodology section; see below for consent search strategy.

Consent search strategy

Electronic databases searched:

CINAHL(Ovid) – years search 82 – 05

EMBASE (Ovid) – years search 96 – 05

MEDLINE (Ovid) – years search 66-95

MEDLINE (Ovid) – years search 66-05

ERIC (Ovid) – years search 66-05

EBM Review – years search All

Health Management NELH – years search: all years.

Search strategy:

MEDLINE	CINAHL	OTHERS
1. controlled.ab. 2. design.ab. 3. evidence.ab. 4. extraction.ab. 5. randomized controlled trials/ 6. meta-analysis.pt. 7. review.pt. 8. sources.ab. 9. studies.ab 10. or/1-9 11. letter.pt. 12. comment.pt. 13. editorial.pt. 14. or/11-13 15. consent 16. 10 not 14 17. 15 and 16	1. meta analysis/ 2. systematic review/ 3. systematic review.pt. 4. (metaanaly$ or meta-analy$).tw. 5. metanal$ 6. nursing interventions.pt. 7. (review$ or overview$).ti. 8. literature review/ 9. exp literature searching/ 10. cochrane$.tw. 11. synthes$.tw. adj3 (literature$ or research$ or studies or data).tw. 12. (medline or medlars or embase or scisearch or psycinfo or psychinfo or psyclit or psychlit).tw,sh. 13. pooled analy$.tw. 14. ((data adj2 pool$) and studies).tw. 15. ((hand or manual$ or database$ or computer$) adj2 search$).tw. 16. reference databases/ 17. ((electronic$ or bibliographic$) adj2 (database$ or data base$)).tw. 18. (review or systematic-review or practice-guidelines).pt. 19. (review$ or overview$).ab. 20. (systematic$ or methodologic$ or quantitativ$ or research$ or literature$ or studies or trial$ or effective$).ab. 21. 18 and 20 22. 19 adj10 20 23. or/1-17,21,22 24. editorial.pt. 25. letter.pt. 26. case study.pt. 27. record review/ 28. peer review/ 29. (retrospective$ adj2 review$).tw. 30. (case$ adj2 review$).tw. 31. (record$ adj2 review$).tw. 32. (patient$ adj2 review$).tw. 33. (patient$ adj2 chart$).tw. 34. (peer adj2 review$).tw. 35. (chart$ adj2 review$).tw. 36. (case$ adj2 report$).tw. 37. exp case control studies/ 38. exp prospective studies/ 39. case studies/ 40. human studies/ 41. "edit and review"/ 42. (adults$ or children).tw. 43. or/24-42 44. 43 not (43 and 23) 45. 23 not 44 46. consent and pre-hospital 47. 46 and 45	1. meta.ab. 2. synthesis.ab. 3. literature.ab. 4. randomized.hw. 5. published.ab. 6. meta-analysis.pt. 7. extraction.ab. 8. trials.hw. 9. controlled.hw. 10. search.ab. 11. medline.ab. 12. selection.ab. 13. sources.ab. 14. trials.ab. 15. review.ab. 16. review.pt. 17. articles.ab. 18. reviewed.ab. 19. english.ab. 20. language.ab. 21. comment.pt. 22. letter.pt. 23. editorial.pt. 24. animal/ 25. human/ 26. 24 not (24 and 25) 27. consent 28. 27 not (21 or 22 or 23 or 26) 29. or/1-20 30. 28 and 29

Additional sources searched:

Scotland's Health On the Web – http://www.show.scot.nhs.uk

National Library of Medicine – http://www.nlm.nih.gov

Department of Health – http://www.dh.gov.uk/Home/fs/en

General Medical Council – http://www.gmc-uk.org/guidance/library/consent.asp

Age of Consent – http://www.avert.org/aofconsent.htm

British Journal of Cancer – http://www.nature.com/bjc/journal/index.html

British Medical Journal – http://bmj.bmjjournals.com

INTRODUCTION

Health professionals have a duty of confidentiality regarding patient information.[1] However, the priority is to ensure that all relevant information necessary is clearly and accurately passed to others when this is necessary for the ongoing care of the patient.

The different aspects of legislation relating to these issues at times appear to conflict with each other. This guidance provides a brief overview of the relevant legislation under the following headings:

- patient identifiable information
- Data Protection Act
- NHS Policy
- protecting patient information
- patients' rights of access to personal health records
- disclosure to other bodies and organisations
- research
- consent
- further reading
- references.

PATIENT IDENTIFIABLE INFORMATION

This is any information that may be used to identify a patient directly or indirectly. It may include:

- patient's name, address, post code or date of birth
- any image or audio tape of the patient
- any other data that has the potential, however remote, that the patient may be identified from it (e.g. rare diseases, drug regimes, statistical analysis of small groups)
- patient record number
- combinations of any of the above increase the risk of a breach of confidentiality,[2] and include all verbal, written and electronic disclosure, whether formal or incidental.

DATA PROTECTION ACT

The main principles of the Data Protection Act 1998[3] should be read in conjunction with this guideline. The Act describes processes for obtaining, recording, holding, using and sharing information.

- Patients must be informed and give consent to any sharing of their personal information. Exceptions to this general rule may exist (**see sections on Disclosure, and Consent**).

Only the minimum amount of data should be collected and used to achieve the agreed purpose.

Information can only be retained for as long as it is needed to achieve its purpose.

Strict rules apply to the sharing of information.

NHS POLICY

All NHS employees must be aware of, and respect a patient's right to, confidentiality.[1,2] A disciplinary offence may have been committed for any behaviour contrary to their organisation's policy or the *NHS Code of Practice: Confidentiality* (in Scotland, the *NHS COP on Protecting Patient Confidentiality)*. Clinicians should be aware of how to access training, support or information they may need and be able to show that they are making every reasonable effort to comply with the relevant standards.[1,2]

PROTECTING PATIENT INFORMATION

There are five essential steps that Ambulance Clinicians and support staff, need to take to ensure that they comply with the relevant standards of confidentiality:

1. Record patient information concisely and accurately.

Inaccurate patient clinical records may contain false information about the patient concerned, for example by omission, error, unfounded comment or speculation. This breaches standards and brings the professional integrity of the ambulance clinician and the organisation into question.

2. Keep patient information physically secure.

The ambulance service has particular difficulties in ensuring that information is not shared accidentally with the public. Not only must any care the patient received be treated confidentially, the information gained must not be disclosed to anyone else unless to do so genuinely promotes patient care. Comments to the public must be guarded. Patient handover information should not be overheard or shared with those not directly involved in the patient's ongoing treatment. Patient records, either electronic or written, must be protected against unwarranted viewing, thus patient clinical records must be shielded from the view of others, stored securely after treatment, and only handed over to those with direct patient care or supervisory responsibility, or authorised ambulance service officers. Discussion about each case/patient must not disclose personal information unless there is genuine and provable health benefit.[2]

3. Follow guidance before disclosing any patient information

It is not sufficient for clinicians to understand the basic principles of confidentiality alone. They must also understand and comply with their organisation's requirements for information sharing. Similarly, it is the responsibility of each service to ensure that data-sharing policies are produced, communicated, monitored, updated and reviewed.[1] If there is any doubt about the sharing of information, there must be a Data Protection Officer and/or a Caldicott Guardian available to advise.[4,5]

4. Conform to best practice

All grades of Ambulance Clinicians come into contact with the public and other NHS disciplines. Any temptation to share information unnecessarily with other people who are known to them must be avoided, as the responsibility lies firmly with the holder of the data, both individually and organisationally.[6] A commitment to best practice should be applied to all patient information in any form, e.g. patient records, electronic data, surface mail, email, faxes, telephone calls, conversations that may be overheard, private comments to friends or colleagues.[7]

5. Anonymise information where possible

Patient information is said to be anonymised when items such as those in section 1 are removed.[1-3] It means that the patient cannot be identified by the receiver of the information and any theoretical possibility of recognition is extremely small. Anonymise patient confidential data wherever possible and reasonable. If information is recorded, retained or transmitted in any way, it should be anonymised unless to do so would prevent any genuine health-benefit reasons for its collection/storage.[1, 2]

PATIENTS' RIGHTS OF ACCESS TO PERSONAL HEALTH RECORDS

Patients have a right to see, and obtain a copy of personal health information held about them.[8] This includes any legally appointed representative and those with parental responsibility for young patients. Children also have this right provided they have the capacity to understand the information. Ambulance Services have a right to charge for this information; guidelines exist for this.[3]

There are exceptions to patients' rights to see their personal health information. If the data could identify someone else and such data cannot be removed from the record, it is subject to legal restrictions. If access to data could cause serious harm to the patient or someone else's physical or mental well-being then the request can be refused.[1,8,9] Within ambulance service operations, these instances are extremely rare. If there is doubt about whether such exceptions exist, the Caldicott Guardian or Data Protection Officer should be consulted and agreement reached with the patient's lead clinician.[9]

Notwithstanding the exceptions noted above, clinicians should make every effort to support a patient's right to gain access to their personal health data. It is a requirement that such data should be received by the patient within 40 days of the request. To enable this, services should have clear written procedures in place to deal with such requests.[3]

DISCLOSURE TO OTHER BODIES AND ORGANISATIONS:

Police

The police have the right of access to personal information (name, address etc) in the investigation, detection and prevention of **any** crime. They also have the right of access to confidential health information (type of illness or injury etc.,) in the investigation, detection or prevention of a **serious** crime (rape, terrorism, murder etc).

They have no right to expect to receive information where criminality, clinician safety and public safety are not involved. Generalised information regarding attendance at an incident **may** be passed to the police through locally agreed procedures, where details of the incident location and what is involved may be disclosed – but passage of personal or confidential health data **may not**.

Fire Service and Other Emergency Services

There is no right of access for emergency service personnel other than the police to a patient's personal health information.[2] Situations may occur where clinicians feel that such disclosure would be in the best interests of the patient, or that by not disclosing it, other emergency workers could be put at risk. Clinicians should follow the best practice advice given in the section above on NHS Policy on such occasions. Otherwise, data access should be governed by formal documented requests and consideration by the Data Protection Officer and/or the Caldicott Guardian.

The Media

There is no basis for disclosure of confidential or identifiable information to the media. Services may receive requests for information in special circumstances, e.g. requests for updates on celebrity patients or following large incidents, when answering press statements (Public Interest exemption). In such instances, the explicit consent of the 'data subjects' should be gained and recorded prior to any disclosure.[2]

For Commercial Purposes

Ambulance Services are not registered to use patient information for primarily commercial purposes. If such use was permitted, each patient would need to give explicit consent for their data to be used within the commercial setting and be given an “opt out” facility. This would need to include all intended purposes of all parties to the agreement and lists of all persons/groups who would have access to the data.[3] Due to the nature of commercial enterprise, this consent would need to be explicit (expressly and actively given) as opposed to implied (acceptance without voicing an objection).

RESEARCH

All data for research should be anonymised wherever possible. If anonymisation would be contrary to the aims of the research, prior consent must be gained. Formal research guidelines exist for the use of health data and these must be consulted.

CONSENT

Consent and patient confidentiality are inextricably linked. In essence, the patient is said to be the owner of his/her own personal, non-anonymised patient data and therefore needs to give approval before it is used by other people.[9] There are exceptions to this general rule:

- There may be legal requirements to disclose data without consent, e.g. due to **notifiable diseases**. Even then, however, the patient must be informed that this has been executed.[3]

- Where there is a risk to the patient’s well being by not informing other professionals without consent, e.g. where a **child or vulnerable adult may be in need of protection** and informing the relevant authorities would appear to safeguard the patient’s best interests.

- **Inability to consent**, e.g. some children, adults who lack capacity or patients who are seriously ill or injured and who could reasonably be expected to give consent if it were otherwise possible to do so. Even in such circumstances, data must be used cautiously and anonymised where possible. If a proxy, guardian or parent is available, they should be consulted.[2]

- Use of personal information without consent may be justified if it is in the **public interest** to do so. This may occur to prevent or detect a serious crime, for example.

In all the above instances, the advice of a Service Caldicott Guardian and/or Data Protection Officer should be sought prior to the use or release of any personal health data.

Key Points – Patient Confidentiality

- Health professionals have a duty of confidentiality regarding patient information. The priority, however, is to ensure that all relevant information is passed to others to ensure ongoing patient care.
- Patient information must be recorded accurately, kept physically secure, and anonymised whenever possible.
- Follow guidance before disclosing any patient information. Data Protection Officers and Caldicott Guardians are there to assist.
- Emergency situations may call for the sharing of patient information with other, mainly emergency-agencies. Follow best practice and act in the best interest of the patient.
- Ensure you are aware of your Service rules for patient confidentiality and follow them – but remember that ongoing patient care should never be compromised in their application.

REFERENCES

1. Health Professions Council. Standards of conduct, performance and ethics: Your duties as a registrant London: Health Professions Council 2003.
2. NHS Scotland Code of Practice on Protecting Patient Confidentiality. Edinburgh: Scottish Executive Health Department. Available from:http://www.confidentiality.scot.nhs.uk/, 2003.
3. Data Protection Act 1998 1998.
4. NHS Executive. Report on the Review of Patient-identifiable Information – December 1997 (Caldicott Report). London: : HMSO, 1999.
5. Brooks J. Caldicott Guardians – driving the confidentiality agenda. *Br J Healthcare Comput Info Manage* 2004;21(3):20-1.
6. Thomas G. Team learning: the issue of patient confidentiality *Work Based Learning in Primary Care* 2004;2(4):377-380.
7. Medical Defence Union. Confidentiality: Medical Defence Union: London. Available from:ttp://www.the-mdu.com/gp/search/searchresults.asp, 2001.
8. General Medical Council. Confidentiality: protecting and providing information: General Medical Council: London. Available from: http://www.gmc-uk.org/guidance/library/confidentiality.asp, 2000.
9. Woogara J. Patients' rights to privacy and dignity in the NHS. *Nurs Stand* 2005;19(18):33-7.

Further Reading

The principles within the following documents have significant impact on patient confidentiality issues, and should be considered essential reading.

- Health Professions Council. Standards of conduct, performance and ethics: Your duties as a registrant: London: Health Professions Council 2003.
- NHS Scotland Code of Practice on Protecting Patient Confidentiality. Edinburgh: Scottish Executive Health Department. Available from:http://www.confidentiality.scot.nhs.uk/, 2003.Data Protection Act 1998
- Also, ***refer to consent guideline.***

METHODOLOGY

Refer to methodology section; see below for patient confidentiality search strategy.

Patient confidentiality strategy

Electronic databases searched:

CINAHL(Ovid) – years search 82 - 05

EMBASE (Ovid) – years search 80 - 05

MEDLINE (Ovid) – years search 66-95

MEDLINE (Ovid) – years search 66-05

ERIC (Ovid) – years search 66-05

EBM Review – years search All

AMED – years search 85 - 05

Search strategy:

MEDLINE	CINAHL	OTHERS
1. controlled.ab.	1. meta analysis/	1. meta.ab.
2. design.ab.	2. systematic review/	2. synthesis.ab.
3. evidence.ab.	3. systematic review.pt.	3. literature.ab.
4. extraction.ab.	4. (metaanaly$ or meta-analy$).tw.	4. randomized.hw.
5. randomized controlled trials/	5. metanal$	5. published.ab.
6. meta-analysis.pt.	6. information.pt.	6. meta-analysis.pt.
7. review.pt.	7. (review$ or overview$).ti.	7. extraction.ab.
8. sources.ab.	8. literature review/	8. trials.hw.
9. studies.ab	9. exp literature searching/	9. controlled.hw.
10. or/1-9	10. cochrane$.tw.	10. search.ab.
11. letter.pt.	11. synthes$.tw. adj3 (literature$ or research$ or studies or data).tw.	11. medline.ab.
12. comment.pt.	12. (medline or medlars or embase or scisearch or psycinfo or psychinfo or psyclit or psychlit).tw,sh.	12. selection.ab.
13. editorial.pt.	13. pooled analy$.tw.	13. sources.ab.
14. or/11-13	14. ((data adj2 pool$) and studies).tw.	14. trials.ab.
15. confidentiality.ab.	15. ((hand or manual$ or database$ or computer$) adj2 search$).tw.	15. review.ab.
16. 10 not 14	16. reference databases/	16. review.pt.
17. 15 and 16	17. ((electronic$ or bibliographic$) adj2 (database$ or data base$)).tw.	17. articles.ab.
	18. (review or systematic-review or practice-guidelines).pt.	18. reviewed.ab.
		19. english.ab.
		20. language.ab.
		21. comment.pt.
		22. letter.pt.
		23. editorial.pt.
		24. animal/
		25. human/
		26. 24 not (24 and 25)

MEDLINE	CINAHL	OTHERS
	19. (review$ or overview$).ab. 20. (systematic$ or methodologic$ or quantitativ$ or research$ or literature$ or studies or trial$ or effective$).ab. 21. 18 and 20 22. 19 adj10 20 23. or/1-17,21,22 24. editorial.pt. 25. letter.pt. 26. case study.pt. 27. record review/ 28. peer review/ 29. (retrospective$ adj2 review$).tw. 30. (case$ adj2 review$).tw. 31. (record$ adj2 review$).tw. 32. (patient$ adj2 review$).tw. 33. (patient$ adj2 chart$).tw. 34. (peer adj2 review$).tw. 35. (chart$ adj2 review$).tw. 36. (case$ adj2 report$).tw. 37. exp case control studies/ 38. exp prospective studies/ 39. case studies/ 40. human studies/ 41. "edit and review"/ 42. (adults$ or children).tw. 43. or/24-42 44. 43 not (43 and 23) 45. 23 not 44 46. patient AND confidentiality 47. 46 and 45	27. confidentiality 28. 27 not (21 or 22 or 23 or 26) 29. or/1-20 30. 28 and 29

Additional sources searched:

BNID - British Nursing Index – http://ds.datastarweb.com/ds/products/datastar/sheets/bnid.htm

British Medical Journal – http://bmj.bmjjournals.com

Centre for Reviews and Dissemination - http://www.york.ac.uk/inst/crd/crddatabases.htm

Department of Health – http://www.dh.gov.uk/Home/fs/en

Healthline – http://www.healthline.com

Health Politics – http://www.health-politics.com

LawDepot – http://legal.dotheresearch.com

Netreach – http://www.netreach.co.uk

Nurse-aide – http://www.nurse-aide.com

Official Documents Archive – http://www.archive.official-documents.co.uk

Office of Public Sector Information – http://www.opsi.gov.uk

The Cochrane Library – http://www.update-software.com/publications/cochrane

Reference sections from relevant articles were searched.

INTRODUCTION

Pain is one of the commonest symptoms in patients presenting to ambulance services.

Control of pain is important not only for humanitarian reasons but also because it may prevent deterioration of the patient and allow better assessment.

There is no reason to delay relief of pain because of uncertainty with the definitive diagnosis. It does not affect later diagnostic efficacy.[1]

Many studies have demonstrated the inadequacy of pre-hospital pain relief[2,3] and that time to pain relief is reduced by pre-hospital administration of analgesia.[4]

Pain is a multi-dimensional construct (**see Table 1**).

Table 1 – Dimensions of pain

Pain consists of several elements:	Pain relief will depend on:
• Treatment of the underlying condition. • Psychological support and explanation. • Physical methods e.g. splinting. • Pharmacological treatment.	• Cause, severity and nature of the pain. • Age of the patient. • Experience/knowledge of the clinician • Distance from receiving unit • Available resources.

ASSESSMENT

An assessment should be made of the requirements of the individual. Pain is a complex experience that is shaped by gender, cultural, environmental and social factors, as well as prior pain experience. Thus the experience of pain is unique to the individual.

It is important to remember that the pain a patient experiences cannot be objectively validated in the same way as other vital signs. Attempts to estimate the patient's pain should be resisted, as this may lead to an underestimation of the patient's experience. Several studies have shown that there is a poor correlation between the patient's pain rating and that of the health professional's, with the latter often underestimating the patient's pain.[5]

Instead, Ambulance Clinicians need to seek and accept the patient's self-report of their pain. This is reinforced by a popular and useful definition of pain: "pain is whatever the experiencing person says it is, existing whenever he/she says it does."[6]

Pain scoring

All patients in pain should have their pain assessed for its:

- nature
- severity
- duration
- location and radiation
- other factors that exacerbate or relieve the pain.

All patients with pain should have a pain severity score undertaken. It has been recognised that pain scoring increases awareness of pain, reveals previously unrecognised pain[7] and improves analgesic administration.[8]

There are a variety of methods of scoring pain using visual analogue scales and simple scoring systems. JRCALC consider that a simple **0-10** point verbal scale (**0=‘*no pain*’** and **10=‘*the worst pain imaginable*’**) will be the most appropriate method in most pre-hospital situations.

This should be undertaken on all patients who are in pain and should be repeated after each intervention (the timing of the repeat score depends on the expected time for the analgesic to have an effect). The absolute value is used in combination with the patient assessment to determine the type of analgesia and route of administration that is most appropriate. The trend in the scores is more important than the absolute value in assessing efficacy of treatment. Scoring will not be possible in all circumstances (e.g. cognitively impaired individuals, communication difficulties, altered level of consciousness) and in these circumstances behavioural cues will be more important in assessing pain).

MANAGEMENT

Analgesia should normally be introduced in an incremental way, considering timeliness, effectiveness and potential adverse events. However, it may be apparent from the assessment that it is appropriate to start with stronger analgesia e.g. in apparent myocardial infarction, fractured long bones. Entonox should be supplied until the other drugs have had time to take effect and if the patient is still in pain, other analgesics administered. Administering analgesia in this step-wise, incremental way minimises the amount of potent analgesia that is required.

Any pain relief must be accompanied by careful explanation of the patient's condition and the pain relief methods being used.

Management of Pain in Adults

Patients with chronic pain, including those receiving palliative care, may experience breakthrough pain despite their usual drug regime. They may require large doses of analgesics to have significant effect. If possible, contact should be made with the team caring for the patient.

TREATING THE CAUSE

Many conditions produce pain and it is vital to treat the cause of the pain, including underlying conditions. This will also help relieve the pain in many situations e.g. giving GTN in cardiac pain, oxygen in sickle cell crisis.

Table 2 – Non-Pharmacological Methods of Pain Relief.

Psychological	***Fear and anxiety*** worsen pain, reassurance and explanation can go a long way towards alleviation of pain. Distraction is a potent analgesic, commonly used in children, but may also apply to adults; simple conversation is the simplest form of distraction.
Dressings	***Burns dressings*** that may cool, such as those specifically designed for the task[9] or ***cellophane wrap***, can alleviate the pain. Burns should not be cooled for more than 20 minutes total time and care should be taken with large burns to prevent the development of hypothermia.[10] However, analgesia should also be provided at the earliest opportunity.
Splintage	Simple splintage of fractures provides pain relief as well as minimising ongoing trauma and bleeding.

NOTE: Most commonly, a patient requires a combination of pharmacological and non-pharmacological methods of pain relief. For example, morphine may be required to enable a splint to be applied.

Table 3 – Pharmacological Methods of Pain Relief (***refer to specific drug protocols***).

Inhalational analgesia	***Entonox*** (50% Nitrous Oxide 50% Oxygen) is a good analgesic for adults who are able to self administer and who can rapidly be taught to operate the demand valve. It is rapidly acting but has a very short half life, so the analgesic effect wears off rapidly when inhalation is stopped. It can be used as the first analgesic whilst other pain relief is instituted. It can also be used in conjunction with morphine, particularly during painful procedures such as splint application and patient movement.
Oral analgesia	***Paracetamol*** and ***ibuprofen*** may be used in isolation or together for the management of mild to moderate pain. It is important to assess the presence of contra-indications to all drugs including simple analgesics. Non-steroidal anti-inflammatory drugs are responsible for large numbers of adverse events, because of their gastro-intestinal side effects and their effects in asthmatics. Some ambulance services may also wish to add a paracetamol/codeine combination to their formulary.

Parenteral and enteral analgesia	***Morphine*** is approved for administration by Paramedics. It remains the gold standard for parenteral analgesia and can be used intravenously or orally. As with other opiates morphine is reversed by naloxone. When administering opiates, naloxone **MUST** be available. If clinically significant sedation or respiratory depression occurs following the administration of opiates the patient's ventilations should be assisted. Decisions to reverse the opiate effect using an opiate antagonist such as naloxone should be made cautiously as this will return the patient to their pre-opiate pain level. Opiate analgesics should not be given intramuscularly because of erratic absorption. The intravenous route has the advantage of rapid onset and the dose can be easily titrated against analgesic effect. ***Oral morphine*** is useful for less severe pain but has the disadvantage of delayed onset, some unpredictability of absorption and having to be given in a set dose. It has the advantage of avoiding the need for intravenous access. It is widely used for patients with mild/moderate pain from injuries such as forearm fractures and hip fractures. Those with severe pain are best treated with an intravenous preparation, augmented with entonox if required. Opiates are often required in sickle cell disease[11] (a review is underway to look at the optimal analgesic treatment in sickle cell disease[12]). There is no evidence that metoclopramide is effective in relieving the nausea induced by opiates in hospital situations[13,14] but this has not been evaluated in the pre-hospital environment where motion sickness may also contribute.
Intranasal opiates (morphine, diamorphine and fentanyl)	Intranasal opiates are not currently approved for administration by Paramedics. Although it has been suggested that they may be useful in the pre-hospital environment and are sometimes used by Doctors, legal restrictions on the administration of opiates by Paramedics have to be addressed before this will be possible. Intranasal opiate analgesia is becoming used more frequently in hospital[15] and has the advantage of potent, rapid action without needing parenteral administration.
Topical analgesia	In vulnerable adults or needle phobic adults, where venepuncture may be required in a non urgent situation, ***tetracaine gel 4%*** can be applied to the skin overlying a suitable vein and the area covered with an occlusive dressing. Such an application takes about 20-30 minutes to work.

METHODS OF PAIN REFLIEF WHICH REQUIRE APPROPRIATELY TRAINED DOCTORS

These methods are included because it is necessary to know what can be done to reduce pain before hospital, if time and logistics allow. A suitably trained (immediate care trained) Doctor should be called early to the scene if it is thought that such assistance may be necessary. Hospital personnel may not all have these skills.

Table 4 – Relief Which Requires Appropriately Trained Doctors.

Ketamine analgesia/ anaesthesia	**Ketamine** is particularly useful in entrapments where a person can be extricated with combined analgesic and sedative effects. At present only Doctors may administer ketamine. Ketamine is a non-opiate, parenteral analgesic that at higher doses is a general anaesthetic agent. It is particularly useful in serious trauma because it does not significantly depress blood pressure or respiration. Adults may experience unpleasant emergence phenomena. Ketamine produces salivation so careful airway management is important, although unnecessary interference should be avoided as laryngospasm may occasionally occur. Atropine may be used concurrently to minimise hypersalivation.
Regional anaesthesia	There is limited room for regional nerve blocks because of the environment and the need to transport the patient to hospital in a timely manner. However, they can be very effective in certain circumstances of severe pain and do not induce drowsiness or disorientation. Femoral nerve blocks may be useful and provide good analgesia for a lower limb injury such as a fractured femur. Clinicians undertaking regional anaesthesia must be suitably trained, prepared and experienced.

Key Points – Management of Pain in Adults

- Pain should be treated as early as possible.
- Pain relief does not affect later diagnosis.
- Pain management consists of treating the cause wherever possible, and analgesia involving psychological, physical and pharmacological interventions.
- All patients should have a pain score before and after each intervention.

REFERENCES

[1] Mackway-Jones K, Harrison M. Analgesia and assessment of abdominal pain. *Emerg Med J* 2000;17(2):128-a-129.

[2] Lord BA, Parsell B. Measurement of Pain in the pre-hospital setting using a visual analogue scale. *pre-hospital Disaster Med* 2003;18(4):353-8.

[3] Hennes H, Kim MK, Pirrallo RG. Pre-hospital pain management: a comparison of providers' perceptions and practices. *Prehosp Emerg Care* 2005 9(1):32-9.

[4] Abbuhl FB, Reed DB. Time to analgesia for patients with painful extremity injuries transported to the emergency department by ambulance. *Prehosp Emerg Care* 2003;7(4):445-7.

[5] Solomon P. Congruence between health professionals' and patients' pain ratings: a review of the literature. *Scandinavian Journal of Caring Sciences* 2001;15(2):174-180.

[6] McCaffery M, Pasero C. *Pain: Clinical manual*. 2nd ed. New York: Mosby, 1999.

[7] Lee JS, Hobden E, Stiell IG, Wells GA. Clinically Important Change in the Visual Analog Scale after Adequate Pain Control. *Acad Emerg Med* 2003;10(10):1128-1130.

[8] Silka PA, Roth MM, Moreno G, Merrill L, Geiderman JM. Pain Scores Improve Analgesic Administration Patterns for Trauma Patients in the Emergency Department. *Acad Emerg Med* 2004;11(3):264-270.

[9] Castner T, Harz C, Schloer J. Cooling – Out of the Bag: Rescue Service 2002. Available from: http://www.waterjel.nl/en/downloads_en.htm.

[10] Allison K, Porter K. Consensus on the pre-hospital approach to burns patient management. *Emergency Medical Journal* 2004;21:112-114.

[11] Rees DC, Olujohungbe AD, Parker NE, Stephens AD, Telfer P, Wright J. Guidelines for the management of the acute painful crisis in sickle cell disease. *British Journal of Haematology* 2003;120(5):744-752.

[12] Bennett KCLB, Dunlop R, Lau J, Benjamin LJ, Carr DB. Drug treatments for pain in sickle cell disease. (Protocol): The Cochrane Database of Systematic Reviews 2001.

[13] Alsalim W, Leung WC, Butler J. Metoclopramide versus placebo with opioid. *Emerg Med J* 2004;21(3):334-335.

[14] Dibble C. Are routine anti-emetics required with IV morphine? 2004. Available from: http://www.bestbets.org/cgi-bin/bets.pl?record=00266

[15] Kendall JM, Reeves BC, Latter VS. Multicentre randomised controlled trial of nasal diamorphine for analgesia in children and teenagers with clinical fractures. *BMJ* 2001;322(7281):261-265.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

All children in pain need analgesia[1], regardless of age or situation.

Pain is one of the commonest symptoms in patients presenting to ambulance services.

Control of pain is important not only for humanitarian reasons but also because it may prevent deterioration of the child and allow better assessment.

There is no excuse for leaving a child in pain because of lack of necessary skills in the clinician. If necessary, suitable expertise should be sought to provide pain relief.

Pain is a multi-dimensional construct (***see Table 1***).

Table 1 – Dimensions of pain.

Pain consists of several elements:	Pain relief will depend on:
• Treatment of the underlying condition. • Psychological support and explanation. • Physical methods e.g. splinting. • Pharmacological treatment.	• Cause, severity and nature of the pain. • Age of child. • Experience/knowledge of the clinician. • Distance from receiving unit. • Available resources.

ASSESSMENT

An assessment should be made of the requirements of the child. Pain is a complex experience that is shaped by gender, cultural, environmental and social factors, as well as prior pain experience. Thus the experience of pain is unique to the individual.

It is important to remember that the pain a child experiences cannot be objectively validated in the same way as other vital signs. Attempts to estimate the child's pain should be resisted, as this may lead to an underestimation of the child's experience. Several studies have shown that there is a poor correlation between the patient's pain rating and that of the health professional's, with the latter often underestimating the patient's pain.[2]

Instead, Ambulance Clinicians need to seek and accept the child's self-report of their pain. This is reinforced by a popular and useful definition of pain: "pain is whatever the experiencing person says it is, existing whenever he/she says it does."[3]

All children in pain should have their pain assessed for its nature, severity, duration, location and radiation and any factors that exacerbate or improve the pain.

Pain scoring

There is no validated method of pain scoring for children in the pre-hospital environment. It is suggested that, pending this, a method that has been validated in the paediatric emergency department (ED) setting is used. The Wong and Baker "faces" (scoring **0** = no hurt, **1** = hurts little bit, **2** = hurts little more, **3** = hurts even more, **4** = hurts whole lot, **5** = hurts worst) (***see appendix 1***)[4] are useful for younger children, as is the Alder Hey Triage Pain Score (AHTPS) (***see Appendix 2***). The AHTPS is a valid measure with good inter-observer rateability for use in EDs.[5] The trend in the scores is more important than the absolute value in assessing efficacy of treatment. Scoring will not be possible in all circumstances (e.g. cognitively impaired individuals, communication difficulties, altered level of consciousness) and in these circumstances behavioural cues will be more important in assessing pain.

MANAGEMENT

Analgesia should normally be introduced in an incremental way, considering timeliness, effectiveness and potential adverse events.

Generally this should always include the *non-pharmacological* methods of treatment as a starting point and background to all pharmacological therapy.

However, it may be apparent from the assessment that it is appropriate to start with stronger analgesia because of the child's condition; for example, a child with bilateral fractured femurs is likely to require vascular access to provide circulatory replacement and will be in severe pain. It would, therefore, be inappropriate to try paracetamol and ibuprofen and wait for them to work. Intravenous morphine would be indicated at an early stage, along with non pharmacological methods of pain control. However, a child with a small superficial burn might try paracetamol with or without ibuprofen.

Entonox should be supplied until the other drugs have had time to take effect, and, if the child is still in pain, other analgesics administered. Administering analgesia in this step-wise, incremental way minimises the amount of potent analgesia that is required.

Any pain relief must be accompanied by careful explanation, involving the child, where possible, and the carer. Include details of the child's condition, the pain relief methods being used, and any possible side-effects.

Children with chronic pain, including those receiving palliative care, may experience breakthrough pain despite their usual drug regime. They may require large doses of analgesics to have significant effect. If possible, contact should be made with the team caring for the child.

NON-PHARMACOLOGICAL METHODS OF PAIN RELIEF

Treating the Cause

Many conditions produce pain and it is vital to treat the cause of the pain, including underlying conditions. This will also help relieve the pain in many situations, e.g. giving oxygen in sickle cell crisis.

Table 2 – Non-Pharmacological Methods of Pain Relief.

Psychological	***Fear and anxiety*** worsen pain and a *child friendly environment* (for example removing equipment which may cause fear and having toys or child friendly pictures around) may go a long way towards alleviation of pain. The ***presence of a parent*** has been shown to reduce the unpleasantness of hospital emergency procedures more than any other single factor and there is no reason why this should not be true in the pre-hospital setting. ***Distraction*** (toys, stories, games etc.) is a potent analgesic – whatever is to hand may be used, but there is no substitute for forward planning.[1]
Dressings	Burns dressings that may cool, such as those specifically designed for the task[6] or cellophane wrap, can alleviate the pain in the burnt or scalded child. Burns should not be cooled for more than 20 minutes total time and care should be taken with large burns to prevent the development of hypothermia.[7]
Splintage	Simple splintage of fractures may provide pain relief as well as minimising ongoing trauma and bleeding.

NOTE: These should be part of all other methods of pain relief.

PHARMACOLOGICAL METHODS OF PAIN RELIEF
(*refer to specific drug protocols*)

Table 3 – Pharmacological Methods of Pain Relief (***refer to specific drug protocols***).

Topical analgesia	It is no longer acceptable to consider the pre-hospital portion of the child's treatment in isolation. The child is on a pathway of care, from the pre-hospital scene to the most appropriate setting within the hospital. Care that can be improved by one sector (pre-hospital) to enhance the quality of another (hospital cannulation) should be provided. Local anaesthetic agents such as **tetracaine gel 4%** can be applied to the skin overlying a suitable vein and the area covered with an occlusive dressing if it is thought likely that the child will require (further) venepuncture on arrival in hospital. Such an application takes about 20-30 minutes to work.
Oral analgesia	**Paracetamol** and **ibuprofen** may be used in isolation or together for the management of mild to moderate pain. **Oral morphine solution** may also prove very effective in the child with moderate to severe pain such as a fractured forearm, but has the disadvantage of delayed onset, some unpredictability of absorption and having to be given in a set dose. It has the advantage of avoiding the need for intravenous access. Those with severe pain are best treated with an intravenous preparation, augmented with entonox if required.
Inhalational analgesia	**Entonox (50% Nitrous Oxide 50% Oxygen)** is a good analgesic for children who are able to self-administer and who can rapidly be taught to operate the demand valve. It is rapid acting but has a very short half life, so the analgesic effect wears off rapidly when inhalation is stopped. It can be used as the first analgesic whilst other pain relief is instituted. It can also be used in conjunction with morphine, particularly during painful procedures such as splint application and patient movement. Quite young children, providing they can be taught to operate the demand valve, and the child's fear of the noise of the gas flow and the mask can be overcome, can use the system. Flavoured (e.g. bubblegum) clear masks may help the child overcome the fear.
Parenteral and enteral analgesia	**Morphine** remains the gold standard for analgesia and can be administered intravenously, intraosseously, and orally (***refer to morphine drug protocols***). Opiate analgesics should be given intravenously rather than intramuscularly to avoid erratic absorption. As with the other opiates, morphine is reversed by naloxone. When administering opiates to children naloxone **MUST** be available and the required dose calculated in case urgent reversal is necessary. If clinically significant sedation or respiratory depression occurs following the administration of opiates, the child's ventilation should be assisted. Decisions to reverse the opiate effect using an opiate antagonist such as naloxone should be made cautiously as this will return the child to their pre-opiate pain level. Intranasal opiates (morphine, diamorphine and fentanyl) are not currently approved for Paramedic administration. Intranasal opiate analgesia is becoming used more frequently in hospital[8] and has the advantage of potent, rapid action without needing parenteral administration. There is no evidence that metoclopramide is effective in relieving nausea induced by opiates. Children have a significant risk of dystonic reactions with metoclopramide and therefore it is not advised in these circumstances.

PAIN RELIEF WHICH REQUIRES APPROPRIATELY TRAINED DOCTORS

These methods are included because it is necessary to know what can be done to reduce pain in children before hospital, if time and logistics allow. A suitably trained (immediate care trained) Doctor should be called early to the scene if it is thought that such assistance may be necessary. Hospital personnel may not all have these skills.

Table 4 – Pain Relief Methods Which Require Appropriately Trained Doctors.

Ketamine analgesia/ anaesthesia	**Ketamine** is particularly useful in entrapments where a child can be extricated with combined analgesic and sedative effects. At present only Doctors may administer ketamine. Ketamine is a non-opiate, parenteral analgesic that at higher doses is a general anaesthetic agent. It is particularly useful in serious trauma because it does not significantly depress blood pressure or respiration. Older children in particular may experience unpleasant emergence phenomena but these tend to be less common in the young. Ketamine produces salivation so careful airway management is important, although unnecessary interference should be avoided as laryngospasm may occasionally occur. Atropine may be used concurrently to minimise hypersalivation.
Regional anaesthesia	There is limited room for regional nerve blocks because of the environment and the need to transport the child to hospital in a timely manner. However, they can be very effective in certain circumstances of severe pain and do not induce drowsiness or disorientation. Femoral nerve blocks may be useful and provide good analgesia for a lower limb injury such as a fractured femur. Clinicians undertaking regional anaesthesia must be suitably trained, prepared and experienced.

Table 5 – Pre-hospital analgesic drugs used in children.

Drug	Route	Pain Severity	Advantages	Disadvantages
Tetracaine gel 4%	Topical	N/A	Reduces pain of venepuncture.	Takes at least 20 minutes to work.
Paracetamol	Oral, Rectal	Mild-moderate	Not currently parenteral. Well accepted, antipyretic.	Slow action.
Ibuprofen	Oral	Mild-moderate	Moderately good analgesic, antipyretic and anti-inflammatory.	Slow action. May cause bronchospasm in asthmatics.
Entonox	Inhaled	Mild-moderate	Quick, dose self regulating.	Fear of mask. Understanding, coordination and cooperation equired.
Oral morphine	Oral	Moderate-severe	Good analgesic for minor/moderate injuries.	May need to adjust dose of IV morphine if given subsequently. Slow action.
Morphine	Intravenous Intraosseous Intranasal[1]	Severe	Rapid onset. Easily reversed with naloxone. Some euphoria.	Need access. Respiratory depression, vomiting. Controlled drug.
Diamorphine[1]	Intranasal Intravenous Intraosseous	Severe	Intranasal – quick and effective.	As for morphine if given IV. More euphoria. Intranasal not currently approved for Paramedics.
Ketamine[1]	Intravenous Intramuscular	Severe	Can be increased to general anaesthesia in experienced hands. No respiratory depression.	Emergence phenomena, salivation, occasional laryngospasm.

[1]Currently not approved for Paramedic administration. Doctor administration only.

Key Points – Management of Pain In Children

- All children in pain need analgesia.
- The method of pain relief used will depend on the cause, severity, nature of the pain and age of child.
- Analgesia should be introduced incrementally.
- Pain scoring faces are useful for use with young children.
- Morphine remains the gold standard for parenteral analgesia and the appropriate dose of naloxone should also be calculated and available.

REFERENCES

1 Royal College of Paediatrics and Child Health. Prevention and Control of Pain in Children. *A Manual for Health Care Professionals* London: BMJ Publishing Group, 1997.

2 Solomon P. Congruence between health professionals' and patients' pain ratings: a review of the literature. *Scandinavian Journal of Caring Sciences* 2001;15(2):174-180.

3 McCaffery M, Pasero C. *Pain: Clinical manual.* 2nd ed. New York: Mosby, 1999.

4 Wong D, Baker C. Pain in children: comparison of assessment scales. *Pediatric Nursing* 1988;14(1):9-17.

5 Jewkes F, Lubas P, McCusker K, editors. *Pre-hospital Paediatric Life Support* 2nd ed. London: Blackwells, 2005.

6 Castner T, Harz C, Schloer J. Cooling – Out of the Bag: Rescue Service 2002.

7 Allison K, Porter K. Consensus on the pre-hospital approach to burns patient management. *Emergency Medical Journal* 2004;21:112-114.

8 Kendall JM, Reeves BC, Latter VS. Multicentre randomised controlled trial of nasal diamorphine for analgesia in children and teenagers with clinical fractures. *BMJ* 2001;322(7281):261-265.

METHODOLOGY

Refer to methodology section.

APPENDIX 1 – The Wong-Baker FACES Pain Rating Scale

This rating scale is recommended for persons age 3 years and older.

Instructions: Point to each face using the words to describe the pain intensity. Ask the child to choose face that best describes own pain and record the appropriate number.

Instructions: Explain to the person that each face is for a person who feels happy because he has no pain (hurt) or sad because he has some or a lot of pain.

Face 0 is very happy because he doesn't hurt at all.

Face 1 hurts just a little bit.

Face 2 hurts a little more.

Face 3 hurts even more.

Face 4 hurts a whole lot.

Face 5 hurts as much as you can imagine, although you don't have to be crying to feel this bad.

Ask the person to choose the face that best describes how he is feeling.

From Hockenberry MJ, Wilson D, Winkelstein ML: *Wong's Essentials of Pediatric Nursing*, ed. 7, St. Louis, 2005, p. 1259. Used with permission. Copyright, Mosby.

APPENDIX 2 – Alder Hey Triage Pain Score

Response	Score 0	Score 1	Score 2
Cry or voice	No cry/complaint Normal conversation	Consolable, not talking, negative	Inconsolable Complaining of pain
Facial Expression	Normal	Short grimace <50% of the time	Long grimace >50% of the time
Posture	Normal	Touching/rubbing/ sparing	Defensive/tense
Movement	Normal	Reduced/restless	Immobile/thrashing
Colour	Normal	Pale	Pale “green”

EXPLANATORY NOTES

Cry/Voice	
Score 0	Child not crying; although quiet is vocalising appropriately and noticing surroundings.
Score 1	Child crying but consolable or is excessively quiet and negative towards carer. On direct questioning says it’s painful.
Score 2	Child is inconsolable, crying and/or persistently complaining about pain.

Facial expression	
Score 0	Normal expression and affect.
Score 1	Some transient expressions that suggest pain but less than 50% of the time.
Score 2	Persistent facial expressions suggesting pain/distress more than 50% of the time. Grimace – open mouth, lips pulled back at corners, furrowed forehead and/or between eyebrows, eyes closed, wrinkled at corners.

Posture – This relates to the child’s behaviour towards the affected body area.	
Score 0	Normal.
Score 1	Exhibiting increased awareness of body area e.g. by touching, rubbing, pointing, sparing or limping.
Score 2	Affected area is held tense and defended so that touching it is deterred, non weight bearing.

Movement	
Score 0	Normal.
Score 1	Movement is reduced or child is noted to be restless/uncomfortable.
Score 2	Movement is abnormal – either very still/rigid or writhing in agony/shaking.

Colour	
Score 0	Normal.
Score 1	Pale.
Score 2	Very pale “green”, the colour that is sometimes seen with nausea or fainting/extreme pallor.

This section outlines the common drugs currently available for administration by Ambulance Clinicians (***refer to specific drug protocols***).

Legal Considerations

Drugs administered by Ambulance Clinicians fall into two categories:

1. non-prescription drugs such as aspirin
2. drugs under the Medicines Act 1968[1] designated prescription-only medicines (POMs). Under normal circumstances, POMs can only be prescribed by a qualified Doctor (or dentist) but exemptions exist under Part III of Schedule 5 to the Prescription Only Medicines (Human Use) Order 1997 which allow suitably trained ambulance Paramedics to administer these drugs in specified circumstances. For the purposes of this order a Paramedic is defined as being on the register of Paramedics maintained by the Health Professions Council pursuant to paragraph 11 of Schedule 2 to the Health Professions Order 2001.

Safety Aspects

Always check drugs to ensure the correctness of:

- type
- strength
- packaging intact
- clarity of fluid
- expiry date.

Drug Documentation

The following should be noted:

- avoid unnecessary use of decimal points, e.g. 3mg, not 3.0mg
- quantities of 1 gram or more should be written as 1g etc.,
- quantities less than 1 gram should be written in milligrams, e.g. 500mg, not 0.5g
- quantities less than 1mg should be written in micrograms, e.g. 100 micrograms, not 0.1mg
- when decimals are unavoidable a zero should be written in front of the decimal point where there is no other figure, e.g. 0.5mL, not .5mL
- use of the decimal point is acceptable to express a range, e.g. 0.5 to 1g
- 'micrograms' and 'nanograms' should not be abbreviated nor should 'units'
- in medicine and pharmacy the term 'millilitre' (ml or mL) is used; cubic centimetre, c.c., or cm^3 should not be used.

Drug Prescribing Terms

In the case of prescription medicines, a variety of abbreviations are used, some of which are described ***Appendix 1***.

NOTE: Internationally recognised units and symbols are used where possible.

DRUG ROUTES

There are a number of drug routes that appropriately trained ambulance personnel can use to administer drugs. These are divided into parenteral routes (***see Table 1***), which require a physical breach of the skin or mucous membrane (e.g. by injection) and non-parenteral routes (***see Table 2***) (i.e. absorbed passively via the gastro-intestinal tract, mucous membranes or skin).

Table 1 – Parenteral Routes

Intramuscular (IM)	Injection of the drug into muscle, which is then absorbed into the blood. Absorption may be decreased in poor perfusion states.
Intra-osseous (IO)	A rigid needle inserted directly into the bone marrow. Resuscitation drugs and fluid replacement may be administered by this route. Absorption is as quick as by the intravenous route.
Intravenous (IV)	Direct introduction of the drug into the cardiovascular system that normally delivers the drug to the target organs very quickly.
Subcutaneous (SC)	Injection of the drug into subcutaneous tissue. This has a slower rate of absorption than from IM injection.

Table 2 – Non-Parenteral Routes

Endotracheal (ET)	Facilitates the rapid absorption of drugs from the bronchial tree when administered through an ET tube. Often used as a secondary route in cardiac arrest patients when IV access has not been established. Drug doses must be doubled and the drug "blown down" to maximise effectiveness. Absorption is variable.
Inhaled (INH)	Gaseous drugs that are absorbed via the lungs.
Nebulisation (Neb)	Liquid drugs agitated in a stream of oxygen create fine droplets that are absorbed rapidly from the lungs.
Oral	Drug is swallowed and is absorbed into the blood from the gut. Effects usually start 30–40 minutes after administration. In serious trauma or illness, absorption may be delayed.
Rectal	Drug is absorbed from the wall of the rectum. This route is used for patients who are having seizures and who cannot be cannulated without risk to themselves or ambulance personnel. Effects usually occur 5–15 minutes after administration.
Sublingual	Tablet or aerosol spray is absorbed from the mucous membrane beneath the tongue. Effects usually occur within 2–3 minutes.
Transdermal (TD)	Absorption of a drug through the skin.

REFERENCES

1. HM Government. The Medicines Act 1968 (Commencement No. 8) Order 1989 Statutory Instrument 1989 No. 192 (C. 6) London: HMSO. Available from: http://www.opsi.gov.uk/si/si1989/Uksi_19890192_en_1.htm.
2. HM Government. The Prescription Only Medicines (Human Use) Amendment Order 2003. Statutory Instrument 2003 No. 696: London: HMSO. Available from: http://www.opsi.gov.uk/si/si2003/20030696.htm
3. Joint Formulary Committee, editor. *British National Formulary*. 50th ed. London: British Medical Association and Royal Pharmaceutical Society of Great Britain, 2005.

APPENDIX 1 – Some common abbreviations[4]

ac	ante cibum (before food)
approx	approximately
bd	twice daily
CD	preparation subject to prescription requirements under The Misuse of Drugs Act
ec	enteric-coated (termed gastro-resistant in BP)
f/c	film-coated
IM	intramuscular
IV	intravenous
m/r	modified-release
MAOIs	monoamine-oxidase inhibitors
max	maximum
MR	modified release
NSAID	non-steroidal anti-inflammatory drug
o. d	omni die (every day)
o. m	omni mane (every morning)
o. n	omni nocte (every night)
p. c	post cibum (after food)
PGD	patient group direction
POM	prescription only medicine
pr	per rectum (rectally)
prn	when required
q.d.s	quater die sumendus (to be taken four times daily)
q.q.h	quarta quaque hora (every four hours)
s/c	sugar-coated
SOS	when required
SR	slow release
stat	immediately
t.d.s	ter die sumendus (to be taken three times daily)
t.i.d	ter in die (three times daily)
top	topical

The drug codes listed below are provided for **INFORMATION ONLY** and represent drugs that may be commonly encountered in the emergency/urgent care environment. **ONLY** the drugs listed in the drug protocol section of these guidelines are for use by registered Paramedics; the remaining drugs are for use by physicians or under patient group directions by Paramedics who have undertaken extended training.

DRUG NAME	CODE	KEY
ADENOSINE	**ADE**	ADENOSINE
ADRENALINE (EPINEPHRINE) 1:1,000	**ADM**	ADRENALINE1:1,000 preparation (**'M'** indicates **'1,000'**)
ADRENALINE (EPINEPHRINE) 1:10,000	**ADX**	ADRENALINE 1:10,000 preparation (**'X'** indicates **'10'**,000)
AMINOPHYLLINE	**AMN**	AMINOPHYLLINE
AMIODARONE	**AMO**	AMIODARONE
AMOXICILLIN	**AMX**	AMOXICILLIN
ALTEPLASE	**APL**	ALTEPLASE
ASPIRIN	**ASP**	ASPIRIN
ATRACURIUM	**ATC**	ATRACURIUM
ATROPINE	**ATR**	ATROPINE
BENZYLPENICILLIN	**BPN**	BENZYLPENICILLIN
CEFALEXIN	**CEF**	CEFALEXIN
CEFOTAXIME	**CFT**	CEFOTAXIME
CO-DYDRAMOL	**CDY**	CO-DYDRAMOL
CHLORPROMAZINE	**CHZ**	CHLORPROMAZINE
CODEINE	**COD**	CODEINE
CODEINE-PARACETAMOL COMBINATION	**CPC**	CODEINE-PARACETAMOL COMBINATION
COLLOID GEL SOLUTION	**COL**	COLLOID GEL SOLUTION (Gelofusine, Haemaccel)
CHLORPHENAMINE (CHLORPHENIRAMINE)	**CPH**	CHLORPHENAMINE
CHLORAMPHENICOL EYE PREPARATION	**CPL**	CHLORAMPHENICOL
CETIRIZINE	**CTZ**	CETIRIZINE
CIPROFLOXACIN	**CXN**	CIPROFLOXACIN
COAMOXICLAV	**CXV**	COAMOXICLAV
CYCLIMORPH	**CYM**	CYCLIMORPH
CYCLIZINE	**CYZ**	CYCLIZINE
CLOTRIMAZOLE	**CZL**	CLOTRIMAZOLE
DICLOFENAC	**DCF**	DICLOFENAC
DICOBALT EDETATE	**DCO**	DICOBALT EDETATE
DIHYDROCODEINE	**DHC**	DIHYDROCODEINE
DIAMORPHINE	**DMO**	DIAMORPHINE
DOMPERIDONE	**DMP**	DOMPERIDONE
DOXYCYCLINE	**DXN**	DOXYCYCLINE
DIAZEPAM	**DZP**	DIAZEPAM
ENOXAPARIN (low molecular weight heparin)	**ENP**	ENOXAPARIN
ERGOMETRINE MALEATE	**ERG**	ERGOMETRINE MALEATE
ERYTHROMYCIN	**ERY**	ERYTHROMYCIN
ETOMIDATE	**ETO**	ETOMIDATE
FLUCLOXACILLIN	**FCX**	FLUCLOXACILLIN
FLUORESCEIN SODIUM	**FLR**	FLUORESCEIN SODIUM
FLUMAZENIL	**FLZ**	FLUMAZENIL
FUROSEMIDE	**FRM**	FUROSEMIDE
FUSIDIC ACID EYE PREPARATION	**FUA**	FUSIDIC ACID
GLUCOSE GEL	**GLG**	GLUCOSE GEL
GLUCOSE 50%	**GLL**	GLUCOSE 50% (Latin suffix **'L'** used to indicate '50'%)

Drugs

JRCALC Drug Codes – July 2006

DRUG NAME	CODE	KEY
GLUCAGON	**GLU**	GLUCAGON
GLUCOSE 10%	**GLX**	GLUCOSE 10% (**'X'** indicates '10'%)
GLYCERYL TRINITRATE (GTN)	**GTN**	GLYCERYL TRINITRATE
HEPARIN (STANDARD UNFRACTIONATED)	**HEP**	HEPARIN
HALOPERIDOL	**HPD**	HALOPERIDOL
HYDROCORTISONE	**HYC**	HYDROCORTISONE
IBUPROFEN	**IBP**	IBUPROFEN
IPRATROPIUM BROMIDE	**IPR**	IPRATROPIUM BROMIDE
KETAMINE	**KET**	KETAMINE
LIDOCAINE (LIGNOCAINE)	**LID**	LIDOCAINE
LORAZEPAM	**LRZ**	LORAZEPAM
LEVONORGESTREL	**LVG**	LEVONORGESTREL
MIDAZOLAM	**MDZ**	MIDAZOLAM
MORPHINE SULPHATE	**MOR**	MORPHINE
METOCLOPRAMIDE	**MTC**	METOCLOPRAMIDE
METHYLPREDNISOLONE	**MTP**	METHYLPREDNISOLONE
METRONIDAZOLE	**MTZ**	METRONIDAZOLE
NITROFURANTOIN	**NFT**	NITROFURANTOIN
NALBUPHINE HYDROCHLORIDE	**NLB**	NALBUPHINE
NALOXONE HYDROCHLORIDE	**NLX**	NALOXONE
NITROUS OXIDE/OXYGEN 50/50	**NOO**	NITROUS OXIDE AND OXYGEN 50/50
OBIDOXIME CHLORIDE	**ODC**	OBIDOXIME CHLORIDE
ONDANSETRON	**ODT**	ONDANSETRON
ORAL REHYDRATION SALTS	**ORS**	ORAL REHYDRATION SALTS
OXYTOCIN	**OXT**	OXYTOCIN
OTOSPORIN EAR DROPS	**OTS**	OTOSPORIN EAR DROPS
OXYGEN	**OXG**	OXYGEN
OXYTETRACYCLINE	**OXL**	OXYTETRACYCLINE
PARACETAMOL TABLETS, ORAL SOLUTION OR SUSPENSION	**PAR**	PARACETAMOL
PROCYCLIDINE	**PCY**	PROCYCLIDINE
PROCHLORPERAZINE	**PCZ**	PROCHLORPERAZINE
PRALIDOXIME MESYLATE	**PDM**	PRALIDOXIME MESYLATE
PREDNISOLONE	**PRD**	PREDNISOLONE
PENICILLIN V	**PNV**	PENICILLIN V
PHENOXYMETHYLPENICILLIN	**PHP**	PHENOXYMETHYLPENICILLIN
PROPOFOL	**PPL**	PROPOFOL
PETHIDINE	**PTH**	PETHIDINE
ROCURONIUM	**RCR**	ROCURONIUM
RETEPLASE	**RPA**	RETEPLASE
SODIUM CHLORIDE 0.9%	**SCP**	SODIUM CHLORIDE (PHYSIOLOGICAL 0.9%)
SALBUTAMOL	**SLB**	SALBUTAMOL
SODIUM LACTATE, COMPOUND	**SLC**	SODIUM LACTATE COMPOUND
SODIUM THIOPENTONE	**STP**	SODIUM THIOPENTONE
SUXAMETHONIUM	**SUX**	SUXAMETHONIUM
SYNTOMETRINE	**SYN**	SYNTOMETRINE
TRAMADOL	**TRM**	TRAMADOL
TERBUTALINE	**TER**	TERBUTALINE
TETANUS IMMUNOGLOBULIN	**TIG**	TETANUS IMMUNOGLOBULIN
TRIMETHOPRIM	**TMP**	TRIMETHOPRIM
TENECTEPLASE	**TNK**	TNK (in common use)
TETRACAINE (AMETHOCAINE)	**TTC**	TETRACAINE
TETANUS/LOW DOSE DIPHTHERIA VACCINE	**TTD**	TETANUS TOXOID/LOW DOSE DIPHTHERIA
VECURONIUM	**VEC**	VECURONIUM
WATER FOR INJECTION	**WFI**	WATER FOR INJECTION

PRESENTATION

Pre-filled syringe or ampoule containing 1 milligram of adrenaline (epinephrine) in 1ml (1:1,000) ADM.

Pre-filled syringe containing 1 milligram of adrenaline (epinephrine) in 10ml (1:10,000) ADX.

ACTIONS

Adrenaline is a sympathomimetic that stimulates both alpha- and beta-adrenergic receptors. As a result the **myocardial** and **cerebral** blood flow is enhanced during CPR and CPR becomes more effective due to increased peripheral resistance maintaining a central blood reserve.

Reverses allergic manifestations of acute anaphylaxis.

Relieves bronchospasm in acute severe asthma.

CAUTIONS

Severe hypertension may occur in patients on beta-blockers and half doses should be administered unless there is profound hypotension.

For patients taking tricyclic anti-depressants (e.g. amitriptyline, imipramine) half doses of adrenaline should be administered for anaphylaxis.

INDICATIONS

Cardiac arrest

Anaphylaxis

Life threatening asthma with failing ventilation and continued deterioration despite nebuliser therapy.

CONTRA-INDICATIONS

Do not give repeated doses of adrenaline in hypothermic patients.

DOSAGE AND ADMINISTRATION

1. Cardiac arrest

Route: IV/ET rapid bolus

Concentration – 1 milligram in 10ml (1:10,000)

AGE	DOSE	VOLUME
Adult	1 milligram (IV)	**10.0ml**
Adult	3 milligrams (ET)	**30.0ml**
11 years	350 micrograms	**3.5ml**
10 years	320 micrograms	**3.2ml**
9 years	290 micrograms	**2.9ml**
8 years	260 micrograms	**2.6ml**
7 years	230 micrograms	**2.3ml**
6 years	210 micrograms	**2.1ml**
5 years	190 micrograms	**1.9ml**
4 years	160 micrograms	**1.6ml**
3 years	140 micrograms	**1.4ml**
2 years	120 micrograms	**1.2ml**
18 months	110 micrograms	**1.1ml**
12 months	100 micrograms	**1.0ml**
9 months	90 micrograms	**0.90ml**
6 months	80 micrograms	**0.80ml**
3 months	60 micrograms	**0.60ml**
1 month	44 micrograms	**0.44ml**
Birth	N/A	**N/A**

REPEAT every 3-5 minutes of ongoing cardiac arrest.

2. Anaphylaxis

Route: IM antero-lateral aspect of thigh or upper arm.

Concentration – 1000 micrograms in 1ml (1:1,000)

AGE	DOSE	VOLUME
Adult	500 micrograms	**0.50ml**
6 years-<12 years	250 micrograms	**0.25ml**
6 months-<6 years	120 micrograms	**0.12ml**
<6 months	50 micrograms	**0.05ml**

REPEAT every 5 minutes as clinically indicated.

NOTE: 250 micrograms in pre-pubertal children even if >12 years of age.

3. Asthma

Route: SC/IM – antero-lateral aspect of thigh or upper arm.

Concentration – 1000 micrograms in 1ml (1:1,000)

AGE	DOSE	VOLUME
Adult	500 micrograms	**0.5ml**
Child	Not indicated	

REPEAT after 5 minutes if clinically indicated.

PRESENTATION

Pre-filled syringe containing 300 milligrams amiodarone in 10ml.

INDICATIONS

Ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT) refractory to defibrillating shocks.

ACTIONS

Class 3 antiarrhythmic, lengthens cardiac action potential & therefore effective refractory period and QT interval on ECG.

Blocks potassium channels in cardiac muscle.

Significant sodium channel blocking activity.

CONTRA-INDICATIONS

No other contra-indications in the context of the treatment of cardiac arrest.

SIDE EFFECTS

Bradycardia.

Vasodilatation causing hypotension, flushing.

Bronchospasm.

Arrhythmias – Torsades de pointes.

DOSAGE AND ADMINISTRATION

Route: IV intravenous bolus – single dose (or IO < 7 years)

CONCENTRATION – 300 milligrams in 10ml

AGE	DOSE	VOLUME
Adult	300 milligrams bolus single dose	**10.0ml**
11 years	177 milligrams bolus single dose	**5.9ml**
10 years	159 milligrams bolus single dose	**5.3ml**
9 years	144 milligrams bolus single dose	**4.8ml**
8 years	129 milligrams bolus single dose	**4.3ml**
7 years	114 milligrams bolus single dose	**3.8ml**
6 years	102 milligrams bolus single dose	**3.4ml**
5 years	93 milligrams bolus single dose	**3.1ml**
4 years	81 milligrams bolus single dose	**2.7ml**
3 years	72 milligrams bolus single dose	**2.4ml**
2 years	60 milligrams bolus single dose	**2.0ml**
18 months	57 milligrams bolus single dose	**1.9ml**
12 months	48 milligrams bolus single dose	**1.6ml**
9 months	45 milligrams bolus single dose	**1.5ml**
6 months	39 milligrams bolus single dose	**1.3ml**
3 months	30 milligrams bolus single dose	**1.0ml**
1 month	21 milligrams bolus single dose	**0.70ml**
Birth	N/A	**N/A**

NOTE: Administer into large vein as extravasation can cause burns.

NOTE: NEVER to be given via endotracheal route.

PRESENTATION

300 milligram aspirin (acetylsalicylic acid) in tablet form (dispersible).

ACTIONS

Has an anti-platelet action which reduces clot formation.

Analgesic, anti-pyretic and anti-inflammatory.

INDICATIONS

Adults with:

clinical or ECG evidence of myocardial infarction or ischaemia

central chest pain, possibly of cardiac origin.

Aspirin should be administered to any patient with chest pain unless the diagnosis is very clearly non-cardiac or the drug is contraindicated.

CAUTIONS

As the likely benefits of a single 300 milligram aspirin outweigh the potential risks, aspirin may be given to patients with:

Asthma

Pregnancy

Kidney or liver failure

Gastric or duodenal ulcer

CONTRA-INDICATIONS

Known aspirin allergy or sensitivity.

Children under 16 years.

Current treatment with anti-coagulants.

Haemophilia or other clotting disorders.

SIDE EFFECTS

Gastric bleeding.

Wheezing in some asthmatics.

DOSAGE AND ADMINISTRATION

Adults

Adults with **apparent, suspected or possible** myocardial infarction.

Route: Oral – chewed or dissolved in water

Concentration – 300 milligrams.

AGE	DOSE	VOLUME
Adult	300 milligrams	**1 tablet**

ADDITIONAL INFORMATION

In suspected MI a 300 milligram aspirin tablet should be given regardless of any previous aspirin taken that day.

Aspirin is contra-indicated in children under the age of 16 years as it may rarely precipitate Reye's Syndrome. This syndrome is very rare and occurs in young children, damaging the liver and brain. It has a mortality rate of 50%.

PRESENTATION

Pre-filled syringe containing 1 milligram atropine in 10ml.

Pre-filled syringe containing 1 milligram atropine in 5ml.

Pre-filled syringe containing 3 milligrams atropine in 10ml.

An ampoule containing 600 micrograms in 1ml.

ACTIONS

May reverse effects of vagal overdrive.

May increase heart rate by blocking vagal activity in sinus bradycardia, second or third degree heart block.

Enhances A-V conduction.

INDICATIONS

Cardiac arrest, after administration of adrenaline, in the management of asystole or pulseless electrical activity (PEA) with a rate of 60 or below.

Symptomatic bradycardia in the presence of **ANY** of these adverse signs:

- absolute bradycardia (pulse <40 beats per minute)
- systolic blood pressure <90mmHg
- paroxysmal ventricular arrhythmias requiring suppression
- inadequate perfusion causing, for example, confusion etc.

Where there is a high risk of asystole:

- recent asystole
- mobitz II AV block
- complete heart block with wide QRS complexes
- ventricular pauses >3 seconds

Organophosphate poisoning.

ADDITIONAL INFORMATION

May induce tachycardia when used after myocardial infarction, which will increase myocardial oxygen demand and worsen ischaemia. Hence, bradycardia in a patient with an MI should **ONLY** be treated if the low heart rate is causing problems with perfusion, such as hypotension (systolic blood pressure <90 mmHg).

CONTRA-INDICATIONS

Should NOT be given to treat bradycardia in suspected hypothermia.

SIDE EFFECTS

Dry mouth, visual blurring and pupil dilation.

Confusion and occasional hallucinations.

Tachycardia, and in the elderly, retention of urine may occur.

Do not use small (<100 micrograms) doses as they may cause paradoxical bradycardia.

DOSAGE AND ADMINISTRATION

Asystole/PEA with a rate of 60 or below

The intravenous and I/O route is vastly superior to the ET route in cardiac arrest and should always be used in preference.

Route: IV (preferred route) or ET

AGE	DOSE	CONCENTRATION	VOLUME
Adult	3 milligrams **(IV)**	100 micrograms per ml	**30.0ml**
Adult	3 milligrams **(IV)**	200 micrograms per ml	**15.0ml**
Adult	3 milligrams **(IV)**	300 micrograms per ml	**10.0ml**
Adult	6 milligrams **(ET)**	300 micrograms per ml	**20.0ml**

SYMPTOMATIC BRADYCARDIA

Route: IV

AGE	DOSE	CONCENTRATION	VOLUME
Adult	500 micrograms	100 micrograms per ml	**5.0ml**
Adult	500 micrograms	200 micrograms per ml	**2.5ml**
Adult	500 micrograms	300 micrograms per ml	**1.6ml**

If no improvement administer further 500 micrograms (0.5 milligrams) **NOTE:** Maximum dose 3 milligrams.

ORGANOPHOSPHATE POISONING

Route: IV/IM

AGE	DOSE	CONCENTRATION	VOLUME
Adult	2 milligrams	100 micrograms per ml	**20.0ml**
Adult	2 milligrams	200 micrograms per ml	**10.0ml**
Adult	2 milligrams	300 micrograms per ml	**6.6ml**
Child	20 micrograms/kg	(IV/IO <7 years)	**Refer to bradycardia table.**

In organophosphate poisoning the doses required may be **VERY HIGH** and on line medical support should be sought before giving further atropine.

The emergence of atropine side effects (dry flushed skin, dilated pupils and tachycardia) suggests that a sufficient dose has been given.

BRADYCARDIA

Route: IV

AGE	DOSE	VOLUME (CONCENTRATION 100 micrograms per ml)	VOLUME (CONCENTRATION 200 micrograms per ml)	VOLUME (CONCENTRATION 600 micrograms per ml)
11 years	600 micrograms	**6.0ml**	**3.0ml**	**1.0ml**
10 years	600 micrograms	**6.0ml**	**3.0ml**	**1.0ml**
9 years	572 micrograms	**5.7ml**	**2.9ml**	**0.95ml**
8 years	516 micrograms	**5.2ml**	**2.6ml**	**0.86ml**
7 years	460 micrograms	**4.6ml**	**2.3ml**	**0.77ml**
6 years	412 micrograms	**4.1ml**	**2.1ml**	**0.69ml**
5 years	370 micrograms	**3.7ml**	**1.9ml**	**0.62ml**
4 years	328 micrograms	**3.3ml**	**1.6ml**	**0.55ml**
3 years	288 micrograms	**2.9ml**	**1.5ml**	**0.48ml**
2 years	244 micrograms	**2.4ml**	**1.2ml**	**0.41ml**
18 months	222 micrograms	**2.2ml**	**1.1ml**	**0.37ml**
12 months	196 micrograms	**2.0ml**	**0.98ml**	**0.33ml**
9 months	178 micrograms	**1.8ml**	**0.89ml**	**0.30ml**
6 months	156 micrograms	**1.6ml**	**0.78ml**	**0.26ml**
3 months	120 micrograms	**1.2ml**	**0.60ml**	**0.20ml**
1 month	100 micrograms	**1.0 ml**	**0.50ml**	**0.17ml**
Birth	100 micrograms	**1.0 ml**	**0.50ml**	**0.17ml**

BRADYCARDIA in children is most commonly caused by HYPOXIA, requiring immediate ABC care, NOT drug therapy.

For administration ONLY in cases of bradycardia caused by vagal stimulation (such as suction or intubation) or organophosphate poisoning.

Benzylpenicillin (Penicillin G)

PRESENTATION

Ampoule containing 600 milligrams of benzylpenicillin as powder.

ACTIONS

Antibiotic active against a range of bacteria.

DOSAGE AND ADMINISTRATION

Administer en-route to hospital (unless already administered by GP etc).

Administer by slow IV injection.

If it is not possible to gain rapid vascular access, the drug should be given by the IM route, as detailed below, into the antero-lateral aspect of the thigh or upper arm – preferably in an area that is well perfused.

Route: IV (or IO <7 years)

Concentration – 600 milligrams dissolved in 9.6ml water for injections.

AGE	DOSE	VOLUME
<1 year	300 milligrams	**5.0ml**
1-<9 years	600 milligrams	**10.0ml**
9 years – adult	1.2 grams (2 vials)	**20.0ml**

Route: IM

Concentration – 600 milligrams dissolved in 1.6ml water for injections.

AGE	DOSE	VOLUME
<1 year	300 milligrams	**1.0ml**
1-<9 years	600 milligrams	**2.0ml**
9 years – adult	1.2 grams (2 vials)	**4.0ml**

INDICATIONS

The initial treatment of suspected meningococcal septicaemia. This is indicated by the presence of a non-blanching rash and signs/symptoms suggestive of meningococcal septicaemia (as below). **Some signs/symptoms may be absent and the order in which they appear may vary.**

The signs and symptoms are:

- respiratory rate and effort – raised
- heart rate – raised (relative bradycardia is a very late sign)
- capillary refill >2 seconds, skin cold to touch (especially in extremities). Skin may appear mottled (early in illness skin may be warm)
- oxygen saturation may be poor or unrecordable (due to poor perfusion)
- temperature – raised (peripheral shutdown or any anti-pyretics given may mask this)
- rigors
- vomiting/diarrhoea/abdominal pain
- rash – develops into petechial, bruise-like purpuric rash or blood blisters. May be no rash
- pain in joints, muscles and limbs
- seizures
- level of consciousness:
- early in shock – alert/able to speak
- as shock advances – babies become limp, floppy and drowsy; older children/adults may develop difficulty in walking/standing, drowsy, confused.

Meningococcal septicaemia is commonest in young children and young adults. It may progress rapidly and the sooner benzylpenicillin is administered the better the outcome.

CONTRA-INDICATIONS

Genuine penicillin allergy.

ADDITIONAL INFORMATION

Penicillin Allergy

Antibiotic allergy – This will be a very difficult judgement for ambulance staff as many members of the public think that they have a penicillin allergy because of minor gastrointestinal upset or other minor symptoms.

DO NOT give penicillin if the history is suggestive of unconsciousness, collapse, swelling, difficulty in breathing or rash on previous administration of penicillin.

Penicillin **MAY** be given if the history is suggestive only of diarrhoea, vomiting or other gastrointestinal upset on previous administration as this is related to the side effects of penicillin rather than an allergy to it.

If in doubt do **NOT** give penicillin and ensure rapid transport to hospital with an appropriate alert message. Document your consideration of penicillin and your reasons for not administering it.

SIDE EFFECTS

In the context of meningococcal septicaemia the release of toxins into the blood stream may actually make the patient feel worse initially and can cause sudden hypotension. Where vascular access is available fluid therapy at 250ml for adults, up to 20ml/kg for children should be commenced **en route** unless the journey time is short.

Hypersensitivity reactions, including urticaria, fever, joint pain, angio-oedema, anaphylaxis and convulsions may occur.

Gastrointestinal upset (diarrhoea, vomiting etc) is a recognised side effect of high dose antibiotic therapy.

PRESENTATION

Ampoule containing 10 milligrams chlorphenamine malleate in 1ml.

ACTIONS

An antihistamine that blocks the effect of histamine released during a hypersensitivity (allergic) reaction. Also has anticholinergic properties.

INDICATIONS

Severe anaphylactic reactions, secondary to IM adrenaline.

Symptomatic allergic reactions falling short of anaphylaxis but causing patient distress e.g. severe itching etc.

CONTRA-INDICATIONS

Known hypersensitivity.

Children less than 1 year of age.

DOSAGE AND ADMINISTRATION

Route: IV

Concentration – 10 milligrams in 1ml.

AGE	DOSE	VOLUME
Adult >12 years	10 milligrams	**1.0ml**
Child 6-<12 years	5 – 10 milligrams	**0.5ml–1.0ml**
Child 1 year-<6 years	2.5 milligrams	**0.25ml**

Administer by **SLOW** intravenous (IV) injection over 1 minute

CAUTIONS

Hypotension

Epilepsy

Glaucoma

Hepatic disease

SIDE EFFECTS

Sedation
Dry mouth
Headache
Blurred vision
Psychomotor impairment
Gastro-intestinal disturbance
Transient hypotension
Convulsions (rare)

The elderly are more like to suffer side effects.

Due to the sedative and psychomotor side effects, anyone receiving chlorphenamine should be advised against driving or undertaking any other complex psychomotor skills.

PRESENTATION

One box containing three single dose plastic tubes of 40% dextrose gel (23 grams each).

INDICATIONS

Known or suspected hypoglycaemia in a patient with a sufficient level of consciousness for there to be no risk of choking or aspiration.

ACTIONS

Rapid absorption through the buccal mucosa resulting in a rapid increase in blood glucose levels.

CAUTIONS

Reduced level of consciousness – patient may choke or aspirate. In such circumstances glucose gel can be administered by soaking a gauze swab and placing it between the patient's lip and gum to aid absorption.

ADDITIONAL INFORMATION

Glucose gel may be repeated as necessary in the hypoglycaemic patient although a failure to achieve effective results should prompt the use of glucagon or glucose 10% (refer to glucose 10% drug protocol) as an alternative.

SIDE EFFECTS

None.

DOSAGE AND ADMINSTRATION

Route: Buccal

Concentration – 40% dextrose gel

AGE	DOSE	VOLUME
Adults	up to 69 grams	**up to 3 tubes**
Children	<23 grams	**<1 tube**

Blood glucose concentration should be measured after each dose.

CHILDREN – Assessment should be more frequent in children who should require a smaller dose for a response.

CHILDREN – For those less than 12 years of age, an appropriate amount, considering the patient's age and ensuring protection of the airway should be given.

PRESENTATION

Ampoule containing 10 milligrams diazepam in an oil-in-water emulsion making up 2ml of milky white fluid (Diazemuls).

Rectal tube containing 2.5 milligrams, 5 milligrams or 10 milligrams diazepam in 2.5ml volume (Stesolid).

INDICATIONS

Fits longer than 5 minutes and **STILL FITTING.**

Repeated fits – not secondary to an uncorrected hypoxia or hypoglycaemic episode.

Status epilepticus.

Eclamptic fits (initiate treatment if fit lasts >2-3 minutes or if it is recurrent).

Symptomatic cocaine toxicity (severe hypertension, chest pain or fitting).

ACTIONS

Central nervous system depressant, acts as an anti-convulsant and sedative.

ADDITIONAL INFORMATION

The intravenous route is preferred for terminating fits and thus, where IV access can be gained rapidly, Diazemuls should be the first choice. Early consideration should be given to using Stesolid when IV access cannot be rapidly and safely obtained, **which is particularly likely in the case of children.** In small children Stesolid should be considered the first choice treatment and IV access sought subsequently.

The earlier the drug is given the more likely the patient is to respond, which is why the rectal route is preferred in children, while the IV route is sought.

Diazepam should only be used if the patient has been fitting for >5 minutes (and is still fitting), or if fits recur in rapid succession without time for full recovery in between. There is no value in giving this drug "preventatively" if the fit has ceased. **In any clearly sick or ill child, there must be no delay at the scene** while administering the drug, and if it is essential to give diazepam, this should be done en route to hospital.

Care must be taken when inserting the rectal tube and this should be inserted no more than 2.5cm in children and 4-5cm in adults. (All tubes have an insertion marker on nozzle).

CAUTIONS

Respiratory depression.

Should be used with caution if alcohol, anti-depressants or other CNS depressants have been taken as side effects are more likely.

Recent doses by carers/relatives should be taken into account when calculating the maximum cumulative dose.

SIDE EFFECTS

Respiratory depression may occur, especially in the presence of alcohol, which enhances the depressive side effect of diazepam. In addition, opioid drugs also enhance the cardiac and respiratory depressive effect of diazepam.

Hypotension may occur. This may be significant if the patient has to be moved from a horizontal position to allow for extrication from an address. Caution should therefore be exercised and consideration given to either removing the patient flat or, if fitting has stopped and it is considered safe, allowing a 10 minute recovery period prior to removal.

Drowsiness and light-headedness, confusion and unsteadiness.

Occasionally amnesia may occur.

DOSAGE AND ADMINISTRATION

Route: IV or IO < 7 years)

Concentration – 10 milligrams in 2ml

AGE	DOSE	VOLUME
Adult	10 milligrams	**2.0ml**
11 years	10 milligrams	**2.0ml**
10 years	9.5 milligrams	**1.9ml**
9 years	8.5 milligrams	**1.7ml**
8 years	8 milligrams	**1.6ml**
7 years	7 milligrams	**1.4ml**
6 years	6.5 milligrams	**1.3ml**
5 years	5.5 milligrams	**1.1ml**
4 years	4.9 milligrams	**0.98ml**
3 years	4.3 milligrams	**0.86ml**
2 years	3.65 milligrams	**0.73ml**
18 months	3.3 milligrams	**0.66ml**
12 months	2.95 milligrams	**0.59ml**
9 months	2.65 milligrams	**0.53ml**
6 months	2.3 milligrams	**0.46ml**
3 months	1.8 milligrams	**0.36ml**
1 month	1.3 milligrams	**0.26ml**
Birth	1.05 milligrams	**0.21ml**

ADULT – Administer **SLOWLY** – titrated to response. Repeat after 5 minutes 20 milligrams maximum dose.

CHILDREN – Administer **SLOWLY** – titrated to response ONCE only.

Route: Rectal

AGE	DOSE	CONCENTRATION	VOLUME
Adult	10 milligrams	10 milligrams in 2.5ml	**2.5ml (1 tube)**
Child 6-12 years	10 milligrams	10 milligrams in 2.5ml	**2.5ml (1 tube)**
Child 1-<6 years	5 milligrams	5 milligrams in 2.5ml	**2.5ml (1 tube)**
Child <1 year	2.5 milligrams	2.5 milligrams in 2.5ml	**2.5ml (1 tube)**

ADULT – If required repeat after 5 minutes maximum dose – 20 milligrams.

CHILDREN – Repeat **ONCE** if required.

If a **SINGLE** dose of diazepam has been given by the PR route and IV access is subsequently available a **SINGLE** dose of IV Diazepam may be given in place of the repeat PR dose where required.

PRESENTATION

Entonox[1] is a combination of nitrous oxide 50%-oxygen 50%. It is stored in medical cylinders that have a blue body with white shoulders.

INDICATIONS

Moderate to severe pain.

Labour pains.

ACTIONS

Inhaled analgesic agent.

CONTRA-INDICATIONS

Severe head injuries with impaired consciousness, as it will further impair consciousness.

Decompression sickness (the bends) where Entonox will expand the size of nitrogen bubbles within the blood stream, further aggravating the problem. Anyone who has been diving within the previous 24 hours should be considered at risk.

Violently disturbed psychiatric patients.

DOSAGE AND ADMINISTRATION

Adults

Entonox should be self-administered via a facemask or mouthpiece, after suitable instruction. It will take about **3-5 minutes** to take effect, but it may be **5-10 minutes** before maximum effect is achieved.

Children

Entonox is safe to use with children provided they are capable of following the administration instructions.

Hospital emergency department staff should be informed when Entonox has been used.

ADDITIONAL INFORMATION

Administration of Entonox should be in conjunction with pain score monitoring.

Entonox has major advantages:

- analgesic effect is rapid, with minimal side effects
- no cardiac or respiratory depression
- can be self-administered
- analgesic effect rapidly reverses, so as not to mask symptoms
- the 50% oxygen concentration is valuable in many medical and trauma conditions
- Entonox can be administered whilst establishing intravenous access to deliver morphine.

The usual precautions must be followed with regard to caring for the Entonox equipment and the cylinder **MUST** be inverted several times to mix the gas when temperatures are low.

SIDE EFFECTS

Minimal side effects.

CAUTIONS

Chest injuries and other conditions when a pneumothorax is suspected, as it may expand this (unless a chest drain is in situ).

[1] For convenience nitrous oxide 50% – oxygen 50% is referred to as Entonox because of the UK ambulance personnel's familiarity with this name.

Furosemide (Frusemide, Lasix) FRM

PRESENTATION

Ampoules containing furosemide 50 milligrams/5ml.
OR
Ampoules containing furosemide 40 milligrams/2ml.
OR
Pre-filled syringe containing furosemide 80 milligrams.

INDICATIONS

Pulmonary oedema secondary to Left Ventricular failure (LVF).

ACTIONS

Furosemide is a potent diuretic with a rapid onset (within 30 minutes) and short duration.

CONTRA-INDICATIONS

Pre-comatose state secondary to liver cirrhosis, severe renal failure with anuria.

Children <16 years.

DOSAGE AND ADMINISTRATION

Route: IV

AGE	DOSE	CONCENTRATION	VOLUME
Adult	50 milligrams	50 milligrams/5ml	**5.0ml**
Adult	40 milligrams	40 milligrams/2ml	**2.0ml**
Adult	40 milligrams	80 milligrams/8ml (pre-filled syringe)	**4.0ml**

Administer **SLOWLY** over 2 minutes.

ADDITIONAL INFORMATION

Nitrates are the first line treatment for acute pulmonary oedema. Use furosemide secondary to nitrates in the treatment of acute pulmonary oedema where transfer times to hospital are prolonged.

CAUTIONS

Hypokalaemia (low potassium) could induce arrhythmias.

Pregnancy.

SIDE EFFECTS

Hypotension.

Gastro-intestinal disturbances.

Glucagon (Glucagen)

PRESENTATION

Glucagon injection, 1 milligram of powder in vial for reconstitution with water for injections.

ACTIONS

Glucagon is a hormone that induces conversion of glycogen to glucose in the liver, thereby raising the blood glucose level.

INDICATIONS

Hypoglycaemia, especially in known diabetics, where blood glucose level <4.0 millimoles per litre or if hypoglycaemia is clinically suspected **and** where oral glucose administration is not possible.

The unconscious patient where hypoglycaemia may be a possible cause.

ADDITIONAL INFORMATION

Generally the choice between the use of oral glucose gel, glucagon IM or glucose 10% IV as first line treatment of hypoglycaemia will be a clinical decision made by the Paramedic taking into account all of the available information.

Glucagon should not be given by IV injection because of increased vomiting associated with IV use. Check blood glucose 5–10 minutes after administration to ensure it has improved to >5.0 millimoles per litre.

Glucagon may be relatively ineffective in those who have already used up their body stores of glycogen (in particular hypoglycaemic children who are not diabetics). Oral glucose gel smeared round the mouth or glucose 10% is preferable as first line treatment in such patients where IV access is obtainable.

Alcohol-induced hypoglycaemia may render glucagon ineffective, however a hypoglycaemic patient who is intoxicated may not fall into this category.

Hypoglycaemic patients who fit should **preferably** be given Glucose 10% IV.

DOSAGE AND ADMINISTRATION

Route: IM antero-lateral aspect of thigh or upper arm

Concentration – 1 milligram per vial.

AGE	DOSE	VOLUME
Adult	1 milligram	**1 vial**
Over 25kg (8-years)	1 milligram	**1 vial**
Below 25kg	500 micrograms	**0.5 vial**
Birth	100 micrograms	**0.1 vial**

RELATIVE CONTRA-INDICATION

Low glycogen stores (e.g. recent use of glucagon).

SIDE EFFECTS

Nausea, vomiting.

Diarrhoea.

Rarely, acute hypersensitivity reaction.

Hypokalaemia.

CAUTIONS

If patient is likely to require thrombolysis then intramuscular administration of any drug should be avoided.

PRESENTATION

Packs containing 500ml of 10% glucose solution (50 grams).

INDICATIONS

Hypoglycaemia, especially in known diabetics, where blood glucose level <4.0 millimoles per litre or if hypoglycaemia is clinically suspected and where oral glucose administration is not possible.

The unconscious patient, where hypoglycaemia may be a possible cause.

ACTIONS

Reversal of hypoglycaemia.

ADDITIONAL INFORMATION

Generally the choice between the use of glucagon IM or glucose 10% IV as first line treatment of hypoglycaemia will be a clinical decision made by the ambulance clinician taking into account all of the available information.

DOSAGE AND ADMINISTRATION

Route: IV

Concentration – 50 grams in 500ml.

AGE	DOSE	VOLUME
Adult	10 grams	**100.0ml**
11 years	10 grams	**100.0ml**
10 years	10 grams	**100.0ml**
9 years	10 grams	**100.0ml**
8 years	10 grams	**100.0ml**
7 years	10 grams	**100.0ml**
6 years	10 grams	**100.0ml**
5 years	9.3 grams	**93.0ml**
4 years	8.2 grams	**82.0ml**
3 years	7.2 grams	**72.0ml**
2 years	6.1 grams	**61.0ml**
18 months	5.6 grams	**56.0ml**
12 months	4.9 grams	**49.0ml**
9 months	4.5 grams	**45.0ml**
6 months	3.9 grams	**39.0ml**
3 months	3.0 grams	**30.0ml**
1 month	2.2 grams	**22.0ml**
Birth	1.8 grams	**18.0ml**

Adults

It is appropriate to cannulate with the largest bore cannula that can confidently be placed and its position in the vein confirmed by a 10-20ml flush of sodium chloride 0.9%. The glucose solution should be administered by IV infusion approximately 100ml (10 grams glucose) at a time.

The dose may be repeated after 5 minutes if there is no response.

If the patient has shown a PARTIAL response then further infusion may be necessary, titrated to response, up to a maximum of 300ml (30 grams) to restore a normal GCS. If after the second dose there has been NO response, rapid transport should be initiated and the hospital pre-alerted. Consideration should be given to alternative diagnoses or the likelihood of a third dose en route benefiting the patient.

Children <40kg

When administering glucose 10% to children a single dose of 5ml/kg is recommended. In larger children this may equate to a volume in excess of 100ml, in which case the adult protocol should be followed.

PRESENTATION

Metered dose spray containing 400 micrograms glyceryl trinitrate per dose.

Tablets containing glyceryl trinitrate 2, 3 or 5 milligrams for buccal administration (depends on local ordering).

INDICATIONS

Cardiac chest pain due to angina or myocardial infarction.

Acute cardiogenic pulmonary oedema.

ACTIONS

A potent vasodilator drug resulting in:

- dilatation of coronary arteries/relief of coronary spasm.
- dilatation of systemic veins resulting in lower pre-load.
- reduced blood pressure.

CONTRA-INDICATIONS

Hypotension (actual or estimated systolic blood pressure <90mmHg).

Hypovolaemia.

Head trauma.

Cerebral haemorrhage.

Sildenafil (Viagra) and other related drugs – glyceryl trinitrate must not be given to patients who have taken sildenafil or related drugs within the previous 24 hours. Profound hypotension may occur.

Unconscious patients.

DOSAGE AND ADMINISTRATION

Route: Buccal/Sub-lingual (spray under the patient's tongue and close mouth).

The mucosa must be moist for GTN absorption, moisten if necessary.

AGE	DOSE	CONCENTRATION	VOLUME
Adult	1-2 spray	400 micrograms per dose spray	**N/A**
Adult	2 milligrams	2 milligrams per tablet	**1 tablet**
Adult	3 milligrams	3 milligrams per tablet	**1 tablet**
Adult	5 milligrams	5 milligrams per tablet	**1 tablet**

Remove tablet if side effects occur e.g. hypotension.

The effect of the first dose should be assessed over 5 minutes. Further doses can be given every 5-10 minutes as indicated provided systolic blood pressure is >90mmHg.

Drugs

ADDITIONAL INFORMATION	SIDE EFFECTS
Glyceryl trinitrate causes vasodilatation, with enlargement of the venous system bed. This causes pooling of blood in the veins with reduction in "pre-load" to the heart. This relieves the work of the left ventricle, and secondarily reduces lung vessel congestion, lessening breathlessness and is the primary treatment in acute left ventricular failure. When using buccal nitrates the patient may spit out the remainder of the tablet when their chest pain is relieved. This may avoid the onset of headache.	Throbbing headache. Flushing. Dizziness. Postural hypotension. Tachycardia. These side effects are mainly related to a generalised vasodilation effect of this drug and are usually transient.

PRESENTATION	INDICATIONS
Ampoule containing 100 milligrams hydrocortisone as either sodium succinate or sodium phosphate in 1ml. **OR** Solu-cortef a powder for reconstitution with up to 2ml of water.	Severe or life threatening asthma – where call-hospital time is >30 minutes. Anaphylaxis. Addisonian Crisis.
ACTIONS	**CONTRA-INDICATIONS**
Glucocorticoid drug that reduces inflammation and suppresses immune response.	Known allergy (which will be to the sodium succinate or sodium phosphate rather than the hydrocortisone itself).
CAUTIONS	**SIDE EFFECTS**
None relevant to a single dose. If patient is likely to require thrombolysis then intramuscular administration of any drug should be avoided.	Sodium phosphate may cause burning or itching sensation in the groin if administered too quickly.

DOSAGE AND ADMINISTRATION

Anaphylaxis or Asthma

Route: IV OR IM when IV access is impossible/IO (<7 years).

		CONCENTRATION	
		100 milligrams per 1ml	100 milligrams per 2ml
AGE	DOSE	VOLUME	VOLUME
Adult	200 milligrams	2.0ml	4.0ml
11 years	140 milligrams	1.4ml	2.8ml
10 years	130 milligrams	1.3ml	2.6ml
9 years	110 milligrams	1.1ml	2.2ml
8 years	100 milligrams	1.0ml	2.0ml
7 years	92 milligrams	0.92ml	1.8ml
6 years	82 milligrams	0.82ml	1.6ml
5 years	74 milligrams	0.74ml	1.5ml
4 years	66 milligrams	0.66ml	1.3ml
3 years	57 milligrams	0.57ml	1.1ml
2 years	49 milligrams	0.49ml	0.98ml
18 months	45 milligrams	0.45ml	0.90ml
12 months	39 milligrams	0.39ml	0.78ml
9 months	36 milligrams	0.36ml	0.72ml
6 months	31 milligrams	0.31ml	0.62ml
3 months	24 milligrams	0.24ml	0.48ml
1 month	18 milligrams	0.18ml	0.36ml
Birth	14 milligrams	0.14ml	0.28ml

Administer by **SLOW** intravenous injection over a minimum of 2 minutes to avoid side effects.

NOTE: It is better to give hydrocortisone if there is any doubt about previous steroid administration.

Steroid-dependent patients who become unwell (Addisonian Crisis)

ADULTS
100 millgrams IV (OR IM when IV access is impossible) – given by **SLOW** IV administration

CHILDREN 1 MONTH – 11 YEARS
Use dosages as per table above

Ibuprofen

PRESENTATION

A solution or suspension containing ibuprofen 100 milligrams in 5ml or tablet form containing 200 milligrams, 400 milligrams, and 600 milligrams.

INDICATIONS

Relief of mild to moderate pain and/or high temperature.

Pain and inflammation of soft tissue injuries.

ACTIONS

Analgesic (pain relieving) and antipyretic (temperature reducing) drug.

Anti-inflammatory (inflammation reducing).

SIDE EFFECTS

Ibuprofen may cause nausea, vomiting, and tinnitus.

CONTRA-INDICATIONS

Should not be administered to dehydrated patients.

Asthma
Known allergy or hypersensitivity to non-steroidal anti-inflammatory drugs (NSAIDs).

Active upper gastro-intestinal disturbance (e.g. oesophagitis, peptic ulcer, dyspepsia).

If a product containing NSAID properties (e.g. Diclofenac, Naproxen) has been given within the last four hours or if the maximum cumulative daily dose has been given then further NSAID i.e. ibuprofen should NOT be given.

DOSAGE AND ADMINISTRATION

Route: Oral

AGE	DOSE	VOLUME
Adults >12 years	200-400 milligrams – max 1.6grams/day	**Varies**
7 years <12 years	200 milligrams	**Varies**
2 years <7 years	100 milligrams	**Varies**
6 months <2 years	50 milligrams	**Varies**
1 month <6 months	5 milligrams/kg	**Varies**

NOTE: Can be given in addition to paracetamol.

3-4 times daily preferably following food in 3-4 divided doses.
In severe conditions (body-weight over 7 killograms) 30 milligramsg/kg daily maximum.

Drugs

Ipratropium Bromide (Atrovent)

PRESENTATION

Nebules containing ipratropium bromide 250 micrograms in 1ml or 500 micrograms in 2ml.

ACTIONS

1. Ipratropium bromide is an antimuscarinic bronchodilator drug. It may provide short term relief in acute asthma, but $beta_2$ agonists (such as salbutamol) generally work more quickly. Ipratropium should be considered in acute severe or life threatening asthma or in cases of acute asthma or COPD which fail to improve with standard therapy (including salbutamol).

2. Ipratropium is considered of greater benefit in:
   a. children suffering acute asthma.
   b. adults suffering with COPD.

INDICATIONS

Acute severe or life threatening asthma (to be given concurrent with first dose of salbutamol).

Acute asthma unresponsive to salbutamol.

Exacerbation of chronic obstructive pulmonary disease (COPD), unresponsive to salbutamol.

CONTRA-INDICATIONS

None in the emergency situation.

DOSAGE AND ADMINISTRATION

Route: Nebuliser

		250 micrograms in 1ml	500 micrograms in 2ml
AGE	DOSE	VOLUME	VOLUME
Adult	500 micrograms	**2.0ml**	**2.0ml**
2-12 years	250 micrograms	**1.0ml**	**1.0ml**
1 month-<2years	125-250 micrograms	**0.50ml–1.0ml**	**0.50ml–1.0ml**

- Nebulised with 6-8 litres per minute oxygen, **ONCE** only.
- Concurrent with first dose of salbutamol in acute severe or life-threatening asthma.
- Concurrent with the second or later dose of salbutamol in COPD or asthma unresponsive to salbutamol alone.
- **NOTE:** May be mixed with salbutamol in same nebuliser in life-threatening asthma.

CAUTIONS

Ipratropium should be used with care in patients with:

- glaucoma (protect the eyes from mist).

- pregnancy and breastfeeding.

SIDE EFFECTS

Headache.

Nausea and vomiting.

Dry mouth.

Difficulty in passing urine and/or constipation.

Tachycardia/arrhythmia.

Paroxysmal tightness of the chest.

Allergic reaction.

PRESENTATION	INDICATIONS
Lidocaine 1% ampoules or mini-jet containing 100 milligrams in 10ml.	If amiodarone is **NOT** available to treat shock resistant ventricular fibrillation (VF) the use of lidocaine may be considered in its place i.e. after three shocks have failed to convert VF.
ACTIONS	**CONTRA-INDICATIONS**
Suppresses the automaticity of the His-Purkinje system. Elevates the electrical stimulation threshold of the ventricles during diastole.	Known allergy to lidocaine or other local anaesthetics. Bradycardia. Asystole. Torsades de pointes. Paroxysmal VT secondary to underlying bradycardia. Porphyria. Where amiodarone has already been administered.
SIDE EFFECTS	**ADDITIONAL INFORMATION**
CNS excitation including convulsions. Fall in blood pressure because of myocardial depression. Bradycardia. Cardiac arrest.	Lidocaine 1% may also be used as a local anaesthetic agent by appropriately skilled and trained clinicians. Refer to local procedures.

DOSAGE AND ADMINISTRATION

Ventricular fibrillation (VF)

NOTE: Lidocaine may be used as an alternative if amiodarone is not available, but amiodarone is the drug of preference in the treatment of arrhythmias.

Route: ADULTS IV/ET – **CHILDREN NOT** to be given via ET route IV (or IO < 7 years).

Concentration – 1% (100 milligrams in 10ml).

AGE	DOSE	VOLUME
Adult	100 milligrams **(IV)**	**10.0ml**
Adult	200 milligrams **(ET)**	**20.0ml**
11 years	35.0 milligrams	**3.5ml**
10 years	32.0 milligrams	**3.2ml**
9 years	29.0 milligrams	**2.9ml**
8 years	26.0 milligrams	**2.6ml**
7 years	23.0 milligrams	**2.3ml**
6 years	21.0 milligrams	**2.1ml**
5 years	19.0 milligrams	**1.9ml**
4 years	16.0 milligrams	**1.6ml**
3 years	14.0 milligrams	**1.4ml**
2 years	12.0 milligrams	**1.2ml**
18 months	11.0 milligrams	**1.1ml**
12 months	9.8 milligrams	**0.98ml**
9 months	8.9 milligrams	**0.89ml**
6 months	7.8 milligrams	**0.78ml**
3 months	6.0 milligrams	**0.60ml**
1 month	4.4 milligrams	**0.44ml**
Birth	N/A	**N/A**

Administer slowly over 2-3 minutes.

Repeat if necessary after 15–20 minutes to a maximum of 200 milligrams.

NOTE: DO NOT give lidocaine if amiodarone has been given already.

PRESENTATION

Ampoule containing metoclopramide 10 milligrams in 2ml.

ACTIONS

An anti-emetic which acts centrally as well as on the gastro-intestinal tract.

INDICATIONS

The treatment of nausea or vomiting in adults over 20 years.

Prevention and treatment of nausea and vomiting following administration of morphine sulphate or nalbuphine.

CAUTIONS

If patient is likely to require thrombolysis then intramuscular administration of any drug should be avoided.

Avoid in cases of drug overdose.

CONTRA-INDICATIONS

Age less than 20 years.

Avoid in first trimester of pregnancy.

Renal failure.

Phaeochromocytoma.

Gastro-intestinal obstruction.

ADDITIONAL INFORMATION

Metoclopramide should always be given in a separate syringe to morphine sulphate. The drugs must not be mixed.

SIDE EFFECTS

Severe extra-pyramidal effects are more common in children and young adults. Drowsiness and restlessness. Cardiac conduction abnormalities following IV administration.

DOSAGE AND ADMINISTRATION

Route: IV

Concentration – 10 milligrams in 2ml.

AGE	DOSE	VOLUME
Adult	10 milligrams	**2.0ml**

ONCE only, given over 2 minutes, prior to opiate administration.

Monitor pulse, blood pressure, respiratory rate and cardiac rhythm before, during and after administration.

PRESENTATION Ampoules containing Morphine Sulphate 10 milligrams in 1ml.	**INDICATIONS** Pain associated with suspected myocardial infarction (analgesic of first choice). Severe pain. The decision about which analgesia and which route should be guided by clinical judgement ***(refer to adult and child pain management guidelines)***.
ACTIONS Morphine is a strong opioid analgesic drug for parenteral administration for pain relief. It is particularly useful for treating severe continuous pain of visceral or soft tissue origins. Morphine produces sedation, euphoria and analgesia; it may both depress respiration and induce hypotension. Histamine is released following morphine administration, this may contribute to its vasodilatory effects and it may also cause bronchoconstriction.	**CONTRA-INDICATIONS** Do **NOT** give morphine in the following circumstances: Children under 1 year of age. Respiratory depression (Adult <10 breaths per minute, Child <20 breaths per minute). Hypotension (actual, not estimated, systolic blood pressure <90mmHg in adults, <80mmHg in school children, <70mmHg in pre-school children). Administration of morphine to patients with clinical signs of haemorrhagic or cardiogenic shock may precipitate irreversible hypotension. Head injury with significantly impaired consciousness (Glasgow Coma Score <12). Phaeochromocytoma (tumour on the adrenal gland). This is a rare condition which is usually unknown to the patient or has been identified and treated. Known hypersensitivity to morphine. Known severe renal or hepatic impairment.

CAUTIONS	SIDE EFFECTS
Use with extreme caution (minimal doses) during pregnancy. **NOTE** not to be used for pain associated with labour where Entonox is the analgesia of choice. Morphine should be given **with great caution** to patients with chest injuries, particularly those with any respiratory difficulty, although if respiration is inhibited by pain, morphine may actually improve respiratory status. Patients with other respiratory problems e.g. asthma, COPD. **Head injury.** Agitation following head injury may be due to acute brain injury, hypoxia or pain. The decision to administer analgesia to agitated head injured patients is a clinical one. It is essential however, that any such patient who receives analgesia is closely monitored as opiates may cause disproportionate respiratory depression and hence increase intracranial pressure. Acute alcohol intoxication. All opioid drugs potentiate the central nervous system depressant effects of alcohol and they should therefore be used with great caution in patients who have consumed a significant amount of alcohol. Patients taking antidepressants, sedatives or major tranquilliser drugs, as these will potentiate the respiratory and cardiovascular depressant effects of morphine. Patients taking monoamine oxidase inhibitors (MAOIs) **SHOULD NOT** be given morphine until their drug information card has been checked.	Respiratory depression. Cardiovascular depression. Nausea and vomiting. Drowsiness. Pupillary constriction.

DOSAGE AND ADMINISTRATION

ENSURE that NALOXONE is available and that the appropriate dose for the age/weight of children is known before morphine is administered.

Morphine, when given IV takes a minimum of 2-3 minutes to begin to work, with the peak effect not being achieved for 10-20 minutes.

Due to the variable absorption rate of morphine when given IM, particularly in the cardiac and trauma patient, this route should **NOT** be used.

If morphine is used in trauma, larger doses (**5–20 milligrams**) may be needed.

Administration must be in conjunction with pain score monitoring.

Morphine **should** be diluted with sodium chloride 0.9% or water for injection to make a concentration of 10 milligrams in 10ml (1 milligram in 1ml).

Route: IV

Concentration – 10 milligrams in 10ml (see above)

AGE	DOSE	VOLUME
Adult	5 milligrams	**5.0ml**
Elderly >65	2.5 milligrams	**2.5ml**
11 years	3.5 - 7.1 milligrams	**3.5ml-7.1ml**
10 years	3.2 - 6.4 milligrams	**3.2ml-6.4ml**
9 years	2.9 - 5.7 milligrams	**2.9ml-5.7ml**
8 years	2.6 -5.2 milligrams	**2.6ml-5.2ml**
7 years	2.3 - 4.6 milligrams	**2.3ml-4.6ml**
6 years	2.1 - 4.1 milligrams	**2.1ml-4.1ml**
5 years	1.9 - 3.7 milligrams	**1.9ml-3.7ml**
4 years	1.6 - 3.3 milligrams	**1.6ml-3.3ml**
3 years	1.4 - 2.9 milligrams	**1.4ml-2.9ml**
2 years	1.2 - 2.4 milligrams	**1.2ml-2.4ml**
18 months	1.1 - 2.2 milligrams	**1.1ml-2.2ml**
12 months	0.98 - 2 milligrams	**0.98ml-2.0ml**
<12 months	N/A	**N/A**

Administer by slow IV injection (rate of approximately 1 milligram per minute, titrated to response) whilst observing the patient over the next 5-10 minutes for effect.

ADULTS - If pain is not reduced to a tolerable level after 5 minutes, further **5 milligram** doses may be given by slow IV injection at 5 minute intervals to **20 milligrams maximum**. The patient should be closely observed throughout remaining treatment and transfer. In medical cases, smaller doses tend to be more effective (**2.5-5 milligrams**).

CHILDREN - The doses and volumes given are the initial and maximum doses. Administer **0.1ml/kg** (equal to **0.1 milligrams/kg**) as an initial slow bolus over 2-3 minutes. If pain is not reduced to a tolerable level after 5-10 minutes then further doses of up to **0.1 milligrams/kg,** titrated to response, may be repeated, at 5-10 minute intervals, up to the **maximum dose 0.2 milligrams/kg.**

NOTE: peak effect of each dose may not occur until 10-20 minutes after administration.

SPECIAL PRECAUTIONS

Naloxone reverses the effects of morphine and should be given if there is any indication of respiratory or cardiovascular depression. It must always be immediately available (refer to naloxone monograph for dosing).

Hypotension may be corrected by fluid therapy, however, caution should be exercised in the patient with cardiac inadequacy, and this option is more appropriate to the trauma scenario.

Morphine frequently induces nausea or vomiting, which in the case of myocardial infarction may increase cardiac workload. Slow IV administration of morphine and use of the lowest dose required to achieve analgesia will minimise this risk of vomiting, but the motion of the ambulance may exaggerate nausea.

ADDITIONAL INFORMATION

Morphine is a Class A controlled drug under Schedule 2 of the Misuse of Drugs Regulations of 1985, and must be stored and its prescription and administration documented in accordance with these regulations.

Morphine is not licensed for use in children but its use has been approved by the Medicines and Healthcare products Regulatory Agency (MHRA) for 'off label' use. This means that it can legally be administered under these guidelines by Paramedics.

Unused morphine in open vials or syringes must be discarded, preferably in the presence of a witness.

PRESENTATION	INDICATIONS
5ml unit dose vials containing morphine sulphate 10 milligrams in 5ml (2 milligrams in 1ml).	Severe pain. The decision about which analgesia and which route should be guided by clinical judgement (see adult and child pain management guidelines).
ACTIONS	**CONTRA-INDICATIONS**
Morphine is a strong opioid analgesic drug for oral administration for pain relief. It is particularly useful for treating severe continuous pain of visceral or soft tissue origins. Morphine produces sedation, euphoria and analgesia; it may both depress respiration and induce hypotension. Histamine is released following morphine administration, this may contribute to its vasodilatory effects and it may also cause bronchoconstriction.	Do **NOT** give oral morphine in the following circumstances: Unable to swallow or protect own airway. Cardiac pain – use intravenous morphine. Children under 1 year of age. Respiratory depression (Adult <10 breaths per minute, Child <20 breaths per minute) or inadequate tidal volume. Hypotension (actual, not estimated, systolic blood pressure <90mmHg in adults, <80mmHg in school children, <70mmHg in pre-school children). Head injury with significantly impaired consciousness (Glasgow Coma Score <12). Phaeochromocytoma (tumour on the adrenal gland). This is a rare condition which is usually unknown to the patient or has been identified and treated. Known hypersensitivity to morphine. Known severe renal or hepatic impairment.

CAUTIONS

Use with **extreme** caution (minimal doses) during pregnancy. **NOTE** not to be used for pain associated with labour where Entonox is the analgesic of choice.

Morphine should be given **WITH GREAT CAUTION** to patients with chest injuries, particularly those with any respiratory difficulty, although if respiration is inhibited by pain, morphine may actually improve respiratory status.

Patients with other respiratory problems e.g. asthma, COPD.

Head injury. Agitation following head injury may be due to acute brain injury, hypoxia or pain. The decision to administer analgesia to agitated head injured patients is a clinical one. It is essential however, that any such patient who receives analgesia is closely monitored as opiates may cause disproportionate respiratory depression and hence increase intracranial pressure.

Acute alcohol intoxication. All opioid drugs potentiate the central nervous system depressant effects of alcohol and they should therefore be used with great caution in patients who have consumed a significant amount of alcohol.

Patients taking antidepressants, sedatives or major tranquilliser drugs, as these will potentiate the respiratory and cardiovascular depressant effects of morphine.

Patients taking monoamine oxidase inhibitors (MAOIs) **SHOULD NOT** be given morphine until their drug information card has been checked.

SIDE EFFECTS

Respiratory depression.

Cardiovascular depression.

Nausea and vomiting.

Drowsiness.

Pupillary constriction.

DOSAGE AND ADMINISTRATION

ENSURE that NALOXONE is available and that the appropriate dose for the age/weight of children is known before morphine is administered.

Administration must be in conjunction with pain score monitoring.

Route: Oral

Concentration – 10 milligrams in 5ml.

AGE	DOSE	VOLUME
Adult	10-20 milligrams	**5-10ml**
11 years	7 milligrams	**3.5ml**
10 years	6.4 milligrams	**3.2ml**
9 years	5.8 milligrams	**2.9ml**
8 years	5.2 milligrams	**2.6ml**
7 years	4.6 milligrams	**2.3ml**
6 years	4.2 milligrams	**2.1ml**
5 years	3.8 milligrams	**1.9ml**
4 years	3.2 milligrams	**1.6ml**
3 years	2.8 milligrams	**1.4ml**
2 years	2.4 milligrams	**1.2ml**
18 months	2 milligrams	**1.0ml**
12 months	1.96 milligrams	**0.98ml**
<12 months	N/A	**N/A**

ADULTS – Dosage to be given is (0.1ml/kg) up to a maximum of 20 milligrams.

SPECIAL PRECAUTIONS

Naloxone reverses the effects of morphine and should be given if there is any indication of respiratory or cardiovascular depression. It must always be immediately available (refer to naloxone monograph for dosing).

Hypotension may be corrected by fluid therapy, however, caution should be exercised in the patient with cardiac inadequacy, and this option is more appropriate to the trauma scenario.

Morphine frequently induces nausea or vomiting, use of the lowest dose required to achieve analgesia will minimise this risk of vomiting, but the motion of the ambulance may exaggerate nausea.

ADDITIONAL INFORMATION

Morphine is not licensed for use in children but its use has been approved by the Medicines and Healthcare products Regulatory Agency (MHRA) for 'off label' use. This means that it can legally be administered under these guidelines by Paramedics.

Unused morphine in open vials or syringes must be discarded, preferably in the presence of a witness.

PRESENTATION

Naloxone Hydrochloride 400 micrograms/1ml ampoule.

ACTIONS

Antagonism of the effects (including respiratory depression) of opioid drugs.

ADDITIONAL INFORMATION

Naloxone may be administered intramuscularly, **undiluted**, (into the outer aspect of the thigh or upper arm) when IV access is impossible, but absorption may be slow. Wherever possible, the IV route should be used.

Overdose with opioid drugs can be fatal as a result of respiratory and cardiovascular depression. The effects of naloxone are **short lived** and patients frequently relapse once the drug has worn off. **All** cases of opioid overdose should be transported to hospital, even if the initial response to naloxone has been good. If the patient refuses, consider, if the patient consents, a loading dose of **800 micrograms IM** to minimise the risk described above.

Some prescription opioid drugs include:

Buprenorphine	(Temgesic)
Codeine	(Used in combination in Codis, Diarrest, Migraleve, Paracodol, Phensedyl, Solpadeine, Solpadol, Syndol, Terpoin, Tylex, Veganin)
Dextromoramide	(Palfium)
Dipipanone	(Dicanol)
Dextropropoxyphene	(Used in combination in Distalgesic/co-proxamal)
Diamorphine	('Heroin')
Dihydrocodeine	(Co-dydramol, DF 118)
Meptazinol	(Meptid)
Methadone	(Physeptone, Methadose)
Morphine	(Oramorph, Sevredol, MST Continus, SRM-Rhotard)
Oxycodone	(Oxycontin)
Pentazocine	(Fortral)
Pethidine	(Pamergan)
Phenazocine	(Narphen)

NOTE: This list is not comprehensive, other opioid drugs are available.

INDICATIONS

Respiratory depression, depression of cardiovascular system and central nervous system depression associated with opioid overdose.

Accidental overdose of opioid drugs, e.g. morphine, nalbuphine.

Overdose of some common analgesics, e.g. co-proxamol (Distalgesic) containing substances such as dextropropoxyphene and codeine (in combination with paracetamol) produce respiratory depression, which is reversed by naloxone.

Unconsciousness associated with respiratory depression of unknown cause, where opioid overdose is a possibility. (Refer to depressed level of consciousness guideline).

CONTRA-INDICATIONS

1. Neonatal patients of opioid addicted mothers, as serious withdrawal effects may occur – emphasis should be on bag-valve-mask ventilation and oxygenation.

SIDE EFFECTS

In patients who are physically dependent on narcotic drugs, violent withdrawal symptoms, including cardiac arrhythmias, may be precipitated by naloxone. Ideally, in these cases titrate the dose of naloxone as described above, to effectively reverse the cardiac and respiratory depression, but still leave the patient in a groggy state.

DOSAGE AND ADMINISTRATION

Respiratory arrest/extreme respiratory depression – When the **URGENCY** of the situation outweighs the need for a controlled effect.

Route: IV/IM bolus

Concentration – 400 micrograms in 1ml.

AGE	DOSE	VOLUME
Adult	400 micrograms **(IV)**	**1ml**
Adult	800 micrograms **(IM)**	**2ml**

If there is no response administer further doses of **400 micrograms**, every 2-3 minutes until an effect is noted.

Repeated doses may need to be given up to every 2-3 minutes en-route to hospital, as the half-life of naloxone is short.

The maximum dose of naloxone is **10 milligram** (equivalent to 25 repeat doses of **400 micrograms**).

Respiratory Depression – When a more **CONTROLLED** effect is required, e.g. in known or potentially aggressive patients who are suffering respiratory ***depression*** rather than arrest, dilute up to 800 micrograms (2ml) of naloxone into 8ml of water for injections or sodium chloride intravenous infusion 0.9% (to a total of 10ml). Administer IV by slow injection, titrated to response. Aim to relieve respiratory depression, but maintain patient in 'groggy' state.

Route: IV/IM

Concentration – 400 micrograms in 1ml.

AGE	FIRST DOSE	VOLUME	SUBSEQUENT DOSE	VOLUME
11 years	352 micrograms	**0.88ml**	3520 micrograms	**8.8ml**
10 years	320 micrograms	**0.80ml**	3200 micrograms	**8.0ml**
9 years	288 micrograms	**0.72ml**	2880 micrograms	**7.2ml**
8 years	260 micrograms	**0.65ml**	2600 micrograms	**6.5ml**
7 years	232 micrograms	**0.58ml**	2320 micrograms	**5.8ml**
6 years	208 micrograms	**0.52ml**	2080 micrograms	**5.2ml**
5 years	184 micrograms	**0.46ml**	1840 micrograms	**4.6ml**
4 years	164 micrograms	**0.41ml**	1640 micrograms	**4.1ml**
3 years	144 micrograms	**0.36ml**	1440 micrograms	**3.6ml**
2 years	124 micrograms	**0.31ml**	1240 micrograms	**3.1ml**
18 months	112 micrograms	**0.28ml**	1120 micrograms	**2.8ml**
12 months	100 micrograms	**0.25ml**	1000 micrograms	**2.5ml**
9 months	88 micrograms	**0.22ml**	880 micrograms	**2.2ml**
6 months	78 micrograms	**0.19ml**	800 micrograms	**2.0ml**
3 months	60 micrograms	**0.15ml**	600 micrograms	**1.5ml**
1 month	44 micrograms	**0.11ml**	440 micrograms	**1.1ml**
Birth **IM ONLY**	200 micrograms	**0.50ml**	N/A	**N/A**

If **NO** response (or a partial but inadequate response), a subsequent dose of **100 micrograms/kg** (**NOTE**: this is 10 times the initial dose)

PRESENTATION

Oxygen (O_2) is a gas provided in compressed form in a cylinder. It is also available in liquid form, in a system adapted for ambulance use. It is fed via a regulator and flow meter to the patient by means of plastic tubing and an oxygen mask or nasal cannula.

INDICATIONS

All cases with cardiac symptoms, decreased level of consciousness, sickle cell disease, carbon monoxide poisoning, major trauma, and long bone fracture.

Chronic obstructive pulmonary disease (COPD) with oxygen saturation (SpO_2) <90-92%.

Hypoxia with SpO_2 <95%.

ACTIONS

Essential for cell metabolism. Adequate tissue oxygenation is essential for normal physiological function. It assists in reversing **hypoxia**, by raising the concentration of inspired oxygen. Hypoxia will, however, only improve if respiratory effort or ventilation and tissue perfusion are adequate. If ventilation is inadequate or absent, assisting or completely taking over the patient's ventilation is essential to reverse hypoxia.

CONTRA-INDICATIONS

Paraquat poisoning.

Defibrillation.

Explosive environments.

NOTE: COPD is **NOT** a contra-indication in the critically ill or injured hypoxic patient but the COPD guidelines should be followed.

CAUTIONS

Oxygen increases the fire hazard at the scene of an accident.

DOSAGE AND ADMINISTRATION

Oxygen therapy is essential in virtually **ALL** cases of serious or potentially serious illness or injury.

Administer high concentration oxygen (O_2) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an SpO_2 of >95%, except in patients with COPD (***see below***).

High concentration O_2 should be administered routinely, whatever the oxygen saturation in all patients sustaining major trauma, long bone fracture, chest pain, acute coronary syndrome, sickle cell crisis, and patients with decreased level of consciousness (Glasgow Coma Score (GCS) <15).

Patients with COPD should receive metered oxygen therapy to achieve an O_2 saturation in the range of 90-92%. In cases of serious respiratory distress, cardiac chest pain, or major trauma in COPD patients, high concentration oxygen may be required.

Oxygen therapy is administered via a mask and tubing. Masks are either the standard (non-reservoir bag) or with reservoir bag. Oxygen may also be administered via an automatic ventilator or self inflating bag-valve-mask and reservoir.

High concentration
Oxygen can be provided through a non-rebreathing mask with a reservoir bag and with an oxygen flow rate sufficient to keep the reservoir bag fully inflated (usually 10-15 litres/min).

Low flow
24–28% oxygen can be provided at flow rates of 2 litres per minute through a medium concentration, non reservoir bag mask.

Layngectomee patients
Layngectomee and other neck breathing patients breathe through a stoma in the neck. A facemask or nasal cannula may be of little or no value. An appropriate method of administration must be considered that delivers oxygen to the stoma.

SIDE EFFECTS

Non-humidified O_2 is drying and irritating to mucous membranes over a period of time.

In patients with COPD who rely upon hypoxic drive for respiration there is a small risk that high-flow oxygen may cause respiratory depression or respiratory arrest (***refer to COPD guideline***).

ADDITIONAL INFORMATION

A pulse oximeter should always be used to measure O_2 saturation whenever O_2 is being administered (except in possible carbon monoxide poisoning where results may be artificially elevated). This is to monitor the effects of O_2 therapy and the effectiveness of the patient's ventilation.

Oxygen saturation levels
- 95-100% normal
- 90-95% evidence of hypoxia
- 85-90% serious hypoxia
- <85% critical hypoxia

Hypoxic drive is found in COPD patients with chronic lung damage, where as a result of long standing respiratory failure, a higher than normal carbon dioxide (CO_2) level is retained in the blood stream. This would normally trigger a persistent high respiratory rate to attempt to lower the CO_2 level. To compensate, the body becomes less sensitive to raised CO_2, and begins to react to a lowered O_2 level, as a trigger to breathe. Giving high concentration O_2 will raise the O_2 level in the blood stream, and may prevent the natural lowering of O_2 occurring to stimulate breathing. This in turn may cause respiratory depression or respiratory arrest. If this occurs, oxygen should be delivered through assisted ventilation or intermittent positive pressure ventilation and the patient removed rapidly to hospital with a **Hospital Alert Message**.

Most patients with acute asthma **DO NOT** have COPD and require high concentration O_2 with a non-rebreathing mask with a reservoir bag and with an oxygen flow rate sufficient to keep the reservoir bag inflated before and after nebulisation.

Some elderly patients have a mixture of COPD, which causes irreversible bronchospasm, and asthma, which is reversible. The priority in treating these patients is to ensure adequate oxygenation. Less seriously ill or injured patients still require O_2 therapy as per individual guidelines.

In cardiac arrest **100% O_2** must be delivered via automatic ventilator **or bag/mask/reservoir during ventilation**.

In carbon monoxide poisoning administering **100% O_2** increases the speed of elimination of CO from red cells.

PRESENTATION

A solution or suspension containing paracetamol 120 milligrams in 5ml or paracetamol 250 milligrams in 5 ml.

INDICATIONS

Relief of mild to moderate pain and/or high temperature.

Intended primarily for use in children but may also be applicable to adults.

ACTIONS

Analgesic (pain relieving) and antipyretic (temperature reducing) drug.

CONTRA-INDICATIONS

Known allergy to paracetamol containing products.

If a product containing paracetamol (e.g. Calpol, Disprol) has been given within the last four hours or if the maximum cumulative daily dose has been given then further paracetamol should **NOT** be given.

DOSAGE AND ADMINISTRATION

Ensure paracetamol has not been taken within the previous 4 hours.

Route: Oral (5ml syringe).

Concentration – 120 milligrams in 5 ml.

AGE	DOSE	VOLUME	MAXIMUM DOSE
Adult >12 years	960 milligrams or 1gram	**40ml – 41.6ml**	**4 grams in 24 hours**
6 to <12 years	480 or 500 milligrams	**20ml – 20.8ml**	**2 grams in 24 hours**
12 months to <6 years	(120 or 125)-(240 or 250) milligrams	**5ml -10ml**	**1 gram in 24-hours**
3 months to <12 months	(60 or 62.5)-(120 or 125) milligrams	**2.5ml – 5ml**	**500 milligrams in 24-hours**

Route: Oral (5ml syringe).

Concentration – 250 milligrams in 5 ml.

AGE	DOSE	VOLUME	MAXIMUM DOSE
Adult >12 years	960 milligrams or 1gram	**19.2ml – 20ml**	**4 grams in 24 hours**
6 to <12 years	480 or 500 milligrams	**9.6ml – 10ml**	**2 grams in 24 hours**
12 months to <6 years	(120 or 125)-(240 or 250) milligrams	**2.5ml – 5ml**	**1 gram in 24-hours**
3 months to <12 months	(60 or 62.5)-(120 or 125) milligrams	**1.25ml – 2.5ml**	**500 milligrams in 24-hours**

ADDITIONAL INFORMATION

A febrile child should not be left at home except where a full assessment has been carried out, the child has no apparent serious underlying illness and the child is referred to the General Practitioner with the full consent of the parent (or carer).

SIDE EFFECTS

Side effects are extremely rare.

PRESENTATION

Nebules containing salbutamol 2.5 milligrams/ 2.5ml or 5 milligrams/2.5 ml.

ACTIONS

Salbutamol is a selective beta2-adrenoreceptor stimulant drug. This has a relaxant effect on the smooth muscle in the medium and smaller airways, which are in spasm in acute asthma attacks. If given by nebuliser, especially if oxygen powered, its smooth-muscle relaxing action, combined with the airway moistening effect of nebulisation, can relieve the attack rapidly.

CAUTIONS

Salbutamol should be used with care in patients with:

hypertension.

angina.

overactive thyroid.

late pregnancy (can relax uterus).

Severe hypertension may occur in patients on beta-blockers and half doses should be used unless there is profound hypotension.

ADDITIONAL INFORMATION

In acute severe or life threatening asthma ipratropium should be given concurrently with the first dose of salbutamol. In acute asthma or COPD unresponsive to salbutamol alone a single dose of ipratropium may be given concurrently with the second or later dose of salbutamol.

Salbutamol often provides initial relief. In more severe attacks however, the use of steroids by injection or orally and further nebuliser therapy will be required. Do not be lulled into a false sense of security by an initial improvement after salbutamol nebulisation.

INDICATIONS

Acute asthma attack where normal inhaler therapy has failed to relieve symptoms.

Expiratory wheezing associated with allergy, anaphylaxis, smoke inhalation or other lower airway cause.

Exacerbation of chronic obstructive pulmonary disease (COPD).

Shortness of breath in patients with severe breathing difficulty due to left ventricular failure (secondary treatment).

CONTRA-INDICATIONS

None in the emergency situation.

SIDE EFFECTS

Tremor (shaking).

Tachycardia.

Palpitations.

Headache.

Feeling of tension.

Peripheral vasodilatation.

DOSAGE AND ADMINISTRATION

NOTE: Ensure pre- and post-nebulisation observations including peak flow readings are taken and documented.

Route: Nebulised with 6-8 litres per minute oxygen.

		CONCENTRATION	
		2.5 milligrams in 2.5ml	5 milligrams in 2.5ml
AGE	DOSE	VOLUME	VOLUME
Adult (>12-years)	5 milligrams	**5.0ml**	**2.5ml**
6 to <12 years	5 milligrams	**5.0ml**	**2.5ml**
12-months to <6-years	2.5 milligrams	**2.5ml**	**1.25ml**
<12-months	2.5 milligrams	**2.5ml**	**1.25ml**

Salbutamol is less effective in children <12 months and a single dose of 2.5 milligrams should be administered. If this is ineffective, further doses should not be given.

In severe attacks nebulisation may need to be repeated as necessary. The pulse rate in children may exceed 140 after significant doses of salbutomol. This is not usually of any clinical significance and should not usually preclude further use of the drug.

Otherwise there is no limit on the maximum number of nebulised doses a patient may have. Repeat doses should, however, be discontinued if the side effects are becoming significant (e.g. tremors, tachycardia >140 beats per minute in adults etc.) This is a clinical decision by the ambulance clinician.

If there is no improvement in peak flow after 5 minutes, administer a further 5 milligrams, nebulised with 6-8 litres per minute oxygen.

In life threatening or acute severe asthma – do not delay further care.
LOAD & GO to NEAREST SUITABLE RECEIVING HOSPITAL and provide nebulisation en-route

PRESENTATION

500ml and 1,000ml packs of sodium chloride intravenous infusion 0.9%.

5 and 10ml ampoules for use as flushes.

INDICATIONS

May be used as an alternative to sodium lactate intravenous infusion for blood and fluid loss, to correct hypovolaemia and improve tissue perfusion.

Dehydration.

Fluid replacement in hyperglycaemic ketoacidotic diabetic coma and pre-coma.

As a flush after drug administration.

As a flush when an intravenous cannula is in situ and where drug therapy may not be desirable.

ACTIONS

Crystalloid solution for fluid replacement.

To establish and maintain the patency of a cannula or for flushing drugs through.

CONTRA-INDICATIONS

None.

SIDE EFFECTS

Infusion of an excessive volume may overload the circulation and precipitate heart failure (evidenced by increased breathlessness, wheezing and distended neck veins). Volume overload is unlikely if the patient is correctly assessed initially and it is very unlikely indeed if patient response is assessed after initial 250 ml infusion and then after each 250 ml of infusion. If there is evidence of this complication, the patient should be transported rapidly to **nearest suitable receiving hospital** whilst administering high concentration oxygen. No further fluid should be given.

DOSAGE AND ADMINISTRATION

In hypovolaemia, Medical Emergencies (e.g. anaphylaxis, GI bleeding, heat exhaustion).

Route: IV rapid infusion.

Concentration – 0.9%.

AGE	DOSE	VOLUME
Adult	250ml	**250ml**

ADULTS – Monitor physiological response; re-assess perfusion, pulse, respiratory rate and blood pressure wherever possible. If these observations improve, slow the infusion rate. If no improvement administer further 250ml boluses (maximum 2 litres).

	Medical Emergencies 20ml/kg		Medical Emergencies initial volume 5ml/kg	
AGE	DOSE	VOLUME	DOSE	VOLUME
11 years	700ml	**700ml**	180ml	**180ml**
10 years	640ml	**640ml**	160ml	**160ml**
9 years	570ml	**570ml**	140ml	**140ml**
8 years	520ml	**520ml**	130ml	**130ml**
7 years	460ml	**460ml**	120ml	**120ml**
6 years	410ml	**410ml**	100ml	**100ml**
5 years	370ml	**370ml**	90ml	**90ml**
4 years	330ml	**330ml**	80ml	**80ml**
3 years	290ml	**290ml**	70ml	**70ml**
2 years	240ml	**240ml**	60ml	**60ml**
18 months	220ml	**220ml**	60ml	**60ml**
12 months	200ml	**200ml**	50ml	**50ml**
9 months	180ml	**180ml**	50ml	**50ml**
6 months	160ml	**160ml**	40ml	**40ml**
3 months	120ml	**120ml**	30ml	**30ml**
1 month	90ml	**90ml**	20ml	**20ml**
Birth	70ml	**70ml**	20ml	**20ml**

ADULTS – In hypovolaemia:
If the patient remains hypotensive despite repeated 250ml boluses **AND** the patient is trapped on scene, request on-line clinical support.
Excessive rise of blood pressure may cause re-bleeding and further haemorrhage. Aim to maintain a systolic blood pressure of 90mmHg, measured accurately where possible or estimated by the presence of a radial pulse where time is critical.

CHILDREN – In hypovolaemia:
If necessary a further dose of up to 20ml/kg may be administered as above. If still hypovolaemic seek on-line medical help.

CHILDREN – In hyperglycaemia:
Generally emergency IV fluids should be minimised or avoided because of serious side effects that may occur. See paediatric diabetic ketoacidosis.

Route: IV flush

AGE	DOSE	VOLUME
Adult or Child >5years	2ml-5ml	**2-5ml**
Adult or Child >5years	10ml-20ml (when infusing glucose)	**10-20ml**
Child: Neonatal <5years	2ml	**2.0ml**
Child: Neonatal <5years	10ml (when infusing glucose)	**10-20ml**

If infusion is established as a precaution – administer by slow rate to "keep vein open."

PRESENTATION

500ml and 1,000ml bags of Compound Sodium Lactate Intravenous Infusion (also called Hartmann's Solution for Injection or Ringer-Lactate Solution for Injection).

INDICATIONS

Blood and fluid loss, to correct hypovolaemia and improve tissue perfusion.

Dehydration.

ACTIONS

Fluid volume replacement.

CONTRA-INDICATIONS

Should **NOT** be used as fluid replacement in diabetic hyperglycaemic ketoacidotic coma and pre-coma; use sodium chloride intravenous infusion 0.9% instead.

SIDE EFFECTS

Infusion of an excessive volume may overload the circulation and precipitate heart failure (increased breathlessness, wheezing and distended neck veins). Volume overload is unlikely if the patient is correctly assessed initially and it is very unlikely indeed if patient response is assessed after initial 250ml infusion and then after each 250ml of infusion. If there is evidence of this complication, the patient should be transported rapidly to **nearest suitable receiving hospital** whilst administering high-flow oxygen.

Do not give further fluid.

CAUTIONS

Compound sodium lactate intravenous infusion should not be given except to keep vein open in **ISOLATED** head injuries because large-volume infusions may increase intra-cranial pressure.

HOWEVER, in head injured patients with other significant trauma, infuse as normal to correct volume loss. Inadequate infusion decreases cerebral blood flow and increases hypoxia.

ADDITIONAL INFORMATION

Compound sodium lactate intravenous infusion contains mainly sodium, but also small amounts of potassium and lactate. It is useful for initial fluid replacement in cases of blood loss.

Sodium lactate diffuses rapidly into extra-cellular space (around 75%), so it is useful for initial resuscitation of major fluid loss, followed by blood or colloid. It is also useful as sole volume replacement in small volume losses.

The volume of compound sodium lactate intravenous infusion needed is 3 times as great as the volume of blood loss. Sodium lactate has **NO** oxygen carrying capacity.

DOSAGE AND ADMINISTRATION

In hypovolaemia, Medical Emergencies (e.g. anaphylaxis, GI bleeding, heat exhaustion)

Route: IV rapid infusion

AGE	DOSE	VOLUME
Adult	250ml	**250ml**

ADULTS – Monitor physiological response; re-assess perfusion, pulse, respiratory rate and blood pressure wherever possible. If these observations improve, slow the infusion rate. If no improvement administer further 250ml boluses/ aliquots to maintain a radial pulse (maximum 2 litres).

	Medical Emergencies 20ml/kg		Medical Emergencies initial volume 5ml/kg	
AGE	DOSE	VOLUME	DOSE	VOLUME
11 years	700ml	**700ml**	180ml	**180ml**
10 years	640ml	**640ml**	160ml	**160ml**
9 years	570ml	**570ml**	140ml	**140ml**
8 years	520ml	**520ml**	130ml	**130ml**
7 years	460ml	**460ml**	120ml	**120ml**
6 years	410ml	**410ml**	100ml	**200ml**
5 years	370ml	**370ml**	90ml	**90ml**
4 years	330ml	**330ml**	80ml	**80ml**
3 years	290ml	**290ml**	70ml	**70ml**
2 years	240ml	**240ml**	60ml	**60ml**
18 months	220ml	**220ml**	60ml	**60ml**
12 months	200ml	**200ml**	50ml	**50ml**
9 months	180ml	**180ml**	50ml	**50ml**
6 months	160ml	**160ml**	40ml	**40ml**
3 months	120ml	**120ml**	30ml	**30ml**
1 month	90ml	**90ml**	20ml	**20ml**
Birth	70ml	**70ml**	20ml	**20ml**

CHILDREN – If necessary a further dose of up to 20ml/kg may be administered as above. If further fluid is required seek on-line medical help.

Excessive rise of blood pressure may cause re-bleeding and further haemorrhage. Aim to maintain a systolic blood pressure of 90 mmHg, measured accurately where possible or estimated by the presence of a radial pulse where time is critical.

If the patient remains hypotensive despite repeated 250ml boluses AND the patient is trapped on scene, request on-line clinical support.

PRESENTATION

An ampoule containing ergometrine 500 micrograms and oxytocin 5 units in 1ml.

INDICATIONS

Postpartum haemorrhage within 24 hours of delivery of the infant where bleeding from the uterus is uncontrollable by uterine massage.

ACTIONS

Stimulates contraction of the uterus within 7 minutes of IM injection.

CONTRA-INDICATIONS

Known hypersensitivity.

Active labour.

Severe cardiac, liver or kidney disease.

Hypertension and severe pre-eclampsia.

Possible multiple pregnancy/known or suspected fetus in utero.

DOSAGE AND ADMINISTRATION

Route: IM

Concentration – 500 micrograms ergometrine and 5 units oxytocin in 1ml.

AGE	DOSE	VOLUME
Adult	500 micrograms ergometrine 5 units oxytocin	**1ml**

SIDE EFFECTS

Nausea and vomiting.

Abdominal pain.

Headache.

Hypertension and bradycardia.

Chest pain and rarely anaphylactic reactions.

PRESENTATION

1 or 1.5 gram tubes of white semi-transparent gel.

Transparent occlusive dressing.

ACTIONS

Tetracaine 4% cream is a local anaesthetic agent which has properties to allow it to penetrate intact skin, thus providing local anaesthesia to the area of skin with which it has been in contact.

INDICATIONS

Where venepuncture may be required in a non urgent situation, in individuals who are believed to have a fear of, or likely to become upset if undergoing venepuncture (usually children, some vulnerable adults or needle phobic adults). Venepuncture includes intravenous injection, cannulation and obtaining venous blood.

Time application so that the area is anaesthetised at time of arrival in ED.

CAUTIONS

Allergy to elastoplast or other adhesive dressing – discuss risk/ benefit with carer.

CONTRA-INDICATIONS

DO NOT apply tetracaine in the following circumstances:

- **the application of tetracaine should not take preference over life saving or any other clinically urgent procedures**
- if the area being considered for anaesthesia will require venepuncture in less than 15 minutes
- known allergy to tetracaine cream, or any of its other constituents
- known allergy to the brand of transparent occlusive dressing
- if the patient is allergic to other local anaesthetics
- if the patient is pregnant or breastfeeding
- if the patient is less than one month old
- avoid applying to open wounds, broken skin, lips, mouth, eyes, ears, anal, or genital region, mucous membranes.

SIDE EFFECTS

Mild vasodilatation over the treated area is to be expected.

Occasionally local irritation may occur.

DOSAGE AND ADMINISTRATION

Route: Topical – Apply to two sites.

Concentration – Variable.

AGE	DOSE	VOLUME
All ages	1-1.5 gram	**1 tube**

Apply one tube directly over a vein that looks as if it would support cannulation – the back of the hand usually works well. Do **not** rub the cream in.

Place an occlusive dressing directly over the "blob" of cream, taking care to completely surround the cream to ensure it does not leak out. Repeat the procedure in one similar, alternative site.

REMEMBER to tell the hospital staff the time of application and location when handing the patient over at the hospital.

SPECIAL PRECAUTIONS

Do not leave on for more than an hour.

ADDITIONAL INFORMATION

Although the application of tetracaine may not directly affect the quality of experience that the patient receives from the ambulance service, it is in line with good patient care as the overall pathway of care the patient will receive will be enhanced.

30-40 minutes after application the area will become numb and remain numb for 4-6 hours.

Tetracaine only needs refrigeration if it is unlikely to be used for a considerable time. Stores should be kept refrigerated. Generally speaking, it does not require refrigeration in everyday use.

Thrombolytics (Reteplase, Tenecteplase) – Rpa/Tnk and Adjunctive Heparin

PRESENTATION

Vials of **reteplase** 10 units for reconstitution with 10ml water for injection.

Vials of **tenecteplase** 10,000 units for reconstitution with 10ml water for injection, or 8,000 units for reconstitution with 8ml water for injection.

NOTE: Whilst the strength of thrombolytics is traditionally expressed in 'units' these units are unique to each particular drug and are **NOT** interchangeable.

INDICATIONS

Acute myocardial infarction within six hours of symptom onset.

Ensure patient fulfils the criteria for drug administration following the model checklist (below). Variation of these criteria is justifiable at local level with agreement of appropriate key stakeholders (e.g. cardiac network).

ACTIONS

Activates the fibrinolytic system, inducing the breaking up of intravascular thrombi and emboli.

JRCALC MODEL CHECKLIST

PRIMARY ASSESSMENT

1. Can you confirm that the patient is conscious, coherent, and able to understand that clot dissolving drugs will be used?
2. Can you confirm that the patient is aged **80** or less?
3. Can you confirm that the patient has had symptoms characteristic of a heart attack (i.e. continuous pain in a typical distribution of 15 minutes duration or more)?
4. Can you confirm that the symptoms started less than 6 hours ago?
5. Can you confirm that the pain built up over seconds and minutes rather than starting totally abruptly?
6. Can you confirm that breathing does not influence the severity of pain?
7. Can you confirm that the heart rate is between **40-140** beats per minute.
8. Can you confirm that the systolic blood pressure is more than 80mmHg and less than **180**mmHg and that the diastolic blood pressure is below 110mmHg?
9. Can you confirm that the electrocardiogram shows abnormal ST segment elevation of 2mm or more in at least 2 standard leads or in at least 2 adjacent precordial leads, not including V1? **NOTE**: ST elevation can sometimes be normal in V1 and V2.
10. Can you confirm that the QRS width is 0.16 seconds or less, and that left bundle branch block is absent from the tracing? **NOTE**: right bundle-branch block permitted only with qualifying ST elevation.
11. Can you confirm that there is **NO** atrio-ventricular block greater than 1st degree? **NOTE**: if necessary after treatment with IV atropine.

SECONDARY ASSESSMENT (CONTRA-INDICATIONS)

12. Can you confirm that the patient is not likely to be pregnant, nor has delivered within the last two weeks?
13. Can you confirm that the patient has not had an active peptic ulcer within the last 6 months?
14. Can you confirm that the patient has not had a stroke of any sort within the last 12 months and does not have permanent disability from a previous stroke?
15. Can you confirm that the patient has no diagnosed bleeding tendency, has had no recent blood loss (except for normal menstruation) and is not taking warfarin (anticoagulant) therapy?
16. Can you confirm that the patient has not had any surgical operation, tooth extractions, significant trauma, or head injury within the last 4 weeks?
17. Can you confirm that the patient has not been treated recently for any other serious head or brain condition? (This is intended to exclude patients with cerebral tumours).
18. Can you confirm that the patient is not being treated for liver failure, renal failure, or any other severe systemic illness?

Previous streptokinase treatment is a contra-indication to the later use of streptokinase. Whilst this is not relevant to the use of tenecteplase or reteplase, it is always worth noting that thrombolytic treatment has been used in the past.

CONSENT

NOTE: many patients with acute myocardial infarction (MI) will not be legally 'competent' to give informed consent, and the Paramedic must act in the individual patient's best interest (refer to consent guideline).

The suggested information for a patient who is being considered for pre-hospital thrombolysis is as follows:-

"It is likely that you have suffered a heart attack, and the best treatment is a clot dissolving drug called 'xxx'. The quicker you receive this drug, the lower the risk from the heart attack – which is why Doctors recommend the treatment is started as soon as possible. These drugs can cause serious side effects in a small minority of patients which I can explain to you in more detail if you so wish, but the risks attached to this treatment are very much less than the likely benefit. Would you like me to give you the injection or would you prefer to have more details?"

In the unlikely event that patients do want more information they should be given the following information:-

"Treatment at this stage saves the lives of about 4 patients for every 100 we treat. But it can sometimes cause serious bleeding. The biggest risk is stroke which affects about 1 patient in every 200. Some patients also have allergic and other effects that do not usually cause any major problem."

RETEPLASE – DOSAGE AND ADMINISTRATION

Route: IV bolus injections separated by 30 minutes.

Concentration – 10 units in 10mls.

AGE	DOSE	VOLUME
Adult	**First dose** 10 units **– note time administered**	**10ml**
	Second dose 10 units – **30 minutes after first dose**	**10ml**

A bolus intravenous injection of unfractionated heparin should be given before the first dose of reteplase and the cannula flushed well with saline **OR** a separate cannula used for reteplase since the two agents are physically incompatible.

HEPARIN

Route: IV single bolus unfractionated heparin.

AGE	DOSE
Adult	5,000U **(prior to administration of reteplase)**

If a heparin infusion HAS NOT commenced within 45 minutes of the original bolus of reteplase, administer a second dose of heparin 1,000U.

AT HOSPITAL

It is essential that care of the patient is handed over as soon as possible to a member of hospital staff qualified to administer the second bolus (if not already given) and commence a heparin infusion.

TENECTEPLASE – DOSAGE AND ADMINISTRATION

Route: IV single bolus adjusted for patient weight.

Concentration – 1,000 U/ml.

AGE		DOSE	VOLUME
<60kg	(>9st6lbs)	6000 units	**6.0ml**
60-69kg	(9st6lbs-10st12lbs)	7000 units	**7.0ml**
70-79kg	(11st -12st6lbs)	8000 units	**8.0ml**
80-89kg	(12st8lbs-14st)	9000 units	**9.0ml**
>90kg	(>14st2lbs)	10000 units	**10.0ml**

A single bolus intravenous injection of unfractionated heparin should be given before administration of tenecteplase and the cannula flushed well with saline.

HEPARIN

Route: IV single bolus unfractionated heparin.

AGE	DOSE
Adult <67kg	4,000U (**prior to administration** of tenecteplase)
Adult >67kg	5,000U (**prior to administration** of tenecteplase)

If the heparin infusion HAS NOT commenced within 45 minutes of the original bolus of tenecteplase, administer a second dose of heparin 1,000U.

AT HOSPITAL

It is essential that care of the patient is handed over as soon as possible to a member of hospital staff qualified to commence a heparin infusion.

IN ALL CASES

Ensure a defibrillator is immediately available at all times.

Monitor conscious level, pulse, blood pressure and cardiac rhythm during and following injections. Manage complications (associated with the acute MI) as they occur using standard protocols. The main early adverse event associated with thrombolysis is bleeding, which should be managed according to standard protocols.

AT HOSPITAL – emphasise the need to commence a heparin infusion in accordance with local protocols.

HEPARIN

Heparin is required as adjunctive therapy with reteplase and tenecteplase to reduce the risk of reinfarction.

It is extremely important that the initial bolus dose is given at the earliest opportunity prior to administration of thrombolytic agents and a heparin infusion is commenced immediately on arrival at hospital.

A further intravenous bolus dose of 1,000 units heparin may be required if a heparin infusion **HAS NOT** commenced within 45 minutes of the original bolus of thrombolytic agent.

Recent trials have suggested that low molecular weight heparin may be useful in patients under 75 years of age (older patients have much higher bleeding risk with this treatment). Research is ongoing and local protocols should be followed. Further information is available at www.warwick.ac.uk/go/emergencycare

ADDITIONAL INFORMATION

'Time is muscle!' Do not delay transportation to hospital if difficulties arise whilst setting up the equipment or establishing IV access. Qualified single responders should press on with administering a thrombolytic if indicated while awaiting arrival of an ambulance.

The increasing availability of primary percutaneous coronary intervention (**PCI**) means some patients with MI will be taken direct to a specialist cardiac centre instead of receiving thrombolysis (see acute coronary syndrome guideline). Local protocols should be followed.

SIDE EFFECTS

Bleeding:
- major – seek medical advice and transport to hospital rapidly.
- minor e.g. at injection sites – use local pressure.

Arrhythmias – these are usually benign in the form of transient idioventricular rhythms and usually require no special treatment. Treat VF as a complication of MI with standard protocols; bradycardia with atropine as required.

Anaphylaxis – extremely rare (0.1%) with third generation bolus agents.

Hypotension often responds to laying the patient flat.

INTRODUCTION

Basic life support refers to maintaining airway patency, and supporting breathing and circulation without the use of equipment other than a protective device, usually a facemask or shield. In the pre-hospital environment BLS includes the use of a bag-mask and Guedal airway.

BLS is undertaken as a prelude to defibrillation, often with an automated external defibrillator (AED).

ADULT BASIC LIFE SUPPORT SEQUENCE (see Appendix 1)

This sequence is for a single ambulance clinician, however, when more than one clinician is present, tasks can be shared and undertaken simultaneously.

1. Safety

Ensure that you, the patient and any bystanders are safe.

2. Check Responsiveness

Gently shake the patient by the shoulders and ask loudly: ***"Are you alright?"***

a. The responsive patient:

- take history and make assessment of what is wrong, with further action determined accordingly.

b. The unresponsive patient:

- obtain help if appropriate
- turn the patient onto his back and then open the airway using head tilt and chin lift. Look in the mouth. If a foreign body or debris is visible attempt to remove it with a finger sweep, forceps or suction as appropriate
- when there is a risk of back or neck injury, establish a clear upper airway by using jaw thrust or chin lift in combination with manual in-line stabilisation of the head and neck by an assistant (if available). If life threatening airway obstruction persists despite effective application of jaw thrust or chin lift, add head tilt a small amount at a time until the airway is open; establishing a patent airway takes priority over concerns about a potential back or neck injury.

3. Keeping the airway open

Look, listen and feel for normal breathing, taking no more than 10 seconds to determine if the patient is breathing normally. If you have any doubt whether breathing is normal, act as if it is **not** normal.

Agonal breathing (occasional gasps, slow, laboured noisy breathing) is common in the early stages of cardiac arrest. It is a sign of cardiac arrest and should not be confused as a sign of life / circulation.

a. If the patient is breathing normally:

- turn into the recovery position
- undertake assessment, monitoring and transport accordingly
- re-assess regularly.

b. If the patient is not breathing normally:

- it may be difficult to be certain that there is no pulse
- if there are no signs of life (lack of movement, normal breathing, or coughing), or there is doubt, start chest compressions at a rate of 100 compressions per minute
- compression depth should be 4–5cm. Allow the chest to recoil completely after each compression. Take approximately the same amount of time for each compression and relaxation. Minimise interruptions to chest compression. Do not rely on a palpable carotid or femoral pulse as a gauge of effective arterial flow.

4. Combine chest compression with rescue breaths

After 30 compressions, open the airway again and provide two ventilations with the most appropriate equipment available, using an inspiratory time of one second with adequate volume to produce normal chest expansion. Each time compressions are resumed the ambulance clinician should place his hands without delay 'in the centre of the chest'.

Add supplemental oxygen as soon as possible.

Continue chest compressions and ventilation in a ratio of 30:2.

Stop to recheck only if he starts breathing normally; otherwise do not interrupt resuscitation until starting advanced life support techniques.

Performing chest compressions is tiring; try to change the person doing chest compressions every two minutes; ensure the minimum of delay during the changeover. Once the airway is secure (for example after tracheal intubation) continue chest compressions uninterrupted at 100 per minute (except for defibrillation or further assessment as indicated). Ventilate 10 times per minute. Avoid hyperventilation.

If attempts at ventilation do not make the chest rise as in normal breathing, then before the next attempt at ventilation:

- check the patient's mouth and remove any obstruction
- recheck that the airway position is optimal with adequate head tilt / chin lift or jaw thrust
- do not attempt more than two breaths each time before returning to chest compressions.

CPR in confined spaces

Over the head CPR and straddle CPR may be considered for resuscitation in confined spaces.

THE RECOVERY POSITION

There are several variations of the recovery position each with its own advantages. No single position is perfect for all patients. The position should be stable, near a true lateral position with the head dependent, and with no pressure on the chest to impair breathing. If the patient has to be kept in the recovery position for more than 30 minutes, turn the patient to the opposite side to relieve pressure on the lower arm.

Use of the Automated External Defibrillator (AED)

1. Make sure you, the patient and any bystanders are safe.

2. If you do not have an AED with you, perform CPR until an AED arrives.

3. As soon as an AED is available:

- switch on the defibrillator and attach the electrode pads. If more than one ambulance clinician is present, CPR should be continued whilst this is done
- follow the spoken / visual directions
- ensure nobody touches the patient whilst the AED is analysing the rhythm.

4a. If a shock is indicated:

- ensure nobody touches the patient
- push the shock button as directed
- continue as directed by the voice/visual prompts.

4b. If no shock is indicated:

- immediately resume CPR using a ratio of 30 compressions to 2 rescue breaths
- continue as directed by voice / visual prompts.

5. Continue to follow AED prompts until:

- qualified help arrives and takes over
- the patient starts to breathe normally
- you are exhausted
- the resuscitation attempt is abandoned.

Key Points – Adult Basic Life Support

- Agonal breathing is common in the early stages of cardiac arrest and should not be confused as a sign of life/circulation.
- If there are no signs of life, start chest compressions at a rate of 100 compressions per minute using a ratio of 30 compressions to 2 breaths.
- Once the airway is secure, chest compressions should be uninterrupted with ventilations 10 times per minute; avoid hyperventilation.
- As soon as an AED is available switch on the defibrillator and attach the electrode pads and follow voice/visual prompts.
- To relieve pressure on the lower arm, whilst in the recovery position, turn the patient to the opposite side every 30 minutes.

SELECT BIBILOGRAPHY

[1] Van Alem AP, Sanou BT, Koster RW. Interruption of cardio-pulmonary resuscitation with the use of the automated external defibrillator in out-of-hospital cardiac arrest. *Annals of Emergency Medicine* 2003;42(4):449.

[2] Eftestol T, Sunde K, Steen PA. Effects of Interrupting Precordial Compressions on the Calculated Probability of Defibrillation Success During Out-of-Hospital Cardiac Arrest. *Circulation* 2002;105(19):2270-2273.

[3] Hallstrom A, Cobb L, Johnson E, Copass M. Cardiopulmonary Resuscitation by Chest Compression Alone or with Mouth-to-Mouth Ventilation. *N Engl J Med* 2000;342(21):1546-1553.

[4] Bahr J, Klingler H, Panzer W, Rode H, Kettler D. Skills of lay people in checking the carotid pulse. *Resuscitation* 1997;35(1):23.

[5] Hauff SR, Rea TD, Culley LL, Kerry F, Becker L, Eisenberg MS. Factors impeding dispatcher-assisted telephone cardio-pulmonary resuscitation. *Annals of Emergency Medicine* 2003;42(6):731.

[6] Handley AJ. Teaching hand placement for chest compression—a simpler technique. *Resuscitation* 2002;53(1):29.

METHODOLOGY

The methodology describing the development process of the international cardio-pulmonary resuscitation treatments recommendations on which this guideline is based is fully described in the publications listed below.

Morley PT, Zaritsky A. The evidence evaluation process for the 2005 International Consensus Conference on cardio-pulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. *Resuscitation* 2005;67(2-3):167-170.

Zaritsky A, Morley PT. The Evidence Evaluation Process for the 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. *Circulation* 2005;112(22_suppl):III-128-130.

Adult Basic Life Support (BLS)

UNRESPONSIVE?

↓

Summon help if appropriate

↓

Open airway

↓

NOT BREATHING NORMALLY?

↓

30 Chest
compressions

↓

2 rescue breaths
30 chest compressions

INTRODUCTION

The heart rhythms associated with cardiac arrest are divided into two groups:

1. **shockable rhythms** – ventricular fibrillation and pulseless ventricular tachycardia (VF/VT)
2. **non-shockable rhythms** – asystole and pulseless electrical activity (PEA).

The principal difference in the management of these two groups is the need for attempted defibrillation in VF/VT. Subsequent actions including chest compressions, airway management and ventilation, venous access, administration of adrenaline and the management of reversible factors, are common to both groups.

Undue time should not be spent trying to establish intravenous access, and interruptions to chest compressions while attempting this must be kept to a minimum. Paramedics should not regard the administration of drugs as a priority in the management of cardiac arrest, and should not incur criticism if none are given during a resuscitation attempt.

The interventions that unequivocally improve survival are early defibrillation and effective basic life support. Attention should focus therefore on early defibrillation and high quality, uninterrupted cardio-pulmonary resuscitation (CPR).

The value of drugs in the management of cardiac arrest is debatable. Establishing intravenous access for their administration is often difficult in the pre-hospital arena, particularly in patients with cardiac arrest. Increasing evidence testifies to the value of CPR in this situation, and particularly chest compressions.

Sequence of Actions – The Adult ALS Algorithm (see Appendix 1)

Having confirmed cardiac arrest, summon help if appropriate.

Start CPR beginning with chest compressions. Ventilate with high concentration oxygen.

Personnel working outside hospital should perform CPR for two minutes (about 5 cycles of 30:2) before attempting defibrillation unless the arrest is witnessed by healthcare professionals and a defibrillator is immediately available.

As soon as the defibrillator arrives, diagnose the rhythm by applying paddles or self adhesive pads to the chest.

1. SHOCKABLE RHYTHMS (VF/PULSELESS VT)

Attempt defibrillation (one shock – 150-200 Joules biphasic or 360 Joules monophasic).

Immediately resume chest compressions (30:2) without re-assessing the rhythm or feeling for a pulse.

Continue CPR for 2 minutes, and then pause briefly to check the monitor,

If VF/VT persists:

- give a further (2nd) shock (150-360 Joules biphasic or 360 Joules monophasic)
- resume CPR immediately and continue for 2 minutes
- pause briefly to check the monitor
- if VF/VT persists give adrenaline 1 milligram IV followed immediately by a (3rd) shock (150-360 Joules biphasic or 360 Joules monophasic)
- resume CPR immediately and continue for 2 minutes
- pause briefly to check the monitor
- if VF/VT persists give amiodarone 300 milligrams IV followed immediately by a (4th) shock (150-360 Joules biphasic or 360 Joules monophasic)
- resume CPR immediately and continue for 2 minutes
- give adrenaline 1 milligram IV immediately before alternate shocks (i.e. approximately every 3-5 minutes)
- give further shocks after each 2 minute period of CPR and after confirming that VF/VT persists.

If organised electrical activity is seen, check for a pulse.

- If a pulse is present, start post-resuscitation care.
- If no pulse is present, continue CPR and switch to the non-shockable algorithm.

If asystole is seen, continue CPR and switch to the non-shockable algorithm.

2. NON-SHOCKABLE RHYTHMS (ASYSTOLE AND PEA)

If these rhythms are identified, start CPR 30:2 and give adrenaline 1 milligram as soon as intravascular access is achieved.

If asystole is displayed, without stopping CPR, check the leads are attached correctly.

Give atropine 3 milligrams if the rhythm is asystole or slow PEA (<60/minute).

Secure the airway as soon as possible to enable continuous chest compressions without pausing for ventilation.

After two minutes CPR 30:2 recheck the rhythm. If asystole is present or there has been no change in ECG appearance resume CPR immediately.

If VF / VT recurs, change to the shockable rhythm algorithm.

If an organised rhythm is present, attempt to palpate a pulse.

If a pulse is present begin post resuscitation care.

If no pulse is present (or there is any doubt) continue CPR. Give adrenaline 1 milligram IV every 3–5 minutes (alternate loops).

If signs of life return during CPR, check the rhythm and attempt to palpate a pulse.

POTENTIALLY REVERSIBLE CAUSES

Potential causes or aggravating factors for which specific treatment exists must be considered during any cardiac arrest. For ease of memory these are presented as the 4H's and 4T's according to their initial letter.

Those amenable to treatment include:

4 H's

1. **Hypoxia** – ensure adequate ventilation, adequate chest expansion and breath sounds. Verify tracheal tube placement.
2. **Hypovolaemia –** PEA caused by hypovolaemia is usually due to haemorrhage from trauma, gastrointestinal bleeding or rupture of an aortic aneurysm. Intravascular volume should be restored rapidly with IV fluid. Rapid transport to definitive surgical care is essential.
3. **Hypothermia –** refer to hypothermia and immersion incident guidelines.
4. **Hyperkalaemia** and other electrolyte disorders are unlikely to be apparent in the pre-hospital arena or amenable to treatment.

4T's

1. **Tension Pneumothorax –** the diagnosis is made clinically; decompress as soon as possible by needle thoracocentesis.
2. **Cardiac Tamponade** is difficult to diagnose as the typical signs (high venous pressure, hypotension) disappear after cardiac arrest occurs. Cardiac arrest after penetrating chest trauma is highly suggestive of cardiac tamponade. Pericardiocentesis or thoracotomy can be performed outside hospital by specialist teams.
3. **Toxins –** only rarely will an antidote be available outside hospital, and in most cases supportive treatment will be the priority.
4. **Thromboembolism –** massive pulmonary embolism is the commonest cause but diagnosis in the field is difficult once arrest has occurred. Specific treatments (like thrombolytic drugs) are not available to ambulance personnel in the UK at present.

THE WITNESSED, MONITORED ARREST

If a patient who is being monitored has a witnessed arrest:

- confirm cardiac arrest, summon help if appropriate
- if the rhythm is VF/VT and a defibrillator is not immediately available consider a precordial thump
- if the rhythm is VF/VT and a defibrillator is immediately available, give a shock first.

When the arrest is witnessed but unmonitored, using the paddles or adhesive electrodes will allow assessment of the rhythm more quickly than attaching ECG electrodes.

Key Points – Adult Advanced Life Support (ALS)

- Unless the arrest is witnessed by HCP and a defibrillator is immediately available, perform CPR for 2 minutes (approximately 5 cycles of 30:2) before attempting defibrillation.
- Secure airway as soon as possible to enable continuous chest compressions.
- For shockable rhythms defibrillate and resume chest compressions (30:2) without re-assessing the rhythm or feeling for a pulse for 2 minutes then check rhythm, if VT/VT persists follow ALS algorithm.
- For non-shockable rhythms start CPR at a ratio of 30:2 and give adrenaline 1mg as soon as intravascular access is achieved.
- Always consider reversible features (4Hs and 4Ts) and correct when possible.

BIBILOGRAPHRY

[1] Wik L, Hansen TB, Fylling F, Steen T, Vaagenes P, Auestad BH, et al. Delaying Defibrillation to Give Basic Cardiopulmonary Resuscitation to Patients With Out-of-Hospital Ventricular Fibrillation: A Randomized Trial. *JAMA* 2003;289(11):1389-1395.

[2] Berg RA, Sanders AB, Kern KB, Hilwig RW, Heidenreich JW, Porter ME, et al. Adverse Hemodynamic Effects of Interrupting Chest Compressions for Rescue Breathing During Cardiopulmonary Resuscitation for Ventricular Fibrillation Cardiac Arrest. *Circulation* 2001;104(20):2465-2470.

[3] Kern KB, Hilwig RW, Berg RA, Sanders AB, Ewy GA. Importance of Continuous Chest Compressions During Cardiopulmonary Resuscitation: Improved Outcome During a Simulated Single Lay-Rescuer Scenario. *Circulation* 2002;105(5):645-649.

[4] Eftestol T, Sunde K, Steen PA. Effects of Interrupting Precordial Compressions on the Calculated Probability of Defibrillation Success During Out-of-Hospital Cardiac Arrest. *Circulation* 2002;105(19):2270-2273.

[5] Wik L, Kramer-Johansen J, Myklebust H, Sorebo H, Svensson L, Fellows B, et al. Quality of Cardiopulmonary Resuscitation During Out-of-Hospital Cardiac Arrest. *JAMA* 2005;293(3):299-304.

[6] Abella BS, Alvarado JP, Myklebust H, Edelson DP, Barry A, O'Hearn N, et al. Quality of Cardiopulmonary Resuscitation During In-Hospital Cardiac Arrest. *JAMA* 2005;293(3):305-310.

[7] Van Alem AP, Sanou BT, Koster RW. Interruption of cardio-pulmonary resuscitation with the use of the automated external defibrillator in out-of-hospital cardiac arrest. *Annals of Emergency Medicine* 2003;42(4):449.

[8] Aung K, Htay T. Vasopressin for Cardiac Arrest: A Systematic Review and Meta-analysis. *Arch Intern Med* 2005;165(1):17-24.

[9] Kudenchuk PJ, Cobb LA, Copass MK, Cummins RO, Doherty AM, Fahrenbruch CE, et al. Amiodarone for Resuscitation after Out-of-Hospital Cardiac Arrest Due to Ventricular Fibrillation. *N Engl J Med* 1999;341(12):871-878.

[10] Dorian P, Cass D, Schwartz B, Cooper R, Gelaznikas R, Barr A. Amiodarone as Compared with Lidocaine for Shock-Resistant Ventricular Fibrillation. *N Engl J Med* 2002;346(12):884-890.

[11] The Hypothermia after Cardiac Arrest Study G. Mild Therapeutic Hypothermia to Improve the Neurologic Outcome after Cardiac Arrest. *N Engl J Med* 2002;346(8):549-556.

[12] Bernard SA, Gray TW, Buist MD, Jones BM, Silvester W, Gutteridge G, et al. Treatment of Comatose Survivors of Out-of-Hospital Cardiac Arrest with Induced Hypothermia. *N Engl J Med* 2002;346(8):557-563.

[13] Nolan JP, Morley PT, Hoek TL, Hickey RW, Resuscitation ALsTFotILco. Therapeutic hypothermia after cardiac arrest. An advisory statement by the Advancement Life Support Task Force of the International Liaison committee on Resuscitation. *Resuscitation* 2003;57(3):231-5.

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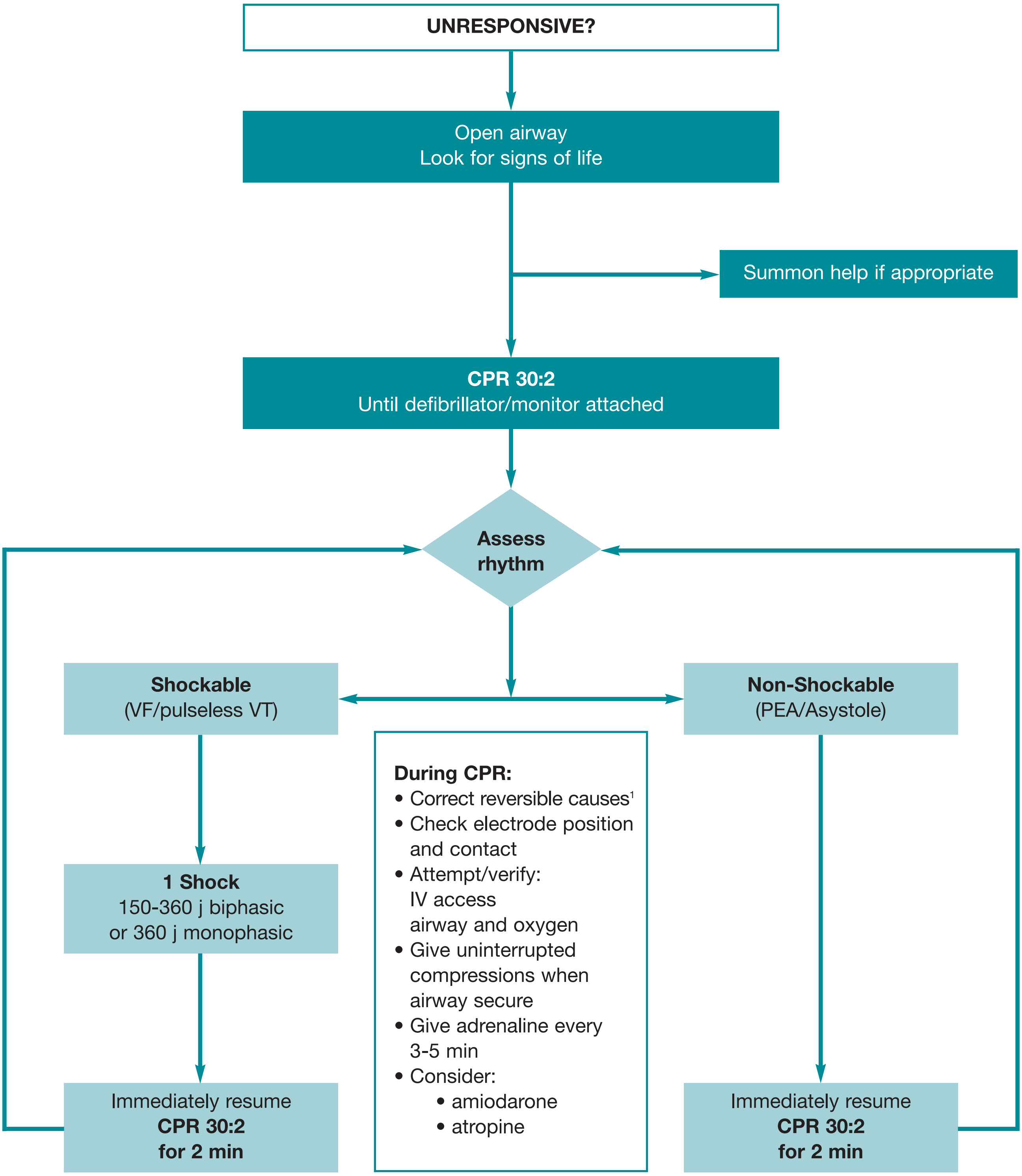
APPENDIX 1 – Adult Advanced Life Support Algorithm



[1]**Reversible Causes**

Hypoxia	Tension pneumothorax
Hypovolaemia	Tamponade, cardiac
Hypo/hyperkalaemia/metabolic	Toxins
Hypothermia	Thrombosis (coronary or pulmonary)

Adult Foreign Body Airway Obstruction (FBAO)

INTRODUCTION

- Foreign body airway obstruction is an uncommon but potentially treatable cause of accidental death.
- In adults, food usually fish, meat or poultry is the commonest cause of obstruction.
- Most cases occur when eating and are therefore usually witnessed. The signs and symptoms vary depending on the degree of airway obstruction (**Table 1**).

ASSESSMENT

Table 1 – General Signs of Foreign Body Airway Obstruction

GENERAL SIGNS OF FOREIGN BODY AIRWAY OBSTRUCTION Attack usually occurs while eating Patient may clutch his neck	
Signs of mild airway obstruction	**Signs of severe airway obstruction**
Response to question – ***"Are you choking?"***	Response to question – ***"Are you choking?"***
Patient speaks and answers **"Yes"**	Patient unable to speak Patient may respond by nodding
Other signs	**Other signs**
Patient is able to: • speak • cough • breathe	• Patient unable to breathe • Breathing sounds wheezy • Attempts at coughing are silent • Patient may be unconscious

MANAGEMENT

Adult foreign body airway obstruction sequence (*see Appendix 1*)

NOTE: also suitable for children over the age of 1 year

Signs of mild airway obstruction

- Encourage patient to cough but do nothing else.
- Monitor carefully, rapid transport to hospital.

Signs of severe airway obstruction

If the patient is conscious:

- Apply up to five back slaps, checking to see if each back slap has relieved the obstruction. The aim is to relieve the obstruction with each backslap rather than necessarily to give all five
- If five back slaps do not relieve the airway obstruction, give up to five abdominal thrusts
- If the obstruction is still not relieved, continue alternating five back slaps with five abdominal thrusts.

If the patient at any time becomes unconscious:

- Support the patient carefully to the ground
- Begin BLS with chest compressions (from 4 of the adult BLS sequence). Chest compressions should be initiated even if a pulse is present in the unconscious patient. During CPR, each time the airway is opened the patient's mouth should be quickly checked for any foreign body that has been partly expelled.

If these measures fail and the airway remains obstructed:

- Attempt to visualise the vocal cords with a laryngoscope
- Remove any visible foreign material with forceps or suction
- If this fails or is not possible, and you are trained in the technique, perform needle cricothyroidotomy.

NOTE:

1. Chest thrusts/compressions generate a higher airway pressure than back blows and finger sweeps.
2. Avoid blind finger sweeps. Manually remove solid material in the airway only if it can be seen.
3. Following successful treatment for FBAO, foreign material may remain in the upper or lower respiratory tract and cause complications later. Patients with a persistent cough, difficulty swallowing or the sensation of an object being stuck in the throat must be assessed further.
4. Abdominal thrusts can cause serious internal injuries and all patients so treated must be assessed for injury in hospital.

Adult Foreign Body Airway Obstruction (FBAO)

Key Points – Adult Foreign Body Airway Obstruction

- Potentially treatable cause of death; often occurs whilst eating.
- Asking the patient ***"are you choking?"*** can aid diagnosis.
- Backslaps and abdominal thrusts may relieve the obstruction, check after each manoeuvre to see if obstruction is relieved.
- Abdominal thrusts can cause internal injuries and patients should be assessed in hospital.
- Avoid blind finger sweeps; manually remove solid material in the airway **ONLY** if it can be seen.

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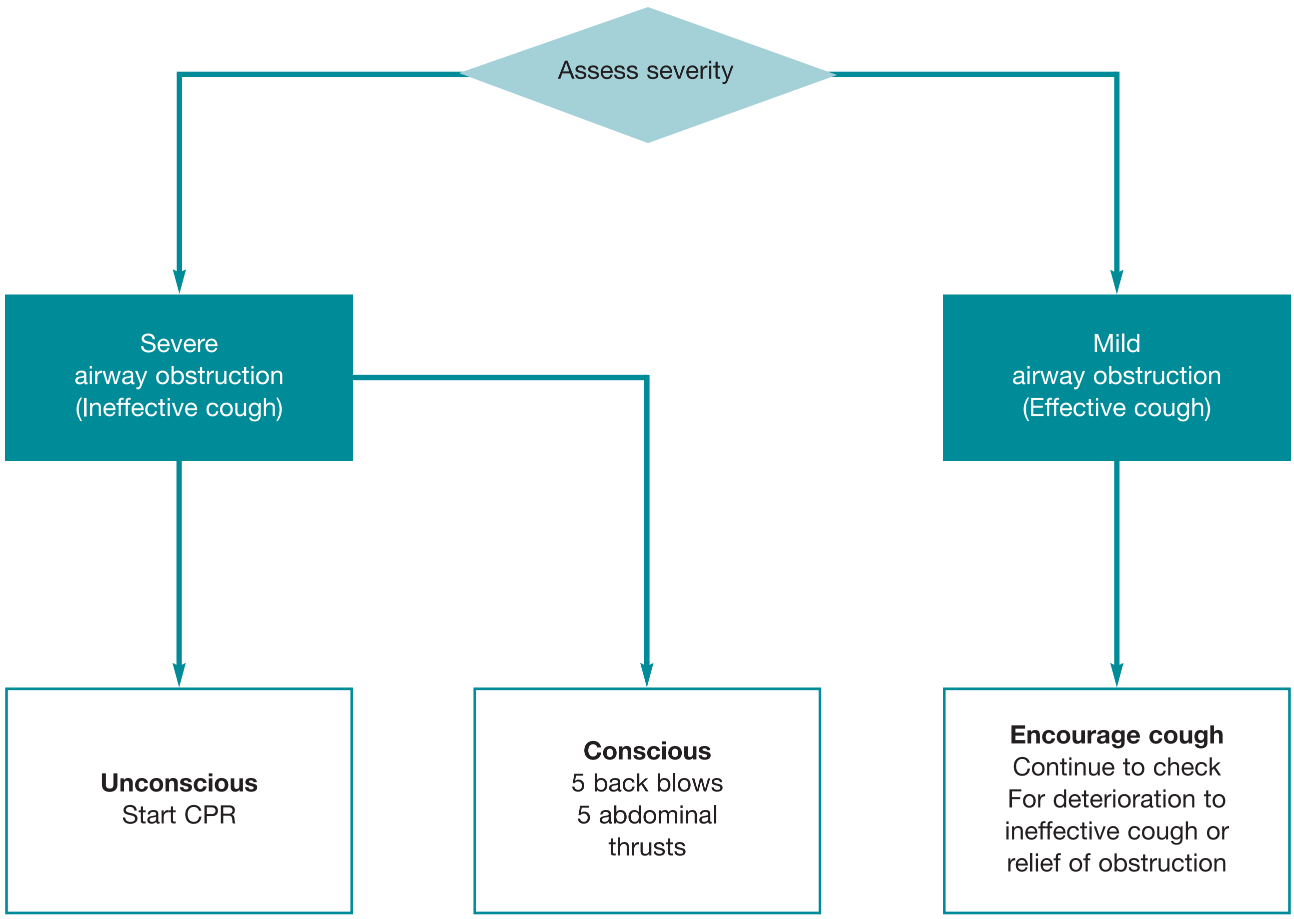
Zaritsky A, Morley PT. The Evidence Evaluation Process for the 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. *Circulation* 2005;112(22_suppl):III-128-130.

APPENDIX 1 – Adult Foreign Body Airway Obstruction Treatment Algorithm



INTRODUCTION

Cardiac arrhythmia is a common complication of acute myocardial infarction and may precede cardiac arrest or complicate the early post resuscitation period.

Rhythm disturbance may also present in many other ways and be unrelated to coronary heart disease.

The management of disorders of cardiac rhythm is a specialised subject often requiring detailed investigation and management strategies that are not available outside hospital.

Diagnosis of the precise rhythm disturbance may be complicated and the selection of optimal treatment difficult. Very often, expert advice will be required, yet this expertise is rarely immediately available in the emergency situation.

PRINCIPLES OF TREATMENT

Management is determined by the condition of the patient as well as the nature of the rhythm.

In all cases give high concentration oxygen and gain venous access.

Always take a defibrillator to any patient with suspected cardiac rhythm disturbance.

Establish cardiac rhythm monitoring as soon as possible.

Document the arrhythmia. This should be done with a 12 lead ECG whenever possible. Provide a printout for the hospital, and if possible archive the record electronically so that further copies can be available at a later time if needed. Repeat the recording if the rhythm should change at any time. Record the ECG rhythm during any intervention (vagotonic procedures or the administration of drugs).

If patients are not acutely ill there may be time to seek appropriate advice.

The presence of adverse signs or symptoms will dictate the need for urgent treatment. The following adverse factors indicate a patient who is unstable because of the arrhythmia:

- evidence of low cardiac output: pallor, sweating, cold clammy extremities, impaired consciousness or hypotension (SBP <90mmHg)
- excessive tachycardia, defined as a heart rate of >150bpm
- excessive bradycardia, defined as a heart rate of <40bpm
- heart failure implies the arrhythmia is compromising left ventricular function. This may cause breathlessness, confusion and hypotension or other features of reduced cardiac output
- ischaemic chest pain implies that the arrhythmia (particularly tachyarrhythmia) is producing myocardial ischaemia. It is particularly important if there is underlying coronary disease or structural heart disease in which ischaemia is likely to lead to life threatening complications including cardiac arrest.

1. BRADYCARDIA

Introduction

A bradycardia is defined as a ventricular rate below 60bpm, but it is important to recognise patients with a relative bradycardia in whom the rate is inappropriately slow for their haemodynamic state.

ASSESSMENT

Assess for adverse signs present (***see below***).

Assess for risk of asystole (***see below***).

MANAGEMENT

If one or more adverse signs are present (see Appendix 1):

- systolic blood pressure <90mmHg
- ventricular rate <40bpm
- ventricular arrhythmias compromising BP or requiring treatment
- heart failure.

Give high concentration oxygen and gain IV access. Give atropine 500mcg IV and repeat after 3–5 minutes if necessary up to a total of 3 milligrams.

CAUTIONS

Doses of atropine lower than 500mcg may paradoxically cause further slowing of ventricular rate. Use atropine cautiously in acute myocardial ischaemia or infarction; an increased rate may worsen ischaemia.

2. RISK OF ASYSTOLE

If the patient is initially stable (i.e. no adverse signs are present) or a satisfactory response is achieved with atropine, next determine the risk of asystole. This is indicated by:

- previous episode of asystole
- Mobitz type II AV block
- complete (third degree) AV block, especially with a broad QRS complex or an initial ventricular rate <40bpm
- ventricular standstill >3 seconds.

If there is a risk of asystole, (i.e. one or more of these signs is present), or the patient shows adverse signs and has not responded satisfactorily to atropine, transvenous pacing is likely to be required. One or more of the following interventions may improve the patient's condition during transport:

- transcutaneous pacing should be undertaken if available
- If transcutaneous pacing is not available:
  - fist pacing may produce ventricular contraction. Give serial rhythmic blows with the closed fist over the lower left sternal edge to pace the heart at a rate of 50–70bpm
  - adrenaline boluses may be given to maintain cerebral perfusion.

NOTES

a. Do not give atropine to patients with cardiac transplants; paradoxical high degree AV block or sinus arrest may result.

b. Complete heart block with a narrow QRS complex escape rhythm is not an absolute indication for pacing. The ectopic pacemaker (which is situated in the atrioventricular junction) may provide a stable rhythm at an adequate rate.

c. Initiate transcutaneous pacing (if equipment is available):

   - if there is no response to atropine
   - patient is severely symptomatic, particularly when high degree block (Möbitz type II or third degree AV block) is present.

NOTE: Transcutaneous pacing may be painful; use analgesia. Verify mechanical capture. Monitor the patient carefully; try to identify the cause of the bradycardia.

3. TACHYCARDIA

Introduction

These guidelines are intended for the treatment of patients who maintain a cardiac output in the presence of the tachycardia.

Pulseless tachycardia is treated with immediate attempts at cardioversion following the algorithm for the treatment of pulseless VT/VF.

MANAGEMENT (see Appendix 2)

1. Support the ABCs.
2. Give high concentration oxygen and gain IV access.
3. Establish cardiac rhythm monitoring.
4. Record and monitor BP and SpO_2.
5. Record a 12-lead ECG if possible, if not, record a rhythm strip.
6. If the rhythm changes at any time, make a further recording.
7. Make a continuous record of the rhythm during any therapeutic intervention (whether a drug or physical manoeuvre like carotid sinus massage).
8. The response to treatment can provide important additional information about the arrhythmia.
9. Identify and treat reversible causes; give analgesia if indicated.
10. Try to define the cardiac rhythm from the ECG. Determine the QRS duration and determine whether the rhythm is regular or irregular. If the QRS duration is 120msec or more the rhythm is a broad complex tachycardia. If less than 120msec, the rhythm is a narrow complex tachycardia.

4. BROAD COMPLEX TACHYCARDIA

- The rhythm is likely to be ventricular tachycardia, particularly in the context of ischaemic heart disease, patients showing adverse signs (reduced consciousness, SBP <90mmHg, chest pain or heart failure), or in the peri-arrest situation.
- In all cases, maintain the supportive measures above and monitor the patient during transport.
- Provide a pre-alert message according to local protocols.

Atrial fibrillation conducted aberrantly may produce an irregular broad complex tachycardia, but the diagnosis is difficult to make with certainty and often requires expert examination of the ECG. This emphasises the importance of recording the ECG when the arrhythmia is present. Ambulance personnel may greatly assist the subsequent diagnosis and management of patients by obtaining good quality ECG recordings. It is advantageous if these can also be archived electronically so that additional copies are available in the future. It is frustratingly common for paper copies of ECGs to be lost after admission to hospital.

5. NARROW COMPLEX TACHYCARDIA

If the rhythm is narrow complex (QRS <120 msec) **AND REGULAR**, it is likely to be either:

- Sinus tachycardia. This is a physiological response, for example to pain, fever, blood loss or heart failure. Treatment is directed towards the cause. Trying to slow the rate is likely to make the situation worse.
- Supraventricular tachycardia (SVT). This is often seen in patients without other forms of heart disease. There may be a history of previous attacks.
- Atrial flutter with regular AV conduction (often 2:1 and a rate of 150bpm).

If sinus tachycardia is absent, start with vagal manoeuvres. In some cases the patient may be aware of techniques that have terminated previous episodes. The Valsalva manoeuvre (forced expiration against a closed glottis) may be effective and is conveniently achieved (especially in supine patients) by asking the patient to blow into a 20ml syringe with sufficient force to push back the plunger. If this fails, perform carotid sinus massage *provided no carotid bruit is heard on auscultation*. A bruit may indicate the presence of atheromatous plaque, rupture of which may cause cerebral embolism and stroke.

Record the ECG (preferably multi-lead) during each manoeuvre. If the arrhythmia is successfully terminated by vagal procedures, it is very likely to have been SVT. If the rhythm is atrial flutter, slowing of ventricular rate may occur and allow the identification of flutter waves on the ECG.

Maintain the supportive measures above and monitor the patient during transport.

AN IRREGULAR narrow complex rhythm is most commonly atrial fibrillation, less commonly atrial flutter with variable block. Maintain the supportive measures above and monitor the patient during transport.

In all cases, ensure the patient is received into a suitable high dependency unit maintaining cardiac monitoring throughout. Ensure detailed hand-over to appropriate staff and that ECGs are safely handed over.

Key Points – Cardiac Rhythm Disturbance

- In all cases give high concentration oxygen.
- Gain venous access.
- Always take a defibrillator to any patient with suspected cardiac rhythm disturbance.
- Establish cardiac rhythm monitoring as soon as possible preferably with a 12-lead ECG.
- Record the ECG rhythm during any intervention and archive. Ensure all ECGs are safely handed over to receiving staff and archive so further copies can be retrieved if necessary.

BIBILOGRAPHY

1 Committee M, Blomstrom-Lundqvist C, Scheinman MM, Aliot EM, Alpert JS, Calkins H, et al. ACC/AHA/ESC guidelines for the management of patients with supraventricular arrhythmias—executive summary: A Report of the American College of Cardiology/American HeartAssociation Task Force on Practice Guidelines and the European Society of Cardiology Committee for Practice Guidelines(Writing Committee to Develop Guidelines for the Management of Patients With Supraventricular Arrhythmias)Developed in collaboration with NASPE-Heart Rhythm Society. *Eur Heart J* 2003;24(20):1857-1897.

2 Guidelines for the management of patients with atrial fibrillation. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the European Society of Cardiology Committee for Practice Guidelines and Policy Conferences (Committee to develop guidelines for the management of patients with atrial fibrillation) developed in collaboration with the North American Society of Pacing and Electrophysiology. *Eur Heart J* 2001;22(20):1852-1923.

METHODOLOGY

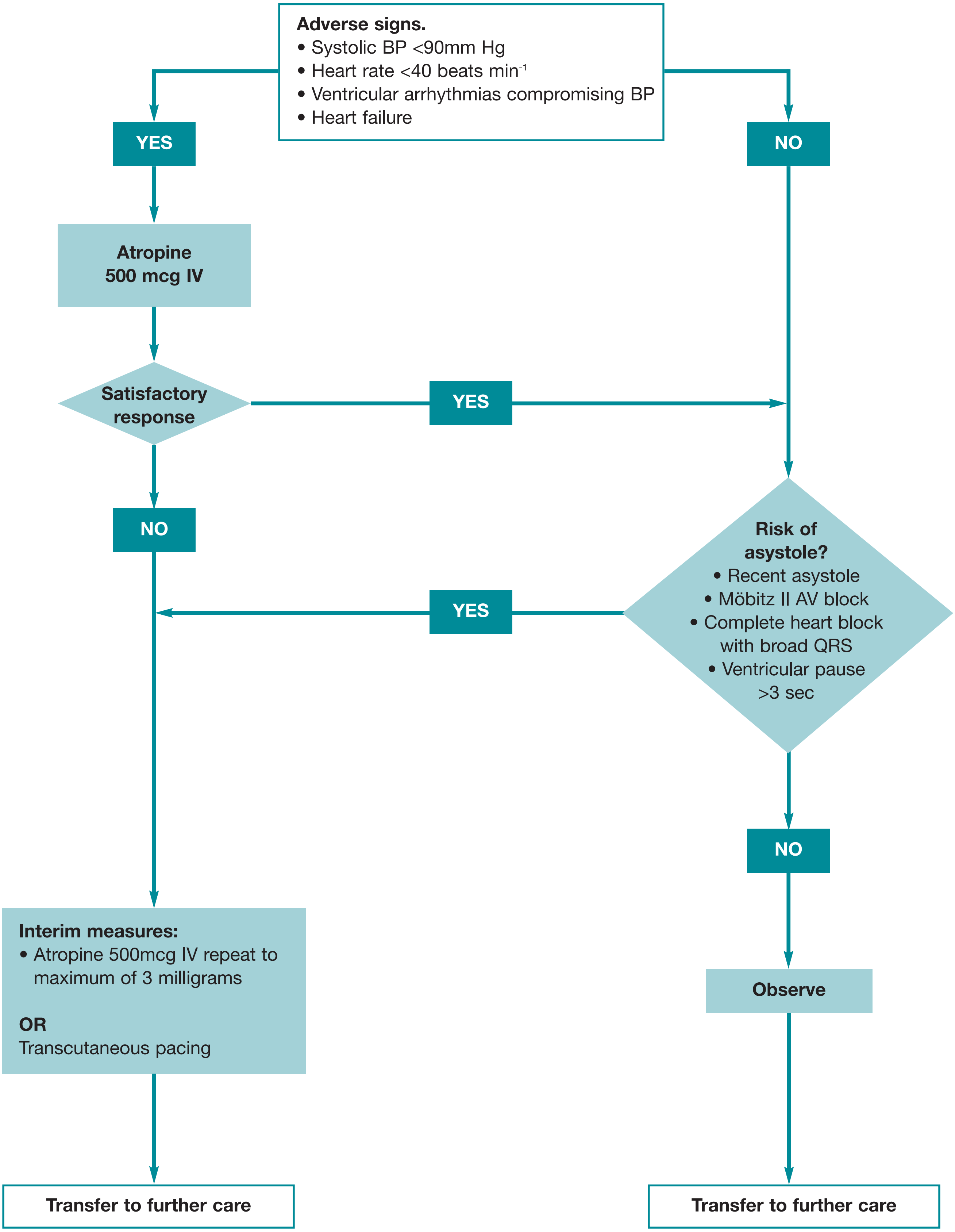
The methodology describing the development process of the international cardio-pulmonary resuscitation treatments recommendations on which this guideline is based is fully described in the publications listed below.

Morley PT, Zaritsky A. The evidence evaluation process for the 2005 International Consensus Conference on cardio-pulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. *Resuscitation* 2005;67(2-3):167-170.

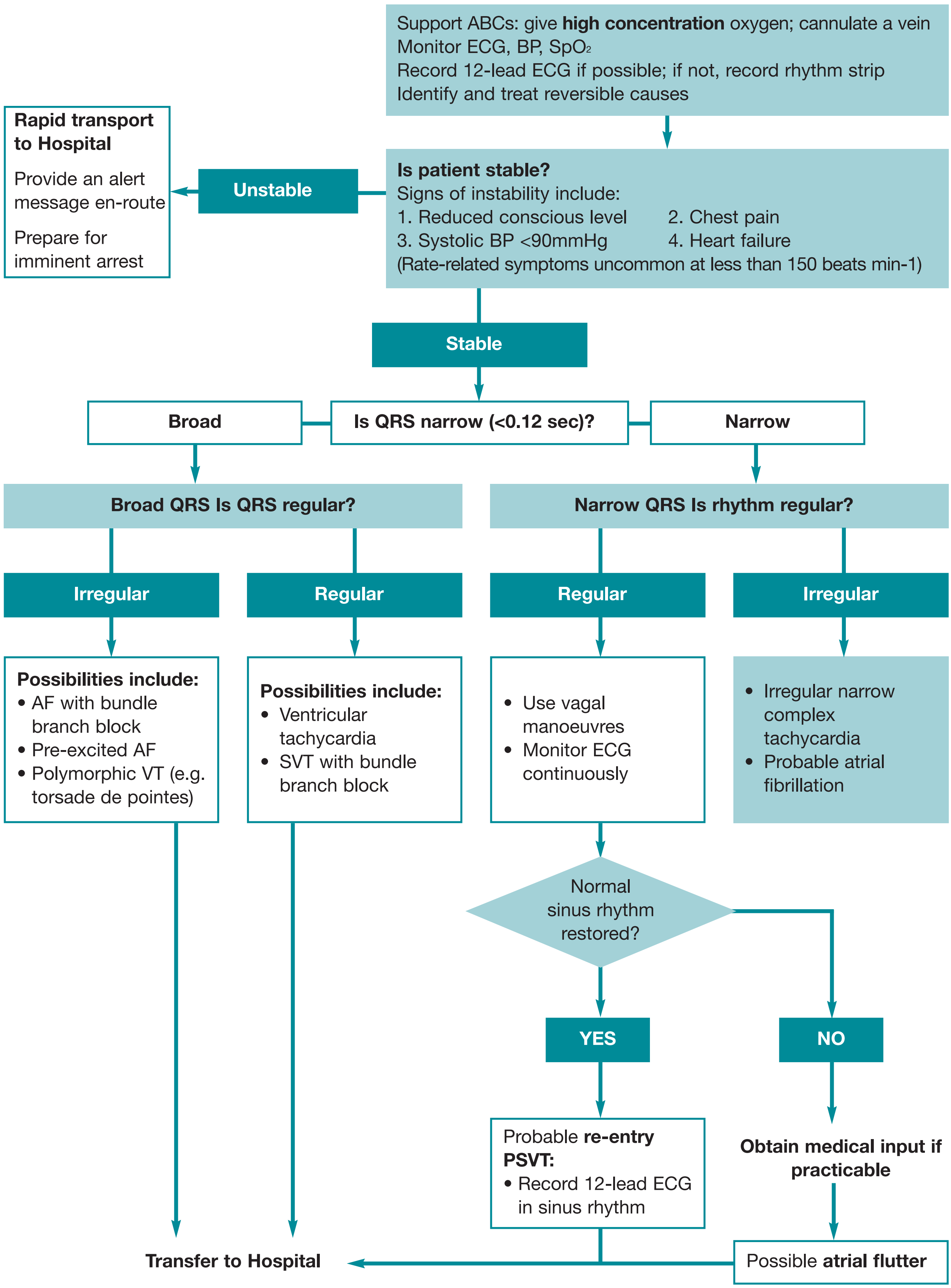
Zaritsky A, Morley PT. The Evidence Evaluation Process for the 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. *Circulation* 2005;112(22_suppl):III-128-130.

APPENDIX 1 – Bradycardia Algorithm

If appropriate, give oxygen, cannulate a vein and record a 12-lead ECG.



APPENDIX 2 – Tachycardia Algorithm



INTRODUCTION

The Implantable Cardioverter Defibrillator (ICD) has revolutionised the management of patients at risk of developing life-threatening ventricular arrhythmia. Several clinical trials have testified to their effectiveness in reducing deaths from sudden cardiac arrest in selected patients,[1-5] and the devices are implanted with increasing frequency. [6-8]

ICDs are used in both children and adults.

ICD systems consist of a generator connected to electrodes placed transvenously into cardiac chambers (the ventricle, and sometimes the right atrium and / or the coronary sinus (**Figure 1**). The electrodes serve a dual function allowing the monitoring of cardiac rhythm and the administration of electrical pacing, defibrillation and cardioversion therapy. Modern ICDs are slightly larger than a pacemaker and are usually implanted in the left subclavicular area (**Figure 1**). The ICD generator contains the battery and sophisticated electronic circuitry that monitors the cardiac rhythm, determines the need for electrical therapy, delivers treatment, monitors the response and determines the need for further therapy.

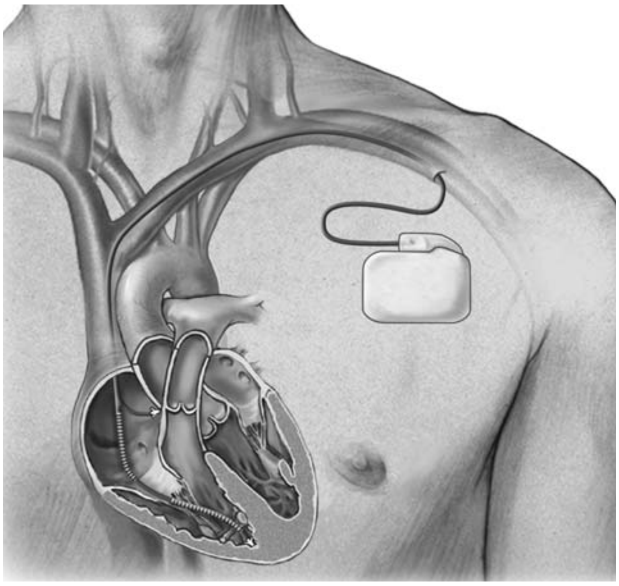


Figure 1 – Usual Location of an ICD (used with the permission of medmovie.com).

The available therapies include:

- Conventional programmable pacing for the treatment of bradycardia
- Anti-tachycardia Pacing (ATP) for ventricular tachycardia (VT)
- Delivery of Biphasic shocks for the treatment of ventricular tachycardia and ventricular fibrillation (VF)
- Cardiac resynchronisation therapy (CRT) (biventricular pacing) for the treatment of heart failure.

These treatment modalities and specifications are programmable and capable of considerable sophistication to suit the requirements of individual patients. The implantation and programming of devices is carried out in specialised centres. The patient should carry a card or documentation which identifies their ICD centre and may also have been given emergency instructions.

The personnel caring for such patients in emergency situations are not usually experts in arrhythmia management, nor familiar with the details of the sophisticated treatment regimes offered by modern ICDs. Moreover, the technology is complex, and evolving rapidly. The non-specialist may have difficulty remaining familiar with the detail of this. In an emergency, patients will often present to the ambulance service or Emergency Department (ED), and the purpose of this guidance is to help those responsible for the initial management of these patients.

GENERAL PRINCIPLES

Some important points should be made at the outset.

When confronted with a patient fitted with an ICD who has a persistent or recurring arrhythmia or where the ICD is firing, expert help should be summoned at the outset. Outside hospital this will normally be from the ambulance service who should be summoned immediately by dialling 999.

When confronted with a patient in cardiac arrest, the usual management guidelines are still appropriate (***refer to cardiac arrest and arrhythmia guidelines***).[9,10] If the ICD is not responding to VF or VT, or if shocks are ineffective, external defibrillation / cardioversion should be carried out. Avoid placing the defibrillator electrodes / pads / paddles close to or on top of the ICD; ensure a minimum distance of 5cm between the edge of the defibrillator paddle pad/electrode and the ICD site. Most ICDs are implanted in the left sub-clavicular position (see Figure 1) and are usually readily apparent on examination; the conventional (apical / right sub-clavicular) electrode position will then be appropriate. The anterior / posterior position may also be used, particularly if the ICD is right sided.

Whenever possible, record a 12-lead electrocardiogram (ECG) and record the patient's rhythm (with any shocks). Make sure this is printed out and stored electronically (where available), for future reference. Where an external defibrillator with an electronic memory is used, (whether for monitoring or for therapy) ensure that the ECG report is printed and handed to appropriate staff. Again, whenever possible, ensure that the record is archived for future reference. Record the rhythm during any therapeutic measure (whether by drugs or electricity). All these records may provide vital information for the ICD centre that may greatly influence the patient's subsequent management.

The energy levels of the shocks administered by ICDs (up to 40 Joules) are much lower than those employed with external defibrillators (100 – 360J). **Personnel in contact with the patient when an ICD discharges will not be harmed, and no special precautions are necessary when handling or treating such patients.** Chest compression and ventilation can be carried out as normal and protective examination gloves worn as usual.

Placing a ring magnet over the ICD generator can temporarily disable the shock capability of an ICD. The magnet does not disable the pacing capability for treating bradycardia. The magnet may be kept in position with adhesive tape if required. Removing the magnet returns the ICD to the status present before application. The ECG rhythm should be monitored at all times when the device is disabled. An ICD should only be disabled when the rhythm for which shocks are being delivered has been recorded. If that rhythm is VT or VF, external cardioversion/defibrillation must be available. With some models it is possible to programme the ICD so that a magnet does not disable the shock capabilities of the device. This is usually done only in exceptional circumstances, and consequently, such patients are rare.

The manufacturers of the ICDs also supply the ring magnets. Many implantation centres provide each patient with a ring magnet and stress that it should be readily available in case of emergency. With the increasing prevalence of ICDs in the community it becomes increasingly important that emergency workers have this magnet available to them when attending these patients.

Decisions to apply a Do Not Attempt Resuscitation (DNAR) order will not be made in the emergency situation by the personnel to whom this guidance is directed. Where such an order does exist however, it should not be necessary to disable an ICD to enable the implementation of such an order.

Many problems with ICDs can only be dealt with permanently by using the programmer available at the ICD centre.

The guidelines should be read from the perspective of your position and role in the management of such patients. For example, the recommendation to 'arrange further assessment' will mean that ambulance clinician should transport the patient to hospital. For ED staff however, this might mean referral to the medical admitting team or local ICD centre.

Coincident conditions that may contribute to the development of arrhythmia (like acute ischaemia, worsening heart failure), should be managed as appropriate according to usual practice. Oxygen (O_2) in high concentration will nearly always be appropriate.

Receiving ICD therapy may be unpleasant "like a firm kick in the chest", and psychological consequences may also arise.[11,12] It is important to be aware of these, and help should be available from implantation centres. An emergency telephone helpline may be available.

MANAGEMENT

To be read in conjunction with the treatment algorithm (**Appendix 1**).

Approach and assess the patient and perform basic life support according to current BLS guidelines. Monitor the ECG.

1. If the patient is in cardiac arrest

1.1 Perform basic life support in accordance with current BLS guidelines. Standard airway management techniques and methods for gaining IV access (if required) should be used.

1.2 If a shockable rhythm is present (VF or pulseless VT), but the ICD is not detecting it, perform external defibrillation and other resuscitation procedures according to current resuscitation guidelines.

1.3 If the ICD is delivering therapy (whether by anti-tachycardia pacing or shocks) but is failing to convert the arrhythmia, then external defibrillation should be provided, as per current guidelines.

1.4 If a non-shockable rhythm is present, manage the patient according to current guidelines. If the rhythm is converted to a shockable one, assess the response of the ICD, as in 1.2 above, performing external defibrillation as required.

1.5 If a shockable rhythm is converted to one associated with effective cardiac output (whether by the ICD or by external defibrillation), manage the patient as usual and arrange further treatment and assessment.

2. If the patient is not in cardiac arrest

Determine whether an arrhythmia is present.

2.2 If no arrhythmia is present:

If therapy from the ICD has been effective, the patient is in sinus rhythm or is paced, monitor the patient, give O_2 and arrange further assessment to investigate possibility of new myocardial infarction (MI), heart failure, other acute illness or drug toxicity / electrolyte imbalance etc.

An ICD may deliver inappropriate shocks (i.e. in the absence of arrhythmia) if there are problems with sensing the cardiac rhythm or there are problems with the leads. Record the rhythm (with shocks if possible), disable the ICD with a magnet, monitor the patient and arrange further assessment with help from the ICD centre. Provide supportive treatment as required.

2.3 If an arrhythmia is present:

If an arrhythmia is present and shocks are being delivered, record the arrhythmia (and shocks if possible) on the ECG. Determine the nature of the arrhythmia. Transport rapidly to hospital in all cases.

TACHYCARDIA

2.3.1 If the rhythm is **supraventricular** i.e. sinus tachycardia, atrial flutter, atrial fibrillation, junctional tachycardia, etc. and the patient is haemodynamically stable, and the patient is continuing to receive shocks, disable the ICD with a magnet. Consider possible causes, treat appropriately and arrange further assessment in hospital.

2.3.2 If the rhythm is **ventricular tachycardia**:

- Pulseless VT should be treated as cardiac arrest (1.2 above).
- If the patient is haemodynamically stable, monitor the patient and convey to the emergency department.
- If the patient is haemodynamically unstable, and ICD shocks are ineffective, treat as per VT guideline.
- An ICD will not deliver anti-tachycardia pacing (ATP) or shocks if the rate of the VT is below the programmed detection rate of the device. Conventional management may be undertaken according to the patient's haemodynamic status.
- Recurring VT with appropriate shocks. Manage any underlying cause (acute ischaemia, heart failure etc.). Sedation may be valuable. Disable ICD (apply magnet) **ONLY** if haemodynamically compromised.

Key Points – Implantable Cardioverter Defibrillators (ICD)

- ICDs deliver therapy with bradycardia pacing, ATP and shocks for VT not responding to ATP or VF.
- ECG records, especially at the time that shocks are given, can be vital in subsequent patient management. A recording should always be made if circumstances allow.
- Cardiac arrest should be managed according to normal guidelines.
- Avoid placing the defibrillator electrode over or within 5cm of the ICD generator site.
- A discharging ICD will not harm a rescuer touching the patient or performing CPR.
- An inappropriately discharging ICD can be temporarily disabled by placing a ring magnet temporarily over the ICD site.

REFERENCES

1 Hallstrom AP, AVID Investigators. Antiarrhythmics versus implantable defibrillators (AVID): rationale, design and methods. *American Journal of Cardiology* 1995;75(7):470-5.

2 Connolly SJ, Hallstrom AP, Cappato R, Schron EB, Kuck KH, Zipes DP, et al. Meta-analysis of the implantable cardioverter defibrillator secondary prevention trials. *Eur Heart J* 2000;21(24):2071-2078.

3 Moss AJ, Zareba W, Hall WJ, Klein H, Wilber DJ, Cannom DS, et al. Prophylactic implantation of a defibrillator in patients with myocardial infarction and reduced ejection fraction. *N Engl J Med* 2002;346(12):877-83.

4 Bardy GH, Lee KL, Mark DB, Poole JE, Packer DL, Boineau R, et al. Amiodarone or an implantable cardioverter-defibrillator for congestive heart failure. *N Engl J Med* 2005;352(3):225-37.

5 Moss AJ, Hall WJ, Cannom DS, Daubert JP, Higgins SL, Klein H, et al. Improved Survival with an Implanted Defibrillator in Patients with Coronary Disease at High Risk for Ventricular Arrhythmia. *N Engl J Med* 1996;335(26):1933-1940.

6 Gregoratos G, Abrams J, Epstein AE, Freedman RA,

Hayes DL, Hlatky MA, et al. ACC/AHA/NASPE 2002 guideline update for implantation of cardiac pacemakers and antiarrhythmia devices: summary article: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/NASPE Committee to Update the 1998 Pacemaker Guidelines). *Circulation* 2002;106(16):2145-61.

[7] Winters SL, Packer DL, Marchlinski FE, Lazzara R, Cannom DS, Breithardt GE, et al. Consensus statement on indications, guidelines for use, and recommendations for follow-up of implantable cardioverter defibrillators. North American Society of Electrophysiology and Pacing. *Pacing and clinical electrophysiology* : PACE 2001;24(2):262-9.

[8] National Institute for Health and Clinical Excellence. Implantable cardioverter defibrillators (ICDs) for the treatment of arrhythmias – review of guidance no. 11 London, 2005.

[9] de Latorre F, Nolan J, Robertson C, Chamberlain D, Baskett P. European Resuscitation Council Guidelines 2000 for Adult Advanced Life Support: A statement from the Advanced Life Support Working Group and approved by the Executive Committee of the European Resuscitation Council. *Resuscitation* 2001;48(3):211-221.

[10] Resuscitation Council (UK). Resuscitation Guidelines 2005. London: Resuscitation Council (UK) http://www.resus.org.uk/pages/guide.htm.

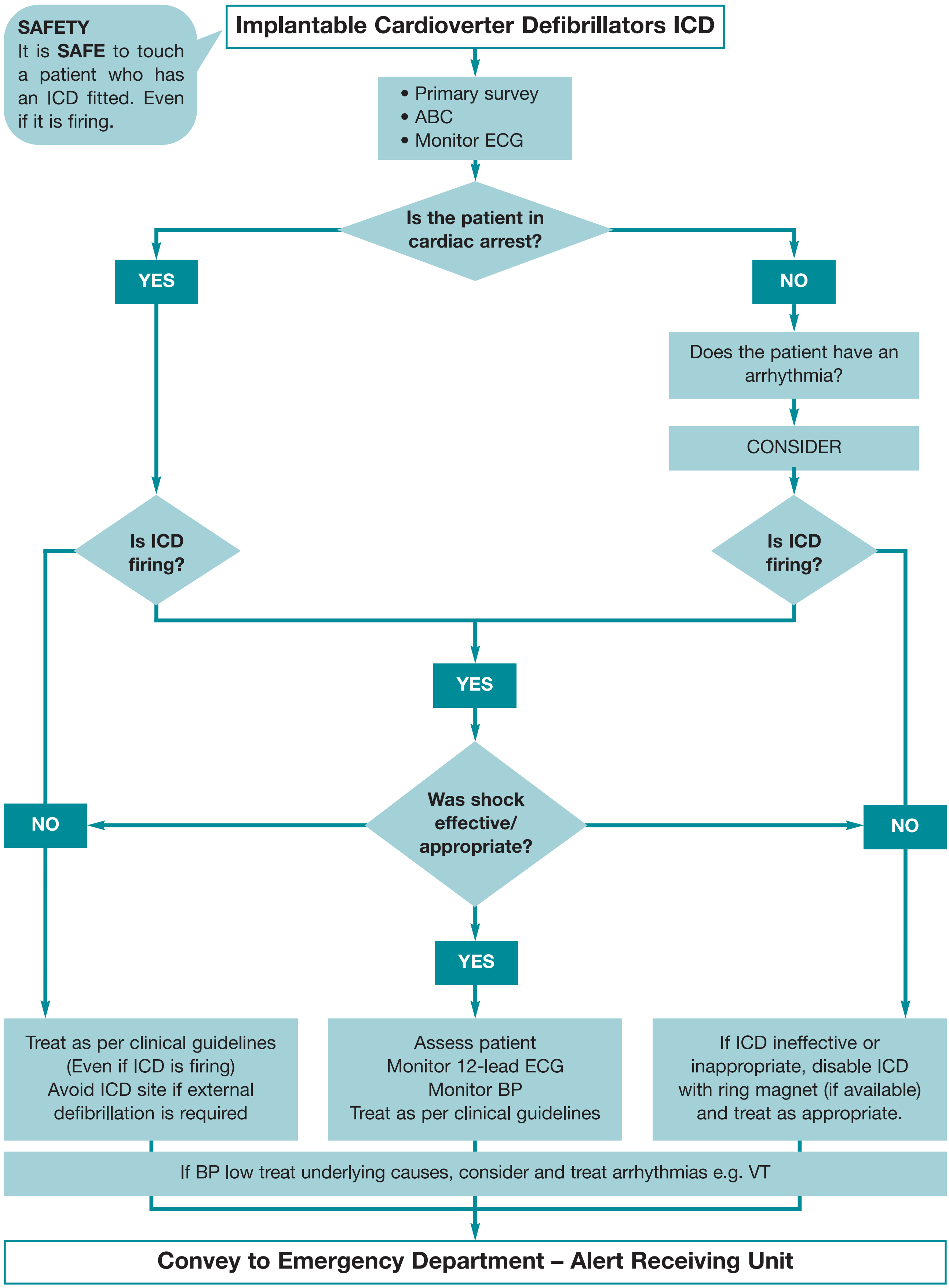
[11] Sears SFJ, Shea JB, Conti JB. How to respond to an implantable cardioverter-defibrillator shock. *Circulation* 2005;111(23):e380-2.

[12] Eads AS, Sears SFJ, Sotile WM, Conti JB. Supportive communication with implantable cardioverter defibrillator patients: seven principles to facilitate psychosocial adjustment. *Journal of cardio-pulmonary rehabilitation* 2000;20(2):109-14.

METHODOLOGY

Refer to methodology section.

APPENDIX 1 – ICD Treatment Algorithm



INTRODUCTION

In patients with cardio-pulmonary arrest, vigorous resuscitation attempts must be undertaken whenever there is a chance of survival, however remote.

Nevertheless, it is possible to identify patients in whom there is absolutely no chance of survival, and where resuscitation would be both futile and distressing for relatives, friends and healthcare personnel and where time and resources would be wasted undertaking such measures.

The views of an attending General Practitioner (GP) or relevant third party should be considered.

CONDITIONS UNEQUIVOCALLY ASSOCIATED WITH DEATH WHERE RESUSCITATION SHOULD NOT BE ATTEMPTED

All the conditions, listed below, are unequivocally associated with death in ALL age groups (see below for further details):

1. massive cranial and cerebral destruction
2. hemicorporectomy
3. massive truncal injury incompatible with life including decapitation
4. decomposition/putrefaction
5. incineration
6. hypostasis
7. rigor mortis

In the newborn, fetal maceration is a contraindication to attempted resuscitation.

FURTHER DETAILS

Decapitation: Self evidently incompatible with life.

Massive cranial and cerebral destruction: Where the injuries are considered by the ambulance clinician to be incompatible with life.

Hemicorporectomy (or similar massive injury): Where the injuries are considered by the ambulance clinician to be incompatible with life.

Decomposition/putrefaction: Where tissue damage indicates that the patient has been dead for some hours, days or longer.

Incineration: The presence of full thickness burns with charring of greater than 95% of the body surface.

Hypostasis: The pooling of blood in congested vessels in the dependent part of the body in the position in which it lies after death (**See Guidance Note 1**).

Rigor mortis: The stiffness occurring after death from the post mortem breakdown of enzymes in the muscle fibres (**See Guidance Note 2**).

In all other cases resuscitation must be commenced and the facts pertaining to the arrest must be established.

Following arrival and the recognition of pulselessness and apnoea (in the presence of a patent airway), chest compression and ventilations should be commenced whilst the facts of the collapse are ascertained.

IN THE FOLLOWING CONDITIONS RESUSCITATION CAN BE DISCONTINUED

- The presence of a DNAR (Do Not Attempt Resuscitation) order or an Advanced Directive (Living Will) that states the wish of the patient not to undergo attempted resuscitation (**see 3b**).
- When the patient's death is expected due to terminal illness.
- Efforts would be futile if **ALL** the following exist together:
  - 15 minutes since the onset of collapse
  - no bystander CPR prior to arrival of the ambulance
  - the absence of any of the exclusion factors on the flowchart (**Appendix 1**)
  - asystole (flat line) for >30 seconds on the ECG monitor screen.
- Submersion of adults for longer than 1 hour, children longer than 1.5 hours (**NOTE:** submersion **NOT** immersion) (**See Guidance Note 3**).

Whenever possible a confirmatory ECG, demonstrating asystole, should be documented as evidence of death. In this situation a 3 or 4 electrode system using limbs alone will cause minimum disturbance to the deceased. If a paper ECG trace cannot be taken it is permissible to make a diagnosis of asystole from the screen alone (**NOTE:** due caution must be applied in respect of electrode contact, gain and, where possible, using more than one ECG lead).

The use of the flow chart shown in **Appendix 1** is recommended.

If efforts are NOT deemed to be futile then resuscitation must continue to establish the patients' response to Advanced Life Support interventions. If the patient does not respond despite full ALS intervention and remains asystolic

for >20 minutes then the resuscitation attempt may be discontinued.

Removal of endotracheal tubes and/or indwelling cannulae should be in accordance with local protocol.

DO NOT ATTEMPT RESUSCITATION (DNAR) / ADVANCED DIRECTIVE (LIVING WILL)[1]

Ambulance clinicians should initiate resuscitation unless:

1. A formal DNAR[2] order is in place, either written and handed to the ambulance crew or verbally received and recorded by Ambulance Control from the patient's attendant requesting the ambulance providing that:
   a. the order is seen and corroborated by the ambulance crew on arrival
   b. the decision to resuscitate relates to the condition for which the DNAR order is in force: resuscitation should not be withheld for coincidental conditions.
2. A known terminally ill patient is being transferred to a palliative or terminal care facility (unless contrary instructions have been issued or the patient and/or carers express a specific wish for resuscitation to be attempted). Such information may be passed to and recorded by Ambulance Control as above.
3. An Advanced Directive (Living Will) has been accepted by the treating physician (patient's GP or Hospital Consultant) as a DNAR order. This should be communicated to Ambulance Control and logged against the patient's address.
   a. Patients may have an Advanced Directive (Living Will) although it is not legally necessary for the refusal to be made in writing or formally witnessed. This specifies how they would like to be treated in the case of future incapacity. Case law is now clear that an advance refusal of treatment that is valid, and applicable to subsequent circumstances in which the patient lacks capacity, is legally binding. An advance refusal is valid if made voluntarily by an appropriately informed person with capacity. Staff should respect the wishes stated in such a document.
   b. In an out of hospital emergency environment, there may be situations where there is doubt about the validity of an advance refusal or DNAR order. If staff are **NOT** satisfied that the patient had made a prior and specific request to refuse treatment, they should continue to provide all clinical care in the normal way.

ACTION TO BE TAKEN AFTER DEATH HAS BEEN ESTABLISHED

In light of the fact that earlier guidelines have been in use by a number of Services for almost 10 years, we no longer believe that it is necessary for a medical practitioner to attend to confirm the fact of death. Moreover, the new GP Contract contains no obligation for a GP to do so when requested to attend by Ambulance Control.

Services should be encouraged, in conjunction with their coroner's service (or Procurator Fiscal in Scotland), to develop a local procedure for handling the body once death has been verified by ambulance personnel.

As a guide the attached procedure (**Appendix 2**) and record form (**Appendix 3**) are suggested.

We further propose the adoption of a locally approved leaflet for handing to bereaved relatives.

GUIDANCE NOTE 1

Initially, hypostatic staining may appear as small round patches looking rather like bruises, but later these coalesce to merge as the familiar pattern. Above the hypostatic engorgement there is obvious pallor of the skin. The presence of hypostasis is diagnostic of death – the appearance is not present in a live patient. In extremely cold conditions hypostasis may be bright red in colour, and in carbon monoxide poisoning it is characteristically 'cherry red' in appearance.

GUIDANCE NOTE 2

Rigor mortis occurs first in the small muscles of the face, next in the arms, then in the legs (30 minutes to 3 hours). Children will show a more rapid onset of rigor because of their large surface area/body mass ratio. The recognition of rigor mortis can be made difficult where, rarely, death has occurred from tetanus or strychnine poisoning. It is stated that the diagnosis of rigor mortis can be confirmed by firmly pressing on a joint such as the knee, when the rigor mortis will be abolished and the joint becomes flaccid.

In some, rigidity never develops (infants, cachectic individuals and the aged) whilst in others it may become apparent more rapidly (in conditions in which muscle glycogen is depleted): exertion (which includes struggling), strychnine poisoning, local heat (from a fire, hot room or direct sunlight).

Rigor should not be confused with cadaveric spasm (sometimes referred to *as instant rigor mortis*) which develops immediately after death without preceding flaccidity following intense physical and/or emotional activity. Examples include: death by drowning or a fall from a height. In contrast with true rigor mortis only one group of muscles is affected and NOT the whole body. Rigor mortis will develop subsequently.

GUIDANCE NOTE 3

Submersion victims

With thanks to Dr F StC Golden for his advice in this specialist area.[3]

Attempting to predict criteria for commencing resuscitative efforts on victims found in water is fraught with danger because of many interacting factors that may contribute to extending accepted anoxic survival times. Chief among these is the heat exchange that occurs in the lungs following aspiration of water.

Should the water temperature be very cold, it will rapidly cool the blood in the pulmonary circulation, which in turn selectively cools the brain for as long as a viable cardiac output continues. Should brain temperature be rapidly cooled to a degree where protection from hypoxia/anoxia is possible (circa 20°C) in the 70 seconds or thereabouts before cardiac failure occurs, then the chances of successful resuscitation are considerably enhanced even if cardio respiratory arrest has been present for an hour or more. For this outcome to be likely, the water temperature has to be near freezing, and usually, but not necessarily, the body mass relatively small. Hence the majority of the accounts of successful resuscitation after submersion pertain to small children being rescued from 'ice water'.

It would seem prudent that resuscitative efforts **should** be made on:

1. Those with a witnessed **submersion** time of 10-15 minutes or less, even though they appear to be dead on rescue.
2. All those where there is a possibility of their being able to breathe from a pocket of air while underwater.
3. All those submerged for up to an hour in ice water or for longer (1.5 hours) in small children.
4. Anyone showing any signs of life on initial rescue.
5. Those whose airway has been only intermittently submerged for the duration of their immersion, e.g. those wearing lifejackets but in whom the airway is being intermittently submerged, provided the body still has a reasonably fresh appearance.

Resuscitative efforts are unlikely to be successful in those submerged for periods exceeding 15 minutes with the exception of those in categories 2-5 above.

Key Points – Recognition of Life Extinct by Ambulance Clinicians

- Ambulance clinicians are increasingly called upon to diagnose death and initiate the appropriate responses to death.
- In patients with cardio pulmonary arrest, vigorous resuscitation efforts must be made whenever there is a chance of survival however remote.
- Some conditions are incompatible with recovery and in these cases resuscitation need not be attempted.
- In some situations, once the facts of the patient/situation/etc are known, resuscitation efforts can be discontinued.
- Patients can and do make anticipatory decisions NOT to be resuscitated. An Advanced Directive (Living Will), if verifiable, must be respected.

REFERENCES

1 Part 2: Ethical Aspects of CPR and ECC. *Resuscitation* 2000;46(1-3):17.

2 British Medical Association. Decisions relating to cardio-pulmonary resuscitation. A joint statement from the British Medical Association, The Resuscitation Council (UK) and the Royal College of Nursing. London: Ethics Department, British Medical Association, 2002.

3 Golden F, Tipton M. *Essentials of Sea Survival.* Leeds: Human Kinetics, 2002.

SELECT BIBLIOGRAPHY

Baskett P, Fisher J, Marsden AK. Recognition of death by ambulance personnel. *JRCALC Newsletter* 1996:1.

Marsden AK, Ng GA, Dalziel K. When is it futile for ambulance personnel to initiate cardio-pulmonary resuscitation? *BMJ* 1995;311(6996):49-51.

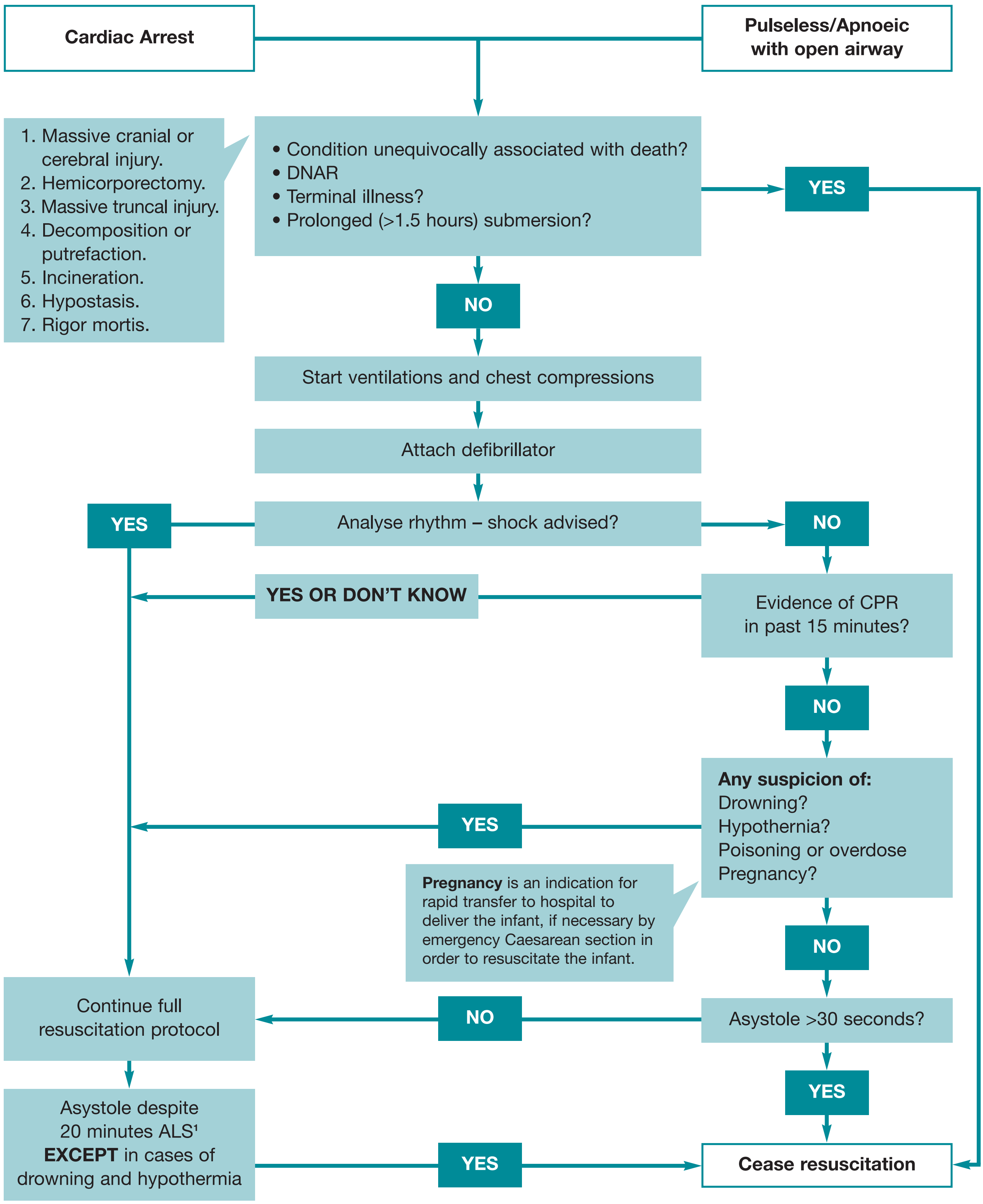
Home Office. Reforming the Coroner and Death Certification Service. A Position Paper. London: The Stationery Office, 2004.

Joint Royal Colleges Ambulance Service Liaison Committee and Ambulance Service Association. JRCALC Clinical Practice Guidelines 2004 for use in UK Ambulance Services. IHCD: Norwich, 2004.

METHODOLOGY

Refer to methodology section.

Appendix 1 – Recognition of Life Extinct by Ambulance Clinicians



[1]Crews without ALS capability should **Load and Go** at the earliest opportunity.

Appendix 2 – Action to be taken after Verification of Fact of Death

Ambulance crew diagnose death.

Are there any suspicious circumstances?

YES

- Take steps to preserve the scene.
- Ask Control to contact Police and advise them of a suspicious death.
- Remain on scene.
- Complete documentation[2].

NO

Death in home or place of normal residence.

Death in a public place.

- Remove patient[1] to a destination **according to agreed local policy**.
- Request Ambulance Control to inform Police of details of case and destination.
- Leave patient documentation[2] with patient.

Are relatives present?

YES

- Offer condolences.
- Leave leaflet with relatives.
- Notify control who inform GP or Out of Hours Service.
- Complete documentation[2].

NO

- Seek contact details (Control may have some).
- Where **NONE** ask control to inform police.
- Remain on scene until police or other person arrives.
- Complete documentation[2].

[1]The Ambulance Service has a responsibility to remove the patient from public gaze. Operational policy will be agreed locally with Police and Coroner's services.
[2]A suggested example of Verification of Fact of Death report is attached as Appendix C.

Appendix 3 – Record Form

CONFIDENTIAL **PRF Number:** ____________

VERIFICATION OF FACT OF DEATH

Date: ______________________ **Time of verification of death:** ______________ **hrs**

Patient's Name: ____

Patient's Address: ____

____

____

Age or Date of Birth: ____

GP Name: ____

GP Address: ____

1. Condition unequivocally associated with death ***State Condition:*** ______________________ ❑
2. Patient pulseless and apnoeic where one or more of the following facts are established:
   - DNAR or Validated Advanced Directive (Living Will) ❑
   - Expected death as a result of terminal illness (incl. during transport) ❑
   - Asystole with no evidence of CPR in past 15 minutes and NO signs of: ❑

     a. DROWNING

     b. HYPOTHERMIA

     c. POISONING OR OVERDOSE

     d. PREGNANCY
   - Asystole **AND** prolonged submersion ***State Duration:*** ______________________ ❑
3. Following 20 minutes of Advanced Life Support where **ALL** the following are confirmed: ❑
   - NO PALPABLE PULSES
   - NO HEART SOUNDS
   - NO RESPIRATORY SOUNDS
   - PUPILS FIXED AND DILATED
   - ASYSTOLE ON ECG FOR 30 SECONDS

	Circle			
Control notified	**YES**	**NO**	Time ______________	hrs
Request police contact	**YES**	**NO**	Time ______________	hrs
Police (if requested) on scene	**YES**	**NO**	Time ______________	hrs
Request GP contact	**YES**	**NO**	Time ______________	hrs
GP (if requested) on scene	**YES**	**NO**	Time ______________	hrs
Relatives/Neighbours contacted	**YES**	**NO**	Time ______________	hrs
Minister of Religion contacted	**YES**	**NO**	Time ______________	hrs

Verified by: ______________________ **Call Sign/PIN:** ______________________

Witnessed by: ______________________ **Call Sign/PIN:** ______________________

Station: ____

INTRODUCTION

Traumatic cardiac arrest is a very different condition from the more usual cardiac arrest which is often related to ischaemic heart disease. Management of traumatic cardiac arrest must be directed toward identifying and treating the underlying cause of the arrest or resuscitation is unlikely to be successful.

Traumatic cardiac arrest may develop as a result of:

1. Hypoxia caused by manageable issues such as obstruction of the airway (e.g. facial injury or decreased level of consciousness) or breathing problems (e.g. pneumo/haemothorax).

2. Hypoperfusion caused by compromise of the heart (e.g. stab wound causing cardiac tamponade) or hypovolaemia (either occult or revealed haemorrhage).

MANAGEMENT:

Ventricular fibrillation/ventricular tachycardia (VF/VT) may be present, although this is unlikely. However, if present it should be managed by defibrillation according to the standard shockable rhythm algorithm (***refer to advanced life support guideline***) and followed by treatment of any identified potential cause.

The potential causes should be addressed by applying standard trauma management principles (***refer to trauma emergencies guideline***). Any problem should be dealt with adequately before moving on to the next:

A – Airway obstruction; ensure the airway is open and clear.

B – Impaired breathing; search for and manage a sucking chest or a tension pneumothorax (***refer to thoracic trauma guideline***). If not absolutely certain then needle thoracocentesis should be performed on both sides. Support and assist ventilation.

C – Hypovolaemia as a result of major blood loss; apply external haemorrhage control and secure vascular access while transferring without delay to definitive treatment.

D – Major head injury (***refer to head trauma guideline***) or spinal cord injury (***refer to neck and back trauma guideline***) impairing ventilation through CNS depression or loss of neuromuscular function.

The international literature and published evidenced-based guidelines over the last five years are quite clear:

Arrested on arrival at the scene:

- resuscitation can be stopped in blunt traumatic cardiac arrest when the patient is apnoeic, pulseless, without organised cardiac electrical activity and without pupillary light reflexes on arrival and where there has been no change after five minutes of cardio-pulmonary resuscitation with full resuscitative effort
- in penetrating traumatic cardiac arrest, resuscitation should be continued for 20 minutes while transferring rapidly to hospital. If a patient has not responded after 20 minutes of Advanced Life Support (ALS) (***refer to advanced life support guideline***) then resuscitation can be terminated.

Arrested in the presence of Emergency Medical Services (EMS):

- termination of resuscitative effort in the patient who has suffered a trauma related cardiac arrest (blunt or penetrating) in the presence of the EMS crew should be considered if the patient has not responded to 20 minutes of ALS.

If no cause amenable to treatment is found by following the above interventions and circulation is not restored, then survival is not possible and further intervention is medically inappropriate.[1-9] The only exceptions to this are pregnancy (when the patient should be rapidly transferred to hospital to deliver the infant), in the presence of hypothermia and with trauma involving children. In this case the JRCALC guideline on paediatric cardiac arrest should be followed and the patient transported rapidly to a hospital Emergency Department.

After stopping resuscitation, the Recognition of Life Extinct by Ambulance Clinicians (ROLE) (***refer to ROLE guideline***) procedure should be followed and the Police informed (**See also Appendix 1**).

Key Points –Traumatic Cardiac Arrest

- Traumatic cardiac arrest is different from cardiac arrest due to primary cardiac disease.
- Assessment and management should follow the trauma guideline, treating problems as they are found.
- If the patient is in blunt traumatic cardiac arrest on crew arrival and there is no change after 5 minutes of full resuscitation, further effort is futile.
- If the patient suffers a traumatic cardiac arrest from penetrating trauma or arrests in the presence of the crew and there is no response to resuscitation after 20 minutes of active resuscitation while moving to hospital, further effort is futile.
- The ROLE procedure should be followed if resuscitation is terminated.

REFERENCES

1. Powell DW, Moore EE, Cothren CC, Ciesla DJ, Burch JM, Moore JB, et al. Is emergency department resuscitative thoracotomy futile care for the critically injured patient requiring pre-hospital cardio-pulmonary resuscitation? *Journal of the American College of Surgeons* 2004;199(2):211-215.

2. Hopson LR, Hirsh E, Delgado J, Domeier RM, McSwain JNE, Krohmer J. Guidelines for withholding or termination of resuscitation in pre-hospital traumatic cardio-pulmonary arrest: joint position statement of the national association of EMS physicians and the american college of surgeons committee on trauma. *Journal of the American College of Surgeons* 2003;196(1):106-112.

3. Martin SK, Shatney CH, Sherck JP, Ho C-C, Homan SJ, Neff J. Blunt Trauma Patients with Prehospital Pulseless Electrical Activity (PEA): Poor Ending Assured. *Journal of Trauma-Injury Infection & Critical Care* 2002; 53(5):876-881.

4. Rosemurgy A, Norris P, Olson S, Hurst J, Albrink M. Prehospital traumatic cardiac arrest: the cost of futility. *J Trauma* 1993;35(3):468-73.

5. Pepe PE, Swor RA, Ornato JP, Racht EM, Blanton DM, Griswell JK, et al. Resuscitation In The Out-Of-Hospital Setting: Medical Futility Criteria For On-Scene Pronouncement Of Death. *Prehospital Emergency Care* 2001 5(5):79 – 87

6. Pasquale M, Rhodes M, Cipolle M, Hanley T, Wasser T. Defining “dead on arrival”: impact on a level I trauma center. *J Trauma* 1996;41((4):726-30.

7. Fulton R, Voigt W, Hilakos A. Confusion surrounding the treatment of traumatic cardiac arrest. *J Am Coll Surg* 1995 181(3):209-14.

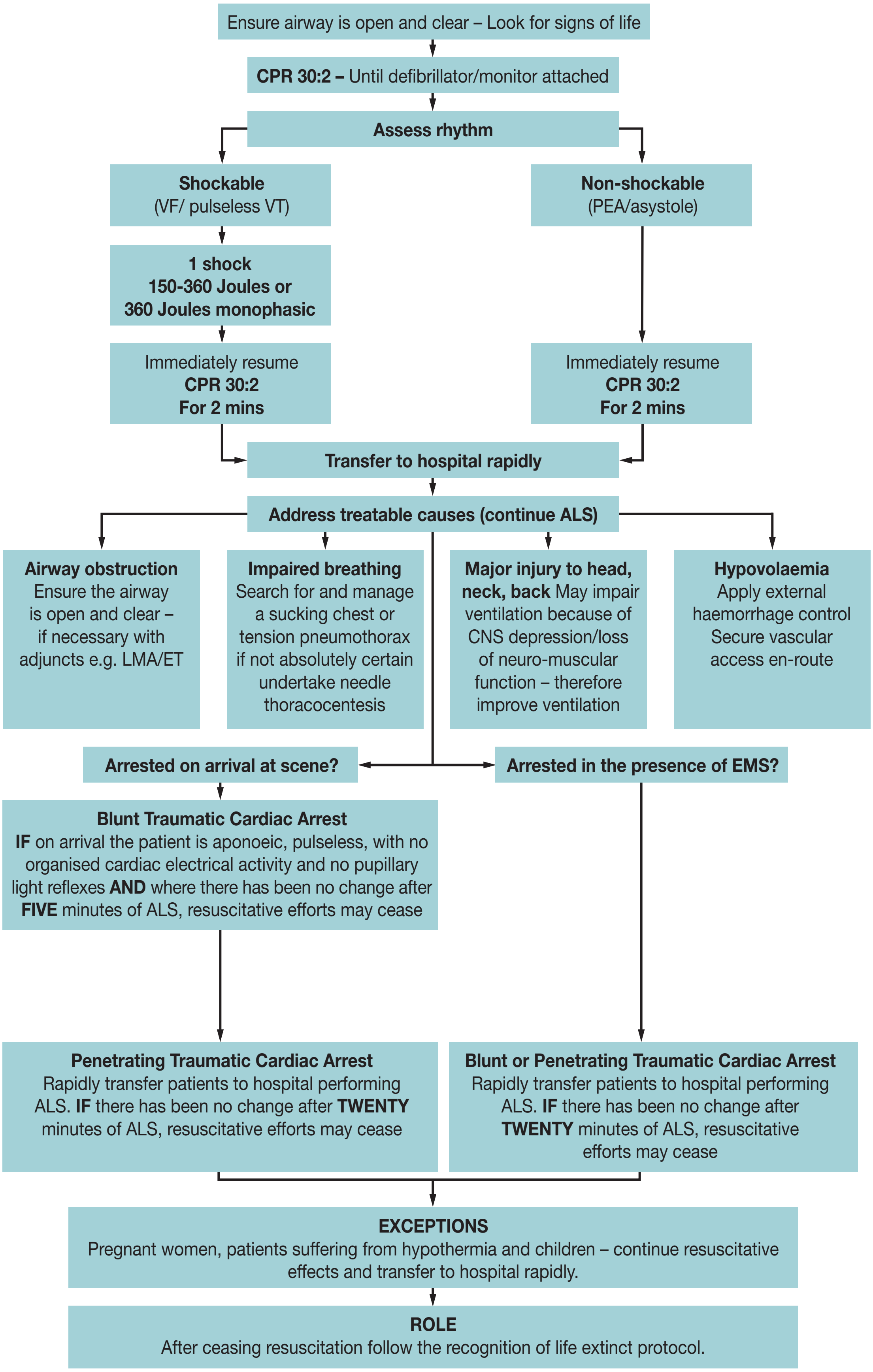
8. Battistella FD, Nugent W, Owings JT, Anderson JT. Field Triage of the Pulseless Trauma Patient. *Arch Surg* 1999;134(7):742-746.

9. Pickens JJ, Copass MK, Bulger EM. Trauma Patients Receiving CPR: Predictors of Survival. *Journal of Trauma-Injury Infection & Critical Care* 2005;58(5):951-958.

METHODOLOGY

Refer to methodology section.

Appendix 1 – Traumatic Cardiac Arrest



INTRODUCTION

Although the care of a wide range of medical conditions will be quite specific to the presenting condition, there are general principles of care that apply to most medical cases, regardless of underlying condition(s).

ASSESSMENT

Primary Survey – MUST be performed on **ALL** patients.

- The primary survey is an invaluable tool for initial assessment of any ill patient, which will detect any **TIME CRITICAL** problems. In some cases, it may be necessary and appropriate to commence early transport and correct problems en-route.
- Assess **ABCDs.**
- Assess and document vital signs from the above survey, including the time the observations were made.

STEPWISE PATIENT ASSESSMENT AND MANAGEMENT

In ABCD management, manage deficits as they are encountered: i.e. do not move on to rectification of Breathing or Circulation until Airway is secured.

Airway Assessment

LOOK	for obvious obstructions e.g. teeth, foreign bodies, vomit, blood or soot/burns/oedema in burn victims.
LISTEN	for noisy airflow e.g. snoring, gurgling or no airflow.
FEEL	for air movement.

Exclude and be prepared to manage airway obstruction resulting from vomit or other debris.

Stepwise Airway Management

Correct any **AIRWAY** deficits immediately by:

- Positioning and posture:
  - head tilt
  - chin lift
  - jaw thrust.
- Aspiration
- Administer oxygen (O_2) early and select appropriate treatment method:
  - oropharyngeal airway
  - nasopharyngeal airway
  - laryngeal mask airway
  - endotracheal intubation
  - (needle cricothyroidotomy)
  - via the stoma in laryngectomy and other neck breathing patients.

Breathing Assessment (inspection, palpation, percussion, auscultation).

- Assess for skin colour and for any evidence of pallor, cyanosis, peripherally and centrally (apply pulse oximeter).
- Expose the chest to observe chest wall movement. If breathing is absent or inadequate, proceed to resuscitation procedures. If unilateral chest movement is occurring, treat underlying cause if possible.
- Assess **respiratory rate and effort** and other factors to assess the 'work' of respiration. Note any **wheezing, noisy respiration**, either on inspiration or expiration. Listen for **stridor** (higher pitched noise on inspiration), suggestive of upper respiratory obstruction.
- Check position of trachea in suprasternal notch.
- Listen to the chest with a stethoscope. Ask the patient to breathe in and out briskly through their mouth. Listen on both sides of the chest:
  - above the nipples in the mid-clavicular line
  - in the mid-axilla under the armpit
  - at the rear of the chest, below the shoulder blade.
- Listen for:
  - normal or reduced air entry
  - equal air entry on each side
  - wheezing (on expiration)
  - crepitations at the rear of the chest (crackles, heard low down in the lung fields at the rear – indicates fluid in the lung in heart failure)
  - additional crackles and wheeze on inspiration that may be associated with inhalation of blood or vomit.
- Pulse oximetry should be undertaken.

Stepwise Breathing Management

Correct any BREATHING deficits immediately:

- administer high concentration oxygen (O_2)[1] (***refer to oxygen protocol for administration and information***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except in:

1. patients with chronic obstructive pulmonary disease (COPD) (who may need a lower concentration ***refer to COPD guideline***) and
2. those with conditions such as chest pain, acute coronary syndrome, sickle cell crisis, and with decreased level of consciousness (Glasgow Coma Scale (GCS) <15) (who should have 100% routinely – ***refer to specific guidelines***)

- consider assisted ventilation at a rate of 12–20 breaths per minute if:
  - SpO_2 is <90% on high concentration O_2
  - respiratory rate is <10 or >30
  - expansion is inadequate
- **Restraint *(Positional)* Asphyxia**. If the patient's condition requires that they are physically restrained (e.g. by Police Officers) in order to prevent them injuring themselves or others or for the purpose of being detained under the Mental Health Act, then it is paramount that the method of restraint allows both for a patent airway and adequate respiratory volume. **Under these circumstances it is essential to ensure that the patient's airway and breathing are adequate at all times.**

Circulatory Assessment

- Assess for evidence of haemorrhage externally (epistaxis, haemoptysis, haematemesis, melaena).
- Assess skin colour and temperature.
- Palpate a radial pulse If absent, assess for a carotid pulse, which, if present assess for pulse rate, volume and regularity.
- Check capillary refill time in fingertips and toes. If abnormal, check centrally (chest) (normal <2 seconds).
- Check blood glucose levels in all patients with history of diabetes, impaired consciousness, seizures, collapse resulting from heat exhaustion or alcohol consumption.

Stepwise Circulatory Management

Identify any **circulation** deficits:

- arrest external haemorrhage
- where appropriate, consider cannulation for drug administration.

Fluid Therapy

NOTE: Special guidance applies in pregnant women (***refer to specific guidelines in the obstetrics and gynaecological section***).

Current research shows little evidence to support the routine use of IV fluids in adult acute blood loss. In circumstances such as penetrating chest and abdominal trauma, survival worsens with the routine use of IV fluids.[2]

Fluids may raise the blood pressure, cool the blood and dilute clotting factors, worsening haemorrhage. Therefore, current thinking is that fluids should only be given when major organ perfusion is impaired.

Medical patients may present with significant dehydration resulting in reduced fluid in both the vascular and tissue compartments. Often this has taken time to develop and will take time to correct. Rapid fluid replacement into the vascular compartment can compromise the cardiovascular system particularly where there is pre-existing cardiovascular disease and in the elderly. Gradual rehydration over many hours rather than minutes is indicated.

If there is visible external blood loss (e.g. vomited blood) greater than 500mls, fluid replacement should be commenced with a 250ml bolus of crystalloid.

Central pulse **ABSENT**, radial pulse **ABSENT –** is an absolute indication for urgent fluid.

Central pulse **PRESENT**, radial pulse **ABSENT** – is a relative indication for urgent fluid depending on other indications including tissue perfusion and blood loss.

Central pulse **PRESENT**, radial pulse **PRESENT – DO NOT** commence fluid replacement[3] unless there are other signs of poor central tissue perfusion (e.g. altered mental state, abnormal cardiac rhythm. If the clinical conditions suggest that major fluid loss (ruptured aortic aneurysm, anaphylaxis, gastrointestinal bleeding) has occurred then commence 250ml bolus of crystalloid.

Re-assess vital signs prior to further fluid administration.

DO NOT delay at scene for fluid replacement; wherever possible cannulate and give fluid **EN-ROUTE TO HOSPITAL.**

Disability Assessment

- Note initial level of responsiveness on AVPU scale (see below), and time of assessment.

A	Alert
V	Responds to voice
P	Responds to painful stimulus
U	Unresponsive

- Assess and note pupil size, equality and response to light.
- Check for purposeful movement in all four limbs. Check sensory function.
- All patients with altered mental status must have their blood glucose levels assessed.
- **Continually re-assess ABCD and initiate appropriate treatments en-route in case of deterioration.**

Evaluate

If any of the following features are identified within the Primary Survey, then the patient should be considered TIME CRITICAL. The priority, other than correcting immediately life-threatening A and B conditions, is to get the patient to definitive care in hospital. Further assessment and treatment should continue en-route:

- airway impairment
- severe breathlessness
- failing ventilation
- severe haemorrhage
- circulatory collapse and shock due to infection
- Addisonian crisis
- cardiac chest pain
- cardiogenic shock
- severe hypotension due to bradycardia or extreme tachycardia
- anaphylaxis
- any person with GCS <15, who does not have a cause that can be treated in pre-hospital environment such as hypoglycaemia (check airway in all decreased GCS cases, check glucose level)
- status epilepticus
- unable to complete a sentence.

NOTE: This list is not inclusive; patients with other signs may also be time critical, this is where the clinical judgement of the Paramedic is important.

- **CORRECT A AND B PROBLEMS ON SCENE, THEN COMMENCE TRANSPORT TO NEAREST SUITABLE RECEIVING HOSPITAL. If airway and breathing cannot be corrected, or haemorrhage cannot be controlled, evacuate immediately, continuing resuscitation as appropriate en-route and alert.**

Provide a Hospital Alert Message.

En-route – continue patient **MANAGEMENT** ***(see below)***.

HISTORY

In order to gather as much relevant information as possible, without delaying care, the accepted format of history taking is as follows:

- presenting complaint – why they called for help at this time
- history of presenting complaint – details of when the problem started, exacerbating factors and previous similar episodes
- direct questioning about associated symptoms, by system. Ask about all appropriate systems
- past medical history, including current medication
- family history
- social history.

Combined with a good physical examination, this format of history taking should ensure that you correctly identify those patients who are time critical, urgent or routine. The history taken must be fully documented. In many cases, a well-taken history will point to the diagnosis.

The presence of “Medic Alert” type jewellery (bracelets or necklets) can provide information on the patient’s pre-existing health risk that may be relevant to the current medical emergency.

SECONDARY SURVEY

In **NON-TIME CRITICAL** conditions, perform a more thorough patient assessment with a brief Secondary Survey. It may be easier and more appropriate to perform this in the ambulance and, in many instances, en-route to hospital, even when the patient is not time critical.

Head

Re-assess airway, breathing, circulation.

Re-assess levels of consciousness (AVPU), pupil size and activity, and record.

Establish GCS (***see Appendix 1***) and record.

Chest

Re-assess respiratory rate and depth, and record.

Re-listen for breath sounds in all lung fields, and record.

Assess for pneumothorax – in small pneumothorax no clinical signs may be detected. A pneumothorax causes breathlessness, reduced air entry and chest movement on the affected side. If this is a **tension pneumothorax**, then the patient will have increasing respiratory distress and distended neck veins, and tracheal deviation away from affected side may also be present.

Assess skin colour and temperature, and record.

Assess heart sounds, assess and confirm heart rate.

Obtain a blood pressure reading using a sphygmomanometer. Document and record results. Obtain a pulse oximeter reading and record.

Re-assess as needed en-route to hospital.

Abdomen

Feel for tenderness and guarding in all four quadrants, check for bowel sounds.

Lower and Upper Limbs *(see below)*

Check for MSC in **ALL** four limbs:

M	MOTOR	Test for movement.
S	SENSATION	Apply light touch to evaluate sensation.
C	CIRCULATION	Assess pulse and skin temperature.

MANAGEMENT

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)

Ensure adequate O_2 therapy and support.

Obtain IV access/infusion, if required.

Apply ECG and pulse oximetry monitoring, as required.

Consider patient positioning, e.g. sitting upright for respiratory problems.

Check blood glucose levels in all patients with history of diabetes, impaired consciousness, seizures collapse resulting from heat exhaustion or alcohol consumption.

Provide drug therapy as required, e.g. glucose 10% IV in cases of hypoglycaemia (***refer to the glucose 10% drug protocol for dosages and information***); hydrocortisone IV (***refer to the hydrocortisone drug protocol for dosages and information***) in Addisonian Crisis.

If the level of consciousness deteriorates or respiratory depression develops in cases where an overdose with opiate-type drugs may be a possibility, consider naloxone (***refer to naloxone drug protocol for dosages and information***). In patient's with fixed pinpoint pupils suspect opiate analgesia use.

Follow **ADDITIONAL MEDICAL** guidelines as indicated by the patient's condition, e.g. cardiac rhythm disturbance.

Correct A and B problems on scene and then commence transport to **Nearest Suitable Receiving Hospital**.

Provide a **Hospital Alert Message/Information** Call if required.

At the hospital, provide a comprehensive verbal handover and a completed **Patient Report Form** to the Receiving Hospital Staff.

ADDITIONAL INFORMATION

Remember that the patient history may give you valuable insight into the cause of the current condition. The following may be of great help in your diagnosis:

- relatives, carers or friends with knowledge of the patient's history.
- packets or containers of medication (including domiciliary oxygen) or evidence of administration devices, e.g. nebuliser machines.
- medic alert type jewellery (bracelets or necklets) which detail the patient's primary health risk (e.g. diabetes, anaphylaxis, Addison's disease etc.) but also list a 24-hour telephone number to obtain a more detailed patient history.

- warning stickers, often placed by the front door or the telephone, directing the health professional to a source of detailed information (one current scheme involves storing the patient details in a container in the fridge, as this is relatively easy to find in the house).
- patient-held warning cards denoting previous thrombolysis, at-risk COPD patients, or those taking monoamine oxidase inhibitor (MAOI) medication.
- patients on long-term steroids or who have adrenal insufficiency may deteriorate rapidly because of steroid insufficiency. If significantly unwell they should be given hydrocortisone and fluids if required.

REMINDER:

Any immediately uncorrectable ABCD problem should be considered time critical. The patient should be transported to hospital with a pre-alert message, with treatment continued en-route.

Key Points – Medical Emergencies

- Detect time critical problems early.
- Minimise time on scene.
- Continuously re-assess ABCD, AVPU.
- Initiate treatments en-route if deterioration.
- Provide hospital alert.

REFERENCES

[1] Kuisma M, Boyd J, Voipio V, Alaspää A, Roine RO, Rosenberg P. Comparison of 30 and the 100% inspired oxygen concentrations during early post-resuscitation period: a randomised controlled pilot study. *Resuscitation* 2006;69(2):199-206.

[2] Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.

[3] Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

METHODOLOGY

Refer to methodology section.

Appendix 1 – Glasgow Coma Scale

GLASGOW COMA SCALE

Item	Score
Eyes Opening:	
Spontaneously	4
To speech	3
To pain	2
None	1
Motor Response:	
Obeys commands	6
Localises pain	5
Withdraws from pain	4
Abnormal flexion	3
Extensor response	2
No response to pain	1
Verbal Response:	
Orientated	5
Confused	4
Inappropriate words	3
Incomprehensible sounds	2
No verbal response	1

INTRODUCTION

Abdominal pain is the most common complaint seen in Emergency Departments (ED).[1] The elderly account for 15% of these attendances. Mortality rises significantly in the over 50's as they can have atypical presentations and are more prone to catastrophic events.

Ambulance crews attend a variety of acute abdominal conditions e.g. appendicitis, renal colic, peptic ulcer perforation, abdominal ischaemia and peritonitis, plus chronic conditions such as irritable bowel syndrome (IBS), gastric and duodenal ulcers and cancer of various abdominal organs.[2] Approximately 25% of patients calling 999 with abdominal pain have serious conditions.

The specific cause of abdominal pain can rarely be determined in the pre-hospital environment. The history, nature, location and pattern of the pain with associated symptoms may point to the possible cause. The most important diagnoses to consider are those that are life threatening, either as the result of internal haemorrhage or perforation of a viscus, and sepsis.

Ruptured aortic aneurysm, ectopic pregnancy and traumatic disruption of the liver or spleen are examples of the former. ABC assessment and resuscitation of such patients may be required.

The most common diagnosis of patients presenting to ED departments with abdominal pain is non specific abdominal pain (NSAP). However there are many specific causes which are of a minor nature e.g. constipation, urinary tract infection (UTI).

ASSESSMENT AND MANAGEMENT

Rapid primary assessment of ABCD in order to evaluate any time critical features.

If time critical, initiate resuscitation and rapidly transport to the nearest appropriate hospital.[3]

Obtain a brief overview of pain history[4] and symptoms.

Fluid therapy

Early cannulation is desirable but should not delay on scene times and a limit of two attempts at cannulation should be made en-route.[3]

Current research shows little evidence to support the routine use of IV fluids in adult acute blood loss. In circumstances such as penetrating chest and abdominal trauma, survival worsens with the routine use of IV fluids.[5]

Fluids may raise the blood pressure, cool the blood and dilute clotting factors, worsening haemorrhage. Therefore, current thinking is that fluids should only be given when major organ perfusion is impaired.

Medical patients may present with significant dehydration resulting in reduced fluid in both the vascular and tissue compartments. Often this has taken time to develop and will take time to correct. Rapid fluid replacement into the vascular compartment can compromise the cardiovascular system particularly where there is pre-existing cardiovascular disease and in the elderly. Gradual rehydration over many hours rather than minutes is indicated.

If there is visible external blood loss (e.g. vomited blood) greater than 500mls, fluid replacement should be commenced with a 250ml bolus of crystalloid.

Central pulse **ABSENT**, radial pulse **ABSENT** is an absolute indication for urgent fluid.

Central pulse **PRESENT**, radial pulse **ABSENT** is a relative indication for urgent fluid depending on other indications including tissue perfusion and blood loss.

Central pulse **PRESENT**, radial pulse **PRESENT – DO NOT** commence fluid replacement,[3] unless there are other signs of poor central tissue perfusion (e.g. altered mental state, abnormal cardiac rhythm). If the clinical conditions suggest that major fluid loss (ruptured aortic aneurysm, anaphylaxis, gastrointestinal bleeding) has occurred then commence 250ml bolus of crystalloid.

Reassess vital signs prior to further fluid administration.

Continue patient management en-route, including:

- administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients. High concentration O_2 should be administered routinely, whatever the oxygen saturation, except for patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***).
- titrated pain relief[1] tailored to needs of the patient.[6] (***refer to pain management guidelines***).
- obtain 12-lead ECG as standard for all elderly patients and all patients with cardiac risks presenting with upper abdominal pain.[1]
- provide a pre-alert to ED.

Medical Emergencies in Adults

HISTORY

Pain history:

- the site
- time of onset
- duration
- quality
- character
- ameliorating/provoking factors
- pain scoring (***refer to pain management guidelines***).[4]

Associated symptoms:[1,7]

- altered bowel habit
- nausea
- vomiting
- blood in vomit or faeces
- burning on urination
- menstrual and sexual history in females of child bearing age.

Past medical history:

- current drug treatment
- presence of similar symptoms in others should be ascertained.

EXAMINATION

Where time critical features are present there is no value in undertaking a detailed examination.

In other circumstances, the presence of tenderness, guarding, rebound tenderness and abnormal or absent bowel sounds may indicate the presence of a serious condition.

ANALGESIA

Entonox is worth consideration but may not be as effective in abdominal pain (***refer to Entonox drug protocol for administration and information***). There is the potential that the nitrous oxide may increase the volume of a gas pocket in the abdomen and it should be used with caution in patients with a markedly distended abdomen.[8]

Early narcotic pain relief has been controversial. No one has conclusively proven that narcotics mask pain and cause problems with subsequent surgical assessment.[9] Current common practice is to relieve pain on humane grounds.[1] Pain has been shown to cloud the patient's ability to concentrate and understand explanations.[10,11] The judicial and titrated use of analgesia prior to a surgeon's assessment of the abdomen is acceptable practice (refer to pain management guidelines).[9]

SPECIFIC CONDITIONS

Elderly and confused patients do suffer pain which may further contribute to confusion.[12] They are more at risk of catastrophic events. They also develop conditions such as diverticulitis rarely seen in younger patients.

Paediatric patients may present with conditions which are specific to childhood e.g. intussusception (inward telescoping of the bowel), pyloric stenosis and are prone to rapid dehydration from diarrhoea and vomiting.

Ectopic Pregnancy accounts for 13% of all pregnancy related deaths (***refer to haemorrhage during pregnancy (including miscarriage and ectopic) guideline***). Patients may present atypically but pain is almost always present. Therefore a thorough history of menstrual function, sexual practice, obstetric and gynaecological features cannot be over emphasised in females of child bearing age.[7]

Pelvic Inflammatory Disease (PID) is a common cause of abdominal pain in females but rarely presents as an acute collapse. The severe forms of pelvic infection with the formation of a tuboovarian abscess are rare but can present with features of systemic sepsis and abdominal pain. A history of PID predisposes to ectopic pregnancy.

Ruptured Abdominal Aortic Aneurysms (AAA) were responsible for almost 6,000 deaths in men and 3,500 in women in England and Wales in 1999. Most deaths occur in the elderly. Less than 25% of all AAA patients present with classic signs and symptoms with a consequential risk of misdiagnosis.[1] This diagnosis must be considered in anyone over the age of 50 who presents with sudden severe abdominal pain or back ache, hypotension with bilateral lower limb ischaemia or mottling (a late sign) especially if there is a history of smoking, hypertension and hypercholesterolaemia.[13]

Appendicitis is also frequently misdiagnosed[1] and up to one third of women of child bearing age with appendicitis are considered as having pelvic inflammatory disease or UTI.[7]

Immunosuppressed patients, for example, human immunodeficiency virus (HIV) and alcoholic patients can present atypically.[1]

Key Points – Abdominal Pain

- The most important diagnoses to consider are those that are life threatening, either as the result of internal haemorrhage or perforation of a viscus and sepsis.
- Myocardial infarction is often misdiagnosed as indigestion.
- Obtain 12-lead ECG for elderly patients and patients with cardiac risks presenting with upper abdominal pain.
- If a patient is in severe pain, adequate analgesia should be given.
- A precise diagnosis of the cause of abdominal pain is often impossible without access to tests and investigations in hospital.

REFERENCES

1. American College of Emergency Physicians (ACEP). Clinical Policy: critical issues for the initial evaluation and management of patients presenting with a chief complaint of nontraumatic acute abdominal pain. *Annals of Emergency Medicine* 2000;36(4):406-15.
2. Blendis L. Abdominal pain. In: PD W, R M, editors. *Textbook of Pain*. 3rd ed. UK: Churchill Livingstone, 1994.
3. Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).
4. Institute of Clinical systems improvement & management of acute pain, Bloomington MN. Assessment & management of acute pain. *Institute for clinical systems Improvement (ICSI)* 2001;74:133.
5. Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.
6. Ricard-Hibon A, Chollet C, Saada S, Loridant B, Marty J. A quality control program for acute pain management in out-of-hospital critical care medicine. *Annals of Emergency Medicine* 1999;34(6):738-44.
7. Kamin RA, Nowicki TA, Courtney DS, Powers RD. Pearls and Pitfalls in the. Emergency Department Evaluation of Abdominal Pain. *Emerg Med Clin N Am* 2003; 21:61-72.
8. Donen N, Tweed WA, White D, Guttormson B, Enns J. Pre-hospital analgesia with Entonox. *Canadian Anaesthetists' Society journal* 1982;29(3):275-9.
9. Nissman SA, Kaplan LJ, Mann BD. Critically reappraising the literature-driven practice of analgesia administration for acute abdominal pain in the emergency room prior to surgical evaluation. *American journal of surgery* 2003;185(4):291-6.
10. Gabbay DS, Dickinson ET. Refusal of Base Station Physicians to Authorise Narcotic Analgesia. *Pre Hospital Emergency Care* 2000;5(3):293-95.
11. Thomas SH, Silen W, Cheema F, Reisner A, Aman S, Goldstein JN, et al. Effects of morphine analgesia on diagnostic accuracy in Emergency Department patients with abdominal pain: a prospective, randomized trial. *Journal of the American College of Surgeons* 2003;196(1):18-31.
12. Zimmerman PG. Cutting-edge Discussions of Management, Policy, and Program Issues in Emergency Care. *Emergency Nursing* 2004;30(3):259-69.
13. Coselli JS, Hekier RJ, Le Maire SA. Abdominal Aortic Disasters: Keys to prompt Recognition Tenets of Therapy. *Consultant* 1999;June:1809-1821.

METHODOLOGY

Refer to methodology section; see below for abdominal pain search strategy.

Abdominal pain search strategy

Electronic databases searched:

Medline (Ovid)

CINAHL.

Search strategy:

Abdom$ / Stomach. exp /gastric. exp

Pain. exp / pain relief. exp / Analgesia. exp / narcotics

Prehospital care / Emergency care

Additional sources searched:

- British Medical Journal – http://bmj.bmjjournals.com
- Emergency Medical Journal – http://emj.bmjjournals.com
- British Society of Gastroenterology – http://www.bsg.org.uk
- American College of Emergency Physicians (ACEP) http://www.acep.org/webportal

INTRODUCTION

Coma is defined as U on the AVPU scale[1] or a Glasgow Coma Score (GCS)[2] (***see appendix 1***) of 8 or less; however any patient presenting with a decreased level of consciousness (GCS<15) mandates further assessment and, possibly, treatment.

The patient with a decreased level of consciousness provides a major challenge for all levels of emergency care staff. Often very little information is presented, and the causes may range from diabetic collapse to factitious illness. Decreased consciousness may be caused by:

- head injury
- hypoglycaemia
- stroke
- epilepsy
- sub arachnoid haemorrhage
- overdose etc.

Alterations in pO_2 (hypoxia) and/or PCO_2 (hyper/hypocapnoea):

- inadequate airway
- inadequate ventilation or depressed respiratory drive
- persistent hyperventilation.

Inadequate perfusion:

- hypovolaemia
- cardiac arrhythmias
- distributive shock
- neurogenic shock
- raised intracranial pressure.

Altered metabolic states:

- hypoglycaemia/hyperglycaemia.

Intoxication or poisoning:

- drug overdose
- alcohol intoxication
- carbon monoxide poisoning.

Medical conditions:

- stroke
- sub arachnoid haemorrhage
- epilepsy
- meningitis
- hypo/hyperthermia.

Head injury:

- raised intracranial pressure.

HISTORY

It is important to understand, wherever possible, the cause of decreased consciousness; the scene may provide clues to assist in formulating a diagnosis:

- any environmental factors, e.g. extreme cold, possible carbon monoxide sources?
- any evidence of tablets, ampoules, pill boxes, syringes, including domiciliary oxygen (O_2), or administration devices, e.g. nebuliser machines?
- any evidence of alcohol, or medication abuse?

Remember that the patient history may give you valuable insight into the cause of the current condition. The following may be of great help in formulating your diagnosis; ask relatives or bystanders:

- is there any history of recent illness or pre-existing chronic illness e.g. diabetes, epilepsy?
- any past history of psychiatric problems?
- any preceding symptoms such as headache, fits, confusion?
- any history of trauma?

NOTE: Remember, an acute condition may be an exacerbation of a chronic condition or a 'new' illness superimposed on top of a pre-existing problem.

ASSESSMENT

The primary survey should be used to assess and detect any **TIME CRITICAL/POTENTIALLY TIME CRITICAL** problems.

Assess **ABCDs.**

NOTE: any patient with a decreased level of consciousness has a compromised airway.

Assess level of consciousness on AVPU scale (***see below***).

A	Alert
V	Responds to voice
P	Responds to painful stimulus
U	Unresponsive

Assess and note pupil size, equality and response to light.

Check for purposeful movement in all four limbs and note sensory function.

Assess blood glucose level and if hypoglycaemic (<4.0 mmol/l) or hypoglycaemia is clinically suspected, administer glucose 10% or glucagon (***refer to glycaemic emergencies guideline***).

Look for any significant injuries (especially to head).

If any of these features are present, correct **A and B problems then transport to nearest suitable receiving hospital**.

Provide a **Hospital Alert Message / Information call.**

Continually re-assess ABCD:

- make special note of any trend in GCS or altered neurological function
- note any trend in blood pressure
- initiate appropriate treatments en-route.

If **NON TIME CRITICAL**, perform a more thorough assessment and secondary survey. Include observations for:

- any evidence of trauma
- breath for ketones, alcohol and solvents
- evidence of needle tracks/marks
- medic alert type jewellery (bracelets or necklets) which detail the patient's primary health risk (e.g. diabetes, anaphylaxis, Addison's disease etc.) but also list a 24-hour telephone number to obtain a more detailed patient history
- warning stickers, often placed by the front door or the telephone, directing the health professional to a source of detailed information (one current scheme involves storing the patient details in a container in the fridge, as this is relatively easy to find in the house)
- patient-held warning cards, for example, those taking monoamine oxidase inhibitor (MAOI) medication.

MANAGEMENT

Follow Medical Emergencies Guideline, remembering to:

TAKE A DEFIBRILLATOR TO THE INCIDENT – many calls to unconscious patients are in fact cardiac arrests.

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)
- administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients. High concentration O_2 should be administered routinely, whatever the oxygen saturation, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***).
- Obtain IV access en-route.
- Apply pulse oximetry and ECG monitoring for detection of hidden hypoxia and arrhythmias (***refer to oxygen and cardiac rhythm disturbance guideline***).

Specifically consider:

- if any suspicion of trauma, immobilise cervical spine and ***refer to trauma emergencies guidelines***
- in the case of severe respiratory depression/arrest support ventilation at a rate of 12–20 breaths per minute if:
  - SpO_2 is <90% on high concentration O_2
  - respiratory rate is <10 or >30
  - expansion is inadequate
  - if the level of consciousness deteriorates or respiratory depression develops in cases where an overdose with opiate-type drugs may be a possibility, consider naloxone ***(refer to naloxone drug protocol for dosages and information***). In a patient with fixed pinpoint pupils suspect opiate use/overdose
- follow **ADDITIONAL MEDICAL** guidelines as indicated by the patient's condition, e.g. ***cardiac rhythm disturbance guideline***

- commence correction of A and B problems on scene, then transport to **nearest suitable receiving hospital**
- provide a **Hospital Alert Message/Information Call** as required.

Key Points – Decreased level of Consciousness

- Maintain patent airway.
- Support ventilation if required.
- Address treatable causes.
- History – obtain as much information as possible.
- Provide pre-alert.

REFERENCES

1. Mackay CA, Burke DP, Burke JA, Porter KM, Bowden D, Gorman D. Association between the assessment of conscious level using the AVPU system and the Glasgow coma scale. *Pre-Hospital Immediate Care* 2000;4(1):17-9.
2. Teasdale G, Jennett B. Assessment of Coma and Impaired Consciousness: A Practical Scale. *The Lancet* 1974;304(7872):81-84.

METHODOLOGY

Refer to methodology section.

Appendix 1 – Glasgow Coma Scale

GLASGOW COMA SCALE

Item	Score
Eyes Opening:	
Spontaneously	4
To speech	3
To pain	2
None	1
Motor Response:	
Obeys commands	6
Localises pain	5
Withdraws from pain	4
Abnormal flexion	3
Extensor response	2
No response to pain	1
Verbal Response:	
Orientated	5
Confused	4
Inappropriate words	3
Incomprehensible sounds	2
No verbal response	1

INTRODUCTION

Difficulty breathing is one of the most common causes of emergency calls for ambulance assistance and is the most common reason for Emergency Department (ED) visits.[2] Approximately 25-50% of dyspnoea patients presenting to the ED are admitted to hospital.[3]

Dyspnoea has many causes involving single and multiple organ systems.[4] Asthma, cardiogenic pulmonary oedema, chronic obstructive pulmonary disease (COPD), pneumonia, cardiac ischaemia, and interstitial lung disease account for approximately 85% of all ED cases of shortness of breath (***treat specific cause as per relevant guideline***).[3]

Less common medical causes of dyspnoea include pulmonary embolus, severe anaemia and hypertensive crisis. In trauma, pneumothorax, flail chest, lung contusion, and severe hypovolaemic shock may also cause severe breathing difficulties. Acidosis following salicylate overdose or ketoacidosis also causes physiological hyperventilation (***treat specific cause as per relevant guideline***).

It is important to identify the underlying cause of the breathing difficulty. Evaluation and assessment of patients with a chief complaint of dyspnoea must include a detailed history and a thorough physical examination.[3]

Diagnosis can be difficult, even with the aid of a chest X-ray.[3] Even so, pre-hospital carers have excellent diagnostic agreement with emergency physician diagnosis by organ system (USA).[5]

HISTORY

A thorough history will help identify possible causes of dyspnoea. In particular ask the patient about:

how long they have had difficulty breathing?

- sudden onset?
- gradual onset?

is there any pain associated with breathing?

- any relationship with pattern of breathing?
- any relationship with depth of respiration?

does the patient have a cough?

- is it productive?
- what colour is the phlegm?

does the patient find certain positions make matters worse?

- e.g. unable to lie down, must sit upright?

Specific respiratory problems:

- asthma (***refer to asthma guideline***)
- COPD – consider acute exacerbation (***refer to COPD guideline***)
- has there been a recent increase in own medication?
- history of pulmonary embolism (***refer to pulmonary embolism guideline***)
- any other diagnosed respiratory disorder?
- smoking.

Specific cardiovascular problems:

- any previous cardiac events e.g. AMI?
- ischaemic heart disease (IHD)
- known heart failure
  - left ventricular failure
  - right ventricular failure
  - congestive heart failure
  - cor pulmonale
- hypertension
- congenital heart problems
- some patients with acute myocardial infarction may have breathlessness as their only symptom.

Other:

- pre-disposing traumatic episodes
- recent surgery or immobilisation
- other associated symptoms to help reach a diagnosis, e.g. constricting pain suggests angina / or possible myocardial infarction (***refer to acute coronary syndrome guideline***):
- hyperventilation syndrome (***refer to hyperventilation syndrome guideline***):
  - often accompanied by numbness and tingling in the limbs and around the mouth.
  - ensure other more serious conditions are excluded before considering this diagnosis.

Table 1 – Evidence Based Differential Diagnosis for Common Conditions[3,6-9]

Most common findings	Pneumonia	Pulmonary Embolism	LVF	Asthma
Symptoms:	Dyspnoea Fever Cough	Dyspnoea Pleuritic chest pain Cough Leg pain Leg oedema	Dyspnoea especially on exertion Orthopnoea/ nocturnal dyspnoea	Dyspnoea Cough Unable to complete sentences
Physical signs:	Tachycardia	Tachycardia Tachypnoea Fever ECG: Nonspecific ST-T wave changes	Peripheral oedema Raised JVP Tachycardia	Wheeze Tachypnoea Tachycardia Pulsus paradoxus Hyperresonant chest Accessory muscle use PEF<50% normal
Auscultation sounds:	Rhonchi	Focal rales	Rales Heart Murmur Rhonchi	Decreased or absent breath sounds if severe
History of:	Smoking IHD	Prolonged immobilisation Recent surgery Thrombotic disease	IHD Hypertension	Previous asthma Recent sharp increase in inhaler use Allergen exposure

ASSESSMENT

Primary Survey

Assess **ABCDs**

Baseline Observations

Specifically assess:

- respiratory rate, effort and effectiveness of ventilation
- degree of dyspnoea[1] (***see additional Information***)
  - where possible, assess on Vertical Visual Analogue Scale (VAS), or against another locally agreed scale.
  - the adequacy of ventilation can be assessed by considering the ventilatory rate and depth (minute volume)
- productive cough, sputum or bubbling:
  - Infection or heart failure
    - frothy white / pink sputum – acute LVF
    - productive cough (yellow / green sputum): chest infection
    - haemoptysis: PE, chest infection, or CA lung
- percuss the chest to determine if there are collections of fluid in the lungs
- raised Jugular Venous Pressure (JVP) and peripheral oedema: heart failure
- obtain a 12-lead ECG and assess for acute cardiac events
- signs of anaphylaxis:
  - itchy rash
  - facial swelling
  - circulatory collapse
- auscultate the chest to determine:
  - adequacy of air entry on both sides of the chest
  - chest sounds:
    - audible wheeze on expiration – asthma or LVF (especially in older patients with no history of asthma)
    - audible stridor – upper airway narrowing (e.g. anaphylaxis or foreign body airway obstruction)
    - rales (crepitations) fine crackling in lung bases
    - LVF
    - rhonchi (harsher, rattling sound) – collections of fluid in larger airways – pneumonia.

Evaluate TIME CRITICAL factors:

These may include:

- extreme breathing difficulty, ***refer to medical emergencies,***
- cyanosis,
- hypoxia – i.e. saturation levels on pulse oximeter (SpO_2) <95% or not responding to high concentration oxygen (O_2) (***see additional information***).
- features of life threatening asthma,
- acute myocardial infarction (***refer to thrombolysis and acute coronary syndrome guidelines***),
- evidence of anaphylaxis,
- features of tension pneumothorax, or major chest trauma,
- if any of these features are present, correct A and B problems, give O_2, **LOAD AND GO** to **nearest suitable receiving hospital**, applying appropriate individual treatment guideline en-route.
- provide a **Hospital Alert Message / Information Call.**

MANAGEMENT

Follow medical emergencies guideline

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)
- administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients. High concentration O_2 should be administered routinely, whatever the oxygen saturation, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***).
- consider assisted ventilation at a rate of 12–20 breaths per minute if:
  - SpO_2 is <90% on high concentration O_2
  - respiratory rate is <10 or >30
  - expansion is inadequate
- position for comfort (usually sitting upright).

Specifically consider:

- anaphylaxis guideline
- asthma guideline
- COPD guideline
- pulmonary oedema guideline
- pulmonary embolism guideline
- thrombolysis guideline and acute coronary syndrome
- Tension pneumothorax: consider needle decompression of the affected side, if suitably trained (***refer to thoracic trauma guideline***).

Reassess degree of dyspnoea after treatment

ADDITIONAL INFORMATION

SpO_2 level

- SpO_2 levels <95% should be considered as hypoxia in all patients except COPD patients (***refer to COPD guideline***).
- Pulse oximetry readings may be affected by motion artefact[10], carboxyhaemoglobin, and nail varnish. If problem from nail varnish then remove varnish or mount probe sideways on finger.[1]

Dyspnoea Visual Analogue Scale (VAS)

Validated Visual Analogue Scales have been used to assess subjective degree of dyspnoea in patients with asthma, COPD, LVF and dyspnoea on exertion.[1,11-14]

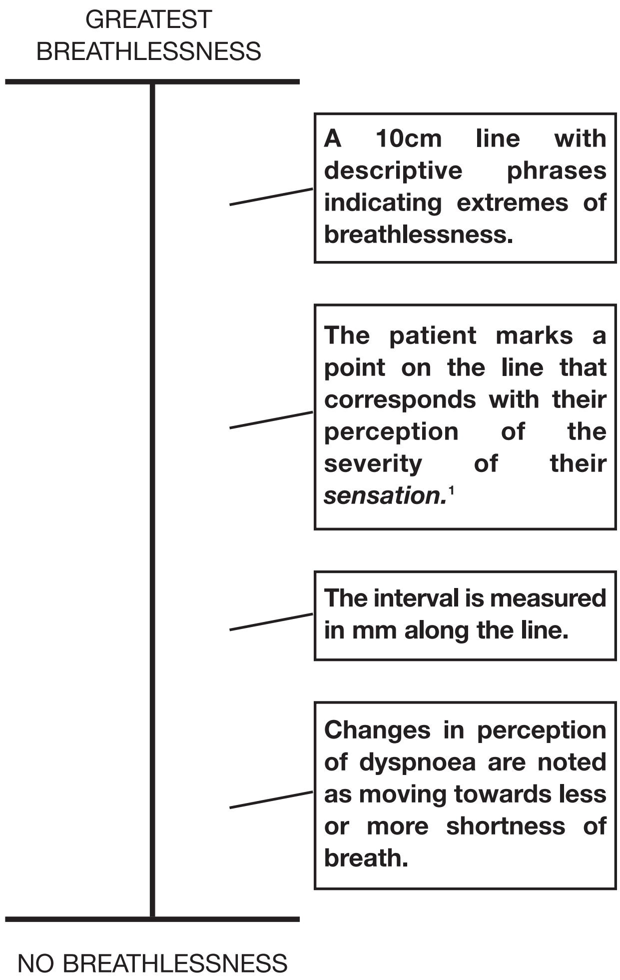
The vertical scale was developed in response to difficulty patients were having using the horizontal scale.[1,15,16]

Continuous VAS scales can identify transient changes brought about by acute episodes of breathlessness, which discrete (0,1,2,3..10) scales cannot.[17] However the use of the instrument requires that the patient has subjective awareness and cognitive function.[1]

The dyspnoea VAS is valid in assessing symptomatic changes and may detect small subjective improvements better than peak expiratory flow rate. In asthma, symptomatic improvement was seen in changes >0.5cm and clinically meaningful improvement seen in changes >2.2cm.[18]

VAS scales have been utilised in the pre-hospital field to indicate the efficacy of different drug treatments.[19,20]

Visual Analogue Scale



Key Points – Dyspnoea

- Is breathlessness of respiratory, cardiac, both or other causes?
- Saturation levels of oxygen <95% are considered hypoxic.
- The visual analogue score is a useful indicator as to the level of dyspnoea and response to treatment.
- Oxygen therapy is essential in dyspnoeic patients; a diagnosis of COPD is not a contra-indication to its administration.

REFERENCES

1. Frownfelter D, Ryan J. Dyspnea – Measurement and evaluation. *Cardiopulmonary Physical Therapy Journal* 2000;11(1):7-15.
2. Parshall MB. Adult emergency visits for chronic cardiorespiratory disease: does dyspnea matter? *Nursing Research* 1999;48(2):62-70.
3. Michelson E, Hollrah S. Evaluation of the patient with shortness of breath: an evidence based approach. *Emergency Medicine Clinics of North America* 1999;17(1):221-37.
4. Mulrow CD, Lucey CR, Farnett LE. Discriminating causes of dyspnea through clinical examination. *Journal of General Internal Medicine* 1993;8(7):383-92.
5. Schaider JJ, Riccio JC, Rydman RJ, Pons PT. Paramedic diagnostic accuracy for patients complaining of chest pain or shortness of breath. 10(4), pp. 245-250. *Prehospital & Disaster Medicine* 1995;10(4):245-50.
6. British Thoracic Society, Scottish Intercollegiate Guidelines Network. The BTS/SIGN British Guideline on the Management of Asthma. *Thorax* 2003;58(Supplement I):i1-i94.
7. Anonymous. The British guidelines on asthma management. 1995 review and position statement. British Thoracic Society, National Asthma Campaign, the General Practitioner in Asthma Group, the British Association of Accident and Emergency Medicine, the British Paediatric Respiratory Society and the Royal College of Paediatrics and Child Health. *Thorax* 1997;52 (Suppl 1):S1-21.
8. Davies MK, Gibbs CR, Lip GY. ABC of heart failure: *Investigation. BMJ* 2000;320(7230):297-300.
9. Watson RD, Gibbs CR, Lip GY. ABC of heart failure: Clinical features and complications. *BMJ* 2000;320(7229):236-39.
10. Gehring H, Hornberger C, Matz H, Konecny E, Schmucker P. The effects of motion artifact and low perfusion on the performance of a new generation of pulse oximeters in volunteers undergoing hypoxemia. *Respiratory Care* 2002;47(1):48-60.
11. Grant S, Aitchison T, Henderson E, Christie J, Zare S, McMurray J. A comparison of the reproducibility and the sensitivity to change of visual analogue scales, Borg scales, and Likert scales in normal subjects during submaximal exercise. *Chest* 1999;116(5):1208-1217.

[12] Wilson RC, Jones PW. A comparison of the visual analogue scale and modified Borg scale for the measurement of dyspnoea during exercise. *Clinical Science* 1989;76(3):277-282.

[13] Mahler DA. The measurement of dyspnea during exercise in patients with lung disease. *Chest* 1992;101(5 Suppl):242S-247S.

[14] Noseda A, Schmerber J, Prigogine T, Yernault JC. Perceived effect on shortness of breath of an acute inhalation of saline or terbutaline: variability and sensitivity of a visual analogue scale in patients with asthma or COPD. *European Respiratory Journal* 1992;5(9):1043-53.

[15] Gift AG, Plaut SM, Jacob A. Psychologic and physiologic factors related to dyspnea in subjects with chronic obstructive pulmonary disease. *Heart & Lung: Journal of Critical Care* 1986;15(6):595-601.

[16] Roberts DK, Thorne SE, Pearson C. The experience of dyspnoea in late stage cancer: patients' and nurses perpectives. *Cancer Nursing* 1993;16(4):310-20.

[17] Harty HR, Heywood P, Adams L. Comparison between continuous and discrete measurements of breathlessness during exercise in normal subjects using a visual analogue scale. *Clinical Science* 1993;85(2):229-36.

[18] Karras DJ, Sammon ME, Terregino CA, Lopez BL, Griswold SK, Arnold GK. Clinically meaningful changes in quantitative measures of asthma severity. *Acad Emerg Med* 2000;7(4):327-34.

[19] Campbell IA, Colman SB, Mao JH, Prescott RJ, Weston CF. An open, prospective comparison of beta 2 agonists given via nebuliser, Nebuhaler, or pressurised inhaler by ambulance crew as emergency treatment. *Thorax* 1995;50(1):79-80.

[20] Zehner WJJ, Scott JM, Iannolo PM, Ungaro A, Terndrup TE. Terbutaline vs albuterol for out-of-hospital respiratory distress: randomized, double-blind trial. *Acad Emerg Med* 1995;2(8):686-91.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Headache is a common presenting problem met by emergency ambulance crews. Its origins may be simple, and require no more than simple painkillers, or be potentially **TIME CRITICAL**, caused by meningitis or subarachnoid haemorrhage.

HISTORY

Take a full history and determine the most probable causes of the headache (***see additional information***). Exclude history of stroke (***refer to stroke/transient ischaemic attack guideline***), head injury (***refer to head trauma guideline***) and glycaemic emergency (***refer to glycaemic emergencies guideline***).

- Is the headache severe? Is it the most severe ever experienced by this patient? Is this an unfamiliar type of headache?
- Has the patient had this type of headache before?
- Is the headache progressive and escalating in severity?
- Was it a sudden onset?
- Is there loss of function or sensation?
- Is there any impairment of consciousness?
- Any visual symptoms or associated vomiting?
- Is the headache one-sided, (frontal) or at the back of the head (occipital) and/or associated with neck stiffness?

ASSESSMENT

Assess: **ABCD**'s

Specifically assess:

- levels of consciousness AVPU (***see below***) (remember the only normal GCS is 15)

A	Alert
V	Responds to voice
P	Responds to painful stimulus
U	Unresponsive

- temperature
- respiratory rate/pulse oximetry
- blood pressure (measure to determine systolic/diastolic)
- neck stiffness and photophobia (light sensitivity of eyes)
- any evidence of a rash
- check for loss of function or altered sensation
- flushed face but cool, pale trunk and extremities
- check blood glucose level.

Evaluate whether any TIME CRITICAL features are present: These may include:

- impaired consciousness, and/or fitting
- respiratory depression
- signs of septic shock – tachycardia, hypotension, impaired consciousness, high temperature – often >39°C
- purpuric skin rash
- suspicion of subarachnoid haemorrhage (SAH)
- suspicion of meningitis.

If any of these features are present, correct **A and B problems then transport to nearest suitable receiving Hospital.**

Provide a **Hospital Alert Message / Information call**

En-route continue patient **MANAGEMENT** (***see below***).

MANAGEMENT

Follow medical emergencies guideline, **remembering to**:

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)

Oxygen and fluid therapy is not usually required, but should be administered if:

- oxygen saturation (SpO_2) is <95%, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline and oxygen protocol***)
- if there is evidence of poor tissue perfusion (***refer to medical emergencies***).

Specifically consider:

- position for comfort.

HOSPITAL ASSESSMENTS

It is often difficult to differentiate between a simple headache which requires no treatment and a potentially more serious condition. The following list identifies symptoms that **require** the patient to undergo hospital assessment:

NOTE: this does not mean that any patient presenting without these symptoms is automatically safe to be left at home.

Finding:

- headache of severe, sudden (thunderclap) onset
- headache localised to the vertex
- escalating unfamiliar headache
- changed visual acuity
- meningeal irritation
- changed mental state and inappropriate behaviour
- newly presenting ataxia.

ADDITIONAL INFORMATION

Neck stiffness

Can be assessed by gently trying to flex the head forwards in the lying position, resistance and pain suggest neck stiffness, however, the absence of neck stiffness does not exclude meningitis (particularly in children under 1-year of age).

Meningitis and/or septicaemia

Meningitis is caused by either viral or bacterial infection. The most severe forms are usually bacterial and the meningococcal type is particularly dangerous, especially in children. Meningococcal meningitis and meningococcal septicaemia are different illnesses and may occur separately or present together.

The infection may start as a sore throat and temperature, but proceeds to headache, temperature, stiff neck, photophobia (light sensitivity) and impaired consciousness. Fitting and coma may also follow, along with a "purpuric" type of skin rash.

Meningococcal disease may present without the classical signs of septicaemia (rash and photophobia). Be alert and remain suspicious. Beware of altered clinical presentations in partially treated infectious conditions.

Meningococcal disease in children, especially very young, may present with only drowsiness, high temperature and signs of recent upper respiratory infection (sore throat or even ear infection), and often have no headache or neck stiffness. The key need in children is to recognise, and react to the seriously ill child (***refer to recognition of the seriously ill child guideline***).

Classically, causes sudden onset blinding headache, commonly described as "like a blow to the back of the head". This may be associated with vomiting and range in severity from isolated headache to causing unconsciousness.

SAH may also present as a gradually worsening crescendo headache associated with so called 'trickle' haemorrhage.

SAH may present as a sudden collapse, with or without a headache, sometimes with apparent full recovery. These patients should not be left at home and require full hospital assessment.

Neck stiffness may also be a sign of SAH.

Cerebral haemorrhage (bleeding into the brain itself) often causes a similar acute picture in older patients.

Migraine

Commonly causes recurrent one-sided headache, often accompanied by nausea or vomiting and blurring distortion of vision. There is frequently a previous history of migraine or similar pattern of headaches but this does not exclude the possibility of a serious bleed in someone who has previously suffered migraines.

Sinusitis and common virus infections

Can all cause quite severe frontal headache.

Glaucoma (acutely raised pressure in the eye)

Is a cause of severe one-sided headache, particularly in elderly patients.

Key Points – Headache

- Crescendo headaches are significant.
- Unfamiliar headaches are significant.
- Migraineurs are at risk of serious intracranial events.
- In headache, blood pressure must be checked.
- Any persistent headache or any headache associated with altered conscious levels or unusual behavior is significant.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Mental disorder is very common at all ages. It affects one person in four at some point during their life. It varies from anxiety and phobic states and mild depression through to serious disorders including severe depression bipolar affective disorders and schizophrenia. Some of the severe disorders may be recurrent, relapsing and remitting, and enduring. Other disorders may be provoked or maintained by or associated with consumption of alcohol and other substances. The presentation may be a first contact with a patient who has a new disorder or a person with an exacerbation of a chronic problem that the mental health services already know about.

Most patients have insight into their problems. Others may have impaired insight or lack it. Some of them may voluntarily agree to accept help whether or not they have insight and / or capacity. However, others may need to be compelled to receive an assessment and treatment, possibly against their will, usually using powers given by the Mental Health Act 1983 (England and Wales). In addition, there may be a physical disease or substance-related (including conditions related to licitly prescribed, and non-prescribed, licit or illicit substances) cause for altered mental states that, usually, resolve with treatment of the underlying problem.

DEFINITIONS

Often, colloquially, all problems and disorders that affect people's mental health are referred to as *'mental health problems'*. Such broad use of this term gives little indication of the severity of the condition or of the likely course of events in particular patient's circumstances. Sometimes, people who have a severe mental disorder are described as having a mental illness. This guideline uses the term *'mental disorder'* to distinguish those conditions that are primarily related to people's mental ill health from the very common and understandable anxieties and emotional reactions of people who are casualties or who require an ambulance service for any other reason.

ASSESSMENT

Approach

Many patients are upset, distressed, anxious, suspicious, disorientated or agitated when faced by Ambulance Clinicians. While considering their own safety, the approach taken by ambulance crews to patients whose behaviour appears concerning should be calm and gradual, relying on the persuasive powers of the clinicians to achieve a conversation and then assessment. Non-verbal indicators such as the patient's appearance or level of agitation should be noted as part of the risk assessment.

The environment may give important clues, such as the presence of medication or a backdrop of chaotic living conditions.

Do not rush. A distressed person may react very badly to rush and hurry. Take time to explain your actions to both the patient and the relatives and always endeavour to be honest about what you are going to do and what is likely to happen.

History

As with any presentation, a history outlining the nature of the complaint is required. This should be carefully explored, with particular reference to previous mental health service involvement, prescription medication, the level of alcohol use and potential substance misuse. Details of the nature of the problem, the presence of hallucinations or delusions, whether visual or auditory, and the patient's thoughts about their experiences and problems are key.

Examination

Physical illness can present as an apparent mental health problem and clinical examination and testing is needed to exclude causes such as hypoglycaemia, head injury, meningitis/encephalitis and intoxication. As part of the assessment of mental state, note should be taken of the following:

ABNORMAL APPEARANCE/BEHAVIOUR:

- anxiety
- agitation
- mood
- orientation in time, place and person
- lack of attention/concentration/distraction
- poor memory
- unusual form/content of speech
- expressed thoughts
- beliefs/hallucinations being described.

If possible, a physical examination with primary observations should be undertaken and recorded. The other features are established from the nature of the consultation and by observation.

CAPACITY

Each Ambulance Service should have a formal process or protocol for establishing the capacity of patients to consent to assessment and to being transported for further care. When patients are willing to accept the assistance offered, there is little difficulty. If they have capacity and decide that they do not wish to accept the treatment offered, then, usually, this must be respected. It is good practice to inform the patient's General Practitioner and the identified Social Worker, if there is one, about this decision. The process should be thoroughly documented using the Ambulance Trust process.

Application for powers to compulsorily assess and treat mentally disordered patients in the face of their refusal

Readers should be aware that, in the current mental health law in England and Wales, application for patients' detention, and compulsory assessment and treatment, against their will if necessary, does not turn directly on tests of capacity, but on certain features of the nature and degree of their mental state and any mental disorder thought to be present at initial assessment, and certain circumstances relating to their needs and risks to themselves and others. Most patients who are detained using the Mental Health Act 1983 do have impaired capacity for their mental disorder, at least, but it is possible that some may not. Also, some incapacitous patients may not satisfy the conditions for compulsory detention, assessment or treatment. Therefore, assessment of patients in these circumstances is a specialised matter. Ambulance clinicians should seek the advice of a Doctor and / or an Approved Social Worker (ASW) if they think that a patient is in this situation.

In the event of refusal and provided that certain conditions are satisfied, then legislation allows for compulsory admission of patients to an appropriate facility for assessment under a Section of the Mental Health Act 1983 for England and Wales (Scotland implemented new Mental Capacity legislation and a new Mental Health Act in 2005).

Due note should be taken of capacity or its impairment in particular cases as a component of assessments of mental state and the potential requirement for application for compulsory powers. Applications are most often made by an ASW after their own assessment and require recommendations from at least one, but, usually, two medical practitioners. In the vast majority of circumstances, at least one of the medical practitioners has, or is required to have, special experience in assessing and managing mental disorders that is substantiated by their recognition under section 12(2) of the Mental Health Act 1983 (England and Wales).

Plainly, conducting this process can take time. Reasonable and proportionate steps can be taken to prevent patients from immediately harming themselves or posing a risk to others while awaiting this assessment, but if physical restraint is required, the Police should be involved. Authority to move patients against their will must come from the ASW who acquires the power to convey patients and to request the support of ambulance staff and / or the police once he or she has made a formal application using the Act. Moving some patients may require the assistance of the Police.

MANAGEMENT

Risk Assessment

A full risk assessment usually involves a thorough assessment. Not all aspects can be carried out by Ambulance Clinicians in emergency circumstances. One of the most concerning aspects of risk assessment relates to a patient's potential for self-harm and, possibly, suicide. This guideline includes a brief method for assessing these risks in ***Appendix 1***.

Violence

Ambulance crews should make an assessment of their personal risk when approaching upset, distressed, disorientated, agitated or threatening patients. If the risk is considered significant, the Police should be called to assist. Safe restraint can only be provided safely with sufficient trained people. It needs more than two people!

Specific Mental Disorders

MOOD, STRESS-RELATED AND ANXIETY DISORDERS

These are the most common groups of problems and often represent the extremes of normal emotion. Depression, panic disorder, phobias and obsessional conditions fall into this category. There may be considerable distress, but the patient usually has insight into their problem.

PSYCHOSIS

This is a general term that describes a group of disorders in which the patient tends to be severely distressed and may not appear to be rational. They may interpret events in a manner that does not appear to be appropriately in touch with reality. They may have strongly-held beliefs that are unusual or unsubstantiated by events. In this situation, they may be described as having delusions. Patients may perceive voices that are not heard by others (called auditory hallucinations). Thus, delusions and hallucinations and impaired insight may appear to assessors to be core symptoms.

MANIA / HYPOMANIA

These patients are often overactive and may have not slept properly for days. They tend to be obsessional and persistent in their behaviour. They have rapid thought processes and tend to tire out their relatives and friends. Patients with mania often suffer from delusions, often delusions of grandeur.

SCHIZOPHRENIA

This is a common and often severe mental illness. It may present acutely with severe change in behaviour or insidiously as a slow but progressive change over a period of time. A patient may be deluded. This means that he or she may strongly hold beliefs that appear inappropriate to the assessor in the context of the patient's life, culture, and circumstances. Auditory hallucinations (false perceptions in which the patient can hear voices, not heard by others, that are talking to them or to another about them) may be a feature, and can cause great distress. Their behaviour may be reported by other people as seriously disordered or irrational, or the patient may show patterns of behaviour and speech that suggest that they might have hallucinations and / or delusions, or they may report such occurrences.

Ambulance clinicians should be aware that these features can also occur in the presence of physical disease, intoxication with licitly or illicitly obtained substances, and under the influence of psychotropic drugs.

PARANOIA

Paranoia can be a feature of both depression and schizophrenia and is normally associated with the patient suffering delusions of persecution. They can be extremely suspicious and can react unpredictably, aggressively or violently. Care should be taken to provide reassurance and avoid provocation.

Table 2 – Drugs used in mental health

Hypnotics /Anxiolytics	Benzodiazepines are among the most frequently used drugs in this category. They can be used to help induce sleep and also to reduce anxiety. In excess they are principally sedative.
Antidepressants	This category includes a number of different groups of drugs that are used over months rather than days, and some types may take up to three weeks to begin to show an effect. Some of the older drugs, the tricyclic antidepressants, are very dangerous in excess. Agitation followed by sedation and cardiac dysrhythmias are the most significant effects in poisoning. The newer antidepressants, such as the serotonin re-uptake inhibitors (SSRIs) are used much more often now. They too can cause significant side-effects too. Monoamine oxidase inhibitors (MAOIs) are now little used, except in cases that have been resistant to more recently developed drugs. The group has an important range of severe drug interactions and, in the ambulance context, morphine and nalbuphine must be avoided. As an interaction, they can cause a dangerous increase in blood pressure.
Antipsychotics	Also known as neuroleptics, these drugs can be taken orally or given by injection and are powerful tranquillizers. They can be used in acute situations to sedate, but are most frequently used in the medium to long-term management of disorders such as schizophrenia.

COMPULSORY ASSESSMENT, TREATMENT AND DETENTION USING THE MENTAL HEALTH ACT 1983

The principal series of orders from the Mental Health Act 1983[1] (England and Wales) that are applicable to the pre-hospital environment are described here. The legislation allows for patients' compulsory admission to hospital. Its use requires a formal application to be made, usually by an ASW (who is specially trained and authorised to do this work), but, occasionally, the patient's nearest relative (the nearest relative is also defined by law for this purpose), but applications also require medical recommendation(s). There are extensive safeguards to prevent abuse of these powers, but, in essence, ambulance crews may be lawfully empowered by the ASW to convey a patient against the patient's wishes. If there are concerns about the safety of the patient or the clinicians, the Police should be requested to assist.

Section 2 – Admission for Assessment

This allows for admission for a period of up to 28 days primarily for the purposes of assessing a person suffering from a mental disorder of a nature or degree that warrants detention and where it is in their own interests or the interests of public safety.

Section 3 – Admission for Treatment

With similar criteria for application as Section 2, this order allows for admission for up to six months and is used to compel treatment of the patient. The ASW requires the consent of the nearest relative.

Section 4 – Admission for Assessment in an Emergency

Admission for a period of 72 hours can be compelled on the application of an ASW or the nearest relative with the recommendation of one Doctor who has prior knowledge of the patient (often the patient's General Practitioner). The applicant should have seen the patient in the previous 24 hours.

Section 135 – Place of Safety Order (private)

Section 135 allows magistrates to make an order that empowers the Police to enter a private dwelling for the purpose of removing a person thought to be suffering from a mental illness to a Place of Safety. The ASW who applied for the order must be present during the execution of the warrant.

Section 136 – Place of Safety Order (public)

Section 136 empowers the Police to remove a person who appears to be suffering from a mental disorder from a public place to a Place of Safety for the purposes of assessment by an ASW and a Doctor. A Place of Safety may be the local Police Station or a hospital but this should be defined and agreed locally and in advance. Local arrangements will apply in respect of where the Doctors who assess the patients subject to Section 136 come from.

Key Points – Mental disorder

In a situation in which there is a distressed patient who appears to be suffering from a mental illness:

- Ambulance clinicians should consider their personal safety before approaching the patient
- A history and examination should also include an assessment of the mental state of the patient
- Capacity to consent must be assessed
- In certain circumstances in which risk of harm to the patient or to others is thought to relate to a disordered mental state, the patient should be protected from causing further harm to themselves or others; an ASW and a Doctor should be asked to assess the patient and consider application for a Section under the Mental Health Act 1983.

REFERENCE

1 Bluglass R, Beedie MA. Mental Health Act 1983. *British medical journal* (*Clinical research ed*) 1983;287(6388):359-60.

METHODOLOGY

Refer to methodology section.

Appendix 1 – Suicide and Self-harm Risk Assessment Form

Item	Value	Patient Score
Sex: female	0	
Sex: male	1	
Age: less than 19 years old	1	
Age: greater than 45 years old	1	
Depression / Hopelessness	1	
Previous attempts at self harm	1	
Evidence of excess alcohol / illicit drug use	1	
Rational thinking absent	1	
Separated / Divorced / Widowed	1	
Organised or Serious attempt	1	
No close / reliable family, job or active religious affiliation	1	
Determined to repeat or ambivalent	1	
Total patient score		

< 3 = **Low Risk**
3-6 = **Medium Risk**
> 6 = **High Risk**

INTRODUCTION

Chest pain is one of the most common symptoms of acute coronary syndrome (ACS).

It is also a common feature in many other non-cardiac conditions such as chest infection with pleuritic pain, pulmonary embolus, reflux oesophagitis, indigestion, and simple musculoskeletal chest pain.

There must be a high index of suspicion that any chest pain is cardiac in origin.

HISTORY

Taking and assessing a history

There are a number of specific factors that may help in reaching a reasoned working diagnosis, and applying appropriate management measures to the patient. ACS cannot be excluded on clinical examination (***refer to ACS guideline***).

Is there a previous history of coronary heart disease?

Nature and location of the pain

Ask about:

- time of onset
- duration
- characteristics (type of pain including radiation)
- aggravating and alleviating factors.

Myocardial infarction and angina pain:

- tends to be central in the chest and constricting in nature.

It may, however, present in:

- the shoulders
- upper abdomen
- referred to the neck, jaws and arms.

Anginal pain:

- tends to last minutes in duration, but should it persist for more than 15-20 minutes, or despite usual treatment, myocardial infarction is more likely.

Associated signs and symptoms

The following associated signs and symptoms are as important as the pain itself and are all strongly indicative of cardiac origin:

- nausea
- vomiting
- sweating
- radiation of pain to the arm(s).

If breathlessness is a predominant symptom/sign with tightness in the chest then causes of breathlessness must be considered.

Pleuritic pain is associated with chest infection and pneumonia producing a stabbing, generally one-sided pain that is **worse on breathing in**. Patients with pleuritic chest pain, associated with infection, usually have a cough with sputum, and may well have a raised temperature (>37.5ºC).

Most pain associated with indigestion is central, related to food and may be associated with belching and burning in nature. However, some patients with myocardial infarction may also get indigestion type pain and belching.

Muscular pain tends to be sharp/stabbing, is worse on movement and often associated with tenderness.

ASSESSMENT

Assess: **ABCD**'s

Specifically look at the patient's general appearance, typical presentations include:

- **Myocardial Infarction (MI) –** pale with cold sweaty extremities
- **chest infection –** good colour with warm sweaty extremities
- **musculoskeletal –** normal appearance.

Assess for accompanying features:

- sweating
- pallor
- breathlessness (including respiratory rate)
- cough.

Evaluate if any TIME CRITICAL features are present, these may include:

- all cardiac related chest pain is time critical
- respiratory rate <10 or >30 breaths per minute
- oxygen saturation (SpO_2) <95% in air
- any major ABCD problems.

If any of these features are present, **CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSPORT to nearest suitable receiving Hospital.**

Provide a **Hospital Alert Message / Information call.** This should be routine practice for **ANY** potentially cardiac related chest pain.

En-Route continue patient **MANAGEMENT** (***see below***).

MANAGEMENT

Management of chest pain (for cardiac chest pain ***refer to ACS guideline***)

Follow the medical emergencies guideline:

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)
- specifically record respiratory rate and blood pressure
- 12-lead ECG for all chest pains (NOTE: may be normal initially in MI)
- monitor with ECG for arrhythmias
- undertake pulse oximetry
- administer high concentration oxygen (O_2) (***refer to oxygen guideline for administration and information***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients. High concentration O_2 should be administered routinely, whatever the oxygen saturation, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***)
- record pain score and consider analgesia (***refer to pain management guidelines***).

Key Points – Non-Traumatic Chest Pain / Discomfort

- Think cardiac first.
- Assess nature of pain and associated symptoms.
- Assess patient's general appearance.
- 12–lead ECG for all chest pains.
- ECG monitor for all chest pains.

REFERENCES

Refer to individual guidelines.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Chest pain is one of the commonest reasons for seeking emergency medical advice.

Chest pain is a cardinal, but not the only, symptom of acute coronary syndrome (ACS) or 'heart attack'.

Coronary heart disease (CHD) is the commonest single cause of death in the UK.

Time is of the essence in restoring coronary blood flow in patients with ST segment elevation myocardial infarction (STEMI). The benefits of reperfusion by thrombolytic treatment or primary percutaneous coronary intervention (PCI) are time-dependent.

Patients with STEMI who are ineligible for thrombolysis have a high mortality rate and should be referred for PCI where facilities exist.[1-5]

Patients with non-STEMI and unstable angina manifestations of ACS are at significant risk of death and should be treated as medical emergencies.

Resuscitation

The risk of cardiac arrest from ventricular fibrillation (VF) or other arrhythmia is highest in the first few hours from symptom onset. VF can occur without warning. A third to one half of deaths from myocardial infarction (MI) occur before hospitalisation.

Survival from VF occurring in the presence of ambulance personnel with a defibrillator immediately available is as high as 40%. This falls rapidly to 2% or less if the defibrillator is not immediately available.

A defibrillator must always be taken, at the earliest opportunity, to patients with symptoms suggestive of a heart attack and remain with the patient until handover to hospital staff.[1,4,5]

ASSESSMENT

The pain associated with ACS typically comes on over seconds and minutes rather than starting abruptly.

The classical presentation is of central chest pain which is constricting in nature and may radiate to the left arm and neck.

Many patients do not have 'classical' presentation as described above and some people, especially the elderly, and those with diabetes, may not experience pain as their chief complaint. This group have a high mortality rate.

Associated symptoms

Nausea and vomiting are common and the patient may express feelings of 'impending doom'.

The patient may be pale and the skin clammy and cold to the touch.

MANAGEMENT

In patients with symptoms suggestive of acute coronary syndrome:

- ensure a defibrillator is immediately available and stays with the patient
- administer **aspirin** (***refer to the aspirin drug protocol for dosages and information***)[1,5]
- administer **glyceryl trinitrate (GTN)** (***refer to the GTN drug protocol for dosages and information***) for patients with ongoing ischaemic discomfort
- administer high concentration oxygen (O_2) (***refer to oxygen guideline***)[6] via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients. High concentration O_2 should be administered routinely, whatever the oxygen saturation, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***)

NOTE: the best place for further assessment and treatment is in the ambulance, to where the patient should be moved at the earliest safe opportunity. It is usually safe and feasible to undertake the following actions while en-route to hospital:

- monitor ECG for arrhythmias
- obtain intravenous access
- monitor vital signs
- repeat dose of GTN if chest discomfort persists
- assess pain score and administer morphine as required IV with anti-emetic cover
- record 12-lead ECG

Patients with ECG evidence of STEMI should be assessed for suitability for reperfusion treatment with thrombolysis (***refer to the thrombolysis drug protocol for dosages and information***) or PCI according to local arrangements. Thrombolytic treatment is increasingly provided by Paramedics in the pre-hospital setting.[1,2,5]

Patients with STEMI but ineligible for thrombolysis (e.g. advanced age, severe hypertension, recent surgery) or in cardiogenic shock should be transferred as an emergency to a suitably experienced centre for PCI according to local arrangements.[1,2,5]

PATIENTS WITH SUSPECTED ACUTE CORONARY SYNDROMES SHOULD BE TRANSFERRED TO HOSPITAL AS BLUE LIGHT EMERGENCIES

ADDITIONAL INFORMATION

The treatment of patients with ACS is a rapidly developing area of medicine.

National and international standards and guidelines for ACS care consistently emphasise the importance of rapid access to defibrillation and reperfusion.[7]

Pre-alerting the hospital can speed up appropriate treatment of STEMI patients. In high performing urban systems this may be all that is required to achieve very rapid treatment times.

The aim of reperfusion treatment, whether by thrombolysis or PCI, is rapid restoration of coronary blood flow to limit heart damage and reduce mortality.

Pre-hospital thrombolysis reduces all-cause mortality compared with hospital thrombolysis and reduces treatment delay by 60 minutes on average.

Primary PCI is of proven superiority to hospital thrombolysis, especially when PCI is provided in high volume, experienced specialist centres.

Primary PCI has not been proven superior to *very early* thrombolysis (within 3 hours of symptom onset) in reducing mortality, but has the advantage of lower bleeding risk.

Key Points – Acute Coronary Syndrome

- Chest pain is a cardinal, but not the only, symptom of ACS.
- Take drugs, oxygen and a defibrillator to the patient.
- Patients with ECG evidence of STEMI should be assessed for suitability for reperfusion treatment with thrombolysis or PCI according to local arrangements.
- The best place for further assessment and treatment is in the ambulance, to where the patient should be moved at the earliest safe opportunity.
- Patients with STEMI but ineligible for thrombolysis (e.g. advanced age, severe hypertension, recent surgery) or in cardiogenic shock should be transferred as an emergency to a suitably experienced centre for PCI.

REFERENCES

1. Arntz HR, Bossaert L, Carli P. Recommendations of a task force of the European Society of Cardiology and the European Resuscitation Council on the pre-hospital management of acute heart attacks. *Resuscitation* 1998;38(73-98).
2. Authors/Task Force M, Silber S, Albertsson P, Aviles FF, Camici PG, Colombo A, et al. Guidelines for Percutaneous Coronary Interventions: The Task Force for Percutaneous Coronary Interventions of the European Society of Cardiology. *Eur Heart J* 2005;26(8):804-847.
3. Morrison LJ, Verbeek PR, McDonald AC. Mortality and pre-hospital thrombolysis for acute myocardial infarction—a meta analysis. *JAMA* 2000;283:2686-92.
4. Erhardt L, Herlitz J, Bossaert L, Halinen M, Keltai M, Koster R, et al. Task force on the management of chest pain. *Eur Heart J* 2002;23(15):1153-1176.
5. Van de Werf F, Ardissino D, Betriu A, Cokkinos DV, Falk E, Fox KAA, et al. Management of acute myocardial infarction in patients presenting with ST-segment elevation. The Task Force on the Management of Acute Myocardial Infarction of the European Society of Cardiology. *European heart journal* 2003;24(1):28-66.
6. Nicholson C. A systematic review of the effectiveness of oxygen in reducing acute myocardial ischaemia. *Journal of Clinical Nursing* 2004;13(8):996-1007.
7. Morrison LJ, Brooks S, Sawadsky B, McDonald A, Verbeek PR. Prehospital 12-lead Electrocardiography Impact on Acute Myocardial Infarction Treatment Times and Mortality: A Systematic Review. *Acad Emerg Med* 2006;13(1):84-89.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Allergic reactions exist on a continuum from mild urticaria (hives) and/or angio-oedema (swelling of the face, eyelids, lips and tongue) to major pulmonary and/or cardiovascular compromise. The extreme end of the spectrum is anaphylaxis which can affect the cardiovascular, pulmonary, cutaneous, and gastrointestinal systems. It is an acute, life-threatening response in patients previously sensitised to an allergen. In general, the longer it takes for anaphylactic symptoms to develop, the less severe the overall reaction.

Table 1 – Common precipitants

Food-induced anaphylaxis	Food is the most common cause of anaphylaxis, particularly peanuts, tree nuts (e.g. hazel, brazil, walnut), fish and shellfish. Facial oedema, laryngeal oedema and respiratory difficulty usually predominate.
Insect sting-induced anaphylaxis	Insect stings are the second most common cause. Bees may leave a venom sac which should be scraped off (not squeezed). Injected allergens commonly result in cardiovascular compromise, with hypotension and shock predominating.
Drug-induced anaphylaxis	Medications, particularly penicillin, account for a large percentage of anaphylactic reactions. Slow release drugs prolong absorption and exposure to the allergen.
Other causes	Include latex, exercise, and semen.

ASSESSMENT[1-4]

Primary Survey

Assess **ABCD**'s

Examine skin for:

- urticaria
- swelling around or within the mouth.

If the history is compatible, i.e. exposure to a possible precipitant, consider an **acute allergic** reaction when the patient presents with:

- an acute onset of illness (minutes to hours) **and**
- cutaneous findings (e.g. urticaria and/or angio-oedema).

Suspect an **anaphylactic reaction** if, in addition to the above, the patient's condition has deteriorated to include:

- airway compromise (e.g. dyspnoea, hoarseness, stridor, wheeze, throat or chest tightness) **and/or**
- cardiovascular symptoms (e.g. hypotension, syncope, pronounced tachycardia).

NOTE: Urticaria and/or angio-oedema are absent in 10%-15% of anaphylactic reactions but consider the diagnosis in an otherwise typical presentation. Gastrointestinal oedema/ hypermotility can result from an anaphylactic event; patients present with colicky abdominal pain, diarrhoea, nausea and vomiting. Patients may report a 'sense of doom'.

If signs of anaphylaxis are identified, immediately correct A and B problems (administer oxygen (O_2) (***refer to oxygen protocol for administration and information***) and adrenaline (refer to adrenaline protocol for administration and information), then pre-alert and transfer to the nearest suitable hospital as an emergency case. Continue management en-route.

Some patients relapse hours after an apparent recovery (**biphasic response**), therefore: **patients who have experienced an anaphylactic reaction should be transferred to hospital for further evaluation.**

Specifically assess:

- airway patency (auscultation, pulse oximetry, and peak expiratory flow (PEF) – if possible)
- cardiovascular status (ECG and BP) a systolic blood pressure <90mmHg indicates hypotension
- if the patient has a history of allergic/ anaphylactic reactions
- if the patient has used their own home auto-injector (Epipen)
- monoamine-oxidase inhibitor (MAOI) or tricyclic antidepressants increase the risk of cardiac arrhythmias, therefore **patients taking MAOI's or tricyclic antidepressants should receive only 50% of the usual dose of adrenaline.**

If the patient has taken beta-adrenergic blockers, these may mask the signs of anaphylaxis and diminish the effects of adrenaline.

MANAGEMENT[3-12]

Allergic Reaction:

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- determine whether the history and physical findings are compatible with an allergic reaction
- quickly remove the triggering source (if possible)
- consider **chlorphenamine** (IV) (***refer to chlorphenamine protocol for dosages and information***) if the symptoms are causing the patient pain or distress. The balance between relief of symptoms and having to cannulate the patient should be carefully considered.

Anaphylaxis:

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- determine whether the history and physical findings are compatible with anaphylaxis (early diagnosis and management dramatically improves outcome)
- quickly remove the triggering source (if possible)
- administer high concentration oxygen (O_2) (***refer to oxygen guideline***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***)
- administer **adrenaline** (IM) (***refer to adrenaline protocol for dosages and information***)
- where call to hospital time is likely to be over 30 minutes consider hydrocortisone (**refer to hydrocortisone protocol for dosages and information**) Its effect can take 4-6 hours but it may minimise the likelihood and severity of a biphasic response
- if haemodynamically compromised, place the patient in the recumbent position with lower limbs elevated, if tolerated (unhelpful with breathing difficulties)
- obtain IV access if possible but **DO NOT** delay transfer to hospital
- consider nebulised **salbutamol** (***refer to salbutamol protocol for dosages and information***) for bronchospasm resistant to IM epinephrine
- administer **chlorphenamine** IV (***refer to chlorphenamine protocol for dosages and information***)
- consider titrating aliquots of 250 millilitres crystalloid solution if hypotension does not respond rapidly to drug treatment
- monitor and re-assess ABC's including ECG, PEF (if possible), BP and pulse oximetry, en-route.

Key Points – Anaphylaxis/allergic reactions

- Anaphylaxis can occur despite a long history of previously safe exposure to a potential trigger.
- Consider anaphylaxis in the presence of acute cutaneous symptoms **and** airway or cardiovascular compromise.
- Anaphylaxis may be rapid, slow or biphasic.
- Oxygen and adrenaline 1:1,000 are the key drugs for managing anaphylaxis.
- The benefit of using appropriate doses of epinephrine (IM) far exceeds any risk.

REFERENCES

1. Brown SG. Clinical features and severity grading of anaphylaxis. *The Journal of allergy and clinical immunology* 2004;114(2):371-6.
2. Kane KE, Cone DC. Anaphylaxis in the pre-hospital setting. *The Journal of emergency medicine* 2004;27(4):371-7.
3. McLean-Tooke AP, Bethune CA, Fay AC, Spickett GP. Adrenaline in the treatment of anaphylaxis: what is the evidence? *BMJ* 2003;327(7427):1332-5.
4. Chamberlain D, Fisher J, Ward M, Cant A, Dawson P, Ewan P, et al. The Emergency Medical Treatment of Anaphylactic Reactions for First Medical Responders and for Community Nurses Resuscitation Council (UK): Available from http://www.resus.org.uk/pages/reaction.htm, 2005.

[5] Langran M, Laird C. Management of allergy, rashes and itching. *Emergency Medical Journal* 2004;21:728-741.

[6] Lieberman P, Kemp S, Oppenheimer J, Lang D, Bernstein I, Nicklas R. The diagnosis and management of anaphylaxis: an updated practice parameter. *Journal of Allergy and Clinical Immunology* 2005;115:S483-523.

[7] Pumphrey RS. Lessons for management of anaphylaxis from a study of fatal reactions. *Clinical and experimental allergy : journal of the British Society for Allergy and Clinical Immunology* 2000;30(8):1144-50.

[8] Sampson HA. Anaphylaxis and emergency treatment. *Pediatrics* 2003;111(6) Pt 3:1601-8.

[9] Sampson HA, Muñoz-Furlong A, Bock SA, Schmitt C, Bass R, Chowdhury BA, et al. Symposium on the definition and management of anaphylaxis: summary report. *The Journal of allergy and clinical immunology* 2005;115(3):584-91.

[10] Thompson K, Chandra R. The management and prevention of food anaphylaxis. *Nutrition Research* 2002;22:89-110.

[11] Affiliation: Royal College of Paediatrics and Child Health UKCAPToTRC. Update on the emergency medical treatment of anaphylactic reactions for first medical responders and for community nurses. *Resuscitation* 2001;48(3):241-3.

[12] Project Team of The Resuscitation Council (UK). Update on the emergency medical treatment of anaphylactic reactions for first medical responders and for community nurses. *Resuscitation* 2001;48(3):241-3.

[13] Brown AF, McKinnon D, Chu K. Emergency department anaphylaxis: A review of 142 patients in a single year. *The Journal of allergy and clinical immunology* 2001;108(5):861-6.

[14] Sheikh A, Alves B. Age, sex, geographical and socio-economic variations in admissions for anaphylaxis: analysis of four years of English hospital data. *Clinical & Experimental Allergy* 2001;31(10):1571-1576.

METHODOLOGY

Refer to methodology section; see below for anaphylaxis/allergic reactions search strategy.

Anaphylaxis/allergic reactions search strategy.

Electronic databases searched:

- MEDLINE (Ovid)
- CINAHL (Ovid)
- COCHRANE (Ovid)
- EMBASE (Ovid)
- BRITISH NURSING INDEX (Ovid)

The dates were limited to 2000 onwards. Only articles relevant to pre-hospital care were reviewed.

Search strategy:

1. first aid/ or emergency health service/ or emergency service/
2. exp EMERGENCY CARE/
3. exp EMERGENCY TREATMENT/
4. exp EMERGENCY MEDICAL SERVICES/
5. or/1-4
6. exp HYPERSENSITIVITY/
7. exp ANAPHYLAXIS/
8. (anaphyla$ or allerg$).tw.
9. 6 and 8
10. (5 and 7) or (5 and 9)
11. limit 10 to yr=2000-2005
12. limit 11 to English
13. remove duplicates from 12

Specific Treatment Options

INTRODUCTION

Asthma is one of the commonest of all medical conditions. It is caused by a chronic inflammation of the bronchi, making them narrower. The muscles around the bronchi become irritated and contract, causing sudden worsening of the symptoms. The inflammation can also cause the mucus glands to produce excessive sputum which further blocks the air passages. These guidelines are concerned with the acute asthma attack.

HISTORY

The patient may well have a history of increased wheezy breathlessness, often worse at night or in the early morning, associated either with infection, allergy or exertion as a trigger. They are usually a known asthmatic and may well be on regular inhaler therapy for this. They may well have used their own treatment inhalers and in some cases will have used a home based nebuliser.

If a patient is suffering a first episode of 'asthma' always consider an inhaled foreign body as a differential diagnosis.

ASSESSMENT[1]

Assess **ABCD**'s:

Asthma usually presents to the ambulance service in one of two forms (***see Table 1***).

Table 1 – Two forms of asthma presentation

Life Threatening	Acute Severe
• exhaustion • confusion • coma • silent chest • cyanosis • feeble respiratory effort • bradycardia • hypotension • peak flow <33% of predicted best value • SpO_2 <92%	• unable to complete sentences in one breath • respiratory rate >25 (adult) • pulse >110 beats per minute • peak flow 33%-50% of predicted best value

Assess for any LIFE-THREATENING features

If **any** of these features are present, **start correcting A and B problems then transfer to nearest suitable receiving hospital** commencing oxygen (O_2) immediately at the patient side.

Provide a hospital alert message / information call.

Those with life threatening asthma may need paralysing and ventilating if they fail to respond to treatment. Rapid transfer to hospital on **blue lights** is therefore extremely important.

En-route continue patient **MANAGEMENT**, (***see below***) providing any other necessary interventions, including nebulisation, steroids etc.

If no **TIME CRITICAL** features are present:

- assess for features of acute severe asthma
- consider the benefits of treatment en-route to hospital unless the patient has a history of full recovery and subsequent refusal of transfer to further care
- any patient who is transferred to hospital requires at least O_2 and nebuliser treatment en-route
- remember that the risk of death in the group of asthmatics previously admitted to hospital with an acute attack is significant.

MANAGEMENT OF ASTHMA[2-4]

Follow medical emergencies guideline, remembering to:

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)
- administer high concentration oxygen (O_2)[5] (***refer to oxygen guideline for administration and information***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***)
- commence transfer to further care.

Specifically:

check peak flow if practicable – note the best of three readings.

- administer **salbutamol**[6-9] via O_2 driven nebuliser, running at 6-8 litres per minutes (***refer to salbutamol drug protocol for dosages and information***). In acute severe or life-threatening cases **ipratropium bromide** (***refer to ipratropium bromide drug protocol for dosages and information***) should be added to the salbutamol. Continue high concentration O_2 after nebulisation
- in cases of hypoventilation in-line nebulisation with a bag-valve-mask (BVM) device, where appropriate using the stoma in laryngectomee and other neck breathing patients and suitable nebuliser attachment should be considered
- monitor using ECG and pulse oximeter
- obtain IV access if possible (**DO NOT** delay transfer to further care)
- if no clinical improvement after 5-10 minutes, administer further salbutamol via nebuliser and consider continuous nebulised salbutamol. Ipratropium bromide should be administered if not given earlier
- repeat or continuous nebulised salbutamol may be given until arrival at hospital or side effects become clinically significant (extreme tachycardia >140 beat per minute in adults, tremors etc.)
- assess chest to exclude evidence of pneumothorax

NOTE: remember the very rare complication in severe asthma of bilateral pneumothoraces

- re-assess to evaluate any improvement in peak flow or improvement in air entry on chest assessment
- administer **hydrocortisone** (***refer to hydrocortisone drug protocol for dosages and information***) IV where there is a delay getting to hospital of 30 minutes or more. Although steroids take some time to take effect, the sooner they are administered the better.

LIFE-THREATENING ASTHMA

A small minority of cases may not respond to O_2 and nebuliser therapy. In these cases the use of subcutaneous or intramuscular epinephrine should be considered where:

- the patient is suffering from life threatening asthma
- ventilation is failing
- deterioration continues despite O_2 and continuous nebulised salbutamol.

This treatment should be reserved for the most serious cases and is NOT intended to be used as a matter of routine due to its arrhythmogenic properties.

Drug Therapy:

- administer **adrenaline**[6-8] (***refer to epinephrine drug protocol for dosage and administration***)
- consider salbutamol (***refer to salbutamol drug protocol for dosage and administration***)
- consider ipratropium bromide (***refer to ipratropium bromide drug protocol for dosage and administration***).

Asthmatic patients do not have hypoxic drive and need high concentration O_2 therapy and nebulisation as described earlier.

ADDITIONAL INFORMATION

The obstruction and subsequent wheezing are caused by three factors within the bronchial tree:

1. increased production of bronchial mucus
2. swelling of the bronchial tube mucosal lining cells
3. spasm and constriction of bronchial muscles.

These three factors conspire to cause blockage and narrowing of the small airways in the lung. Because inspiration is an active process involving the muscles of respiration, the obstruction of the airways is overcome on breathing in. Expiration occurs with muscle relaxation, and is severely delayed by the narrowing of the airways in asthma. This generates the wheezing on expiration that is characteristic of this condition.

Medical Emergencies

The obstruction in its most severe form can be **TIME CRITICAL** and some **2,000 people a year die as a result of asthma**. In adults, asthma may often be complicated and mixed in with a degree of bronchitis, especially in smokers. This can make the condition much more difficult to treat, both routinely and in emergencies. The majority of asthmatic patients take regular “preventer” and “reliever” inhalers.

Asthma is managed with a variety of inhaled and tablet medications. Inhalers are divided into two broad categories (preventer and reliever). The preventer inhalers are normally anti-inflammatory drugs and these include steroids and other milder anti-inflammatory such as Tilade. The common steroid inhalers are beclomethasone (Becotide), budesonide (Pulmicort) and luticasone (Flixotide).

These drugs act over a period of time on the lung to reduce the inflammatory reaction that causes the asthma. Regular use of these inhalers often eradicates all symptoms of asthma and allows for a normal lifestyle.

Treatment (reliever) inhalers include salbutamol (Ventolin), terbutaline (Bricanyl) and ipratropium bromide (Atrovent). These inhalers work rapidly on the lung to relax the smooth muscle spasm when the patient feels wheezy or tight chested. They are used in conjunction with preventer inhalers. Inhalers are often used now through large plastic spacer devices, such as the Volumatic. This allows the drug to spread into a larger volume and allows the patient to inhale it more effectively.

In mild and moderate asthma attacks some patients may be treated with high doses of "relievers" through a spacer device. This has been shown to be as effective as giving a salbutamol nebuliser.

Peak Flow Metering

Peak flow is a rapid measurement of the degree of obstruction in the patient's lungs. It measures the maximum flow on breathing out, or expiring and therefore can reflect the amount of airway obstruction. Many patients now have their own meter at home and know what their normal peak flow is. Clearly, when control is good, their peak flow will be equivalent to a normal patient's measurement, but during an attack it may drop markedly.

Patients using a peak flow meter for the first time since 2004 will be given a new EU-scale meter. Existing asthmatic patients who require a replacement meter may notice that their readings have changed.

Peak Expiratory Flow (PEF) readings obtained on an EU-scale meter will be more accurate than those from a Wright scale meter, because changes in airflow will result in PEF readings changing uniformly for the whole range of the meter. The Wright scale has been previously noted to over-represent changes in airflow in the mid-range, and under represent changes in the low and high ranges.

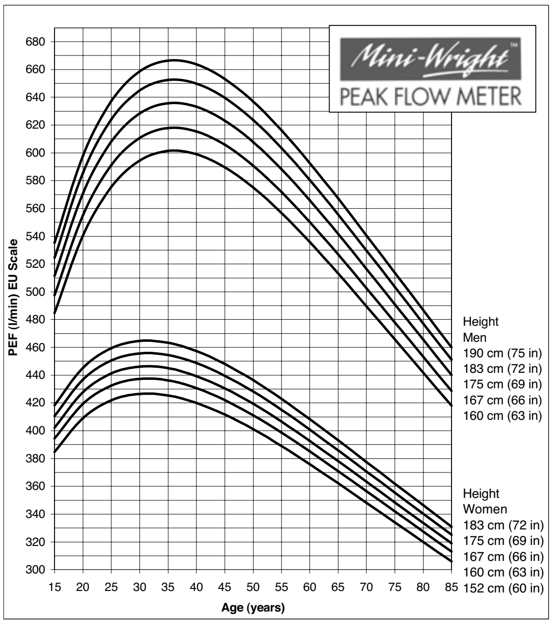
Correcting these small inaccuracies results in PEF readings that are different – until the new EN 13826 standard meters are used for all PEF measurements, it will be important to note which scale has been used with the patient.

The new peak flow meters have a similar appearance to the old meters, but the scale (the part of the meter that you read the PEF value from) will have changed. If you use a Mini-Wright, the EU-scale will be a different colour – blue text printed on a yellow background. Apart from the scale, the new Mini-Wright behaves and handles as reliably as the old meter.

It is important to recognise that if a patient knows their normal peak flow using one scale, that this may not be comparable to readings taken using a meter that has a different scale.

PEAK EXPIRATORY FLOW RATE - NORMAL VALUES

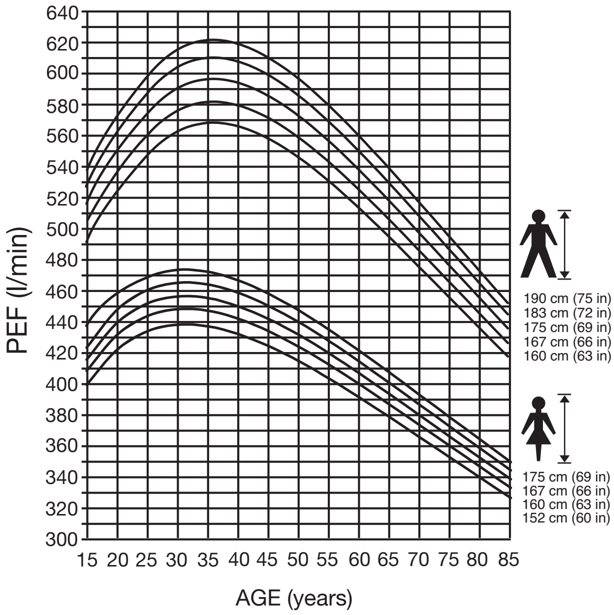
For use with EU/EN13826 scale PEF meters only



Adapted by Clement Clarke for use with EN13826 / EU scale peak flow meters from Nunn AJ Gregg I, Br Med J 1989:298;1068-70

For use with Wright " scale peak flow meters

A value of up to 80 litres/min below the mean can be regarded as normal (i.e. falliing within the lower 95% confidence limit)



From Nunn AJ Gregg I, Br Med J 1989:298;1068-70

Figure 1 – peak flow charts

Steroid therapy.[10-17]

Steroids need to be given early in an acute asthma attack and can be given intravenously as hydrocortisone.

Key Points – Asthma

- Asthma is a common life threatening condition.
- Its severity is often not recognised.
- Accurate documentation is essential.
- Peak flow can be measured on more than one scale.
- A silent chest is a pre-terminal sign.

REFERENCES

1 Rebuck AS, Read J. Assessment and management of severe asthma. *Am J Med* 1971; 51: 788-98. *American Journal of Medicine* 1971;51:788-98.

2 British Thoracic Society, Scottish Intercollegiate Guidelines Network. The BTS/SIGN British Guideline on the Management of Asthma. *Thorax* 2003;58(Supplement I):i1-i94.

3 British Thoracic Society, National Asthma Campaign, Royal College of Physicians of London in association with the General Practitioner in Asthma Group, The British Association of Accident and Emergency Medicine, The British Paediatric Respiratory Society, Health RCoPaC. The British guidelines on asthma management 1995 review and position statement. *Thorax* 1997;52(Suppl 1):S1-S21.

4 British Thoracic Society. Guidelines on the management of asthma: statement by the British Thoracic Society, British Paediatric Association, the Research Unit of the Royal College of Physicians of London, the Kings Fund Centre, the National Asthma Campaign, the Royal College of General Practitioners, the General Practitioners in Asthma Group, the British Association of Accident and Emergency Medicine, and the British Paediatric Respiratory Group following a meeting at the Royal College of Physicians of London on 4 and 5 June 1992. *Thorax* 1993;48(Supplement):S1-S24.

5 Cochrane GM. Acute severe asthma: oxygen and high dose beta agonist during transfer for all? *Thorax* 1995;50:1-2.

6 Salmeron S, Brochard L, Mal H. Nebulized versus intravenous albuterol in hypercapnic acute asthma: a multicentre, double-blind, randomized study. *American Journal of Respiratory Critical Care Medicine* 1994;149:1466-70.

7 Lawford P, Jones BM, Milledge JS. Comparison of intravenous and nebulised salbutamol in initial treatment of severe asthma. *BMJ* 1978(1):84.

8 Crompton GH. Nebulized or intravenous beta 2 adrenoceptor agonist therapy in acute asthma? *European Respiratory Journal* 1990(3):125-6.

9 Fergusson RJ, Stewart CM, Wathen CG. Effectiveness of nebulised salbutamol administered in ambulances to patients with severe acute asthma. *Thorax* 1995;50:81-2.

10 Rowe BH, Spooner C, Ducharme FM. Early emergency department treatment of acute asthma with systemic corticosteroids (Cochrane review). *The Cochrane Library* 2001;3.

11 Rowe BH, Spooner C, Ducharme FM. Corticosteroids for preventing relapse following acute exacerbations of asthma (Cochrane review). *The Cochrane Library* 2001;3.

12 Fanta CH, Rossing TH, McFadden ER. Glucocorticoids in acute asthma. A critical controlled trial. *Am J Med* 1983; 74: 845-51. *American Journal of Medicine* 1983;74:845-51.

13 Fiel SB, Swartz MA, Glanz K, Francis ME. Efficacy of short term corticosteroid therapy in outpatient treatment of acute bronchial asthma. *American Journal of Medicine* 1983;75:259-62.

14 Chapman KR, Verbeek PR, White JG, Rebuck AS. Effect of a short course of prednisone in the prevention of early relapse after the emergency room treatment of acute asthma. *N Engl J Med* 1991;324:788-94.

15 Ratto D, Alfaro C, Sipsey J. Are intravenous corticosteroids required in status asthmaticus? *JAMA* 1988;260:527-29.

16 Stein LM, Cole RP. Early administration of corticosteroids in emergency room treatment of acute asthma. *Annals of Internal Medicine* 1990;112:822-27.

17 MRC Sub-Committee on Clinical Trials. Controlled trial of the effects of cortisone acetate in status asthmaticus. Report to the Medical Research Council by the sub committee on clinical trials. *Lancet* 1956;271(6947):803-6.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Chemical, biological, radiological and nuclear incidents (CBRN) materials are all very different and each present unique difficulties for ambulance crews. However chemical, biological and radioactive agents present four main types of hazard, depending on the physical properties and characteristics of the agent released:

1. contact hazard
2. inhalation hazard
3. injection hazard
4. ingestion hazard.

1. **Contact Hazards –** are created by chemical, biological or radioactive agents which can be absorbed into the skin. These agents can be in solid, liquid or vapour form. Most biological agents do not pose contact hazards, unless the skin is cut or abraded.
2. **Inhalation Hazards –** are created by vapour, aerosols or contaminated dust that can be inhaled into the lungs.
3. **Injection Hazards –** result from chemical, biological or radiological agents being injected – either by the agent moving from the injection site into the blood stream or being injected directly into a vein or artery.
4. **Ingestion Hazards –** result from chemical, biological or radiological agents being ingested.

In addition to these four types of hazards, **radioactive agents** present a significant additional hazard that result from the radiation they emit.

Nuclear Hazards – will be those resulting from a nuclear explosion. These will include extensive blast and fire damage, direct radiation effects and widespread radiological contamination.

PERSONAL SAFETY

- **On identification of a CBRN incident advise Ambulance Control immediately.**
- **Do not put yourself at risk.**
- Park uphill and upwind.
- Do not put yourself at risk; do not enter the site or deal with casualties unless appropriately trained and protected in NHS standard chemical protective personal protective equipment.
- Put on a high visibility jacket and safety helmet, or personal protective equipment (PPE) only if trained in its use.
- Close all vehicle windows and vents.
- Switch off air conditioning in vehicle.
- Obey all cordons and safety advice.
- Where possible, avoid contact with contaminated casualties.

If you come into contact with affected or contaminated casualties, you must consider yourself contaminated and a casualty! Remain at scene, commence self-decontamination (***see additional information***) and isolate yourself until given further instructions **(see Appendix 1**).

Conscious casualties (*contact only if protected with appropriate PPE*):

- re-assure them constantly
- minimise handling
- if necessary provide modesty blankets.

Encourage them to:

- face into the wind at a point where the wind is unlikely to cause further contamination.
- **not to leave the site**
- remove their contaminated clothing
- control any haemorrhage with direct pressure
- assist other casualties
- commence self decontamination.

Unconscious casualties (*treat only if protected with appropriate NHS Standard PPE*):

- check ABC

If breathing present:

Place in recovery position facing the wind

If not breathing:

- **DO NOT** attempt mouth to mouth – **use bag-valve-mask.**

TO BE USED WHEN CAUSE IS UNKNOWN AND SYMPTOMS ARE CONSISTENT WITH A CBRN INCIDENT

Approach to collapsed casualties: STEP 1-2-3 (Safety Triggers for Emergency Personnel)

Step 1 – One collapsed casualty:

- approach using normal procedures – CBRN contamination unlikely.

Step 2 – Two collapsed casualties at one location – CBRN contamination possible:

- approach with caution. Consider all options
- if CBRN possible or suspected follow the advice for STEP 3.

Step 3 – Three or more collapsed casualties at one location:

- **DO NOT** approach the scene – CBRN contamination likely

IF POSSIBLE:

- withdraw
- contain
- report
- if contaminated, isolate yourself and commence self-decontamination
- send for specialist help
- (M)ETHANE / CHALETS assessment to be provided as soon as possible (see below).

NOTE: Do not compromise your safety or that of your colleagues or the public.

MNEMONICS FOR RAPID INCIDENT ASSESSMENT

METHANE

M My call sign, or name and appointment. Major incident, **STANDBY** or **DECLARED.**

E Exact location – where possible, map reference.

T Type of incident – e.g. chemical, explosion, road traffic collision (RTC).

H Hazards – present and potential.

A Access – best routes for access and egress to scene and rendezvous point(s) (RVP).

N Number of casualties – approximate numbers and types of casualties (**P1, P2, P3, DEAD** and whether contaminated.)

E Emergency services – report on **emergency** services already on site and if further services required.

CHALETS

C Casualties – approximate number and type, call sign

H Hazards – present or potential

A Access – safest route

L Location

E Emergency Services – on scene or required

T Type of Incident – chemical, biological, radiological, blast etc.

S Safety – PPE's

CHEMICAL INCIDENTS

Managing the Consequences of a Deliberate Chemical Release:

Characteristics of a Chemical Incident:

Rapid action producing mass casualties.

Persistent liquid contact and downwind vapour hazards.

Casualties can contaminate first responders.

Decontamination will probably be necessary and needs to start quickly.

Most effective in confined spaces where there are lots of people.

Casualties from a Chemical Incident

Lots of casualties (hundreds) probably at scene.

Injury occurs very rapidly (minutes).

Must be treated rapidly if they are to survive.

Very few casualties will occur more than two or three days later.

Decontamination issues:

Most contamination will be on clothing **which should be removed early.**

Skin must be decontaminated rapidly – **wet decontamination is advised.**

BIOLOGICAL INCIDENTS

Managing the Consequences of a Deliberate Biological Release:

Characteristics of a Biological Incident

Slow action producing mass casualties over time.

Could go undetected until people become ill **and attend their GP or Emergency Departments.**

Potential for epidemic with some diseases.

Need for decontamination will depend on agent used.

Most effective in confined spaces where there are lots of people.

Casualties from a Biological Incident

Unlikely to be any casualties at the scene.

Window for treatment in first 12 to 24 hours.

Cannot tell who has been exposed.

First casualties will start to appear two to three days later.

It may be very difficult to be sure the incident is over.

Decontamination Issues

Washing skin and clothing should be effective.

Surgical masks, gowns, eye protection and gloves should be worn when dealing with any infectious patient.

RADIOLOGICAL AND NUCLEAR INCIDENTS:

Managing the Consequences of a Deliberate Radiological Release:

Characteristics of a Radiological Incident

Few immediate casualties.

Some may have blast injuries.

Need to monitor those present for contamination.

Persistent radiation hazard.

Persistent contact and downwind hazards.

Casualties can contaminate first responders.

Decontamination will be necessary **and needs to start quickly with removal of clothing and wet decontamination.**

Casualties from a Radiological Incident

Few casualties at scene.

Damage is dosage related and cumulative.

Casualties will become ill over a period of days to weeks.

Casualties will need reassurance.

Decontamination Issues (see Appendix 2)

Most contamination on clothing.

Skin must be decontaminated rapidly.

Need to provide shielding from radiation.

ADDITIONAL INFORMATION

Decontamination

Equipment:

- ID tags
- scissors
- large plastic bags (for clothing)
- small clear bags (for personal belongings)
- buckets
- sponges/soft brushes/wash cloths
- warm water source
- disposable towels.

Decontamination technique:

RINSE → WIPE → RINSE

CBRN Detection

There are a wide range of products available to aid with the detection of Chemical and Radiological incidents.

Emergency departments have been supplied with Toxi-Boxes (Toxicological Analytical Sampling Kits). These are to be used for toxicological sampling.[1]

Other products available include electronic personal dosimeters for detection of radiation exposure; toxic vapour analyser for detection of organic/non-organic vapours.[2] Also available are pre-filled syringes for use as antidotes in the release of chemicals, particularly organophosphorus agents.[3]

Each local service should be consistent with regards to equipment, including PPE, in case of a CBRN incident.

Key Points – Chemical, Biological, Radiological and Nuclear incidents

- Steps 1,2 and 3
- Early METHANE / CHALETS call once a chemical incident is identified
- Stay away from the scene unless protected in appropriate PPE
- Encourage walking casualties to disrobe and self-decontaminate where possible
- Once contaminated, you become a casualty.

REFERENCES

[1] Heptonstall J, Gent N. CBRN incidents: Clinical management and Health protection: Health Protection Agency, 2005.

[2] Department of Health. Pre-Hospital Guidelines for the Emergency Treatment of Deliberate Realease of Organophosphorus (OP) Nerve Agents. London: HMSO, 2004.

[3] Thermo Electron Corporation. http://www.thermo.com.

SELECT BIBLIOGRAPHY

Department of Health; Emergency Preparedness Division. NHS emergency planning guidance London: HMSO, 2005.

Group ALS. Major Incident Medical Management and Support (MIMMS): The Structured Approach to Major Incident http://europa.eu.int/comm/environment/civil/prote/pdf docs/disaster_med_final_2002/d16.pdf.

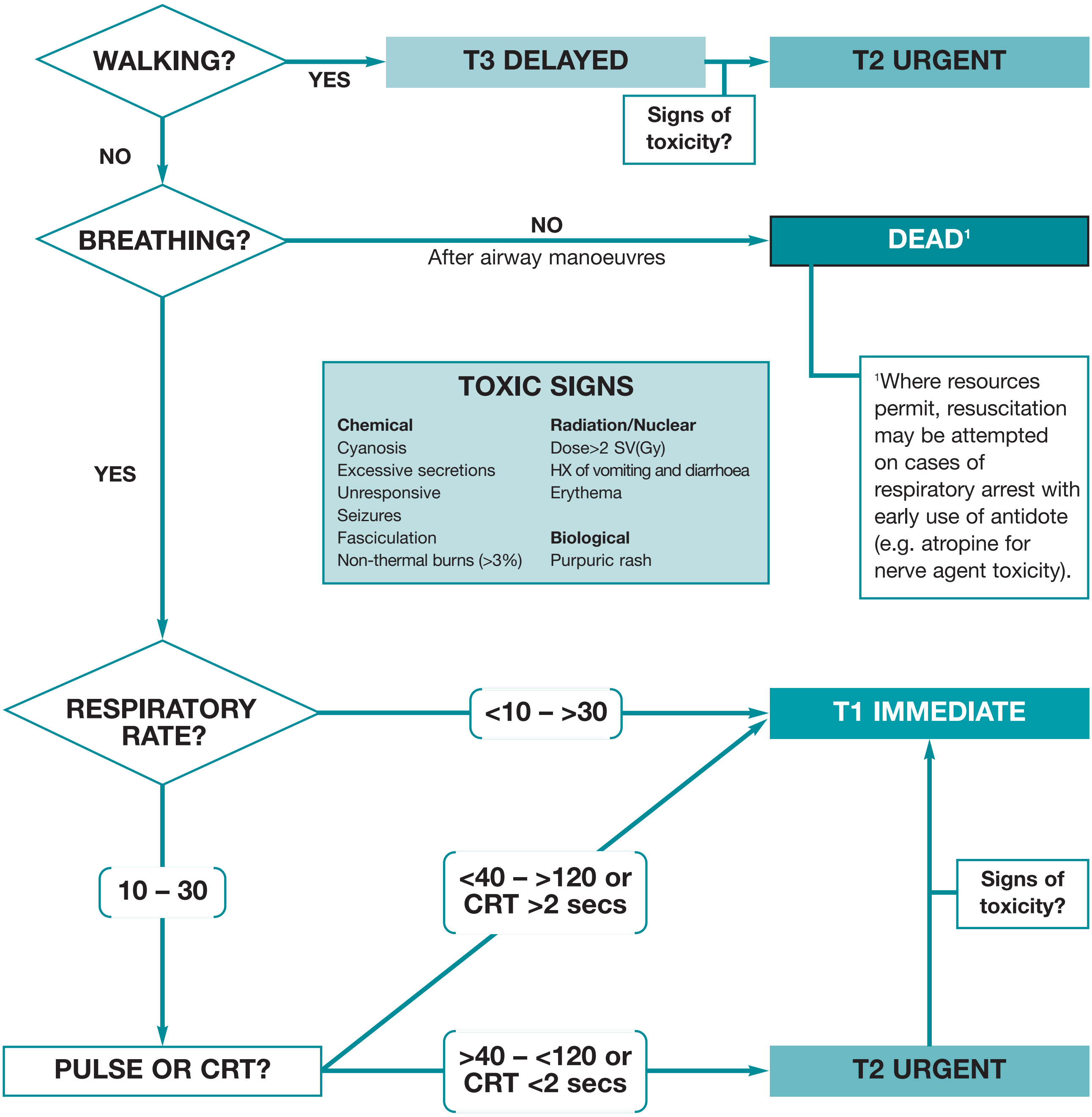
METHODOLOGY

Refer to methodology section.

Appendix 1 – CBRN (SPECIAL AGENT) TRIAGE SIEVE: For use before and during decontamination

NOTE: Triage may be modified on specialist medical advice after receipt of information about the contaminating agent.

Where the nature of the contaminating agent is unknown (e.g. white powder), treat initially as for chemical contamination until advised otherwise.



Appendix 2 – CBRN SORT: For use after decontamination at a casualty clearing station or in hospital

CBRN SORT (for use after decontamination)

		PLEASE CIRCLE
RESPIRATION	10-29 per minute	**+4**
	>30 per minute	**+2**
	>30 per minute + cyanosis	**+0**
	≤9 per minute	**+0**
	RESPIRATORY ARREST	**Immediate OR Expectant**
HEART RATE	60-100 per minute	**+4**
	41-59 **OR** 100-120 per minute	**+2**
	<40 per minute	**+0**
	>120 per minute	**+0**
	CARDIAC ARREST	**DEAD**
SYSTOLIC BLOOD PRESSURE	>90mmHg	**+4**
	70-89 mmHg	**+3**
	50-69 mmHg	**+2**
	1-49 mmHg	**+1**
	CARDIAC ARREST	**DEAD**
GLASGOW COMA SCORE	13-15	**+4**
	9-12	**+3**
	6-8	**+2**
	4-5	**+1**
	3 **OR** CONVULSIONS	**+0**
FASCICULATION	None	**+4**
	Local/intermittent	**+2**
	General/continuous	**+0**
	Flaccidity	**+0**
BIOLOGICAL	if purpuric rash	**-2**
RAD OR NUC	if vomiting, diarrhoea, erythema or dose >2Sv	**-2**

TOTAL SCORE OUT OF 20

EVACUATION SCORE		EVACUATION PRIORITY
20	**DELAYED**	**T3**
18-19	**URGENT**	**T2**
0-17	**IMMEDIATE**	**T1**

Specific Treatment Options

Appendix 3 – GLOSSARY OF TERMS: COUNTER-TERRORISM

ACPO(TAM)	Association of Chief Police Officers (Terrorism and Allied Matters)
ATO	Ammunition Technical Officer
ATSAC	ACPO(TAM) Strategic Advice Centre (normally established at Scotland Yard)
AWE	Atomic Weapons Establishment, Aldermaston
(CB)IED	(Chemical or Biological) Improvised Explosive Device
CCC	Civil Contingencies Committee
CCCG	Chief Constable's Co-ordinating Group (Strategic Group)
CMLO	Consequence Management Liaison Officer
COBR	Cabinet Office Briefing Room(s) (Central Govt co-ordinating group)
Dstl	Defence, Science & Technology Laboratory, Porton Down – part of the Ministry of Defence
EHO	Environmental Health Officer
EOD	Explosives Ordnance Disposal
FSC	Forward Scientific Controller
FCP	Forward Control Point
FMC	Forward Medical Controller
GLO	Government Liaison Officer
GLT	Government Liaison Team
HazMat	Hazardous Material
IPE	Individual Protective Equipment
JHAC	Joint Health Advisory Cell
JIG	Joint Intelligence Group
JMC	Joint Military Commander
MACA	Military Aid to the Civil Authorities
MACC	Military Aid to the Civil Community
MACP	Military Aid to Civil Power
MAGD	Military Aid to Govt Departments
NARO	Nuclear Accident Response Organisation (MoD)
PIC	Police Incident Commander
PMBS	Police Main Base Station
POLSA	Police Search Adviser
PPE	Personal Protective Equipment
SAS	Special Air Squadron
SBS	Special Boat Squadron
SF	Special Forces
SIO	Senior Investigating Officer
SMC	Senior Military Commander
SO13	Met Police Anti-terrorist Squad
SSA	Senior Scientific Authority
TAG	Technical Assessment Group, Dstl Chemical and Biological Science
TRF	Technical Response Force (specialist military/scientific team)

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a general term that covers a variety of previously used labels which are now recognised as different aspects of the same underlying problem. The term COPD encompasses:

- chronic bronchitis
- emphysema
- chronic obstructive airways disease (COAD)
- chronic obstructive lung disease (COLD)
- chronic airflow limitation disease (CALD)
- some cases of chronic asthma.

COPD is a chronic progressive disorder characterised by airway obstruction that does not change markedly over several months. Whilst the impairment is considered permanent it may be partially reversible (at least transiently) by bronchodilator and/or other therapies.

Patients with COPD usually present to the ambulance service with an acute exacerbation of the underlying illness. COPD is a concomitant/secondary illness in many incidents with other chief complaints.

Some patients with severe COPD may carry information (e.g. a card) to assist in their care. This can be used to guide therapy.

ASSESSMENT

Primary Survey

Assess **ABCD**'s

HISTORY

See dyspnoea guideline

Specific presenting features of an acute exacerbation of COPD include:

- worsening of a previously stable condition
- increased wheeze
- increased dyspnoea, particularly on expiration
- increased sputum volume
- chest tightness
- fluid retention.

Specifically assess:

- respiratory rate and effort, and any noises (e.g. "bubbling" or wheeze) associated with breathing indicating respiratory distress
- whether the event is an exacerbation of COPD or something new e.g. pulmonary oedema, acute asthma
- the status of current treatment, including domiciliary oxygen therapy.

Differential diagnoses include pneumonia, pneumothorax, left ventricular failure, pulmonary embolism, lung cancer, upper airway obstruction and allergic reaction/anaphylaxis.

Establish whether any **TIME CRITICAL** features are present. These may include:

- extreme breathing difficulty (by reference to patient's usual condition)
- cyanosis (although peripheral cyanosis may be 'normal' in some patients)
- exhaustion
- hypoxia (oxygen saturation) <85%, unresponsive to oxygen (O_2) – COPD patients will normally have a lower than normal oxygen saturation (SpO_2).

MANAGEMENT [1-7]

Always check to determine if the patient has a personalised treatment plan available.

If any **TIME CRITICAL** features are present, provide immediate care for airway and breathing problems then transfer to the nearest suitable receiving hospital. Provide a **hospital alert message/information call.**

If confident of diagnosis of an exacerbation of COPD, follow information on patient's information card, if available.

Follow ***medical emergencies guideline***, start correcting:

- **airway –** maintain patency
- **breathing** – nebulise with **salbutamol** (***refer to salbutamol drug protocol for dosages and information***). If inadequate response after five minutes, a further nebulised salbutamol combined with **ipratropium bromide** (***refer to ipratropium bromide drug protocol for dosages and information***) should be considered. Ipratropium is given once only; salbutamol may be repeated at regular intervals unless the side effects of the drug become significant.

- **circulation** – cannulate a suitable vein if transferring to hospital
- position for comfort and ease of respiration; often sitting forwards helps.

Specifically monitor ECG and SpO_2.

If, after nebulisation, there are no features of life-threatening or severe COPD (e.g. low respiratory rate), controlled oxygen therapy (***refer to oxygen protocol***) should be maintained to achieve an oxygen saturation of 90-92%.

Be prepared for respiratory arrest.

ADDITIONAL INFORMATION

A small proportion of COPD sufferers are chronically hypoxic and when given oxygen may develop increasing drowsiness and loss of respiratory drive. If this occurs, reduce oxygen concentration and support ventilation if required.

Pulse oximetry, whilst important in COPD patients, will not indicate carbon dioxide (CO_2) levels which are assessed by capnography or more commonly, blood gas analysis in hospital.

If the primary illness in a patient with COPD requires high concentration oxygen (such as anterior myocardial infarction, major trauma etc) then this should **NOT BE WITHHELD**. The patient should be continually monitored closely for changes in respiratory rate and depth and the inspired concentration adjusted accordingly. In the short time that a patient is in ambulance care hypoxia presents a much greater risk than hypercapnia in most cases.

Whilst blood gas levels are important to continuing long term care of the patient, a lack of oxygen will prove fatal far more rapidly in the acute setting than changes in CO_2 levels which alter more slowly.

Use of systemic corticosteroids as advocated in asthma is of no proven benefit in acute exacerbations of COPD. A course of oral steroids and/or antibiotics may be appropriate based on the judgement of the assessing hospital Doctor or General Practitioner.

Key Points – Chronic Obstructive Pulmonary Disease

- Early respiratory assessment (including oxygen saturation) is vital.
- If in doubt, provide oxygen therapy, titrating en-route, aiming for oxygen saturation of 90-92%.
- Provide nebulisation with salbutamol and assess response.

REFERENCES

1. The British Thoracic Society Standards of Care Committee. Guidelines on the Management of COPD. *Thorax* 1997;52(Suppl V):S1-S28.
2. Moayyedi P, Congleton J, Page RL. Comparison of nebulised salbutamol and ipratropium bromide with salbutamol alone in the treatment of chronic obstructive pulmonary disease. *Thorax* 1995;50:837-4.
3. O'Driscoll BR, Taylor RJ, Horsley MG. Nebulised salbutamol with and without ipratropium bromide in acute airflow obstruction. *Lancet* 1989(1):1418-20.
4. Rebuck AS, Chapman KR, Abboud R. Nebulized anticholinergic and sympathomimetic treatment of asthma and chronic obstructive airways disease in the emergency room. *American Journal of Medicine* 1987;82:59-64.
5. Shrestha M, O'Brien T, Haddox R. Decreased duration of emergency department treatment of chronic obstructive pulmonary disease exacerbations with the addition of ipratropium bromide to beta-agonist therapy. *Annals of Emergency Medicine* 1991;20:1206-09.
6. Koutsogiannis Z, Kelly A-M. Does high dose ipratropium bromide added to salbutamol improve pulmonary function for patients with chronic obstructive airways disease in the emergency department? *Aust N Z J Med* 2000;30(1):38-40.
7. Harrison M. Multiple different bronchodilators unnecessary in acute COPD, 2004.
8. Murphy R, Mackway-Jones K, Sammy I, Driscoll P, Gray A, O'Driscoll R, et al. Emergency oxygen therapy for the breathless patient: guidelines prepared by North West Oxygen Group. *Emergency Medicine* 2001;18(421-23).

METHODOLOGY

Refer to methodology section.

INTRODUCTION

A convulsion or seizure is a period of involuntary muscular contraction, often followed by a period of lethargy and confusion and sometimes profound sleep. The commonest presentation to ambulance services is the tonic/clonic seizure, previously known as 'grand mal'.

Eclamptic convulsions are specific to pregnancy and often associated with pre-eclampsia (raised blood pressure with proteinuria). One third of cases occur for the first **time in the first 48 hours after delivery** (***refer to pregnancy induced hypertension (including eclampsia) guideline***).

Convulsions can occur for various reasons, including:

Epilepsy:	In pre-hospital care, the majority of episodes attended are convulsions occurring in patients known to have epilepsy. These patients are usually on anti-epileptic medication, (e.g. phenytoin, sodium valproate (Epilim), carbamazepine (Tegretol), and lamotrigine (Lamictal). Urinary incontinence and tongue biting often accompany a full epileptic convulsion (tonic/clonic).
Febrile	The other most common
Convulsions:	ambulance emergency involving convulsions is febrile convulsions. These tend to occur in children.
Cardiac Arrest:	**REMEMBER**, as a convulsion occurs, the brain is acutely starved of oxygen (O_2). A convulsion may be the presenting sign of circulatory arrest at the onset of sudden **CARDIAC ARREST. Always take a defibrillator to patients who are convulsing**.
Hypoglycaemia:	Convulsions may be a presenting sign of **HYPOGLYCAEMIA** and should be considered in **ALL** patients, especially known diabetics. An early blood glucose level reading is essential in all actively convulsing patients (including known epileptics).
Hypoxia:	Any patient suffering from hypoxia, regardless of cause, may convulse. The cause may be very simple which is why good A and B maintenance is important prior to drug therapy.
Hypotension:	Severe hypotension can trigger a convulsion. This may be seen with syncope or a vasovagal attack where the patient remains propped up. In these instances there will usually be a clear precipitating event and no prior history of epilepsy. Once the patient lies flat and the blood pressure is restored the convulsion may stop.

There are a significant number of other causes of convulsions and these include:

- infection
- cerebral tumour
- electrolyte imbalance
- drug overdose.

It is important not to label a patient as epileptic unless there is a known diagnosis.

HISTORY

Is the patient known to be epileptic?

If so, are they on medication, and are they taking it?

Have they had convulsions recently?

Has the adult patient been unwell at present? Have they had a high temperature?

Is the patient **DIABETIC** (could this be secondary to hypoglycaemia)?

Is the patient pregnant or delivered in the last 48-hours? – could this be due to eclampsia? (***refer to pregnancy induced hypertension (including eclampsia) guideline***).

Is there any history of head injury?

Is there any evidence of alcoholism or drug usage? Convulsions are more common in alcoholics, and associated with hypoglycaemia and can be triggered by a number of prescription or illegal drugs (e.g. tricyclic antidepressants).

ASSESSMENT

Assess **ABCD**'s

Check blood glucose level.

Evaluate whether there are any TIME CRITICAL features present: These may include:

- any major ABCD problems
- serious head injury
- status epilepticus (***see below***)
- underlying infection, e.g. meningococcal septicaemia (***refer to benzylpenicillin drug protocol***).

If any of these features are present, **CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSFER** to **nearest suitable receiving hospital –** in these cases the ease and safety with which the patient can be moved whilst still convulsing should be considered and treatment may need to begin in situ.

Provide a **Hospital Alert Message / Information call.**

En-route continue patient **MANAGEMENT** (***see below***).

If no **TIME CRITICAL** problems are present, perform a more thorough assessment and a brief secondary survey.

Is there any sign of **ARRHYTHMIA** in an elderly patient (***refer to cardiac rhythm disturbance guideline***)? (e.g. a burst of rapid ventricular tachycardia may drop the blood pressure, and cause transient cerebral **HYPOXIA,** giving rise to a convulsion).

Assess type of convulsion, if still convulsing; is this a generalised convulsion, or a focal fit?

Assess for raised temperature (patient may feel hot after a convulsion) and any sign of a rash i.e. possible meningococcal septicaemia (***refer to meningococcal septicaemia guideline***).

Assess for mouth/tongue injury, incontinence.

MANAGEMENT

Follow medical emergencies guideline, remembering to:

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)
- administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***). All patients who are convulsing, post ictal or have a convulsion secondary to a head injury (***refer to head trauma guideline***) (even if they appear fully recovered) should receive high concentration O_2
- establish if any treatment e.g. rectal diazepam has already been administered
- obtain IV access if convulsion persists or recurs.

Specifically consider:

- position for airway security, comfort and protection from dangers, especially the head
- **DO NOT** attempt to force an oropharyngeal airway into a convulsing patient. A nasopharyngeal airway is a useful adjunct in such patients
- apply ECG and pulse oximetry and monitor especially in the elderly
- check **BLOOD GLUCOSE LEVEL** to exclude hypoglycaemia. If blood glucose <4.0mmol/l or hypoglycaemia is clinically suspected, give oral glucose, glucose 10% IV titrated to response or **glucagon** IM (**refer to glucose 10% and glucagon protocols for dosage and administration**)
- most tonic/clonic convulsions are self-limiting and do not require drug treatment. However, if a patient convulses repeatedly in close succession or has one convulsion lasting >5 minutes then administer **diazemuls** IV titrated to response. **Stesolid** may be given when IV access cannot be obtained (***refer to diazepam protocol for dosage and administration***)
- if the patient can be moved, despite the convulsing, it is important to reach hospital for definitive care as rapidly as possible
- **CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSFER IMMEDIATELY TO NEAREST SUITABLE HOSPITAL**
- provide a **Hospital Alert Message / Information Call.**

ADDITIONAL INFORMATION

Post ictal

This is the term given to patients who have had a convulsion but who are now in the recovery phase. Convulsions are extremely disorientating, even for epileptics who may suffer them regularly. It is not uncommon for patients to act out of character when in the post ictal state. This may include verbal or physical aggression. Oxygen therapy and a calm approach are important. Remember, when the patient recovers they may be a completely different person.

Status Epilepticus

Patients with persistent and continual convulsions are in **STATUS EPILEPTICUS**, and need aggressive ABC care and rapid transfer to hospital. Intravenous diazemuls, 10mg should be given by slow IV injection. Stesolid may be given where appropriate (**refer to diazepam protocol for dosage and administration**). **This is a medical emergency and patients must be removed to hospital as rapidly as possible.**

Epilepsy

A number of patients with diagnosed epilepsy, who have repeated convulsions and a well documented history of this, may present regularly to the Ambulance Service.

If they are **fully recovered and not at risk**, and **in the care of a responsible adult**, consideration may be given to not transferring patients routinely to hospital unless they wish to travel. These cases must have vital signs recorded along with the explanation given to the patient. Patients and the responsible adult should be advised to contact either the General Practitioner (GP) if the patient feels generally unwell or 999 if there are repeated convulsions.

The reasons for the decision not to transfer to further care must be documented, and must be signed by the patient and/or carer. Ensure contact is made with the patient's GP particularly in cases where the patient has made repeated calls.

There are many causes of convulsions as outlined above and you should remember to consider them in other settings, such as in a road traffic collision (RTC) with a driver who has "blacked out", consider whether the accident may be related to a convulsion.

It is important, wherever possible, to obtain contact details of any witnesses to a convulsion in the above circumstances and pass this to the receiving hospital.

Key Points – Convulsions in adults

- Most tonic/clonic convulsions are self-limiting and do not require drug treatment.
- Convulsions may be secondary to other medical conditions e.g. hypoxia, hypoglycaemia.
- Administer drugs if convulsion lasts longer than 5 minutes.
- Consider eclampsia as a cause of the convulsion.
- Only patients with known epilepsy who make a full recovery and can be supervised adequately can be considered to be left at home.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Gastrointestinal (GI) bleeding is a common medical emergency. It is diagnosed by the presence of haematemesis – vomiting of fresh/ dark red/ brown/ black or 'coffee ground' blood (depending on how long it has been in the stomach), melaena (malodorous, liquid, black stool) or bright red/ dark blood with clots per rectum (PR). Patients can present with a wide range of clinical severity from mild anaemia to massive, life-threatening haemorrhage.

Gastrointestinal haemorrhage is commonly divided into acute upper and lower GI bleeding:

ACUTE UPPER GI BLEEDING

Accounting for around 5,000 deaths each year in the UK, upper GI bleeding has a higher prevalence in socioeconomically deprived areas. Constituting 80% of all GI bleeds, they frequently present with a history of aspirin or non-steroidal antiinflammatory drug (NSAID) use. Only 50% of patients present with haematemesis alone, 30% with melaena and 20% with haematemesis and melaena; those with haematemesis tend to have greater blood loss than melaena alone. Patients older than 60 years account for up to 45% of all cases (60% of these women). Death is uncommon in those less than 40 years but the mortality rate, around 10%, increases steeply thereafter; almost all deaths occur in the elderly, particularly those with comorbid conditions.

Whilst upper GI bleeding may cause hypovolaemic shock, it is not ordinarily associated with pain. Common causes include:

Peptic ulcers

More than 50% of cases are due to peptic ulcers which, together with oesophagitis and gastritis, account for up to 90% of all upper GI bleeding in the elderly. Eighty five percent of deaths occur in persons older than 65 years.

Mallory-Weiss tears

Around ten percent are caused by oesophageal tears, which are more common in the young. Predisposing factors include hiatal hernia and alcoholism. Initiating factors are persistent coughing or severe retching and vomiting, often after an alcoholic binge; haematemesis presents after several episodes of non-bloody emesis. Bleeding can be mild to moderate.

Oesophageal varices

Variceal bleeding is also the cause of approximately ten percent of cases. These patients can bleed severely with up to 8% dying within 48 hours from uncontrolled haemorrhaging. It is commonly associated with alcoholic cirrhosis and increased portal pressure (causing progressive dilation of the veins and protrusion of the formed varices into the lumen of the oesophagus). Patients may become haemodynamically unstable with little warning.

ACUTE LOWER GI BLEEDING

Patients with a lower GI haemorrhage commonly present with bright red blood/ dark blood with clots PR; haematemesis or melaena usually indicating an upper GI source. Bright red blood PR, in isolation, precludes upper GI bleeding in over 98% of cases (unless the patient appears hypovolaemic). Lower GI bleeds are less likely to present with signs of haemodynamic compromise, are more prevalent in men and also have a common history of aspirin or NSAID use. The mean age is 63 to 77 years with mortality around 4% (even serious cases have rarely resulted in death). Common causes include:

Diverticulosis

Diverticular bleeding accounts for up to 55% of cases. Patients commonly present with an abrupt but painless PR bleed. The incidence of diverticular bleeding increases with age.

Inflammatory bowel disease

Major bleeding from ulcerative colitis and Crohn's disease is rare. Inflammatory bowel disease accounts for less than 10% of cases.

Haemorrhoids

Haemorrhoids also account for less than 10% of cases. Bleeding is bright red and usually noticed on wiping or in the toilet bowl. The incidence is high in pregnancy, a result of straining associated with constipation and hormonal changes. Further evaluation may be needed if the patient complains of an alteration of bowel habit and blood mixed with the stool.

HISTORY

- Is there unexplained syncope (should raise suspicion of concealed GI bleed)?
- Does the visible bleed originate from the upper or lower GI tract?
- When did the bleeding begin?
- Is there a history of GI disease?
- Is there a history of aspirin or NSAID use?
- Does the patient take beta blockers or calcium-channel blockers (would mask tachycardia in the shocked patient)?
- Does the patient take Iron tablets or have they consumed beetroot/ drinks containing red dye (may alter colour of stool)?
- Is there a history of anticoagulatory or antiplatelet therapy?
- Is there a history of bleeding disorders?
- Is there a history of liver disease/ abdominal surgery or alcohol abuse?
- Did haematemesis present after an increase in intra-abdominal pressure (from retching or coughing) and several episodes of non-bloody emesis?
- What is the character and quantity of blood loss? If not visible ask the patient or relatives to estimate colour/ volume (PR blood loss is difficult to estimate. The blood acts as a laxative, but repeated blood-liquid stool, or just blood, is associated with more severe blood loss than maroon/ black solid stool).

ASSESSMENT & MANAGEMENT

Initial priorities focus on the principles of 'Airway, Breathing, and Circulation'; identifying the source of the bleed is secondary. Patients may benefit from early endoscopy, the results from which will determine the best course of treatment, so do not delay. Prehospital management is limited but similar regardless of cause. The priority is to promote haemodynamic stability.

- Haematemesis may compromise the airway. Patients with an altered level of consciousness should be positioned flat and on their side (not supine) to prevent aspiration. Suctioning may be required.
- High flow, high concentration oxygen should be administered.
- Shocked patients may be weak, dizzy, confused, agitated, hyperglycaemic, hypotensive, tachycardic, tachypnoeic, and have pallid/ cool/ sweaty skin. Tachycardia (pulse greater than 100bpm) and hypotension (manual systolic BP less than 100mmHg) indicate haemodynamic instability. These patients should be placed in a head-down 'recovery' position to maintain cerebral perfusion. Early IV access should be established with two large-bore cannulae placed in the anticubital fossae. A crystalloid solution should be warmed and infused slowly; judicious aliquots of 250mls should be titrated to maintain the presence of a radial pulse, which equates approximately to a systolic BP of >90mmHg.
- Rapid infusion should be avoided. Overtransfusion may encourage rebleeding or cause pulmonary/ cerebral oedema.
- A baseline ECG should be considered. Patients may present with chest pain due to decreased myocardial perfusion and increased myocardial demand. Comfort should be maintained by assessing the need for analgesia. Ensure a systolic BP of >90-100mmHg before administering IV **morphine or nalbuphine**, tailoring doses to suit individual patient requirements.

Key Points

- Haematemesis or melaena indicates an upper GI source.
- Bright red or dark blood with clots PR indicates a lower GI source.
- Almost all deaths from GI bleeds occur in the elderly.
- Around 80% of all GI bleeds stop spontaneously or respond to conservative management.
- Crystalloids should be used judiciously (250ml aliquots).

REFERENCES

[1] Baradarian, R. Ramdhaney, S. Chapalamadugu, R. Skoczylas, L. Wang, K. Rivilis, S. Remus, K. Mayer, I. and Iswara, K. Tenner, S. (2004). Early intensive resuscitation of patients with upper gastrointestinal bleeding decreases mortality. *American journal of gastroenterology. 99, 4: 619-622.*

[2] Bosch, J. and Abraldes, J. (2004). Management of gastrointestinal bleeding in patients with cirrhosis of the liver. *Seminars in haematology.* 42,1: 8-12.

[3] Bounds, B. and Friedman, L. (2003). Lower gastrointestinal bleeding. Gastroenterology clinics of *North America.* 32: 1107-1125.

[4] British society of gastroenterology endoscopy committee. (2002). Non-variceal upper gastrointestinal haemorrhage. *Gut.* 51(Suppl iv): iv1-iv6.

[5] Coppola, M. (2001). Life-threatening upper GI emergencies, part 2: upper GI bleeding and perforation. *Journal of critical illness.* 16, 8: 367-373.

[6] Dallal, H. and Palmer, K. (2001). ABC of the upper gastrointestinal tract: upper gastrointestinal haemorrhage. *BMJ.* 323: 1115-1117.

[7] Derry, S. and Loke, Y. (2000). Risk of gastrointestinal haemorrhage with long term use of aspirin: mata-analysis. *BMJ.* 321: 1183-1187.

[8] Fallah, M. Prakash, C. and Edmundowicz, S. (2000). Acute gastrointestinal bleeding. *Advances in gastroenterology.* 84: 1183-1208.

[9] Farrell, J. and Friedman, L. (2000). Gastrointestinal bleeding in older people. *Gastroenterology clinics of North America.* 29, 1:1-36.

[10] Ghosh, S. Watts, D. and Kinnear, M. (2001). Management of gastrointestinal haemorrhage. *Postgraduate medical journal.* 78: 4-14.

[11] Hawkey, G. Cole, A. McIntyre, A, Long, R. and Hawkey, C. (2001). Drug treatment in upper gastrointestinal bleeding: value of endoscopic findings as surrogate end points. *Gut.* 49: 372-379.

[12] Lingenfelser, T. (2001). Lower intestinal bleeding. Best practice and research clinical gastroenterology. 15, 1:135- 153.

[13] Nisar, P. and Scholefield, J. (2003). Managing haemorrhoids. BMJ. 327: 847-851. Palmer, K. (2004). Management of haematemesis and melaena. *Postgraduate medical journal.* 80: 399-404.

[14] Revell, M. Porter, K. and Greaves, I. (2002). Fluid resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal.* 19: 494-498.

[15] Ricard-Hibbon, A. Chollet, C. Saada, S. Loridant, B. and Marty, J. (1999). A quality control programme for acute pain management in out-of-hospital critical care medicine. *Annals of Emergency Medicine.* 34:6.

[16] Rupp, T., Singh, S., and Waggenspack, W. (2004). Gastrointestinal hemorrhage: The pre-hospital recognition, assessment & management of patients with a GI bleed. *Journal of Emergency Medical Services.* 29,8: 80-95.

[17] Smith, G. (2004). The management of acute upper gastrointestinal bleeding. *Nursing Times.* 100, 26: 40-43.

[18] Soreide, E. and Deakin, C. (2005). Prehospital fluid therapy in the critically injured patient – a clinical update. *International journal of the care of the injured*. Article in press.

[19] Zuckerman, G. (2000). Acute gastrointestinal bleeding: clinical essentials for the initial evaluation and risk assessment by the primary care physician. *Journal of the American osteopathic association.* 100, 12: S4-7.

INTRODUCTION

A non-diabetic individual maintains their blood glucose level within a narrow range from 3.0 to 5.6mmol per litre. This is achieved by a balance between glucose entering the blood stream (from the GI tract or from the breakdown of stored energy sources) and glucose leaving the circulation through the action of insulin.

HYPOGLYCAEMIA

A low blood glucose level is defined as <4.0mmol/L, but it must be remembered that the clinical features of hypoglycaemia may be present at higher levels. Clinical judgement is as important as a blood glucose reading. The reversal of hypoglycaemia is an important pre-hospital intervention. Hypoglycaemia if left untreated may lead to the patient suffering permanent brain damage and may even prove fatal.

HISTORY

Hypoglycaemia will occur when glucose metabolism is disturbed through:

- inadequate carbohydrate intake
- excessive physical activity
- insulin or other hypoglycaemic drug treatments.

Other factors, which should be considered, are:

- excessive or chronic alcohol intake may also precipitate hypoglycaemia.

Any person whose level of consciousness is reduced or who is having a seizure should have hypoglycaemia excluded.

SIGNS AND SYMPTOMS

These can vary from patient to patient. Some patients are able to detect the early symptoms for themselves, but others may deteriorate rapidly and without apparent warning. Common symptoms include:

- confusion
- headache
- drowsiness
- aggression
- sweating
- fitting
- unconsciousness
- abnormal neurological features may occur. These can include a one-sided weakness, identical to a stroke.

Symptoms may be masked due to medication or other injuries, for example, with beta-blocking agents.

ASSESSMENT AND MANAGEMENT OF HYPOGLYCAEMIA

Follow medical emergencies guideline, remembering to:

Assess and start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)

Consider and look for patient history signs (medical alert bracelets, chains and cards)

Obtain and record blood glucose levels **pre** and **post** treatment.

Specifically consider:

- where the patient is conscious, oral glucose (sugary drink, chocolate bar/biscuit or **glucose gel**) may be given until the glucose level has improved to at least 5.0mmol/L
- where the patient has impaired consciousness, is uncooperative or there is a risk of aspiration or choking, administer IV glucose 10% (***refer to glucose 10% protocol for dosage and information***) by slow IV infusion. **In all cases, administration of IV glucose should be titrated against effect. Re-check blood glucose after 10 minutes to ensure that it has improved to a level of at least 5.0mmol/L, in conjunction with an improvement in level of consciousness**. An improvement in the patient's condition should be seen almost immediately, as the effects of glucose IV are very rapid. **A further dose of glucose IV may be required**
- if IV glucose cannot be administered, glucagon (***refer to glucagon protocol for dosage and information***) may be given via the IM route. It may take 5-10 minutes for glucagon to begin to work and it requires the patient to have adequate glycogen stores. Thus, it may be ineffective in intoxicated, alcoholic, anorexic patients or non-diabetic patients regardless of age.

Once patients are alert and able to swallow, they should be given a drink containing glucose and a carbohydrate food.

If no improvement is seen after a further 5-10 minutes, **immediately transfer to the nearest suitable receiving hospital.**

Provide a hospital alert message/ information call. Continue patient management en-route.

It may be appropriate to leave certain categories of patients at home with advice to take further food by mouth. This includes diabetic patients who are **fully recovered** after being treated with 10% glucose IV and have a blood glucose of > 5.0mmol/L, **and are in the care of a responsible adult**. They must also be advised to call for help if any symptoms of hypoglycaemia recur. *Ambulance Services may arrange locally for a message to be forwarded to the local diabetic nurse/ primary health care team.*

All other patients who have been hypoglycaemic and have received treatment should be encouraged to attend hospital, especially if they:

- are elderly
- **are taking oral hypoglycaemic agents, as hypoglycaemia may recur**
- have no history of previous diabetes and have suffered their first hypoglycaemic episode
- have a blood glucose level <5.0mmol/L after treatment
- have not returned to normal mental status within 10 minutes of IV glucose
- have been treated with glucagon
- have any additional disorders or other complicating factors, e.g. renal dialysis, chest pain, cardiac arrhythmias, alcohol consumption, dyspnoea, seizures or focal neurological signs / symptoms
- signs of infection (urinary tract infection, upper respiratory tract infections) and/or unwell (flu-like symptoms).

HYPERGLYCAEMIA

Hyperglycaemia is the term used to describe high blood glucose levels. Symptoms include thirst, urinary frequency and tiredness. Symptoms are usually of slow onset.

Diabetic ketoacidosis (DKA)

A relative lack of circulating insulin means that cells cannot take up glucose from the blood and use it to provide energy. This forces the cells to provide energy for metabolism from other sources such as fatty acids. This produces acidosis and ketones. The body tries to combat this metabolic acidosis by hyperventilation to blow off carbon dioxide. High blood glucose level means glucose spills over into the urine dragging water and electrolytes with it causing dehydration and glycosuria.

History

The history, particularly the presence of polydipsia (thirst) and polyuria should alert the pre-hospital provider to the possibility of hyperglycaemia and DKA.

New onset diabetes may present with DKA. More frequently it complicates intercurrent illness in a known diabetic. Infections, myocardial infarction (which may be silent) or a CVA may precipitate the condition. Omissions or inadequate dosage of insulin or other hypoglycaemic therapy may also contribute or be responsible. Some medications, particularly steroids may greatly exacerbate the situation.

Signs and symptoms:

One or more of the following may be present:

Symptoms:

- increased urinary output
- increased thirst
- increased appetite.

Signs:

- fruity odour of ketones on the breath (a smell resembling nail varnish remover). Not everyone can detect this odour
- lethargy, confusion and ultimately unconsciousness
- dehydration, dry mouth and possibly circulatory failure due to hypovolaemia
- hyperventilation
- deep sighing respirations (Kussmaul breathing)
- weight loss.

ASSESSMENT

Assess **ABCD**'s

Assess blood glucose level.

Assess dehydration; if the skin of the forearm is raised in a gentle pinch it remains tented, only returning to its normal position slowly. The patient's mouth will be dry. In severe cases this may lead to hypovolaemic shock.

MANAGEMENT OF HYPERGLYCAEMIA

Follow medical emergencies guideline, remembering to:

- administer high concentration oxygen (O_2) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except in patients with Chronic Obstructive Pulmonary Disease (COPD) (***refer to COPD guideline***)
- measure blood glucose level
- undertake ECG.

If time critical, correct life threatening conditions (airway and breathing) on scene then commence transfer to nearest suitable receiving hospital. These patients have a potentially life-threatening condition and they require urgent hospital treatment including insulin and fluid/ electrolyte therapy.

If the patient is shocked, with poor capillary refill, tachycardia, reduced Glasgow Coma Score (GCS) and hypotension, then consider IV access and commence fluid therapy en-route if time permits.

Fluid therapy

Diabetic patients may present with significant dehydration resulting in reduced fluid in both the vascular and tissue compartments. Often this has taken time to develop and will take time to correct. Rapid fluid replacement into the vascular compartment can compromise the cardiovascular system particularly where there is pre-existing cardiovascular disease and in the elderly. Gradual rehydration over hours rather than minutes is indicated.

Central pulse ABSENT, radial pulse ABSENT **is an absolute indication for urgent fluid.**

Central pulse PRESENT, radial pulse ABSENT is a relative indication for urgent fluid depending on other indications including tissue perfusion and blood loss.

Central pulse PRESENT, radial pulse PRESENT **DO NOT** commence fluid replacement[2] **unless there are other signs of poor central tissue perfusion (e.g. altered mental state, disturbed cardiac rhythm). If the clinical conditions suggest that significant dehydration has occurred then commence 250ml bolus of crystalloid. Do not give more than one litre of fluid in the first hour, because of specific hazards in hyperglycaemia when electrolyte levels are not yet known.**

Re-assess vital signs prior to further fluid administration.

DO NOT delay at scene for fluid replacement; wherever possible cannulate and give fluid **EN-ROUTE TO HOSPITAL.**

Provide a hospital pre-**alert message/ information** call according to local protocols.

Diabetic monitoring:

Diabetic patients may monitor their blood or urine glucose levels to assess control of their condition. These records provide a valuable source of information. The records should accompany the patient to hospital and should be handed to receiving staff. It is not unusual however, to attend a patient in whom diabetic monitoring is haphazard or omitted altogether.

Key Points – Glycaemic Emergencies

- Clean skin prior to obtaining blood glucose reading (using either soapy solution or an alcohol wipe, allowing the finger to dry).
- If blood glucose reading of <4.0mmol/l treat with oral solids (glucose drinks, chocolate or hypostop solutions) if GCS >13.
- If GCS 13 or less consider IM glucagon or 10% IV glucose 100ml bolus and review patient's condition, titrate to effect.
- Administer high concentration O_2 therapy.
- Consider fluid therapy to counteract the effects of dehydration.

REFERENCES

Adler, P.M. (1986) Serum glucose changes after administration of 50% dextrose solution: pre- and in-hospital calculations. *American Journal of Emergency Medicine*; 4 (6): p.504-506

Anderson, S. Hogskilde, P.D. Wetterslav, J. Bredgaard, M. Moller, J.T. Dahl, J.B. (2002) Appropriateness of leaving emergency medical service treated hypoglycaemic patients at home: a retrospective study. *Acta Anaesthesioligogica Scandinavica*; 46 (4): p.464-468

Boyd, R. Foex, B. (2000) Towards evidence-based emergency medicine: best BETs from the Manchester Royal Infirmary. Glucose or glucagon for hypoglycaemia. *Journal of Accident and Emergency Medicine*; 17 (4): p.287

Cain, E. Ackroyd-Stolarz, S. Alexiadis, P. Murray, D. (2003) Prehospital hypoglycaemia. The safety of not transporting treated patients. *Prehospital Emergency Care Journal*; 7 (4): p.458-65.

Carstens, S. Sprehn, M. (1998) Prehospital treatment of severe hypoglycaemia: a comparison of intramuscular glucagon and intravenous glucose. *Prehospital & Disaster Medicine*; 13 (2-4): p.44-50

Carter, A.J. Keane, P.S. Dreyer, J.F. (2002) Transport refusal by hypoglycaemic patients after on-scene intravenous dextrose. *Academy of Emergency Medicine*; 9 (8): p.855-7

Chiasson, J-L. Avis-Jilwan, N. Belanger, R. Bertrand, S. Beauregard, H. Ekoe, J-M. Fournier, H. Harrankova, J. (2003) Diagnosis and treatment of diabetic ketoacidosis and the hyperglycaemic hyperosmolar state. *Canadian Medical Association Journal*; 168 (7): p.859-866

Department of Health, National Service Framework for Diabetes. Standards 2: management of diabetic emergencies. London.

Dunger, D.B. Sperling, M.A. Acerini, C.L. Bohn, D.J. Daneman, D. Danne, T.P.A. Glaser, N.S. Hanas, R. Hintz, R.L. Levitsky, L.L. Savage, M.O. Tasker, R.C. Wolfsdorf, J.I. (2004) European Society for Paediatric Endocrinology/ Lawson Wilkins Pediatric Endocrine Society Consensus Statement on Diabetic Ketoacidosis in Children and Adolescents. *Pediatrics*, 113; e113-140.

English, P. Williams, G. (2004) Hyperglycaemic crisis and lactic acidosis in diabetes mellitus. *Postgraduate Medical Journal*; 80: p.253-61

Holstein, A. Plaschke, A. Vogel, M.Y. Egberts, E.H. (2003) Prehospital management of diabetic emergencies- a population-based intervention study. *Acta Anaesthesioligogica Scandinavica*; 47: p.610-615

Kamalakannan, D. Baskar, V. Barton, D.M. Abdu, T.A.M (2003) Diabetic Ketoacidosis in pregnancy. *Postgraduate Medical Journal*; 79: p.454-457

Leese, G.P. Wang, J. Broomhall, J. Kelly, P. Marsden, A. Morrison, W. Frier, B.M. Morris, A.D. (2003) Frequency of Severe Hypoglycaemia Requiring Emergency Treatment in Type 1 and Type 2 Diabetes. A population-based study of health service resource use. *Diabetes Care*; 26 (4): p.1176-1180

Lerner, E.B. Billittier, A.J 4th. Lance, D.R. Janicke, D.M. Teuscher, J.A (2003) can Paramedics safely treat and discharge hypoglycaemic patients in the field? *American Journal Emergency Medicine;* 21 (2): p.115-120

Matilla, E.M. Kuisma, M.J. Sund, K.P. Voipio-Pulkki, L-M. (2004) Out-of hospital hypoglycaemia is safely and cost-effectively treated by Paramedics. *European Journal of Emergency Medicine*; 11 (2): p.70-74

http://gateway.uk.ovid.com/gw2/ovidweb.cgi [Accessed 01/03/2005]

National Collaborating Centre for Women's and Children's Health. (2004) Type 1

Diabetes: diagnosis and management of type 1 diabetes in children and young people. RCOG press. London.

Roberts, K. Smith, A. (2003) Outcome of diabetic patients treated in the pre-hospital arena after a hypoglycaemic episode, and an exploration of treat and release protocols; a review of the literature. *Emergency Medical Journal*; 20: p.274-276

METHODOLOGY

Refer to methodology section; see below for glycaemic emergencies search strategy.

Glycaemic emergencies search strategy

Electronic databases searched:

- National library of medicine (Pubmed) – (2003-2005)
- Cochrane – (2003-2005)
- Prodigy – (2003-2005)
- CINAHL (Ovid) – (2003-2005)

Search strategy:

Pubmed: limits- English, Humans, 2003-2005 (undertaken Feb 2005)

#1 hypoglycaemia #2 pre-hospital OR pre-hospital #3 emergency AND treatment #4 refusal AND treatment #6 treatment refusal #7 glucagon #8 dextrose 10%.

#2 AND #8, #1 AND #8, #1 AND #8 AND #2, #1 AND #3 AND #8, #1 AND #2 AND #3 AND #6 AND #7, #1 AND #2 AND #3 AND #6, #2 AND #7, #1 AND #3, #1 AND #2 AND #3, #1 AND #6, #1 AND #2. Total= 41 articles, 8 articles considered relevant.

Pubmed: limits- English, Humans, 2003-2005 (undertaken Feb 2005)

#1 hyperglycaemia #2 pre-hospital OR pre-hospital #3 emergency AND treatment #4 treatment AND therapy #5 diabetic ketoacidosis #6 hyperosmolar hyperglycaemic state.

#1 AND #2, #1 AND #3, #1 AND #3 AND #4, #2 AND #5, #3 AND #5, #3 AND #6, #2 AND #6, #4 AND #6. Total= 35 articles, 8 articles considered relevant.

Cochrane: all sections, terms, words= 22 articles, non-relevant or duplicate.

CINAHL: Diabetic Ketoacidosis/ di, dt, ep, ss, th [diagnosis, drug therapy, epidemiology, symptoms, therapy] exp. Limit to 2003-2005. Total= 32 articles, 5 considered relevant.

Hypoglycaemia (limits as above)/dt, rf, th [dryg therapy, risk factors, therapy]. Total= 39 articles.

BMJ- 3 articles considered relevant.

New England Journal of Medicine- 1 article relevant.

NICE/ NeLH- 2 articles considered relevant.

Prodigy- Chlorpropamide, Glibenclamide- risk of hypoglycaemia in type 2 diabetics.

Taking into account duplication across the journals and databases, and duplication of articles already included in Version 3 JRCALC guidelines; a total of 8 articles covering hypo/hyperglycaemia were considered relevant to pre-hospital care.

Electronic journal search

New England Journal of Medicine (all available years)

BMJ (EMJ) (all available years)

Pediatrics

Hand journal search

New England Journal of Medicine (2003-2005)

Hand search reference lists

Additional sources searched:

Department of Health
http://www.dh.gov.uk/PolicyAndGuidance/HealthAndSocialCareTopics/Diabetes/fs/en – (date accessed 14/02/2005)

Books

Greenstein, B (2004).Trounce's clinical pharmacology for nurses 17th edition. Churchill Livingstone. London. p.196

Lissauer, T. Clayden, G (2001). Illustrated textbook of Paediatrics 2nd edition. Mosby.

Tortora, G.J. Grabowski, S.R. (2000). Principles of anatomy and physiology 9th edition. John Wiley & sons, inc. New York

INTRODUCTION

Minor heat-related problems include:

- ankle swelling
- calf cramps
- heat rash (prickly heat).

Major problems are heat exhaustion and heat stroke. These tend to occur in three circumstances:

1. **classic heat stroke** is due to very high external temperatures. It tends to be more common in older patients in very hot climates
2. **exertional heat stroke** is due to excess heat production. This tends to occur in:
   - athletes
   - manual workers
   - firefighters
   - military recruits
3. A variety of drugs may predispose to heat illness as above. In addition, people who take drugs of abuse (e.g. cocaine, ecstasy, amphetamines) and then do a lot of dancing, e.g. at a "rave," may also get heat illness.

ASSESSMENT

It is important to suspect heat exhaustion/heat stroke from the history, circumstances and abnormalities on physical examination as above. However it may be dangerous to assume that collapse in an athlete is due to heat. Check for other potential causes e.g. diabetes or cardiac problems (***refer to relevant guidelines***).

In heat exhaustion the patient may have flu-like symptoms, such as:

- headache
- nausea
- dizziness
- vomiting
- cramps.

On examination the temperature may or may not be elevated (usually less than 41°C) but they will have a raised heart rate, a lowered blood pressure and will be sweating.

The difference between heat stroke and heat exhaustion is that in heat stroke the patient will have neurological symptoms such as:

- decreased level of consciousness
- ataxia
- convulsions.

In addition the temperature will always be elevated, typically more than 41°C. Sweating may be absent.

Heat stroke is potentially fatal and the patient needs to be cooled as an emergency.

MANAGEMENT[1-4]

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)
- administer high concentration oxygen (O_2) (***refer to oxygen guideline***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***)
- apply pulse oximetry
- measure blood glucose.

If major ABC problems:

- correct A and B on site then
- commence transfer to nearest suitable receiving hospital
- provide a hospital alert message / information call
- continue treatment en route to hospital.

Specifically assess:

Circulation:

- if the patient is fully conscious with no central nervous system disturbance (i.e. heat exhaustion), they can be treated with oral fluid replacement.[5] If possible use a dextrose and saline re-hydration fluid.
- In more severe illness:
  – ECG monitoring
  – obtain IV access

In fit individuals with heat exhaustion, initial fluid replacement should be undertaken before vital signs become abnormal. If the patient has symptoms suggestive of heat exhaustion then give a fluid bolus of 250mls saline. However high volumes should be avoided as they may induce cerebral oedema.

If either central or peripheral pulses are absent then 250mls boluses of saline are required up to one litre total. Early transfer to hospital is required.

- Re-assess vital signs after each bolus.
- **DO NOT** delay at scene for fluid replacement; wherever possible cannulate and give fluid **EN-ROUTE TO HOSPITAL.**

Disability:

- check Glasgow Coma Score[8]

Exposure / environment:

- remove the patient from the hot environment or remove cause if possible
- remove to an air conditioned vehicle if available
- measure the patient's temperature (and if possible the ambient temperature)
- remove outer clothing
- commence cooling with fanning, tepid sponging, water mist or a wet sheet loosely over the patient's body (**NOT** cold water as this may cause vasoconstriction and reduce heat loss).
- Transfer the patient with air conditioning turned on or with windows open.

Key Points – Heat Exhaustion and Heat Stroke

- Heat exhaustion/heat stroke occurs in high external temperatures, as a result of excess heat production and with certain drugs. The higher the level of activity the lower the temperature required to produce heat stroke.
- Do not assume that collapse in an athlete is due to heat – check for other causes.
- In heat exhaustion the patient may suffer flu-like symptoms, such as headache, nausea, dizziness, vomiting, and cramps, but the temperature may not be elevated.
- In heat exhaustion (heat stroke) the patient will have neurological symptoms such as decreased level of consciousness, ataxia, and convulsions and the temperature will be elevated, typically >41°C.
- Remove the patient from the hot environment or remove cause, if possible, remove outer clothing and cool.

REFERENCES

1 Eichner ER. Treatment of suspected heat illness. *International Journal of Sports Medicine* 1998;19(Suppl 2):S150-3.

2 Yaqub B, Al-Deeb S. Heat stroke: aetiopathogenesis, neurological characteristics, treatment and outcome. *Journal of Neurological Science* 1998;156(2):144-51.

3 Waters TA. Heat illness: tips for recognition and treatment. *Cleveland Clinic Journal of Medicine* 2001;68(8):685-7.

4 Barrow MW, Clark KA. Heat-related illnesses. *American Family Physician* 1998;58(3):149-59.

5 Maresh CM, Herrera-Soto JA, Armstrong LE. Perceptual responses in the heat after brief intravenous versus oral rehydration. *Medicine and Science in Sports and Exercise* 2001;33(6):1039-45.

6 Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.

7 Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

8 Teasdale G, Jennett B. Assessment of Coma and Impaired Consciousness: A Practical Scale. *The Lancet* 1974;304(7872):81-84.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Hyperventilation syndrome is defined as "a rate of ventilation exceeding metabolic needs and higher than that required to maintain a normal level of plasma CO_2".

Physiological hyperventilation can occur in a number of situations, including life-threatening conditions such as:

- pulmonary embolism
- diabetic ketoacidosis
- asthma
- hypovolaemia.

As a rule, hyperventilation due to emotional **stress** is **rare in children**, and physical causes are much more likely to be responsible for hyperventilation.

Specific presenting features can include:

- acute anxiety
- tetany due to calcium imbalance
- numbness and tingling of the mouth and lips
- carpopedal spasm
- aching of the muscles of the chest
- feeling of light headedness or dizziness.

HISTORY

Refer to dyspnoea guide

ASSESSMENT [1,2]

Assess **ABCD**'s:

Specifically consider:

- history of onset of hyperventilation
- previous history and cause of hyperventilation episodes
- previous medical history
- differential diagnosis such as pulmonary oedema, acute asthma, chest infection, pulmonary embolism, diabetic ketoacidosis or other causes of metabolic acidosis, pneumothorax, drug overdose or acute myocardial infarction (***refer to specific guidelines***)
- auscultation of breath sounds during assessment of breathing
- hyperventilation in the presence of the following should immediately confirm an alternative diagnosis:
  - cyanosis
  - reduced level of consciousness
  - reduction in SpO_2.

MANAGEMENT [1,2]

If ABCD need correction then treat as per medical guidelines as it is unlikely to be due to hyperventilation syndrome but is more likely to be physiological hyperventilation secondary to an underlying pathological process.

Maintain a calm approach at all times.

Reassure the patient and try to remove the source of the patient's anxiety, this is particularly important in children.

Coach the patient's respirations whilst maintaining a calm environment.

ADDITIONAL INFORMATION

The cause of hyperventilation cannot always be determined with sufficient accuracy (especially in the early stages) in the pre hospital environment.

Always presume hyperventilation is secondary to hypoxia or other underlying respiratory disorder until proven otherwise.

The resulting hypocapnia will result in respiratory alkalosis bringing about a decreased level of serum ionised calcium. This electrolyte imbalance will result in tetany, paresthesia and carpopedal spasm.

The practice of encouraging the patient to rebreathe their own air (via a paper bag) can be potentially harmful if the cause of the hyperventilation is due to an increased oxygen demand from a medical cause.[3] This practice should therefore be abandoned in pre-hospital care.

The aim of treatment is to restore a normal level of pCO_2 over a period of time by reassuring the patient and coaching then regarding their respirations.

Key Points – Hyperventilation

- Medical conditions can cause hyperventilation.
- In children a medical cause is more likely than stress.
- Administer oxygen until otherwise indicated.
- Paper bag treatment is no longer considered appropriate.
- Tetany, paresthesia and carpopedal spasm may occur.

REFERENCES

[1] Ball R. Waiting to Exhale: the assessment and management of hyperventilation. *Journal of Emergency Medical Services* 1998;23(1):62-75.

[2] Caroline NL. *Emergency Care in the Streets.* Boston, Mass: Little, Brown and Company, 1995.

[3] Callaham M. Hypoxic hazards of traditional paper bag rebreathing in hyperventilating patients. *Annals of Emergency Medicine* 1989;18(6):622-28.

SELECT BIBILOGRAPHY

Seeley R, Stephens T, Tate P. *Anatomy and Physiology.* 6th ed. Toronto: McGraw – Hill, 2003.

Wilson KJ, Waugh A, Ross JS. *Anatomy and Physiology in Health and Illness*. Edinburgh: Churchill Livingstone, 1999.

Tortora GJ, Grabowski SR. *Principles of Anatomy and Physiology*. New York: Harper Collins College Publishers, 1996.

METHODOLOGY

Refer to methodology section.

HYPOTHERMIA

Hypothermia is defined as a core body temperature below 35°C

The severity of hypothermia can be defined as:

Type	Core temperature
mild hypothermia	32-35°C
moderate hypothermia	30-32°C
severe hypothermia	<30°C

There are three main classifications of hypothermia depending on the speed at which a person loses heat:

1. **Acute hypothermia (immersion hypothermia).** This occurs when a person loses heat very rapidly e.g. by falling into cold water. It is often associated with near-drowning. Inquiry should be made as to why the person is in the water as an injury or illness may have caused them to fall. Acute hypothermia may also occur in a snow avalanche when it may be associated with asphyxia.
2. **Subacute hypothermia (exhaustion hypothermia).** This typically occurs in a hill walker who is exercising in moderate cold who becomes exhausted and is unable to generate any heat. Heat loss will occur more rapidly in windy conditions or if the patient is wet or inadequately clothed. It may be associated with injury or frostbite. Do not forget that if one person in a group of walkers is hypothermic, others in the party who are similarly dressed and who have been exposed to identical conditions may also be hypothermic.
3. **Chronic hypothermia.** In chronic hypothermia heat loss occurs slowly, often over days or longer. It most commonly occurs in the elderly person living in an inadequately heated house or the person who is sleeping rough. It can be associated with injury or illness e.g. the patient who falls or has a stroke and who is on the floor overnight.

It is important to make an assessment of the reasons why the patient has become hypothermic, and be aware of concurrent injuries or illness which may have precipitated the hypothermia.

Hypothermia is more common in the very old and the very young where thermoregulation may be impaired. It is associated with some medical conditions (e.g. hypothyroidism) and also with alcohol.

ASSESSMENT

Assess **ABCD**'s

Measurement of the core temperature usually relies on determining the rectal or oesophageal temperature which is usually not practical in the pre-hospital situation. The accuracy of tympanic thermometry in the pre-hospital arena is unproven.

As temperature measurement in the field is difficult, it is important to suspect and treat hypothermia from the history and the circumstances of the situation.

Shivering occurs early but will cease when the temperature falls further. The patient will feel cold to the touch.

Early symptoms are non-specific including:

- ataxia
- slurred speech
- apathy
- irrational behaviour.

As the temperature falls, there may be:

- a progressive decrease in the level of consciousness (***refer to decreased level of consciousness guideline***)
- a slowing of the heart
- a slowing of respiratory rates
- cardiac arrhythmias (atrial fibrillation, ventricular fibrillation) may occur and can be provoked by rough handling (***refer to cardiac rhythm disturbance guideline***)
- with profound hypothermia the patient may be asystolic
- hypothermia may mimic death (very slow and weak or undetectable pulse, very slow and shallow respiration, fixed dilated pupils). Even if cardiac arrest does occur, the hypothermia is protective and good outcomes have resulted from prolonged resuscitation of hypothermic patients. **DO NOT STOP CARDIAC RESUSCITATION IN THE FIELD** (***refer to cardiac arrest guidelines***).

MANAGEMENT[1-5]

Ensure careful patient handling to minimise the risk of cardiac arrhythmias due to the hypothermia.

Airway: (with cervical spine protection if indicated)

- be gentle, intubate only if necessary as airway manoeuvres may induce ventricular fibrillation.

Breathing:

- respiratory rate may be very slow, so check respiration for 10 seconds
- administer high concentration oxygen (O_2) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***).

Circulation:

- IV cannulation
- measure blood sugar, and treat for hypoglycaemia if required
- IV fluids are only needed in cases of trauma and fluid loss (***see below***). If IV fluids are given, warm the fluids, if possible.[6]

For management of cardiac arrest (***see below and refer to cardiac arrest guidelines***).

Disability

Exposure/environment:

- obtain shelter from the wind, protect from the elements
- prevent further heat loss. **DO NOT** remove wet clothing; wrap the patient appropriately (in the mildly hypothermic patient, if one prevents further heat loss, they will be able to warm up spontaneously by their own metabolism)
- if the patient is conscious, give them a hot drink and food if available and appropriate
- when in ambulance or in shelter, gently remove wet clothes and dry the patient before covering them with blankets
- **DO NOT** rub the patient's skin as this causes vasodilatation and may increase heat loss
- **DO NOT** give the patient alcohol as this causes vasodilatation and may increase heat loss.

Manage co-existing trauma or medical condition as per relevant guidelines.

Cardiac arrest in hypothermia

Cardiac arrest in hypothermia is treated with the same principles as in the normothermic patient except:

- defibrillation is unlikely to be effective if the patient's body temperature is below 30°C
- drugs are less likely to be effective at low temperatures. In addition they will not be metabolised at low temperature and so if repeated doses are given they will build up and will suddenly have an effect when the patient is re-warmed.

So:

- attempt one loop of defibrillation/drugs and continue ventilations/compressions but no further defibrillation/drugs. Defibrillation can be attempted again when the core temperature has risen
- hypothermia causes stiffness of the chest wall so more resistance will be felt with ventilation and chest compression
- hypothermia is protective and good outcomes have resulted from prolonged resuscitation of hypothermic patients. **DO NOT STOP CARDIAC RESUSCITATION IN THE FIELD**
- when cardiac arrest occurs in remote locations (e.g. in the mountains), it is recommended that chest compressions should not be started unless it is possible to continue it throughout the rescue period. It is better to wait to commence initial chest compressions rather than to have to stop and then start again.

Key Points – Hypothermia

- Hypothermia is defined as a core body temperature below 35°C.
- There are three main classifications depending on the speed at which a person loses heat: acute, subacute, and chronic hypothermia.
- Prevent further heat loss; wrap the patient appropriately but DO NOT remove wet clothing, rub the skin or give alcohol.
- Rough handling can invoke cardiac arrhythmias so handle patients carefully.
- Cardiac arrest is treated in the usual way, bearing in mind that drugs/ defibrillation are less likely to be effective at low temperatures.

REFERENCES

[1] Giesbrecht GG. Prehospital treatment of hypothermia. *Wilderness and environmental medicine* 2001;12(1):24-31.

[2] Bernardo LM, Gardner MJ, Lucke J. The effects of core and peripheral warming methods on temperature and physiologic variables in injured children. *Pediatric Emergency Care* 2001;17(2): 138-42.

[3] Grief R, Rajek A, Laciny S. Resistive heating is more effective than metallic-foil insulation in an experimental model of accidental hypothermia: a randomized controlled trial. *Annals of Emergency Medicine* 2000;35(4):337-45.

[4] Snadden D. The field management of hypothermic casualties arising from Scottish mountain accidents. *Scott med J* 1993;38:99-103.

[5] Handley AJ, Goldern FS, Keatinge WR. Report of the Working Party on Out of hospital management of hypothermia. *J Br Assoc Immed Care* 1993;16(2): 34-35.

[6] Cassidy ES, Adkins CR, Rayl RH. Evaluation of warmed intravenous fluids in the pre-hospital setting. *Air Medical Journal* 2001;20(5):25-6.

[7] Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.

[8] Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

SELECT BIBLIOGRAPHY

Larach MG. Accidental hypothermia. *Lancet* 1995;345(8948):493-8.

Keatinge WR. Hypothermia: dead or alive? *BMJ* 1991;302(6767):3-4.

Lloyd EL. ABC of Sports Medicine: Temperature and Performance I: Cold. *BMJ* 1994;309(6953):531-534.

Lloyd EL. Accidental hypothermia. *J Br Assoc Immed Care* 1995;18(2):26-8.

METHODOLOGY

Refer to methodology section.

INTRODUCTION[1]

Meningococcal disease is the leading infectious cause of death in children and young adults and can kill a healthy person of any age within hours of their first symptoms. There are two main clinical presentations that often co-occur:

1. meningitis
2. septicaemia

Meningococcal septicaemia occurs when meningococcal bacteria invade the bloodstream and release their toxic products. This can progress rapidly to shock and circulatory collapse. Deterioration is often rapid and irreversible, with treatment becoming less effective by the minute.

Clinical outcome is largely dependent upon early recognition and early intervention.

ASSESSMENT

Airway:

Breathing:

- breathing rate
- breathing effort
- measure oxygen saturation (SpO_2)

Circulation:

- pulse
- capillary refill time

Disability:

A Alert
V Responds to voice
P Responds to painful stimulus
U Unresponsive

Expose:

- look for rash (***see below***)
- take temperature if appropriate.

The patient may have been previously unwell with non-specific symptoms, for example:

- irritability
- pyrexia
- ‘flu-like’ symptoms.

THE RASH

Presentation – classically haemorrhagic type (purpuric). In pigmented skin it may be helpful look at conjunctivae under lower eyelid.

If a glass tumbler is pressed firmly against a purpuric rash the rash will **NOT** fade, **rash remains visible through the glass.**

If there is a non blanching rash in an unwell person, meningococcal septicaemia must be assumed.

A non-blanching rash is indicative of meningococcal septicaemia but is not a foolproof technique, there may be **NO** rash.

Any patient in whom meningococcal disease is suspected should be re-assessed regularly for the appearance of a non blanching rash.

CLINICAL FINDINGS

The patient will present as “unwell” and the clinical condition may rapidly deteriorate to include:

- raised respiratory rate & effort
- raised heart rate (relative bradycardia is a very late sign)
- capillary refill >2 seconds, skin cold to touch (especially in extremities)
- skin may appear mottled (early in illness, skin may be warm)
- SpO_2 reduced or may be unrecordable (poor perfusion)
- raised temperature (peripheral shutdown or any antipyretics given may mask this)
- rigors
- vomiting, abdominal pain, and diarrhoea
- rash – develops into a petechial, bruise like purpuric rash or blood blisters
- may be no rash
- pain in joints, muscles and limbs
- seizures.

Level of consciousness:

- early in shock alert / able to speak
- as shock advances:-
  - **babies:** limp, floppy and drowsy
  - **older children and adults:** difficulty in walking, standing, drowsy, and confused.

MANAGEMENT[2-6]

Open airway.

Administer high concentration oxygen (O_2) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***)

Consider assisted ventilation at a rate of 12–20 breaths per minute if:

- SpO_2 is <90% on high concentration O_2
- respiratory rate is <10 or >30
- expansion is inadequate

Correct A and B problems at scene then **DO NOT DELAY TRANSFER** to nearest receiving hospital.

Administer benzylpenicillin[7,8] (***refer to benzylpenicillin protocol for dosages and information***) **IN TRANSIT**.

NOTE: The illness may progress rapidly – the sooner benzylpenicillin is administered the better the outcome.

Fluid therapy

Patients with septicaemia develop a relative hypovolaemia as they are vasodilated (increasing the vascular volume) and also lose fluid into many tissues (oedema). Increasing the circulating volume can help counteract this effect.

Central pulse **ABSENT**, radial pulse **ABSENT** – is an absolute indication for urgent fluid.

Central pulse **PRESENT**, radial pulse **ABSENT** – is an indication for urgent fluid depending on other indications including tissue perfusion and blood loss.

Central pulse **PRESENT**, radial pulse **PRESENT – DO NOT** commence fluid replacement[10] **UNLESS** there are other signs of circulatory failure (cold peripheries, delayed capillary refill time, mottled skin, weak thready pulse) then commence:

- **ADULTS** – 250ml bolus of crystalloid
- **CHILDREN** – 20ml/kg bolus of crystalloid.

Re-assess vital signs prior to further fluid administration.

DO NOT delay at scene for fluid replacement; wherever possible cannulate and give fluid **EN-ROUTE TO HOSPITAL**.

Check blood glucose level and treat if necessary.

Provide hospital alert message including age of patient.

Repeat assessment and further management of ABCs as necessary en route.

RISK OF INFECTION TO AMBULANCE PERSONNEL

Meningococcal bacteria are very fragile and do not survive outside the nose and throat.

Public health guidelines recommend preventative antibiotics only for health workers whose mouth or nose is directly exposed to large particle droplets / secretions from the respiratory tract of a patient with meningococcal disease. This type of exposure is unlikely to occur unless Ambulance Clinicians are in close proximity to patients, for example, when undertaking airway management or inhaling droplets when patients cough or sneeze.

When a case of meningococcal disease is confirmed, the public health Doctor will ensure that antibiotics are offered to any contacts of the case whose exposure puts them at increased risk of infection.

Key Points – Meningococcal septicaemia

- Meningococcal disease is the leading infectious cause of death in children and young adults and can kill a healthy person of any age within hours of their first symptoms.
- There are two main clinical presentations, meningitis and septicaemia, that often co-occur.
- The patient may have non-specific symptoms, such as irritability, pyrexia, and ‘flu-like’ symptoms.
- Look for rash; a non-blanching rash is indicative of meningococcal septicaemia but is not conclusive.
- Re-assess patients regularly for the appearance of a non blanching rash.
- Administer benzylpenicillin; the illness may progress rapidly, the sooner benzylpenicillin is administered the better the outcome.

REFERENCES

[1] PHLS Meningococcal Infections Working Party. The Epidemiology and Control of Meningococcal Disease. *Communicable Disease Report* 1989; 8:3-6.

[2] Begg N. Reducing mortality from meningococcal disease. *BMJ* 1992;305:133-134.

[3] Wylie PAL, Stevens D, Drake IW, Stuart J, Cartwright K. Epidemiology and clinical management of meningococcal disease in West Gloucestershire: retrospective, population based study. *BMJ* 1997;315:774-779.

[4] Association of British Pharmaceutical Industry. Compendium of Data Sheets and Summaries of Product Characteristics with the Code of Practice for the Pharmaceutical Industry: London: Datapharm Publications Ltd, 1998-9.

[5] PHLS Meningococcal Infections Working Party. Control of Meningococcal Disease: Guidance for consultants in communicable disease control. *Communicable Disease Report* 1995;5(13):R189-R195.

[6] Department of Health and Social Security. Meningococcal infection: meningitis and septicaemia. London: HMSO, 1988.

[7] Cartwright K, Reilly S, White D, Stuart J. Early treatment with parenteral penicillin in meningococcal disease. *BMJ* 1992;305:143-147.

[8] Strang RJ, Pugh EJ. Meningococcal infections: reducing the case fatality by giving penicillin before admission to hospital. *BMJ* 1992;305:141-142.

[9] Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.

[10] Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

SELECT BIBLIOGRAPHY

[11.] Granier S, Owen P, Pill R, Jacobson L. Recognising meningococcal disease in primary care: qualiative study of how General Practitioners process clinical and contextual information. *BMJ* 1998;316:276-279.

[12] Riordan FAI, Thomson APJ, Sills SA, Hart CA. Who spots the spots? Diagnosis and treatment of early meningococcal disease in children. *BMJ* 1996;313:1255-1256.

[13] Surtees SJ, Stockton MG, Gietzen TW. Allergy to penicillin: fable or fact? *BMJ* 1991;302:1051-1052.

[14] Office for national statistics. Notifications of infectious diseases and deaths from infectious diseases, 1998-1996.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Accidental and deliberate drug overdose – is a common problem met by Ambulance Clinicians. Accidental poisoning with ingestion, inhalation and skin contact with noxious chemicals is a more rarely encountered emergency. The majority of these episodes of poisoning are dealt with along similar lines with general supportive care, but some require more specific action.

Intentional overdose/self harm – urgently establish the likely physical risk, the person's emotional and physical state, and any requirement for further support services e.g. police, in an atmosphere of respect and understanding.

A rapid mental health assessment should be undertaken including assessment of suicide risk (e.g. The SAD PERSONS scale).[1] (***refer to mental disorder guideline***)

Principles of treatment

In all cases of overdose, management is based upon:

- identification of poisons
- specific treatment for specific poisons
- rapid access to hospital.

HISTORY

Take a history of:

- the event e.g. when did it happen?
- the drug/substance ingested
- the quantity of the drug/substance ingested
- collect all suspected drugs/substances
- mode of poisoning e.g. ingestion, inhalation
- any other factors that may be relevant, e.g. paracetamol taken with alcohol is more toxic to the liver than if taken alone
- has any treatment occurred yet, either by the patient, carers, or health professionals.

ASSESSMENT

Assess **ABCD**'s

Assess the nature of the drug or substance involved. Expert advice should be available to all ambulance crews from the **National Poisons Information Service**. Individual ambulance services will have different arrangements for accessing this information.

Evaluate if there are any **TIME CRITICAL** features present. These may include:

- impaired ABCD's
- impairment of consciousness and respiration are often combined in overdose (***refer to decreased level of consciousness guideline***)
- extreme hypotension (BP <70 mmHg) is common in sedative and anti-depressant overdose
- arrhythmias (***refer to cardiac rhythm disturbance guideline***)
- convulsions (refer to fitting guideline)
- hypothermia – especially if patient has been unconscious for a time (***refer to hypothermia guideline***)
- hyperthermia.

Overdose with a number of drugs is potentially **TIME CRITICAL** – see **ADDITIONAL INFORMATION**.

If any of these features are present, **CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSPORT** to Nearest Suitable Receiving Hospital

Provide a **Hospital Alert Message / Information call**

En-route continue patient **MANAGEMENT** (***see below***).

MANAGEMENT

Follow Medical Emergencies Guidelines, remembering to:

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)

Specifically consider:

- provide effective **AIRWAY** management
- administer high concentration oxygen (O_2) (***refer to oxygen guideline***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***). Oxygen should not be given in paraquat poisoning
- ensure adequate ventilation. If respiration and levels of consciousness are decreased, and drugs such as morphine, heroin or other related drugs are

suspected, provide respiratory support to relieve respiratory depression. Consider the use of naloxone (IV/IM) to reduce respiratory depression (***refer to naloxone protocol for dosages and administration***). Be aware that naloxone can induce sudden recovery with severe agitation and acute withdrawal symptoms

- establish IV access as appropriate en-route to hospital
- if patient is exposed to chemicals, remove patient from the source of chemical at once. In the case of **SKIN CONTAMINATION** with chemicals, remove clothing with care **NOT** to contaminate rescuers, and IRRIGATE with generous amounts of water
- if patient has impaired consciousness (***refer to decreased level of consciousness guideline***) **ALWAYS** check blood glucose level and correct if low (blood glucose <4.0mmol/l) with glucose 10% IV (***refer to glucose 10% protocol for dosages and information***). Glucagon is often not effective in overdoses
- collect any **MEDICINE CONTAINERS** or **ACTUAL MEDICINES** for inspection at hospital
- if patient vomits, retain a sample, if possible, for inspection at hospital
- **NEVER** induce vomiting
- in the case of swallowed caustics and petroleum products dilute by giving a glass of **milk** at the scene wherever possible
- activated charcoal may be of benefit if given within one hour of ingestion. However, at present, it is not routinely recommended for use in pre-hospital care because of the difficulty of administration and the risks of aspiration (which are exacerbated by the risk of motion sickness).

OTHER SUBSTANCES MAY ALSO CAUSE MAJOR PROBLEMS

Carbon Monoxide (CO) poisoning

Organophosphate insecticides:

- respiratory depression
- fits
- wheezing and sweating
- atropine may be needed (***refer to atropine protocol for dosages and administration***).

Paraquat:

- pulmonary
- renal
- liver damage which is progressive and irreversible
- **O_2 THERAPY IS CONTRA-INDICATED IN THESE PATIENTS.**

ADDITIONAL INFORMATION[2]

Overdose with a number of drugs is potentially **TIME CRITICAL**, some of which are dealt with in more detail in the table below:

Table 1 – Potentially Time Critical Drugs

Tricyclic antidepressants: amitriptyline (Tryptizol) clomipramine (Anafranil) dothiepin (Prothiaden) imipramine (Tofranil)	**Serious effects:** • cardiac arrhythmias, hypotension. **Immediate care:** • symptomatic treatment, avoid anti-arrhythmic drugs.
Opiate and opioid drugs: morphine, diamorphine (heroin) compound drugs containing an opioid drug (co-proxomol)	**Serious effects:** • respiratory and cardiac depression. **Immediate care:** • naloxone.
Beta-blockers: Atenolol Sotalol Propranolol	**Serious effects:** • bradycardia. **Pre-hospital care:** • atropine, external pacing.
Digoxin	**Serious effects:** • cardiac arrhythmias. **Pre-hospital care:** • dependent on arrhythmia.

Table 2 – Specific Common Poisons

Alcohol	Alcohol intoxication is a common emergency, and is usually a transient problem. However, when combined with drugs in overdose, it may pose a major problem. When combined with opiate drugs or sedatives, it will further decrease the level of consciousness and increase the risk of **ASPIRATION OF VOMIT**. In combination with paracetamol it increases the risk to the liver. **Remember to check the blood glucose levels** especially in children and young adults who are "drunk", as hypoglycaemia (blood glucose <4.0mmol/l) is common and requires treatment with oral glucose, glucose 10% IV (***refer to glucose 10% protocol for dosages and information***). **NOTE:** Glucagon is not effective in alcohol induced hypoglycaemia.
Carbon monoxide poisoning	The essential requirement with carbon monoxide poisoning is to be alert to the possibilities of the diagnosis. Any patient found unconscious or disorientated in an enclosed space, for example, a patient involved in a fire in a confined space, where ventilation is impaired, or a heating boiler may be defective, should be considered at risk. The supposed cherry red skin colouration in carbon monoxide poisoning, is rarely seen in practice. The immediate requirement is to remove the patient from the source (and administer 100% oxygen) as carbon monoxide is displaced from haemoglobin more rapidly the higher the concentration of oxygen. This must be given continuously.
CS gas	CS gas is now carried by police forces for defensive purposes. CS spray irritates the eyes (tear gas) and respiratory tract. **AVOID** contact with the gas which is given off from patient's clothing. Where possible keep two metres from the patient and give them self-care instructions. Symptoms normally resolve in 15 minutes but may however potentiate or exacerbate existing respiratory conditions. If symptoms are present: • remove patient to a well ventilated area • remove contaminated clothes and place in a sealed bag • remove contact lenses • do not routinely irrigate the eyes as CS gas particles may dissolve and exacerbate irritation. If irrigation is required use copious amounts of saline. Patients with severe respiratory problems should be immediately transported to hospital. Ensure good ventilation of the vehicle during transfer to further care.
Cyanide	Cyanide poisoning is fortunately exceedingly rare and requires specific treatment outside the remit of ambulance Paramedics and technicians. However full supportive therapy should be given to these patients who should be transported immediately to hospital. Poisoning may occur in certain industrial settings. Cyanide "kits" should be available and the kit should be taken to hospital with the patient. The patient requires injection with Dicobalt edetate 300ml IV over 1 minute followed by 250 ml of glucose 10% IV or administration of the currently unlicensed drug hydroxycobalamin.
Iron	Iron pills are regularly used by large numbers of the population including pregnant mothers. In overdose, especially in children, they are exceedingly dangerous. They may cause extensive damage to the liver and gut and these patients will require hospital assessment and treatment. Charcoal is contra-indicated as it may interfere with subsequent treatment.
Paracetamol and Paracetamol-containing compound drugs	Remember that many analgesic drugs contain paracetamol and a combination of codeine or dextropropoxyphene. This, in overdose, creates two serious dangers for the patient. The codeine and dextropropoxyphene are both derived from opioid drugs, and may well produce profound respiratory depression, especially if alcohol is involved. **This can be reversed with naloxone** (***refer to naloxone protocol for dosages and administration***). The second problem is the paracetamol that, even in modest doses (20 – 30 tablets), may induce severe liver and kidney damage in susceptible patients. There is no evidence of this initially and this may lull the patient and ambulance clinician into a false sense of security. It frequently takes 24 to 48 hours for the effects of paracetamol damage to become apparent and urgent blood levels are required to assess the patient's level of risk.
Tricyclic Antidepressants	Poisoning with these drugs may cause impaired consciousness, profound hypotension and cardiac arrhythmias. They are a common treatment for patients who are already depressed. Newer anti-depressants such as fluoxetine (Prozac) and paroxetine (Seroxat) have different effects. ECG monitoring and IV access should be established early in the treatment of tricyclic overdose. Arrhythmias with a pulse should be treated with oxygen initially and anti-arrhythmic only given if there is circulatory collapse. The likelihood of fitting is high, this should be treated as per convulsions guidelines.

Table 3 – Illegal Drugs

Drug	Description	Outward signs	Effects	Administration	Side effects	Treatment
Cocaine	Cocaine is an alkaloid found in the leaves of the South American shrub Erythroxylon Coca. It is a powerfully reinforcing psycho stimulant. Crack is made from cocaine in a process called freebasing.	• Hyperexcitability; agitated, irritable and sometimes violent behaviour • Sweating • Dilated pupils.	Induces a sense of exhilaration, euphoria, excitement, reduced hunger in the user primarily by blocking the re-uptake of the neurotransmitter dopamine in the mid-brain, blocks noradrenaline uptake causing vasoconstriction and hypertension. **NOTE:** Since crack is purer and therefore more potent than street cocaine, it enters the bloodstream more quickly and in higher concentrations. Because it is smoked, crack cocaine's effects are felt more quickly and they are more intense than those of powder cocaine. However, the effects of smoked crack are shorter lived than the effects of snorted powder cocaine.	Cocaine comes in the form of a powder that is almost always 'cut' or mixed with other substances. It can be: • snorted through the nose • rubbed into the gums • smoked • injected. Crack comes in the form of solid rocks, chips, or chunks that are smoked.	The symptoms of a cocaine overdose are intense and generally short lived. Although fairly uncommon, people do die from cocaine or crack overdose, particularly following ingestion (often associated with swallowing 'evidence'). All forms of cocaine/crack use can cause coronary artery spasm, myocardial infarction and accelerated ischaemic heart disease, even in young people. Various doses of cocaine can also produce other neurological and behavioural effects such as: • dizziness • headache • movement problems • anxiety • insomnia • depression • hallucinations. The unwanted effects of cocaine or crack overdose may include some or all of the following: • tremors • dangerous or fatal rise in body temperature • delirium • myocardial infarction • cardiac arrest • seizures including status epilepticus • stroke • kidney failure.	Cocaine toxicity must be treated as a medical emergency and the patient transferred rapidly to hospital. In addition to the usual management of overdose/poisoning, the specific treatment of acute cocaine poisoning in the pre-hospital environment should take into account the likely necessity for: • **O_2 therapy** – administer high concentration oxygen (O_2) (***refer to oxygen guideline***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***) • **assisted ventilation** – consider assisted ventilation at a rate of 12–20 breaths per minute if: SpO_2 is <90% on high concentration O_2, respiratory rate is <10 or >30, expansion is inadequate • monitoring ECG • administer aspirin and GTN if the patient complains of chest pain (***refer to GTN protocol for dosage and administration***). If the patient has a 12-lead ECG suggestive of myocardial infarction and a history of recent cocaine use then administer nitrates but do not administer thrombolytics. • administration of diazemuls, or stesolid if the patient has severe hypertension, chest pain or is fitting (***refer to diazepam protocol for dosage and administration***) • administration of paracetamol and cooling if the body temperature is elevated (***refer to paracetamol protocol for dosage and administration***). **NOTE:** swallowed crack cocaine represents a **severe medical emergency** and needs **URGENT** transportation to hospital **EVEN IF ASYMPTOMATIC.**

Table 4 – Illegal Drugs (continued)

Drug	Description	Outward signs	Effects	Administration	Side effects	Treatment
Amphetamines Bennies, Billy Whiz, Black Beauties, Bumblebees, Clear Rocks, Co-pilots, Crank, Croke, Glass, LA Turnarounds, Mollies, Oranges, Pep Pills, Pink Champagne, Pink Speed, Bombs, Rippers, Rocks, Speed, Splash, Sulph, Sulphate, Wake Ups, Whizz	Amphetamines have been around since the 1930's and have been medically prescribed in the past for diet control and as a stimulant.	Mood swings, extreme hunger, sleeplessness, and hyperactivity.	Increases energy levels, confidence and sociability.	Swallowed, sniffed or rarely injected. Onset about 30 minutes. Lasts for several hours. Used with other drugs or alcohol, the effects are magnified.	**Cardiovascular:** • tachycardia can lead to heart failure even in healthy individuals (***refer to cardiac rhythm disturbance guideline***) • hypertension can produce pinpoint haemorrhages in skin, especially on the face and even lead to stroke. **Central Nervous System:** • "High" feelings • panic • paranoia can produce mental illness picture in long term use • poor sleep • hyperpyrexia. **Gastrointestinal:** • liver failure.	Monitor pulse, blood pressure, cardiac rhythm. Control agitation and treat seizures with diazepam (0.1-0.3 mg/kg body weight for adults or children) or lorazepam (4 mg in an adult and 0.05 mg/kg in a child). Narrow-complex tachycardia with cardiac output is best left untreated. If systolic BP> 220 and diastolic BP > 140 mm Hg in the absence of longstanding hypertension give diazepam (0.1-0.3 mg/kg body weight in adults and children). Correct hypotension by raising the foot of the bed and/or by giving fluids as per medical emergencies. Hyperthermia requires rapid transport to hospital, cooling measures may be undertaken in transit (refer to heat stroke guideline).
LSD	Lysergic acid diethylamide (LSD) or "acid" is a "mind altering drug" that works on the brain to alter the brain's perception of things. It was discovered in 1943, and was used in the 1960s as a "recreational drug".	Agitated, unusual behaviour, clear mental disturbance. The patient may appear distant and display anxious behaviour. **DO NOT** interfere unduly as the trip will self limit, and communication is easier then. Keep patient safe, and remember other drugs and alcohol will aggravate the effects of LSD.	The alterations in perception may be pleasant or "night-marish", or a mix of both, and last for some 12 hours.	Produced on patches of blotting paper, called tabs or trips, often with printed motifs including cartoon characters. Once swallowed they take 30-60 minutes to work. The trip will last up to 12 hours and cannot be stopped. LSD is not addictive but is illegal.	**Central Nervous System:** • visual hallucinations (distortion and delusions), which can cause dangerous behaviour • nightmarish perceptions "bad trips" may last for 12 hours. • nausea and vomiting • personality changes and psychiatric illness • nightmarish flashbacks that can last for years after drug use stops • delusions – false sensations or visions – may affect taste, hearing and vision • can trigger hidden mental illness in individuals • permanent eye damage can occur.	Usually self limiting but sedate if necessary with intravenous diazepam (10 milligrams starting dose for an adult).

Specific Treatment Options

Table 4 – Illegal Drugs (continued)

Drug	Description	Outward signs	Effects	Administration	Side effects	Treatment
3-4 methylene dioxymetham-phetamine (MDMA) – Ecstacy "E"	Commonly known as doves, apples, strawberries, diamonds	Sweating, dilated pupils and elevated mood.	Feeling warm, energetic, and friendly, rising to a state of euphoria.	"E" tablets may be white embossed "headache" sized pills, or coloured capsules. Take 40 minutes to work, lasting for 2 – 6 hours. "E" may not be addictive but is illegal.	**Cardiovascular System:** • tachycardia (***refer to cardiac rhythm disturbance guideline***) • capillary rupture, causing red marking on the face in particular. **Central Nervous System:** • a few people develop hyperpyrexia which can be life-threatening. These patients need urgent transfer to hospital for specialist care. Cooling measures (***refer to heat exhaustion/heatstroke guideline***) may be helpful but should not delay transfer to further care • depression, panic and anxiety may also occur. **Liver and Kidney damage:** • liver failure and severe kidney damage may occur. Cystitis and heavy periods may occur in females who use "E".	Give diazepam 0.1-0.3 mg/kg body weight orally or iv to control anxiety and agitation. Control convulsions with diazepam 0.1-0.3 mg/kg body weight or lorazepam (4mg in an adult and 0.05 mg/kg in a child). If the systolic BP > 220 and diastolic > 140 mm Hg in the absence of long-standing hypertension give diazepam (0.1-0.3 mg/kg body weight in adults and children). Correct hypotension by raising the foot of the bed and/or by giving fluids as per medical emergencies • cooling measures (refer to heat exhaustion/heat stroke guideline) may be helpful but should not delay transfer to further care • depression, panic and anxiety may also occur.

Duty of Care

It is not uncommon to find patients who have or claim to have taken an overdose and subsequently refuse treatment or admission to hospital. An assessment of their mental health state and suicide risk should be made. If, despite reasonable persuasion, the patient refuses treatment, it is not acceptable to leave them in a potentially dangerous situation without any access to care.

Assistance may be obtained from the medical/clinical director or a member of the clinical team and a judgement must be made to seek appropriate advice. Attendance of the Police or local mental health team may be required, particularly if the patient is at risk.

Key Points – Overdose and Poisoning

- Establish: the event, drug or substance involved, the quantity, mode of poisoning, any alcohol consumed.
- **NEVER** induce vomiting.
- If caustics and petroleum products have been swallowed dilute by giving **milk** at the scene wherever possible.
- If the patient vomits, retain a sample, if possible, for inspection at hospital.
- Bring the substance or substances and any containers for inspection at hospital.

SELECT BIBILOGRAPHY

[1] Patterson WM, Dohn HH, Bird J, Patterson GA. Evaluation of suicidal patients: The Sad Persons scale. *Psychosomatics* 1983;24(4):343-349.

[2] (NPIS) TNPIS. TOXBASE Available from: http://www.spib.axl.co.uk/.

[3] National Institute for Clinical Excellence. Self-harm: The short-term physical and psychological management and secondary prevention of self-harm in primary and secondary care: NICE: London, 2004.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

A function of the pulmonary capillary bed is to filter the circulation of the minute blood clots that are a daily occurrence in health. Pathological obstruction of the pulmonary vessels usually presents as one of four types:

1. **multiple small pulmonary emboli** – characterised by progressive breathlessness more commonly identified at outpatients appointments than through emergency presentation due to the long standing nature of the problem
2. **segmental emboli with pulmonary infarction** – may present with pleuritic pain and / or haemoptysis but with little or no cardiovascular compromise
3. **major pulmonary emboli** – obstruction of the larger branches of the pulmonary tree may present with sudden onset of shortness of breath with transient rise in pulse and / or fall in blood pressure. Often a precursor to a massive pulmonary embolism (PE)
4. **massive pulmonary emboli** – often presenting with loss of consciousness, tachypnoea and intense jugular vein distension, and may prove immediately or rapidly (within 1 hour) fatal or unresponsive to cardio-pulmonary resuscitation

Pulmonary embolism and deep vein thrombosis (DVT) can be considered as two manifestations of a single entity; venous thromboembolism (VTE).

Evidence has shown that PE was not diagnosed in as many as 70% of people in whom it was subsequently found to be a main cause of death.

HISTORY[1-5]

See dyspnoea guideline

The most common symptoms of PE are (in order of frequency, most common first):

- dyspnoea
- tachypnoea
- pleuritic pain
- apprehension
- tachycardia
- cough
- haemoptysis
- leg pain / clinical DVT.

PE can present with a wide range of symptoms and is often atypical, however 80-90% of all confirmed PE patients exhibit one or more predisposing factors.

Any patient presenting with any symptom suggestive of PE, but in particular shortness of breath and/or chest pain, who also has a pre-disposing factor should be considered at risk of PE.

Wells criteria can be used to assess the risk of DVT (**Table 1**).

Table 1 – Wells Criteria[6]

Item	Score
Clinical signs and symptoms of DVT (leg swelling and pain with palpation of the deep veins).	3
An alternative diagnosis is less likely than pulmonary embolism.	3
Heart rate >100 beats/minute.	1.5
Immobilization or surgery in the previous 4 weeks.	1.5
Previous DVT/pulmonary embolism.	1.5
Hemoptysis.	1
Maglinancy (treatment ongoing or within previous 6 months or palliative).	1
Total Points	

Probability of PE:

- >6 points – high
- 2 to 6 points – moderate
- <2 points: low

Table 2 – Pre-disposing factors for PE (**at least one present in 80-90% cases**)

Surgery	especially recent: • abdominal • pelvic • hip or knee surgery • post operative intensive care.
Obstetrics	pregnancy
Cardiac	recent acute myocardial infarction
Limb problems	recent lower limb fractures varicose veins lower limb problems secondary to stroke or spinal cord injury
Malignancy	abdominal and/or pelvic in particular advanced metastatic disease concurrent chemotherapy
Miscellaneous	age >40 (and risk continues to increase with age) previous proven PE/DVT immobility thrombotic disorder other recent trauma

Lesser risk factors include air, coach or other travel leading to periods of immobility, especially whilst sitting, oral oestrogen (some contraceptive pills) and central venous catheterisation.

Over 70% of patients who suffer PE have peripheral vein thrombosis and vigilance is therefore of great importance – it may not initially appear logical to check the legs of a patient with chest pain but can be of great diagnostic value in such cases.

ASSESSMENT

Assess **ABCD**'s:

Specifically consider:

- respiratory rate and effort
- any signs and symptoms combined with predisposing factors
- lower limb assessment may reveal unequal/swollen limbs that are occasionally hot and red. Calf tenderness/pain may be present. Extensive leg clots may also lead to femoral tenderness
- evidence of right heart strain (jugular vein distension)
- differential diagnoses include pleurisy, pneumothorax or cardiac chest pain
- evaluate whether any **TIME CRITICAL** features are present. These may include:
  - extreme breathing difficulty
  - cyanosis
  - severe hypoxia (SaO_2 < 90%, unresponsive to O_2).

If any of these features are present **correct A and B problems then transfer to the nearest suitable receiving hospital.**

Provide a Hospital Alert Message/Information Call.

MANAGEMENT[5,7]

Follow **medical emergencies guideline** remembering to:

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)
- Position for comfort and ease of respiration – often sitting forwards but be aware of potential hypotension
- Be prepared for cardio-respiratory arrest

Specifically consider:

- monitor using ECG and pulse oximeter
- be aware that the classic $S_1Q_3T_3$ 12 lead ECG presentation is often **NOT** present, even during massive PE. The commonest finding is a sinus tachycardia.
- administer high concentration oxygen (O_2) (***refer to oxygen guideline***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***)
- consider assisted ventilation at a rate of 12–20 breaths per minute if:
  - SpO_2 is <90% on high concentration O_2
  - respiratory rate is <10 or >30
  - expansion is inadequate
- rapid transfer
- IV access en-route where appropriate.

ADDITIONAL INFORMATION

Whilst there is no specific pre-hospital treatment available, there may be a window of opportunity to deal with massive PE before the patient progresses to cardiac arrest. Thrombolytic therapy has been proved of benefit to many of these patients but, because of the difficulty in accurate diagnosis, this should only be performed in the hospital setting. Surgical intervention (embolectomy) may also be required.

High index of suspicion and rapid transfer are the keys to saving these patients.

Key Points – Pulmonary Embolism

- Common symptoms of PE are dyspnoea, tachypnoea, pleuritic pain, apprehension, tachycardia, cough, haemoptysis, leg pain / clinical DVT
- Risk factors may be identifiable from the history
- Ensure ABCD assessment and apply a saturation monitor early
- Lower limb may be unequal/swollen, occasionally hot and red, tenderness/pain may be present
- Apply oxygen and if in respiratory distress, transfer to further care as a medical emergency.

REFERENCES

[1] Donnamaria V, Palla A, Petruzzelli S. A way to select on clinical grounds patients with high risk for pulmonary embolism: a retrospective analysis in a nested case-control study. *Respiration* 1995;62(4):201-04.

[2] Hoellerich VL, Wigton RS. Diagnosing pulmonary embolism using clinical findings. *Archives of Internal Medicine* 146;9(1699-1704).

[3] Stein PD, Hull RD, Saltzman HA. Strategy for diagnosis of patients with suspected acute pulmonary embolism. *Chest* 1993;103(5):1553-59.

[4] The British Thoracic Society Standards of Care Committee. Suspected Acute Pulmonary Embolism – a practical approach. *Thorax* 1997;52(Suppl 4):S2-S24.

[5] American College of Chest Physicians: Consensus Committee on Pulmonary Embolism. Opinions regarding the diagnosis and management of venous thromboembolic disease [review]. *Chest* 1998;113(2):499-504.

[6] Wells PS, Anderson DR, Rodger M, Ginsberg JS, Kearon C, Gent M, et al. Derivation of a simple clinical model to categorize patients probability of pulmonary embolism: increasing the models utility with the SimpliRED D-dimer. *Thromb Haemost* 2000; 83:4165-20.

[7] Guidelines on diagnosis and management of acute pulmonary embolism. *Eur Heart J* 2000;21(16): 1301-1336.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Pulmonary oedema is a condition that results from the accumulation of fluid in the lungs. Fluid congestion decreases gas exchange across the alveoli, resulting in decreased oxygenation of the blood and, in some cases, accumulation of carbon dioxide (CO_2).

The pathophysiology of pulmonary oedema can be thought of in terms of three factors:

1. flow
2. fluid
3. filter.

Flow

The ability of the heart to eject the blood delivered to it depends on three factors:

1. the amount of blood returning to the heart (preload)
2. the co-ordinated contraction of the myocardium
3. the resistance against which it pumps (afterload).

Pre-load may be increased by over-infusion of IV fluid or fluid retention associated with renal failure. Co-ordinated contraction fails following heart muscle damage (myocardial infarction (MI), heart failure) or due to arrhythmias. After-load increases with hypertension, atherosclerosis, aortic valve stenosis or peripheral vasoconstriction.

Fluid

The blood passing through the lungs must have enough ‘oncotic’ pressure to ‘hold on’ to the fluid portion as it passes through the pulmonary capillaries. As albumin is a key determinant of oncotic pressure, low albumin states lead to pulmonary oedema, e.g. burns, liver failure, nephrotic syndrome.

Filter

The capillaries through which the fluid passes may increase in permeability, e.g., acute lung injury (as in smoke inhalation), pneumonia or drowning.

The commonest cause of pulmonary oedema presenting to UK Ambulance Services is secondary to acute heart failure.[1]

The overall prevalence of heart failure varies between 1-2%, varying with age. 80% of these people will be diagnosed following acute admission to hospital.[1] Approximately 30% will be re-admitted to hospital each year.[2]

The signs and symptoms of pulmonary oedema can be difficult to differentiate from other causes of breathlessness, such as exacerbation of chronic obstructive pulmonary disease (COPD), pulmonary embolism or pneumonia. Therefore, a thorough history and physical examination are needed. Accuracy of Paramedic assessment of acute left ventricular failure (LVF) varies between 77% and 89%[3-5] when compared to physician in-hospital diagnosis.

HISTORY

See dyspnoea guidelines for evidence-based differential diagnoses.

Symptoms:	dyspnoea worsening cough (productive of white sputum) pink frothy sputum waking at night gasping for breath breathlessness on lying down (sleeping on more pillows recently?) anxious / restless.
Symptoms of MI may be associated with:	ankle oedema chest pain worsening of angina.
Previous history:	admissions for ‘heart failure’, ‘fluid on legs/lungs’ previous MI / angina / angioplasty /coronary artery bypass grafting diabetes hypertension.
Current medication:	home oxygen ACE inhibitors beta-blockers diuretics anti-arrhythmic drugs.
Other risk factors for heart disease:	smoking family history high cholesterol diabetes.

ASSESSMENT

Primary Survey: Assess ABCD

Monitoring and baseline observations:

- respiratory rate
- pulse
- blood pressure (BP)
- Initial 3-lead ECG followed by 12-lead ECG.

Specifically assess:

- excessive sweatiness or clamminess
- carotid pulse (rate, rhythm) – tachycardia common
- BP may be high (>170/100), or low in extremis
- raised jugular venous pressure
- central cyanosis.

Chest

- respiratory rate and effort
- fine inspiratory crackling heard over the bases
- wheeze may indicate either asthma or pulmonary oedema
- pitting oedema to the ankles often associated.

ECG changes

ECG may show signs of:

- acute MI
- arrhythmia
- heart strain
- hypertrophy.

Evaluate TIME CRITICAL factors:

- extreme breathing difficulty
- central cyanosis
- hypoxia i.e. oxygen (O_2) saturation levels (SpO_2) <95% or not responding to high concentration O_2 (***refer to dyspnoea guideline***)
- exhaustion
- decreased level of consciousness
- systolic blood pressure (BP) <90mmHg, or tachycardia in beats per minute numerically exceeds systolic BP mmHg measure.

If any of these features are present, start correcting **A** and **B** problems, give high concentration **O_2, LOAD and GO** to **nearest suitable receiving hospital** and treat en route. Provide the hospital with **an alert message / Information call.**

MANAGEMENT

NOTE: Remember that in a significant proportion of patients, the underlying cause will be acute MI. If suspicious, follow the acute coronary syndrome guideline.

Follow **medical emergencies guidelines** remembering to:

start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination).

Administer high concentration oxygen (O_2) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***).

Consider assisted ventilation at a rate of 12–20 breaths per minute if:

- oxygen saturation (SpO_2) is <90% on high concentration O_2
- respiratory rate is <10 or >30
- expansion is inadequate.

Sit the patient upright / prop the trolley up.

Prepare equipment for respiratory or cardiac arrest.

Administer **glyceryl trinitrate** (GTN) (***refer to the GTN drug protocol for dosages and information***), assess for response.

Gain IV access where possible en-route to hospital.

Administer furosemide (***refer to the furosemide drug protocol for dosages and information)***.

Apply continuous positive airway pressure (CPAP) if equipment and training allow, if respiratory distress continues after 10 minutes, as evidenced by:

- persisting tachypnoea (>24 breaths per minute)
- persisting hypoxia (central cyanosis or saturations <90%).

Reassess the patient and reconsider the diagnosis.

If wheeze is a predominant feature, administer salbutamol by nebuliser (***refer to the salbutamol drug protocol for dosages and information***).

Continuous Positive Airway Pressure (CPAP)

CPAP is a single level of positive pressure applied throughout the whole respiratory cycle. Its use requires specialist equipment and training.[6]

- By providing constant pressure, the alveoli are 'splinted open' and gas exchange is promoted throughout the lungs
- Three prospective randomised controlled trials have looked into the use of CPAP in emergency department patients.[7-9] These and others conclude that it is a feasible intervention, which improved survival to hospital discharge, decreased intubation rates and resulted in fewer complications. Importantly, the average age of trial participants was comparable to the population likely to be encountered by Paramedics
- Three pre-hospital studies exist suggesting CPAP is feasible in this setting, and may reduce severity of acute LVF and increase SpO_2 levels.[10-12] Expert opinion has recommended CPAP for use in the pre-hospital environment.[13-15]
- Exclude contra-indications:

  – high likelihood of alternative diagnosis

  – hypotensive (systolic <90mmHg)

  – patients <V on AVPU scale

  – suspected MI

  – renal patients requiring dialysis

  – vomiting

  – unable to tolerate the tight-fitting face mask

  – use an initial starting pressure of 10cmH_2O

Glyceryl Trinitrate (GTN)

The use of nitrates in pulmonary oedema is associated with improved survival to hospital discharge in retrospective cohort studies.[16]

Buccal nitrates produce an immediate reduction in pre-load, comparable with IV GTN.

Nitrates have some benefit as the first line treatment in acute pulmonary oedema.[17]

Furosemide

There is little high-level evidence for or against the use of **furosemide** (***refer to furosemide protocol for dosage and information***) in the treatment of acute pulmonary oedema, but it has been standard treatment for many years.

There is some evidence that furosemide can have a transient adverse vasoconstrictor effect; it is unclear whether this is beneficial or harmful.[18-20]

The acute vasodilator effect of furosemide is inhibited by aspirin.

Pre-hospital trials comparing repeated furosemide vs. repeated nitrates favour the use of nitrates.[21]

Furosemide should only be given after nitrates (which act on both pre-load and after-load).

Other Treatments

The effectiveness of salbutamol in the treatment of pulmonary oedema presenting in the acute setting is unclear. However, owing to the diagnostic uncertainty and possibility for misdiagnosis,[5] it forms part of the management algorithm; this may avoid depriving COPD/asthma patients of vital bronchodilators.

Morphine and diamorphine are commonly used in the in-hospital emergency management of pulmonary oedema. The drugs act by reducing pre-load (venodilation) and also serve to decrease anxiety. Despite their widespread use, there is no conclusive trial evidence showing symptomatic improvement or mortality benefit. There is some concern over their safety for the pre-hospital management of pulmonary oedema[5] and Paramedics currently only have legal authority to administer morphine in order to provide analgesia (***refer to morphine drug protocol for dosage and information***).

Key Points – Pulmonary oedema

- Pulmonary oedema can be difficult to differentiate from other causes of breathlessness, such as exacerbation of COPD, pulmonary embolism or pneumonia; therefore, a thorough history and physical examination are needed
- Symptoms include dyspnoea, worsening cough, pink frothy sputum, waking at night gasping for breath, breathlessness on lying down (sleeping on more pillows recently?), and anxiousness/restlessness
- Prepare equipment for respiratory or cardiac arrest
- Early oxygen and nitrate administration are the key to early treatment
- Sit the patient upright.

REFERENCES

[1] Gibbs C, Davies M, Lip G, editors. *ABC of heart failure*. London: BMJ Books, 2002.

[2] Anonymous. ACE Inhibitors in the treatment of chronic heart failure: effective and cost-effective. *Bandolier* 1994;1(8):59-61.

[3] Tresch DD, Dabrowski RC, Fioretti GP, Darin JC, Brooks HL. Out-of-hospital pulmonary edema: diagnosis and treatment. *Annals of Emergency Medicine* 1983;12(9):533-537.

[4] Hoffman JR, Reynolds S. Comparison of nitroglycerin, morphine and furosemide in treatment of presumed pre-hospital pulmonary edema. *Chest* 1987;92(4):586-593.

[5] Bruns BM, Dieckmann R, Shagoury C, Dingerson A, Swartzell C. Safety of pre-hospital therapy with morphine sulfate. *American Journal of Emergency Medicine* 1992;10(1):53-57.

[6] Tan IKS, Oh TE. *Intensive care manual*. Oxford: Butterworth-Heinemann, 1997.

[7] Crane SD, Elliott MW, Gilligan P, Richards K, Gray AJ. Randomised controlled comparison of continuous positive airways pressure, bilevel non-invasive ventilation, and standard treatment in emergency department patients with acute cardiogenic pulmonary oedema. *Emerg Med J* 2004;21(2):155-161.

[8] Park M, Sangean MC, Volpe MdS, Feltrim MIZ, Nozawa E, Leite PF, et al. Randomized, prospective trial of oxygen, continuous positive airway pressure, and bilevel positive airway pressure by face mask in acute cardiogenic pulmonary edema *Critical Care Medicine* 2004;32(12):2407-2415.

[8] L'Her E, Duquesne F, Girou E, Rosiere XD, Conte PL, Renault S, et al. Noninvasive continuous positive airway pressure in elderly cardiogenic pulmonary edema patients. *Intensive Care Medicine* 2004;30(5):882-888.

[10] Gardtman M, Waagstein L, Karlsson T, Herlitz J. Has an intensified treatment in the ambulance of patients with acute severe left heart failure improved the outcome? *European Journal of Emergency Medicine* 2000;7(1):15-24.

[11] Kosowsky JM, Stephanides SL, Branson RD, Sayre MR. Prehospital use of continuous positive airway pressure (CPAP) for presumed pulmonary edema: a preliminary case series. *Prehospital Emergency Care* 2001;5(2):190-196.

[12] Kallio T, Kuisma M, Alaspaa A, Rosenberg PH. The use of pre-hospital continuous positive airway pressure treatment in presumed acute severe pulmonary edema. *Prehospital Emergency Care* 2003;7(2):209-213.

[13] Julian DG, Boissel JP, De Bono DP, Fox KAA, Heikkila J, Lopez-Bescos L. Acute myocardial infarction: pre-hospital and in-hospital management. The Task Force on the Management of Acute Myocardial Infarction of the European Society of Cardiology. *European Heart Journal* 1996;17(1):43-63.

[14] Arntz HR, Bossaert L, Carli P, Chamberlain D, Davies M, Dellborg M. The pre-hospital management of acute heart attacks. Recommendations of a Task Force of the European Society of Cardiology and the European Resuscitation Council. *European Heart Journal* 1998;19(8):1140-1164.

[15] British Thoracic Society Standards of Care Committee. Non-invasive ventilation in acute respiratory failure: BTS guideline. *Thorax* 2002;57(3):192-211.

[16] Crane SD. Epidemiology, treatment and outcome of acidotic, acute, cardiogenic pulmonary oedema presenting to an emergency department. *European Journal of Emergency Medicine* 2002;9(4):320-324.

[17] Johnson A, Mackway-Jones K. Towards evidence based emergency medicine: best BETs from the Manchester Royal Infirmary. Furosemide or nitrates in acute left ventricular failure. *Emergency Medicine Journal* 2001;18:59-60.

[18] Anonymous. Part 6: advanced cardiovascular life support. Section 6: pharmacology II: agents to optimize cardiac output and blood pressure. *Resuscitation* 2000;46(1-3):155-162.

[19] Francis CS, Siegel RM, Goldsmith SR, Olivari MT, Levine B, Cohn JN. Acute vasoconstrictor response to intravenous furosemide in patients with chronic congestive heart failure: activation of the neurohumoral axis. *Annals of Internal Medicine* 1985;103(1):1-6.

[20] Kraus PE, Lipman J, Becker PJ. Acute preload effects of furosemide. *Chest* 1990;98(1):124-128.

[21] Cotter G, Metzkor E, Kaluski E, Faigenberg Z, Miller R, Simovitz A. Randomised trial of high-dose isosorbide dinitrate plus low-dose furosemide versus high-dose furosemide plus low-dose isosorbide dinitrate in severe pulmonary oedema. *Lancet* 1998;351(9100):389-393.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Sickle cell anaemia is a hereditary condition affecting the haemoglobin contained within red blood cells. It predominantly affects people of African or Afro-Caribbean origin, but can also affect people of Mediterranean, Middle Eastern and Asian origin.

When an acute sickle cell crisis occurs, the red blood cells change shape from the usual bi-concave discs to an irregular or crescent shape. These cells become unable to carry oxygen effectively, and begin to clump together. This leads to reduced blood flow in the capillaries causing tissue hypoxia and a marked reduction in the life of the cells involved.

HISTORY

A previous history of sickle cell anaemia and sickle cell crisis will be present in most cases, with the patient almost always being aware of their condition.

The crisis may follow as a result of an infection, during pregnancy, or after the patient has been anaesthetised.

These painful crises can result in damage to the patient's lungs, kidneys, liver, bones and other organs and tissues. The recurrent nature of these acute episodes is the most disabling feature of sickle cell anaemia, and many chronic problems can result, including leg ulcers, blindness and stroke. Acute coronary chest syndrome (ACS)[1,2] is the leading cause of death amongst sickle cell patients.

Signs & symptoms:

- severe pain, most commonly in the joints of the arms and legs, but also in the back and abdomen
- difficulty in breathing
- high temperature, reduced oxygen (O_2) saturation, cough and chest pain may indicate ACS
- swelling of the joints
- pallor
- tiredness/weakness
- dehydration.

MANAGEMENT[3,4]

- the patient will often be able to guide their care from the usual practice for them and they may have an individualised treatment plan available.

Follow ***medical emergencies guideline***. In addition:

- administer high concentration O_2 (***refer to oxygen protocol for administration and information***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients. High concentration O_2 should be administered routinely, whatever the oxygen saturation, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***), as this helps to counter tissue hypoxia and reduce cell clumping
- check 12-lead ECG. This may be the only indication of the presence of ACS (***refer to ACS guideline***)
- patients with a sickle cell crisis will not have acute fluid loss, but may present with dehydration resulting in reduced fluid in both the vascular and tissue compartments, if they have been ill for an extended period of time. Often this has taken time to develop and will take time to correct. Gradual rehydration over many hours rather than minutes is indicated. Consider obtaining IV access.
- all sickle cell patients should be offered pain relief[5] (***refer to pain management guidelines***), and this should initially be through administration of **Entonox** (***refer to Entonox protocol for administration and dosage***) (**NOTE:** Entonox should not be used for extended periods for sickle cell patients). Consider use of IV analgesia ***(refer to pain management guidelines***)
- position the patient so as to minimise pain
- patients should not walk to the ambulance, as this will exacerbate the effects of hypoxia in the tissues
- unless there is a life-threatening condition present, patients in sickle cell crisis should be transferred to the specialist centre where they are normally treated.

Key Points – sickle cell crisis

- Sickle cell anaemia is a hereditary condition affecting the haemoglobin contained within red blood cells; the cells are irregular in shape and become unable to carry oxygen effectively
- Sickle cell crises can result in damage to the lungs, kidneys, liver, bones and other organs and tissues
- Sickle cell crises can painful and patients should be offered pain relief
- Administer high concentration oxygen therapy
- Acute coronary chest syndrome (ACS) is a leading cause of death amongst sickle cell patients, therefore, check 12-lead ECG.

REFERENCES

[1] Yale SH, Nagib N, Guthrie T. Acute chest syndrome in sickle cell disease. Crucial considerations in adolescents and adults. *Postgraduate medicine* 2000;107(1):215-8, 221-2.

[2] Vichinsky EP, Neumayr LD, Earles AN, Williams R, Lennette ET, Dean D, et al. Causes and Outcomes of the Acute Chest Syndrome in Sickle Cell Disease. *N Engl J Med* 2000;342(25):1855-1865.

[3] Gurkamal V, Harold B, Donohoe R. A Snapshot clinical audit examining the management of Sickle Cell Crisis: London Ambulance Service NHS Trust: Available from: http://www.londonambulance.nhs.uk/aboutus/trustboard/media/Trust%20Board_28Sept04.pdf, 2004.

[4] Department of Health. Report of a working party of the Standing Medical Advisory Committee on Sickle Cell, Thalassaemia and other Haemoglobinopathies. London: HMSO, 1993.

[5] Maxwell K, Streetly A, Bevan D. Experiences of hospital care and treatment seeking for pain from sickle cell disease: qualitative study. *BMJ* 1999;318(7198):1585-1590.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Stroke is common and may be due to either intracranial haemorrhage or infarction.

Over 130,000 people a year in England and Wales have their first stroke, and some 60,000 deaths are associated with stroke annually. Stroke is the third most common cause of death after heart disease and cancer.

85% of strokes are caused by cerebral infarction and 15% by intracranial haemorrhage.

Thrombolytic[1] treatment for cerebral infarction needs to be undertaken early to be successful. In order to determine suitability for treatment patients must undergo a scan, therefore, patients need to be transferred to an appropriate hospital. For the benefits of thrombolysis to be most effective it needs to be administered within 3 hours of onset of symptoms.

The most sensitive features associated with diagnosing stroke and TIA are facial weakness, arm and leg weakness, and speech disturbance.

A TIA occurs when blood supply to part of the brain is briefly interrupted. TIA symptoms, which usually occur suddenly, are the same as those of stroke but are usually short lasting.

The risk of a patient with TIA developing a stroke is high and symptoms should always be taken seriously.

ASSESSMENT

Assess **ABCD**'s

- May have airway and breathing problems (***refer to dyspnoea guideline***).
- Level of consciousness may vary (***refer to decreased level of consciousness guideline***).

Evaluate if the patient has any TIME CRITICAL features – these may include:

- any major ABC problem
- altered level of consciousness.

If any of these features are present, start **correcting A and B problems then transport to the nearest suitable receiving hospital. Local arrangements should be in place to ensure that optimal use is made of specialist in-hospital resources (e.g. stroke unit).**

- Provide a **Hospital Alert Message / Information Call**
- En-route – continue patient **management** (***see below***)
- Assess blood glucose level. Always check if the patient is **diabetic**, as **hypoglycaemia** may present as one sided weakness.

If there are no TIME CRITICAL features present, perform a more thorough assessment as a brief secondary survey:

- assess blood pressure because often in the early stages the blood pressure is markedly raised
- assess Glasgow Coma Scale (GCS)[2] on **unaffected side** – eye and motor assessments may be more readily assessed if speech is badly affected
- assess for presence of speech abnormality, either slurred speech (dysarthria) or problems speaking or with the understanding of speech (dysphasia)
- assess limb power and sensation. May have mainly sensory impairment with numbness or "pins and needles" down affected side
- assess for sudden onset of weakness of the face and arm, as when combined with speech abnormality, stroke is the most likely diagnosis (***refer to Table 1***).

Table 1 – FAST Test[3,4]

Facial Weakness	ask the patient to smile or show teeth. Look for NEW lack of symmetry
Arm Weakness	(motor) – Ask the patient to lift their arms together and hold for 5 seconds. Does one arm drift or fall down? The arm with motor weakness will drift downwards compared to the unaffected limb
Speech	ask the patient to repeat a phrase. Assess for slurring or difficulty with the words or sentence

These components make up the **FAST** (face, arms, and speech test) assessment that should be carried out on **ALL** patients with suspected stroke/TIA.

MANAGEMENT[5-9]

Follow ***medical emergencies guideline***, remembering to:

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)
- correct hypoxia,[10,11] administer high concentration oxygen (O_2) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***)
- consider assisted ventilation at a rate of 12–20 breaths per minute if:
  - oxygen saturation (SpO_2) is <90% on high concentration O_2
  - respiratory rate is <10 or >30
  - expansion is inadequate
  - if not time critical, consider IV access. Patients are often dehydrated: consider IV saline.

Fluid Therapy

Patients having suffered a stroke will not have acute fluid loss, but may present with dehydration resulting in reduced fluid in both the vascular and tissue compartments, if they have been ill for an extended period of time. Often this has taken time to develop and will take time to correct. Rapid fluid replacement into the vascular compartment can compromise the cardiovascular system particularly where there is pre-existing cardiovascular disease and in the elderly. Gradual rehydration over many hours rather than minutes is indicated.

Consider recording 12-lead ECG

Specifically:

- check blood glucose level (***refer to glycaemic emergencies guideline***)
- conscious patients should be conveyed in the semi recumbent position
- patients should be nil by mouth

DO NOT administer aspirin if a stroke/TIA is suspected.

Key Points – STROKE/Transient Ischaemic Attack (TIA)

- Stroke is common and may be due to either intracranial haemorrhage or infarction
- The most sensitive features associated with diagnosing stroke and TIA are facial weakness, arm and leg weakness, and speech disturbance – FAST test
- FAST test should be carried out on ALL patients with suspected stroke/TIA
- **DO NOT** administer aspirin if a stroke/TIA is suspected.

REFERENCES

1 Kwan J, Hand P, Sandercock P. Improving the efficiency of delivery of thrombolysis for acute stroke: a systematic review. *QJM* 2004;97(5):273-279.

2 Teasdale G, Jennett B. ASSESSMENT OF COMA AND IMPAIRED CONSCIOUSNESS: A Practical Scale. *The Lancet* 1974;304(7872):81-84.

3 Harbison J, Hossain O, Jenkinson D, Davis J, Louw SJ, Ford GA. Diagnostic Accuracy of Stroke Referrals From Primary Care, Emergency Room Physicians, and Ambulance Staff Using the Face Arm Speech Test. *Stroke* 2003;34(1):71-76.

4 Nor AM, McAllister C, Louw SJ, Dyker AG, Davis M, Jenkinson D, et al. Agreement Between Ambulance Paramedic- and Physician-Recorded Neurological Signs With Face Arm Speech Test (FAST) in Acute Stroke Patients. *Stroke* 2004;35(6):1355-1359.

5 ACT NOW Expert Panel. Improving patient management and outcomes in acute stroke: a coordinated approach: Available from: http://www.boehringer-ingelheim.com/corporate/asp/news/ndetail.asp?ID=1955, 2004.

6 Adams HP, Adams RJ, Brott TG, Zoppo GJ, Furlan A, Goldstein LB, et al. ASA Scientific Statement: Guidelines for the early management of patients with acute ischaemic stroke. *Stroke* 2003;34(4):1056.

7 Evenson KR, Rosamond WD, Morris DL. Prehospital and in-hospital delays in acute stroke care. *Neuroepidemiology* 2001;20(2):65-76.

8 European Stroke Initiative Executive Committee and the EUSI Writing Committee. European Stroke Initiative Recommendations for Stroke Management – Update 2003. *Cerebrovascular Diseases* 2003;16:311-337

[9] Party ISW. National clinical guidelines for stroke, 2nd edition. London: Royal College of Physicians, 2004.

[10] Pancioli AM, Bullard MJ, Grulee ME, Jauch EC, Perkis DF. Supplemental oxygen use in ischaemic stroke patients: does utilisation correspond to need for oxygen therapy? *Archives of Internal Medicine* 2002;162:49-53.

[11] Ronning OM, Guldvog B. Should stroke victims routinely receive supplemental oxygen therapy? A quasi randomised controlled trial. *Stroke* 1999;30:2033-37.

[12] Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.

[13] Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

METHODOLOGY

Refer to methodology section.

INTRODUCTION

All trauma patients should be assessed and managed in a systematic way, using the primary survey to identify patients with actual or potentially life threatening injuries.

If any abnormality is detected during the assessment, the need for **senior clinical support** should be considered.

This guideline uses **mechanism of injury** and **primary survey** as the basis of care for all trauma patients.

All these guidelines reflect the principles of the Pre-Hospital Trauma Life Support (PHTLS RCS Ed)1, and Advanced Trauma Life Support (ATLS) training courses.

BASIC TRAUMA INCIDENT PROCEDURE

Safety:

1. **SELF –** personal protective equipment is mandatory
2. **SCENE**
3. **CASUALTY.**

Remember, safety is **dynamic** and needs to be continually re-assessed throughout.

Scene Assessment:

- consider resources required
- consider possibility of major incident/chemical, biological, radiological or nuclear (CBRN) (***refer to CBRN guideline***)
- early situation report:
  - operational
  - clinical.

Deliver situation report using **'METHANE'** format[2]

M	**M**ajor incident standby or declared
E	**E**xact location of incident
T	**T**ype of incident
H	**H**azards (present and potential)
A	**A**ccess and egress routes
N	**N**umber, severity and type of casualties
E	**E**mergency services present on scene and further resources required

Remember to check the scene for other casualties e.g. the ejected casualty from an RTC.

Always consider the **mechanism of injury** and the possible injury patterns that may result, but mechanism of injury alone cannot exclude injury.

PATIENT ASSESSMENT

The primary survey should be used to assess and detect any **TIME CRITICAL/POTENTIALLY TIME CRITICAL** problems

Primary Survey – (60 – 90 seconds for assessment)

- **A**IRWAY with spine control
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)
- **E**XPOSURE and ENVIRONMENT

Stepwise Patient Assessment and Management

In **ABCDE** management, problems should be dealt with as they are encountered, i.e. do not move onto breathing and circulation until airway is secured. Every time an intervention has been carried out, re-assess the patient.

At each stage consider:

- need for rapid evacuation to hospital
- need for early senior clinical support.

Airway Assessment

Look	for obvious obstructions e.g. teeth, foreign bodies, vomit, blood or soot/burns/oedema in burn victims
Listen	for noisy airflow e.g. snoring, gurgling or no airflow
Feel	for air movement

AT ALL TIMES immobilise the whole spine until it has been cleared, this will usually be with manual immobilisation initially (***see neck and back injury guideline***).

Stepwise Airway Management

Correct any airway problems immediately by:

- positioning
- suction (if available and appropriate)
- jaw thrust (no neck extension)
- oropharyngeal airway
- nasopharyngeal airway
- laryngeal mask airway (if appropriate)
- endotracheal intubation
- surgical airway (needle cricothyroidotomy).

All steps should be considered but may be omitted if not considered appropriate.

Remember: **ALL** trauma patients need high concentration oxygen.

Breathing Assessment

Expose the chest:

Look	for cyanosis, respiratory rate, depth and equality of breathing and assess effort. Look for obvious chest injury e.g. open wounds, flail segment. Remember to look in the axillae
Listen	for altered breathing patterns, auscultate to assess air entry and compare sides, percuss for hyporesonance or hyperresonance
Feel	for depth and equality of chest movement, crepitus of rib fractures or abnormal movement flail segments
Note	remember sides and back

Assess adequacy of breathing

- respiratory rate and depth (<10 or >30 breaths per minute (bpm))
- equality of air entry
- pulse oximetry should be undertaken
- oxygen saturation (SpO_2) <95% except in patients with COPD (***refer to COPD guideline***).

If the assessment elicits any suggestion of abnormal breathing then immediately assess for signs of life-threatening injury utilising **'TWELVe'**

Examine the neck and chest for the signs of:

T	**T**racheal deviation
W	**W**ounds, bruising, swelling
E	**E**mphysema (surgical)
L	**L**aryngeal crepitus
V	**V**enous engorgement (jugular)

To **exclude** life-threatening injuries:

- tension pneumothorax
- open pneumothorax
- massive haemothorax
- flail chest.

Stepwise Breathing Management

Correct any breathing problems immediately:

- administer high concentration oxygen (O_2) via a non-rebreathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except for patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***)
- For sucking chest wounds (***refer to thoracic trauma guideline***)
- decompress tension pneumothorax if present, trained and authorised to do so (***refer to thoracic trauma guideline***)
- flail segment may be splinted with a hand.

Consider assisted ventilation at a rate of 12–20 respirations per minute if any of the following are present:

- oxygen saturation (SpO_2) <90% on high concentration oxygen
- respiratory rate <10 or >30bpm
- inadequate chest expansion.

Restraint (POSITIONAL) Asphyxia

If the patient's condition requires that they are physically restrained (e.g. by Police Officers) in order to prevent them injuring themselves or others or for the purpose of being detained under the Mental Health Act, then it is paramount that the method of restraint allows both for a patent airway and adequate respiratory volume. **Under these circumstances it is essential to ensure that the patient's airway and breathing are adequate at all times.**

Circulatory Assessment

Look for and control external haemorrhage.

Remain alert to the possibility of internal bleeding which requires immediate evacuation to hospital:

- assess skin colour and temperature
- palpate for a radial pulse – if present, implies a systolic BP of 80-90mmHg and adequate perfusion of vital organs, but this is highly variable.[3] If absent, feel for a carotid pulse which, if present, implies a systolic BP of about 60mmHg
- assess pulse rate and volume
- check capillary refill time **centrally** i.e. forehead or sternum.

Consider hypovolaemic shock and beware of its early signs:

- pallor
- cool peripheries
- anxiety, abnormal behaviour
- increased respiratory rate
- tachycardia.

Look for signs of blood loss in five places (**see below**):

1. external	
2. chest	during **B** assessment
3. abdomen	by palpation (limited value) and observation of external marks and bruises
4. pelvis	gently spring once only
5. long bones	open or closed fractures

Recognition of Shock

Shock is difficult to diagnose. Certain groups of patients hide the signs of shock, notably, children, pregnant women, those on medication such as beta blockers, and the physically fit; for these groups of patients the signs of shock appear late:

- in adults, blood loss of 750-1000ml will produce little evidence of shock; blood loss of 1000-15000ml is required before more classical signs of shock appear
- **REMEMBER** this loss is from the circulation **NOT** necessarily from the body.

Stepwise Circulatory Management

Correct any circulatory problems immediately by:

1. Arresting external haemorrhage with the use of:

- direct pressure
- pressure on proximal artery
- tourniquet if exsanguinating.

2. Consider splinting:

- major long bone fractures with various devices
- pelvic fractures e.g. triangular bandages, inverted Kendrick Extrication Device or pelvic straps.

NOTE: Internal or uncontrolled haemorrhage requires rapid evacuation to hospital with alert message.

Fluid Therapy

Obtain IV access. (large bore cannula)

Current research shows little evidence to support the routine use of IV fluids in adult trauma patients. In circumstances such as penetrating chest and abdominal trauma, survival worsens with the routine use of IV fluids.[4]

Fluids may raise the blood pressure, cool the blood and dilute clotting factors, worsening haemorrhage. Therefore, current thinking is that fluids should only be given when major organ perfusion is impaired.

If there is visible external blood loss greater than 500mls, fluid replacement should be commenced with a 250ml bolus of crystalloid.

Central pulse **ABSENT**, radial pulse **ABSENT** – is an absolute indication for urgent fluid. If the patient has a carotid pulse but no radial pulse then other clinical factors should also be considered before decision on fluid administration.

Central pulse **PRESENT**, radial pulse **ABSENT** – is a relative indication for urgent fluid depending on other indications including tissue perfusion and visible/expected blood loss.

Central pulse **PRESENT**, radial pulse P**RESENT – DO NOT** commence fluid replacement,[5] unless there are other signs of poor central tissue perfusion (e.g. altered mental state, cardiac rhythm disturbance).

Re-assess vital signs prior to further fluid administration.

DO NOT delay at scene for fluid replacement; wherever possible cannulate and give fluid **EN-ROUTE TO HOSPITAL.**

Disability Assessment:

Note initial level of responsiveness on AVPU scale, and time of assessment (***see below***).

- **A** Alert
- **V** Responds to voice
- **P** Responds to painful stimulus
- **U** Unresponsive

Assess and note pupil size, equality and response to light.

Any patient with altered mental status should have their blood glucose checked to rule out hypo or hyperglycaemia as the cause.

Exposure/Evaluation

At this stage further monitoring may be applied.

Care must be taken to ensure patient does not suffer from exposure to cold/wet conditions.

Evaluate whether the patient is time critical or non-time critical on the basis of the primary survey.

Non-trapped time critical patients need to be appropriately packaged and transported **IMMEDIATELY** to the nearest appropriate hospital.

If the patient remains absolutely trapped, consider early senior clinical support.

En-route, provide a **HOSPITAL ALERT MESSAGE** and continue **PATIENT RE-ASSESSMENT/MANAGEMENT.**

Consider the need for analgesia (*refer to pain management guidelines*).

Secondary survey will usually be undertaken during transit to hospital. In critical trauma it may not be possible to undertake the secondary survey before arrival at hospital.

Head

- re-assess airway
- check skin colour and temperature
- palpate for bruising / fractures
- check pupil size and activity
- examine for loss of cerebrospinal fluid
- check Glasgow Coma Scale[6,7] (***see Appendix 1***)
- assess for signs of basal skull fracture.

Neck

- the collar will need to be loosened for proper examination of the neck
- re-assess for signs of life-threatening injury:

- **T** **T**racheal deviation
- **W** **W**ounds, bruising, swelling
- **E** **E**mphysema (surgical)
- **L** **L**aryngeal crepitus
- **V** **V**enous engorgement (jugular)

- assess and palpate for spinal tenderness, particularly note any bony tenderness.

Chest

- re-assess rate and depth of breathing
- re-assess for contusions, seatbelt marks and flail segments
- feel for rib fractures, instability and surgical emphysema
- auscultate for breath sounds in all lung fields and assess/re-assess the chest for signs of:
  - pneumothorax
  - haemothorax
  - pulmonary contusion
  - flail segment
  - cardiac tamponade.

For further information ***refer to the thoracic trauma guideline***.

Abdomen

- examine for open wounds, contusions, seatbelt marks
- feel for tenderness and guarding, examining the whole abdomen
- remember to examine the back and the front.

Pelvis

- only ‘spring’ the pelvis once; this avoids the risk of starting catastrophic bleeding
- assume a pelvic injury based on the mechanism
- blood may be visible from urethra / vagina.

Lower and Upper Limbs

- examine lower limbs then upper limbs
- look for wounds and evidence of fractures
- check for MSC in **ALL** four limbs:

M	MOTOR	Test for movement
S	SENSATION	Apply light touch to evaluate sensation
C	CIRCULATION	Assess pulse and skin temperature

- assess pulse and skin temperature.

SPECIAL CIRCUMSTANCES IN TRAUMA

The Trapped Patient

Entrapment can be:

- **Relative:** trapped by difficulty in access/egress from the wreckage, including the physical injury stopping normal exit
- **Absolute:** firmly trapped by the vehicle and its deformity necessitating specialised cutting techniques to free the patient[8]

  All absolutely trapped patients are at high risk of having suffered significant transfer of energy and therefore are at increased risk of severe injury. Senior Clinical help should be mobilised at the earliest opportunity.

Actions:

- perform assessment as per trauma guideline
- liaise / mobilise other services as necessary
- give situation report to control
- form a rescue plan
- provide analgesia (***refer to pain management guidelines***).

Key Points – Trauma Emergencies

- Overall assessment of safety: self, scene, casualties is of prime importance.
- The primary survey forms the basis of patient assessment, with due consideration for cervical spine control.
- Early application of oxygen and arrest of external haemorrhage can be life saving.
- Consider mobilising senior clinical support at the earliest opportunity.

REFERENCES

1 Pre-hospital Trauma Course. In: Thurgood A, Hall J, editors: http://www.marsbasics.co.uk/pdf/87256trauma_course_final.pdf, 2005.

2 Hodgetts TJ, Porter C. *Major incident management system* London: BMJ Books, 2002.

3 Deakin CD, Hicks IR. AB or ABC: pre-hospital fluid management in major trauma. *Emerg Med J* 1994;11(3):154-157.

4 Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.

5 Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

6 Norwood SH, McAuley CE, Berne JD, Vallina VL, Creath RG, McLarty J. A Prehospital Glasgow Coma Scale Score <= 14 Accurately Predicts the Need for Full Trauma Team Activation and Patient Hospitalization after Motor Vehicle Collisions. *Journal of Trauma-Injury Infection & Critical Care* 2002;53(3):503-507.

7 Teasdale G, Jennett B. ASSESSMENT OF COMA AND IMPAIRED CONSCIOUSNESS: A Practical Scale. *The Lancet* 1974;304(7872):81-84.

8 Mackenzie R, Sutcliffe R. Pre-hospital care: the trapped patient. *J R Army Med Corps* 2000;146(1):39-46.

METHODOLOGY

Refer to methodology section.

Appendix 1 – Glasgow Coma Scale

GLASGOW COMA SCALE	
Item	**Score**
Eyes Opening:	
Spontaneously	4
To speech	3
To pain	2
None	1
Motor Response:	
Obeys commands	6
Localises pain	5
Withdraws from pain	4
Abnormal Flexion	3
Extensor response	2
No response to pain	1
Verbal Response:	
Orientated	5
Confused	4
Inappropriate words	3
Incomprehensible sounds	2
NO verbal response	1

INTRODUCTION

Trauma to the abdomen can be extremely difficult to assess even in a hospital setting. In the field, identifying which abdominal structure/s has been injured is less important than identifying that abdominal trauma itself has occurred.

It is therefore, of major importance to note abnormal signs associated with blood loss, and establish that abdominal injury is the probable cause, rather than being concerned with, for example, whether the source of that abdominal bleeding originates from the spleen or liver.

There may be significant intra-abdominal injury with very few, if any, initial indications of this at the time the abdomen is examined by the Paramedic at the scene.

HISTORY

Observe the mechanism of injury.

In the road traffic collision (RTC) situation, look for impact speed and severity of deceleration. Was a seat belt worn? Lap belts are particularly associated with torn or perforated abdominal structures.

In cases of stabbing and gunshot wound, what was the length of the weapon or the type of gun and the range?

ASSESSMENT

Assess and correct deficits with:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)

Evaluate whether a patient is **TIME CRITICAL/ POTENTIALLY TIME CRITICAL or NON-TIME CRITICAL** following criteria as per trauma emergencies guideline.

If patient is **TIME CRITICAL/POTENTIALLY TIME CRITICAL**, immobilise cervical spine if indicated ***(refer to neck and back guideline)*** and go to nearest suitable receiving hospital with a Hospital Alert Message.

En-route – continue patient **MANAGEMENT *(see below).***

In **NON-TIME CRITICAL** patients, perform a more thorough patient assessment with a brief secondary survey.

Specifically assess:

- assess both chest and abdomen as many abdominal organs are covered by the lower ribs, and the lower chest margins extend over abdominal structures (e.g. liver and spleen).
- examine abdomen for external wounds, contusions, seat belt abrasions, evisceration (protruding organs).
- assess for tenderness, guarding and rigidity by **GENTLE** palpation of all four areas (quadrants) of the abdomen.
- consider the potential for pelvic injuries and gently assess lower ribs for evidence of fractures.
- shoulder tip pain may indicate pathology in the abdomen which is irritating the diaphragm and should increase suspicion of injury.

NOTE: Many patients found later to have significant **INTRA-ABDOMINAL TRAUMA** show little or no evidence of this in the early stage, so do **NOT** rule out injury if initial examination is normal.

MANAGEMENT

Follow Trauma Emergencies Guideline, remembering to:

- ensure **ABCD**'s and immobilise cervical spine (***refer to neck and back guideline***).

Respiration

- administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-rebreathing mask, using the stoma in laryngectomee and other neck breathing patients. High concentration O_2 should be administered routinely, whatever the oxygen saturation, in patients sustaining major trauma and long bone fracture, except for patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***)
- consider assisted ventilation at a rate of 12–20 respirations per minute if any of the following are present:
  - oxygen saturation (SpO_2) is <90% on high concentration O_2
  - respiratory rate is <10 or >30bpm
  - inadequate chest expansion.

Fluid Therapy

Obtain IV access.

Current research shows little evidence to support the routine use of IV fluids in adult trauma patients. In circumstances such as penetrating chest and abdominal trauma, survival worsens with the routine use of IV fluids.[1]

Fluids may raise the blood pressure, cool the blood and dilute clotting factors, worsening haemorrhage. Therefore, current thinking is that fluids should only be given when major organ perfusion is impaired.

If there is visible external blood loss greater than 500mls, fluid replacement should be commenced with a 250ml bolus of crystalloid.

Central pulse **ABSENT**, radial pulse **ABSENT** is an absolute indication for urgent fluid. If the patient has a carotid pulse but no radial pulse then other clinical factors should also be considered before decision on fluid administration.

Central pulse **PRESENT**, radial pulse **ABSENT** is a relative indication for urgent fluid depending on other indications including tissue perfusion and blood loss.

Central pulse **PRESENT**, radial pulse **PRESENT DO NOT** commence fluid replacement,[2] unless there are other signs of poor central tissue perfusion (e.g. altered mental state, cardiac rhythm disturbance).

Re-assess vital signs prior to further fluid administration.

DO NOT delay at scene for fluid replacement; wherever possible cannulate and give fluid **EN-ROUTE TO HOSPITAL**.

Specifically consider:

- cover exposed bowel with warmed dressings soaked in crystalloid solution.
- **DO NOT** attempt to push organs back into the abdomen.
- impaling objects, e.g. a knife must be **LEFT IN-SITU** for removal under direct vision in the operating theatre. Any **impaling objects** should be adequately secured prior to transfer to further care. If the impaling object is pulsating, then it should not be completely immobilised, but allowed to pulsate.
- consider the mechanism of injury and immobilise as per the neck and back trauma guideline.
- if pain is severe, patient may self-administer Entonox ***(refer to entonox drug protocol for administration and information)*** but be cautious if the injury could also affect the thoracic cavity.
- in cases of more severe pain use appropriate analgesia ***(refer to pain management guidelines)*** as this has been shown to improve subsequent management.

ADDITIONAL INFORMATION

The abdomen is divided within into three anatomical areas:

1. **abdominal cavity**
2. **pelvis**
3. **retro-peritoneal area.**

1. Abdominal Cavity

The abdominal cavity extends from the diaphragm to the pelvis. It contains the stomach, small intestine, large intestine, liver, gall bladder and spleen.

Remember the upper abdominal organs are partly in the lower thorax and lie under the lower ribs. Fractures of lower ribs will endanger upper abdominal structures such as the **LIVER** and **SPLEEN**.

2. Pelvis

The pelvis contains the bladder, the lower part of the large intestine and, in the female, the uterus and ovaries. The iliac artery and vein lie over the posterior part of the pelvic ring and may be torn in pelvic fractures, adding to already major bleeding.

3. Retro-peritoneal Area

The retroperitoneal area lies against the posterior abdominal wall, and contains the kidneys and ureters, pancreas, abdominal aorta, vena cava, and part of the duodenum.

These structures are attached to the posterior abdominal wall, and are often injured by the shearing forces involved in rapid deceleration.

ABDOMINAL INJURIES

Blunt

This is the most common pattern of injury seen and is related to direct blows to the abdomen or rapid deceleration.

The spleen, liver and "tethered" structures such as duodenum, small bowel and aorta are the most commonly injured.

Penetrating

Stab wounds, gunshot wounds and other penetrating injuries.

Stab Wounds

Stab injures **MUST** be assumed to have done serious damage until proved otherwise. Damage to liver, spleen or major blood vessels may cause massive haemorrhage. Mortality from isolated abdominal stab wounds is about 1-2%.

Remember that upper abdominal stab wounds may have caused major intra-thoracic damage, if the weapon was directed upwards (***refer to thoracic trauma guideline).***

Similarly, chest stabbing injuries may also cause intra-abdominal injury.

Gunshot Wounds

Gunshot wounds (GSW) tend to cause more direct than indirect injury, due to the forces involved and the chaotic paths that bullets may take. The same rules apply to associated intra-thoracic injuries.

Key Points – Abdominal Trauma

- Abdominal trauma can be difficult to assess.
- Identifying that abdominal trauma has occurred is more important than identifying which structure/s have been injured, therefore note signs associated with blood loss.
- Observe mechanism of injury.
- Ensure **ABC**'s and immobilise cervical spine.
- Transport to the nearest appropriate facility, providing an alert message en-route.

REFERENCES

[1] Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.

[2] Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

METHODOLOGY

Refer to methodology section; see below for abdominal trauma search strategy.

Abdominal trauma search strategy

Electronic databases searched:

- Ovid
- AMED
- British Nursing Index
- Medline
- CINAHL.

Search strategy:

(Assessment OR Examination) AND (Abdomen OR Abdominal)

(Trauma OR Injury) AND (Abdomen OR Abdominal).

Additional sources searched:

Prehospital Trauma Life Support (PHTLS) – http://www.naemt.org/PHTLS

The American Trauma Society – http://www.amtrauma.org

Trauma.org – http://www.trauma.org

Health Canada – http://www.hc-sc.gc.ca

The National Guideline Clearinghouse (NGC) – http://www.guideline.gov

Bickley LS. *Bates' Guide to Physical Examination and History Taking*. Philadelphia: Lippincott Williams & Wilkins, 2003

Caroline NL. *Emergency Care in the Streets*. Boston, Mass: Little, Brown and Company, 1995.

INTRODUCTION

Burns arise in a number of accident situations, and may have a variety of accompanying injuries or pre-existing medical problems associated with the burn injury. Scalds, flame or thermal burns, chemical and electrical burns will all produce a different burn pattern, and inhalation of smoke or toxic chemicals from the fire may cause serious accompanying complications.

A number of burn cases will also be seriously injured following falls from a height in fires, or injuries sustained as a result of road traffic collision where a vehicle ignites after an accident.

Explosions will often induce flash burns, and other serious injuries due to the effect of the blast wave or flying debris.

Inhalation of superheated smoke, steam or gases in a fire, will induce major airway swelling and respiratory obstruction. This is especially important in children, where inhalation of steam, even from a kettle has been known to cause rapid fatal airway obstruction.

Preceding long term illness, especially chronic bronchitis and emphysema, will seriously worsen the outcome from airway burns.

Remember that a burn injury may be preceded by a medical condition causing a collapse (e.g. elderly patient with a stroke collapsing against a radiator).

Burns can be very painful and treatment of pain is important ***(refer to pain management guideline)***.

ASSESSMENT

Ensure safety of yourself the patient and the scene.

Stop the burning process

Assess and correct deficits with:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)

Specifically assess:

- assess airway for signs of burns which include:
  - **soot** in the nasal and mouth cavities
  - **cough** and hoarseness
  - coughing up **blackened** sputum
  - **difficulty** with breathing and swallowing
  - **blistering** around the mouth and tongue
  - **scorched** hair, eyebrows or facial hair.
- assess breathing for rate, depth and any breathing difficulty.
- evaluate whether patient has any **TIME CRITICAL features**. These may include:
  - any major ABCD problems
  - any signs of airway burns, soot or oedema around the mouth and nose
  - history of hot air or gas inhalation; these patients may initially appear well but can deteriorate very rapidly
  - any evidence of circumferential (completely encircling) burns of the chest, neck, limb
  - any significant facial burns
  - burns >25% body surface area (BSA) in adults
  - presence of other major injuries.
- if any of these features are present, **IF POSSIBLE CORRECT A AND B PROBLEMS then initiate TRANSFER to nearest suitable receiving hospital with a Hospital Alert Message.**
- any patient who has a high risk history or is starting to develop respiratory problems should be immediately transported to hospital as they can deteriorate very rapidly and need complex airway intervention.

Assessment of burn severity using a method with which you are familiar.[1]

- Wallace's Rule of Nines or the Lund and Browder chart
- Half burnt/half not burnt approach to give burn area of:
  - >50%
  - 25-50%
  - 12.5-25%
  - <12.5%.

Use all of the burn area, including reddening, do not try to differentiate between levels of burn (first, second, third degree etc).

Only a rough estimate is required, an accurate measure is not possible in the early stages.

En-route continue patient **MANAGEMENT** (***see below***).

If patient is non-time critical, perform a more thorough patient assessment with a brief secondary survey.

It is **IMPORTANT** to **document the TIME the burn occurred**, as is the time and volume of **ALL** infusions, as all subsequent fluid therapy is calculated from the time of the burn onwards.

In **ELECTRICAL** burns it is important to search for **entry and exit sites**. Assess ECG rhythm. The extent of burn damage in electrical burns is often impossible to assess fully at the time of injury.

In **SCALDS**, the **skin contact time and temperature** of the burning fluid determines the depth of the burn. Scalds with boiling water are frequently of extremely short duration as the water flows off the skin rapidly. Record the type of clothing, e.g. wool retains the hot water. Those resulting from hot fat and other liquids that remain on the skin may cause significantly deeper and more serious burns. Also the **time to cold water and removal of clothing** is of significant impact and should be included in pre-arrival advice from Control.

In **CHEMICAL** burns, it is vital to note the **nature of the chemical.** Alkalis in particular may cause deep, penetrating burns, sometimes with little initial discomfort. Certain chemicals such as phenol or hydrofluoric acid can cause poisoning by absorption through the skin and therefore must be irrigated with **COPIOUS**[2] amounts of water.

CIRCUMFERENTIAL (Encircling completely a limb or digit) full thickness burns, may be "limb threatening", and require early in hospital incision/release of the burn area along the length of the burnt area of the limb (escharotomy).

HISTORY

What happened? When did it happen?

What temperature (e.g. boiling water, hot fat etc.) were they exposed to and for how long? What first aid was undertaken?

Were any other injuries sustained?

Are any circumstances present that increase the risk of airway burns (confined space, prolonged exposure)?

Any evidence of co-existing or precipitating medical conditions.

MANAGEMENT

Follow Trauma Emergencies Guideline, remembering to:

- ensure **ABC**'s and immobilise C-spine if any potential for neck trauma.
- intubate/assist ventilation if airway obstructed or ventilation is impaired.
- administer high concentration oxygen (O_2) via a non-rebreathing mask, using the stoma in laryngectomee and other neck breathing patients, whatever the SpO_2, as readings may be false due to carboxyhaemoglobin.

Specifically consider:

- if the patient is wheezing as a result of smoke inhalation, nebulisation with salbutamol and an O_2 flow of at least 6-8 litres per minute will frequently improve symptoms ***(refer to the drug protocols for dosages and information)***. It is important, wherever possible, to obtain a peak flow reading both before and after nebulisation, to assess and record its effect.
- after initial irrigation with water, cut off burning, or smouldering clothing, providing it is not adhering to the skin.
- cover the burn area with cling film, wrapping may have a constricting effect so smaller pieces are better than a circumferential sheet. Cling film provides a good dressing through which a burn can be reviewed. Infection is directly related to the number of times a burn is dressed and then uncovered to be assessed by another person.
- continue to irrigate over the cling film or gel based dressing whilst ensuring the rest of the patient is warmly wrapped. Be aware of the potential for hypothermia induced by continual irrigation. It is rare to need more than 10 minutes irrigation except for chemicals that adhere to the skin (e.g. phosphorus).
- gel based dressings should be considered only in minor (<12.5% BSA) burns due to the potential for hypothermia.
- **in alkali burns,** irrigate with water en-route to hospital, as it may take hours of irrigation to neutralise the alkali. This also applies to eyes that require copious and continual irrigation with water or saline.
- **chemical** burns should **NOT** be wrapped in cling-film but covered with wet dressings ***(refer to CBRN guideline).***

- if either the burn area is >25% BSA, or the circulation is compromised by accompanying injuries, or IV analgesia may be required, then obtain IV access and commence slow infusion of crystalloid IV **EN-ROUTE TO HOSPITAL**. ***(see additional information).***
- provide analgesia as required e.g. morphine if the pain is severe ***(refer to the morphine drug protocol for dosages and information)***. Cooling and application of dressings frequently eases pain, but care must be taken not to "over-cool" the patient as hypothermia is a risk. This is a particular risk in children. Entonox ***(refer to the entonox drug protocol for administration and information)*** is not appropriate in burns if > 50% O_2 is required.
- paracetamol suspension may be useful in small children with scalds ***(refer to the paracetamol drug protocol for dosages and information).***

With burn cases, in addition to the usual clinical report details transmitted via radio, the following information should be transmitted:

- **extent** of burn **area**
- **time** of burn
- **burning agent**
- any indication of airway burns
- any evidence of burns involving the entire or majority of the circumference of the chest, neck or a limb.

ADDITIONAL INFORMATION

In some areas with specialist burns units direct admission guidelines may be in place.

Fluid Therapy

If an area of greater than 25% of the body is affected and the time from injury to hospital is likely to be in excess of an hour then fluid therapy should commence as below.

- Secure IV access in an un-burnt limb en-route to hospital, with largest bore IV cannula possible. Avoid areas where a burned area lies above the IV site, as when the burnt tissue swells, the veins will be compressed and the IV will cease to function.
- Where IV access is particularly difficult, leave this until the patient reaches hospital **DO NOT delay to obtain IV access**.
- Crystalloid should be used in the following initial doses over the first 30 minutes from time of injury:

Age	Volume
Adult	1000 ml
5-11 years	500 ml
<5 years	10 ml/kg

If the burn is complicated by other traumatic injury then standard fluid therapy should take precedence.

Non-Accidental Injury

You must always be mindful of the possibility of non-accidental injury. Ensure all documentation is comprehensive and, where possible, retain samples of clothing etc for the hospital. The role of the Ambulance Service is to report the **possibility** of non-accidental injury to the appropriate agencies, not to confirm that it has taken place ***(refer to child protection guideline)***.

Key Points – Burns

- Airway status can deteriorate rapidly and may need complex interventions available at the emergency departments.
- Stopping the burning process is essential.
- The time from burning is an essential piece of information.
- Consider transport to regional burns centres as local policy / protocol dictates.
- Pain relief is important.

REFERENCES

[1] Collis N, Smith G, Fenton OM. Accuracy of burn size estimation and subsequent fluid resuscitation prior to arrival at the Yorkshire Regional Burns Unit: a three year retrospective study. *Burns* 1999;25(4):345-51.

[2] Cooke MW, Ferner RE. Chemical burns causing systemic toxicity. *Arch Emerg Med* 1993;10(4):368-71.

SELECT BIBLIOGRAPHY

Gordon M, Goodwin CW. Burn management: initial assessment, management, and stabilization. *Nursing Clinics of North America* 1997;32(2):237-49.

Ashworth HL, Cubison TCS, Gilbert PM. Treatment before transfer: the patient with burns. *Emergency Medicine Journal* 2001;18:349-351.

Allison K, Porter K. Consensus on the pre-hospital approach to burns patient management. *Emergency Medical Journal* 2004;21:112-114.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Electrocution may result in burn injury to the skin and deeper tissues including muscles and nerves. As a result of being thrown, patients may also sustain mechanical injury such as joint dislocation.

Electrocution may result in cardiac arrhythmias and cardio-respiratory arrest. Sustained muscle contraction from the electrical current may produce respiratory arrest or other mechanical damage.

Arrhythmias are unlikely to develop with domestic voltage once the patient is isolated from the current; with high voltage sources arrhythmias may develop later.

HISTORY

Do not approach the patient until any local electrical supply is cut off and you are certain it is safe to approach.

Establish how the patient was electrocuted and the voltage of the supply involved. The important information is whether it is domestic (240 volts) low voltage (less than 240 volts) or high voltage (greater than 480 volts).

ASSESSMENT

Assess and correct deficits with:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)

If the patient is in cardiorespiratory arrest refer to adult or child advanced life support guidelines.

Assess for time critical features:

- cardiorespiratory arrest
- major ABCD problem
- facial or airway burn
- cardiac arrhythmia compromising circulation
- extensive burns
- evidence of significant mechanical injury.

IF PRESENT CORRECT AIRWAY AND BREATHING PROBLEMS AND TRANSPORT RAPIDLY TO NEAREST SUITABLE RECEIVING HOSPITAL WITH A PRE-ALERT MESSAGE.

If no time critical features, complete primary and secondary assessment for burn and mechanical injuries prior to transport.

MANAGEMENT[1,2]

Take the defibrillator to the patient.

Manage **ABCD**'s.

Immobilise the cervical spine when there is risk of injury (refer to neck and back trauma guideline).

Administer high concentration oxygen (O_2) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except in patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***)

Monitor patient with ECG and pulse oximetry.

Manage burns and mechanical injuries (***refer to burns and trauma emergencies guidelines***).

FURTHER CARE

Patients exposed to a high voltage electrical source should always be transferred to the emergency department.

Following exposure to a domestic or low voltage electrical source, if the patient is asymptomatic with no injuries and has normal initial 12-lead ECG, then transportation to hospital is not routinely required.[3,4]

Key Points – Electrocution

- Scene safety.
- Manage cardiac arrest according to usual guidance.
- Severe tissue damage may be present despite apparently minor injury.
- Exposure to domestic voltage may not require hospitalisation.

REFERENCES

[1] Dollery W. Towards evidence based emergency medicine: best BETs from the Manchester Royal infirmary. Management of household electrical injury. *Emergency Medicine Journal* 1998;15(4):228.

[2] Blackwell N, Hayllar J. A three year prospective audit of 212 presentations to the emergency department after electrical injury with a management protocol. *Postgrad Med* J 2002;78(919):283-285.

[3] Wilson CM, Fatovich DM. Do children need to be monitored after electric shocks? *Journal of Paediatrics and Child Health* 1998;34(5):474-6.

[4] Garcia CT, Smith GA, Cohen DM. Electrical injuries in a pediatric emergency department. *Annals of Emergency Medicine* 1995;26(5):604-608.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Head injury is estimated to be the cause of 1,000,000 hospital presentations each year in the UK, with an incidence of severe brain injury of between 10 and 15 per 100,000 population.[1] It may be an isolated injury or be part of multi-system traumatic injury. There is a significant association with cervical spinal injury in those with a depressed level of consciousness.[2]

Little can be done for primary brain injury, i.e. damage that occurs to the brain at the time of injury. Injury prevention strategies such as the wearing of motorcycle helmets or use of vehicle restraint systems (e.g. seatbelts and airbags) are the only viable means of reducing these injuries.[3,4]

Secondary brain injury is that which occurs following the primary event as a result of hypoxia, hypercarbia and hypoperfusion. The reduced level of consciousness may lead to airway obstruction or inadequate ventilation with consequent decreased oxygenation and increased levels of carbon dioxide and a metabolic acidosis. Blood loss from other sources in a multi-system trauma may lead to hypovolaemia and a fall in the cerebral perfusion pressure.

NEVER presume decreased conscious level is solely due to alcohol. Intoxicated patients commonly sustain head injuries as well.

HISTORY

Mechanism of injury

In a person with altered level of consciousness, at risk of intracranial head injury, an appreciation of the forces that were involved in causing the injury is helpful. With scene indicators such as a "bulls-eye" of the windscreen or blood staining of the dashboard or steering wheel in a motor vehicle collision, or significant scratch or fracture damage to a protective helmet, there should be suspicion of significant injury. The identification of a weapon that might have been used in an assault, or blood staining on objects immediately adjacent to the casualty with a bleeding head wound following a fall may be extremely helpful.

A history of a period of loss of consciousness raises the risk of significant injury.[5] The duration and depth of unconsciousness are of great value, as are changes over time. For example, a period of lucidity followed by decreasing consciousness would suggest the development of an extra-dural haematoma.

Amnesia is difficult to quantify. National Institute for Clinical Excellence guidelines state that retrograde amnesia (amnesia for the events before injury) of greater than 30 minutes indicates major injury. Post-traumatic amnesia is less predictive, but also suggests significant injury.

The association of head injury with cervical spine trauma is significant and movement of the limbs should be noted, together with other symptoms suggesting spinal cord injury (***refer to neck and back guideline***).

In the presence of a decreased level of consciousness, other medical causes should be sought. A history of epilepsy might suggest a convulsion or a history of diabetes might suggest hypoglycaemia as a cause for the reduced level of consciousness.

Consideration should also be given to the role of alcohol or recreational and other drugs as a cause.

ASSESSMENT

Assessment of the neurological state takes place after the ABCs have been adequately addressed.

A patient with a depressed level of consciousness is less capable of protecting their airway. Loss of a gag reflex increases the risk of aspiration. The airway should be cleared and maintained, with an airway adjunct if necessary. Manual in-line immobilisation of the cervical spine, with due regard to potential injury during airway manoeuvres must be maintained.

Assessment of the adequacy of breathing, particularly the respiratory rate and the depth of breathing is needed. A respiratory rate of between 10 and 30 breaths per minute with visible and palpable good chest excursion is ideal. Formal measurement of breathing is impractical in the pre-hospital environment during the assessment and resuscitation phase.

Maintenance of the circulation has relevance for maintaining cerebral perfusion. External haemorrhage control and fluid replacement to raise and maintain the blood pressure are important.

A simple **AVPU** score, together with pupillary size and reactivity and the noting of spontaneous movements in particular limbs is sufficient for the primary survey neurological assessment. A formal **Glasgow Coma Scale**[6] **(GCS)** assessment can be done but needs to be thoroughly reliable and reproducible. If done hurriedly or incompletely, it can produce a misleading clinical picture and result in inappropriate on-going care following arrival at the Emergency Department (ED).

Other clear indicators of head injury such as a boggy swelling or laceration of the scalp should be noted and reported, together with the leakage of cerebrospinal fluid (CSF) from the ears and/or nose or blood from the ears. Brain matter coming from a wound should be covered with a light dressing. A finger should not be inserted to feel for a fracture or check the origin of injury.

MANAGEMENT

The aim of pre-hospital treatment is to deliver adequate oxygen to the brain by:

- optimising oxygenation of the blood
- maintenance of the cerebral perfusion pressure.

Administer high concentration oxygen via a non-rebreathing mask, using the stoma in laryngectomee and other neck breathing patients to ensure an oxygen saturation (SpO_2) of >95%, except for patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***).

Cervical spinal injury should be assumed to be present and managed appropriately (***refer to neck and back trauma guideline***). The patient needs to be delivered to the most appropriate facility for management of the injury. Ideally this would be a centre with neurosurgery, but in many cases a rapidly accessible ED capable of supplementing the pre-hospital management and identifying the extent of injury before promptly referring on is optimal.

Management of problems identified by the primary survey should occur as they are identified and are considered in more detail.

Airway management with cervical immobilisation

Hypoxia is the major danger for head injury care and there is clear evidence that it worsens the prognosis[7]. An obstructed airway may occur through loss of muscle tone of the oropharyngeal structures and physical obstruction by the tongue falling backwards or by the accumulation of secretions or blood in the pharynx.

The airway should be inspected for foreign bodies, being aware that with the patient lying supine, any object is likely to have fallen to the back of the mouth. Simple airway manoeuvres to draw the tongue forward should be applied, but because of the need to protect the cervical spine, only jaw thrust and chin lift are acceptable. Head tilting should be a last resort for the airway that cannot be adequately opened and the risk/benefit balance should be considered.

Suction should be used to clear any fluid obstruction but only under direct vision. Stimulation of the pharynx by the suction catheter can raise the intracranial pressure (ICP).

In a patient with some tongue obstruction of the airway, an oropharyngeal airway should be considered. If the patient retains a gag reflex or there is retching then vomiting may be induced and the airway should be removed. Any of these physical responses to insertion will raise the ICP.

If the patient will not tolerate an oral airway, or in some head injured patients where there is jaw clenching, or trismus, it may be necessary to use a nasopharyngeal airway. If the airway is obstructed and the jaw is clenched then the risks of inserting a nasopharyngeal airway are less than the theoretical risk of the airway passing through a basal skull fracture. Unless carefully inserted, this device may exacerbate an airway problem by inducing an epistaxis. The airway should be inserted across the floor of the nose below the inferior turbinate and, unless this is clearly identified by lifting the nostril and advancing posteriorly, there is potential for misplacement and a risk that the airway will cross the cribriform plate and enter the brain. This is particularly a risk if there are facial fractures.

Endotracheal intubation will secure an airway against the risk of aspiration and allow optimal ventilation. Insertion, however, is technically more difficult than simple airway insertion and requires the patient to have lost oropharyngeal reflexes.

If a patient's conscious level is sufficiently depressed that an endotracheal tube can be inserted without the use of sedating and paralysing drugs then the outcome is bleak. UK Paramedics are currently not authorised to administer anaesthetic drugs. It may be possible to intubate if the patient has taken a large amount of alcohol or illegal drugs before injury.

Any instrumentation of the upper airway will raise the ICP and exacerbate the secondary brain injury.[8] The use of force to overcome the resistance is likely to be deleterious to the patient outcome and should not be used. A balance is required between the clear benefits of airway manoeuvres and the danger of raising ICP and increasing the level of injury. An airway escalator is illustrated in **Figure 1**.

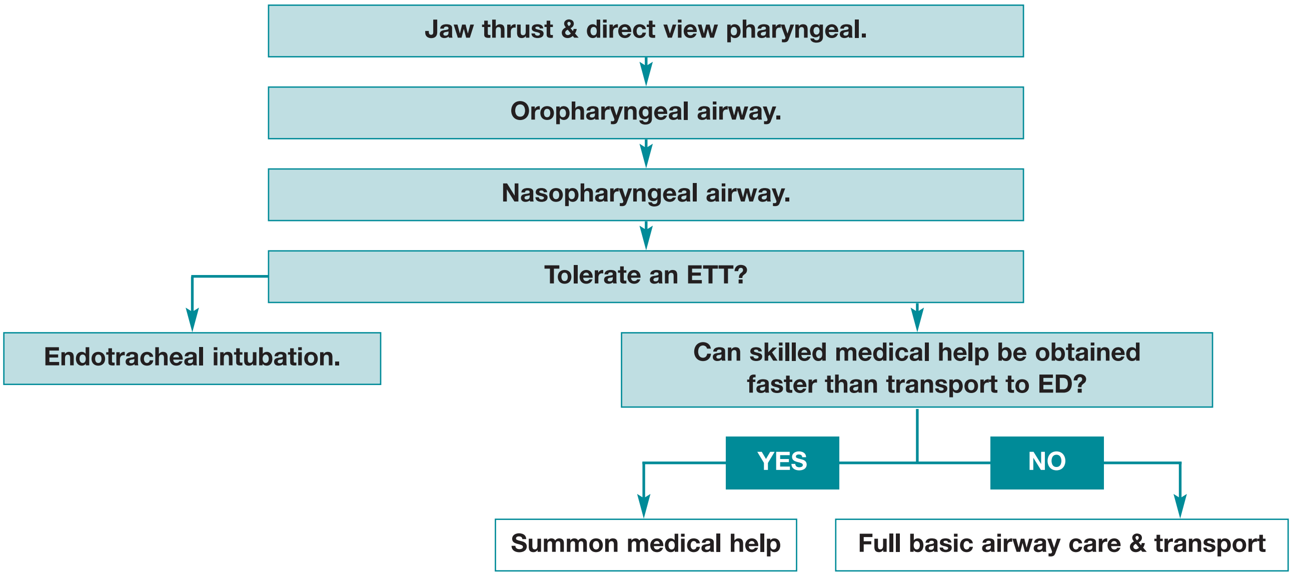


Figure 1- Management of an obstructed airway in head injury.

Drug assisted intubation is possible in the pre-hospital environment but the research evidence for Paramedics having this skill is currently lacking. A mobile medical team resource may be able to provide this option, however the delay in their arrival on scene and the delays that will then follow while the airway is secured need to be balanced against the benefit of definitive airway control over optimal airway control with simple manoeuvres and rapid transfer.

There are a number of intermediate "rescue" airways available such as the laryngeal mask airway (LMA) and combitube. The insertion of these large devices into the pharynx will raise ICP and they do not secure the airway. While they may allow an airway to be obtained, the case for their use in UK trauma practice is currently not established.

Surgical airways, needle cricothyroidotomy and surgical cricothyroidotomy, are possible in the field but have significant complication rates and are profoundly stimulating to the patient and may increase the ICP.

There is a clear association between head injury and concurrent cervical spine injury. In the presence of an altered level of consciousness or while under the influence of alcohol, a reliable clinical assessment of the cervical spine cannot be made. Cervical spine immobilisation is mandatory. There is some evidence that a firmly fitting cervical collar may raise the ICP[9,10] but immobilisation is required to prevent exacerbation of any spinal cord injury. It is being suggested that a collar should be used during extrication but that once the patient is fully immobilised on a long board with blocks and tape to the head the collar could be loosened. This could not yet be considered the standard of care in the pre-hospital field (***refer to neck and back trauma protocol***).

Breathing

The importance of treating hypoxia and preventing hypercarbia has been described.

In the presence of a depressed level of consciousness, there may be inadequate respiratory effort.

- consider assisted ventilation at a rate of 12–20 respirations per minute if:
  - oxygen saturation (SpO_2) is <90% on high concentration O_2
  - respiratory rate is <10 or >30
  - expansion is inadequate.

A combative patient is unlikely to have inadequate ventilation but could certainly be hypoxic. The less conscious patient group may require support both in terms of rate and chest excursion.

Circulation

Cerebral perfusion pressure (CPP) needs to be maintained for optimal patient benefit. This is determined by the balance between mean arterial pressure (MAP) (mathematically the mean pressure during the cardiac pumping cycle) pushing blood into the brain and the ICP resisting this.

CPP = MAP – ICP

$$\text{MAP} = \text{diastolic pressure} + \frac{(\text{systolic pressure} - \text{diastolic pressure})}{3}$$

The ICP is increased by the presence of anything that occupies space (haematoma, oedema/swelling) or causes vasodilatation (hypoxia, hypercarbia).

In UK practice, it is currently accepted that best care is achieved by maintaining an MAP of >90 mmHg and a systolic of the order of 120mmHg. Pressures below this are related to a poorer neurological outcome. That hypotension worsens outcome is clearly established, but the true minimum pressure is not fully defined.[11,12]

Hypotension is unlikely to be caused by isolated head injury and so would usually indicate the presence of other significant injury causing blood loss.

Fluid Therapy

Obtain IV access.

Current research shows little evidence to support the routine use of IV fluids in adult trauma patients. In circumstances such as penetrating chest and abdominal trauma, survival worsens with the routine use of IV fluids.[13]

Fluids may raise the blood pressure, cool the blood and dilute clotting factors, worsening haemorrhage. Therefore, current thinking is that fluids should only be given when major organ perfusion is impaired.

If there is visible external blood loss greater than 500mls, fluid replacement should be commenced with a 250ml bolus of crystalloid.

Central pulse **ABSENT**, radial pulse **ABSENT** is an absolute indication for urgent fluid. If the patient has a carotid pulse but no radial pulse then other clinical factors should also be considered before decision on fluid administration.

Central pulse **PRESENT**, radial pulse **ABSENT** is a relative indication for urgent fluid depending on other indications including tissue perfusion and blood loss.

Central pulse **PRESENT**, radial pulse **PRESENT DO NOT** commence fluid replacement,[14] (unless there are other signs of poor central tissue perfusion (e.g. altered mental state, cardiac rhythm disturbance).

DO NOT delay at scene for fluid replacement; wherever possible cannulate and give fluid **EN-ROUTE TO HOSPITAL.**

The use of mannitol to reduce brain swelling and size can be used in the presence of focal neurological signs to prevent herniation but is currently limited to use under medical direction. Hypertonic saline is also being investigated, but is not currently usual standard of care in the UK.

Disability

A rapid and mini-neurological assessment is required at the point of first assessment to give a baseline against which improvement or deterioration can be measured. It should consist of:

Conscious level

This is a good indicator of severity of injury and progression over time. The AVPU (alert, voice responsive, pain responsive, unresponsive) scale is quick and reproducible. It is generally acceptable during the early stages of resuscitation.

AVPU scale

A	Alert
V	Voice responsive
P	Pain responsive
U	Unresponsive

The GCS is more sensitive to change but requires careful formal assessment; it should not be approximated. The headline figure falls between 3 and 15 but should be broken down into its three components.

Table 1 – Glasgow Coma Scale[6]

GLASGOW COMA SCALE	
Item	**Score**
Eyes Opening:	
Spontaneously	4
To speech	3
To pain	2
None	1
Motor Response:	
Obeys commands	6
Localises pain	5
Withdraws from pain	4
Abnormal Flexion	3
Extensor response	2
No response to pain	1
Verbal Response:	
Orientated	5
Confused	4
Inappropriate words	3
Incomprehensible sounds	2
NO verbal response	1

There are a number of pitfalls in the assessment:

- in the absence of eyelid muscle tone in a deeply unconscious person, the eyes may be open. If there is no response to stimulation, then this is recorded as **"none".**
- if there is severe facial swelling that would prevent eye opening, then this is recorded as such.
- verbal response in small children does not fit with the scale and so a modification is applied:

5	appropriate words, social smile, fixes and follows with eyes
4	cries but consolable
3	persistently irritable
2	restless and agitated
1	none

- deaf patients or those who cannot give a verbal response, such as those with a tracheostomy are recorded as found, but a caveat is included in the assessment.
- during motor assessment, if there is a difference between the two sides of the body, then the better response is recorded.

Pupil response

These should be round and equal in size. They should respond promptly by constriction when a light is shone into them. When light is shone in one, the other pupil should respond appropriately to this too. Any abnormalities should be noted.

Causes for abnormality include local trauma and loss of sight through other eye disease. Many more elderly patients may be taking medication to dilate or constrict the pupil and these can have a long duration of action. Even opiate analgesia may be the cause.

The cause cannot be assumed in the presence of head injury and it may be an indicator of significant brain injury/swelling.

Convulsions

A fit can occur immediately after the blow to the head and have little prognostic significance but may also occur a little later with major significance, indicating significant intracranial pathology. Post-traumatic epilepsy can develop, but could certainly not be determined in the early stages of care.

Management is the same as for any convulsion. Protection from further harm, protection of the airway and oxygenation are the key interventions.

Assess blood glucose en-route to hospital

Secondary Survey

A thorough assessment of an injured patient requires full exposure and a careful stepwise assessment of all areas, both front and back. This is not appropriate in the pre-hospital environment, but it is reasonable to note any other injuries that have been found or are suspected during the pre-hospital phase.

It is important to gather any scene information about the mechanism and potential confounding factors, since the ED will be "blind" to these. Witness accounts are very valuable. The time course of the patient following injury is very valuable; has there been any consciousness, has the patient walked, or even moved limbs, since the injury?

Information on patient identity or clues as to the next of kin will also be invaluable.

Transfer to further care

Victims of significant head injury require optimal oxygenation and tissue perfusion as quickly as possible and then evaluation and appropriate management of any lesion within the cranial vault and optimal management of the pressures, both blood and intracranial.

Early optimisation is probably best achieved by transporting to the nearest ED capable of securing a definitive airway and performing this assessment. More extensive monitoring and evaluation requires a neurosurgical facility at the earliest opportunity.

There is no doubt that early evacuation of an intracranial haematoma is in the patient's best interests and has a significantly improved outcome. Systems need to design a patient care process that ensures that the patient gets to definitive care as soon as possible i.e. directly to an ED with neurosurgery on site, but balances this with the hazard of delay in optimisation through longer pre-hospital transport times.

The process should be predetermined rather than "done on the fly". The solution may be to take to the nearest ED and do a secondary transfer, or bypass facilities and travel directly to the neurosurgical centre. This will vary with the geography and the capacity of the system.

Key Points – Head Trauma

- **NEVER** presume decreased conscious level is solely due to alcohol; intoxicated patients commonly sustain head injuries as well.
- Ascertain duration and depth of unconsciousness, as a period of unconsciousness raises the risk of significant injury.
- Unconscious patients are less capable of protecting their airway; obstruction may occur through loss of muscle tone, physical obstruction, the tongue falling backwards, or by the accumulation of secretions or blood in the pharynx.
- Simple airway manoeuvres to draw the tongue forward should be applied, but because of the need to protect the cervical spine, only jaw thrust and chin lift are acceptable.
- The aim of pre-hospital treatment is to deliver adequate oxygen to the brain.

REFERENCES

[1] Headway: The brain injury association. Head injury – a silent epidemic.

[2] Iida H, Tachibana S, Kitahara T, Horiike S, Ohwada T, Fujii K. Association of head trauma with cervical spine injury, spinal cord injury, or both. *Journal of Trauma* 1999;46(3):450-2.

[3] Mock CN, Maier RV, Boyle E, Pilcher S, Rivara FP. Injury prevention strategies to promote helmet use decrease severe head injuries at a level I trauma center. *Journal of Trauma* 1995;39(1):29-33.

[4] Bradbury A, Robertson C. Prospective audit of the pattern, severity and circumstances of injury sustained by vehicle occupants as a result of road traffic accidents. *Archives of Emergency Medicine* 1993;10(1):15-23.

[5] National Institute for Clinical Excellence. Head injury: Triage, assessment, investigation and early management of head injury in infants, children and adults London: National Institute for Health and Clinical Excellence, 2003.

[6] Teasdale G, Jennett B. ASSESSMENT OF COMA AND IMPAIRED CONSCIOUSNESS: A Practical Scale. *The Lancet* 1974;304(7872):81-84.

[7] Meixensberger J, Renner C, Simanowski R, Schmidtke A, Dings J, Roosen K. Influence of cerebral oxygenation following severe head injury on neuropsychological testing. *Neurological Research* 2004;26(4):414-7.

[8] Ampel L, Hott KA, Sielaff GW, Sloan TB. An approach to airway management in the acutely head-injured patient. *Journal of Emergency Medicine* 1988;6(1):1-7.

[9] Kolb JC, Summers RL, Galli RL. Cervical collar induced changes in intracranial pressure. *American Journal of Emergency Medicine* 1999;17:135-7.

[10] Davies G, Deakin C, Wilson A. The effect of a rigid collar on intracranial pressure. *Injury* 1996;27:647-649.

[11] Chambers IR, Treadwell L, Mendelow AD. Determination of threshold levels of cerebral perfusion pressure and intracranial pressure in severe head injury by using receiver-operating characteristic curves: an observational study in 291 patients. *Journal of Neurosurgery* 2001;94(3):412-6.

[12] The Brain Trauma Foundation. The American Association of Neurological Surgeons. The Joint Section on Neurotrauma and Critical Care. Resuscitation of blood pressure and oxygenation. *J Neurotrauma* 2000;17(6-7):471-8.

[13] Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.

[14] Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

METHODOLOGY

Refer to methodology section.

INTRODUCTION

There are about 700 deaths by drowning a year in the UK, and many more times that number of near-drowning. A high percentage of these deaths involve children. In the majority of drowning, water enters the lungs, but 10–15% of cases involve intense laryngeal spasm with death resulting from asphyxia (so called dry-drowning).

The term **near drowning** applies to survivors of drowning including those resuscitated from cardiac or respiratory arrest resulting from an immersion incident.

It is customary to refer to incidents of near drowning as **IMMERSION** or **SUBMERSION**. In submersion incidents the head is below water and the main problems are **asphyxia** and **hypoxia**. With immersion the head usually remains above the water and the main problems will be **hypothermia** and cardiovascular instability from the hydrostatic pressure of the surrounding water on the lower limbs.

Trauma is often a major accompanying factor in the immersion incident. In particular, dives into shallow pools are often associated with **neck** and/or **head injury**.

In addition, **intoxication** from alcohol or drugs may often accompany immersion incidents. Occasionally an immersion incident may be precipitated by a medical cause such as **seizure**.

NOTE: as survival has been recorded after prolonged submersion, resuscitation and transport to hospital should be undertaken in all recent cases of near drowning. Only if the victim is discovered in cardiac arrest 1.5 hours or more after having entered the water should the fact of death be presumed.

HISTORY

History is often incomplete at the incident scene, both relating to the incident and the casualty.

Establish the number of patients involved.

Note the environment: swimming pools, hot tubs, fresh or sea water. Increasingly, immersion may occur because long hair becomes entangled in a drain or filter outlet, for example in a hot tub.[1]

Try to obtain the time of accident, time of rescue, time of first effective cardio-pulmonary resuscitation (CPR).

Note the duration of any **SUBMERSION** and the water temperature and type (salt, fresh, contaminated).

RESCUE

NOTE: NEVER PUT YOURSELF AT RISK – Preserve your own safety and that of other rescuers.

Changes in haemodynamics after water immersion (the "hydrostatic squeeze effect") make positional hypotension likely and the blood pressure will fall if the patient is raised vertically from the water. Rescuers must always attempt to maintain the victim flat and avoid vertical removal from water.

If the history suggests a neck injury take special care of cervical spine immobilisation during rescue and resuscitation.

Aspiration of water during drowning is common (around 80%). Tilting to drain aspirated water simply empties water from the stomach into the pharynx, risking further airway contamination. **Mechanical drainage of water from the lungs should not be carried out.** The lungs can be ventilated even with large volumes of water inside them.

ASSESSMENT

Primary Survey and Resuscitation

Assess and manage **ABCD**'s as per resuscitation guidelines.

Airway clearance and ventilation are the first priorities. Adequate ventilation and oxygenation may restore cardiac activity in drowning, so are worthy of major effort.[2]

The recovered patient is in great danger of vomiting. Alcohol/drugs are particularly likely to induce vomiting. Suction equipment and/or postural draining may be necessary if appropriate.

Administer high concentration oxygen (O_2) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except in patients with chronic obstructive pulmonary disease (COPD) ***(refer to COPD guideline)***

Consider assisted ventilation at a rate of 12–20 respirations per minute if:

- SpO_2 is >90% on high concentration O_2
- respiratory rate is <10 or >30
- expansion is inadequate

Ventilation in a near drowned casualty may be difficult as lung compliance is reduced if water has been inhaled.

Endotracheal intubation may be required and is desirable in order to secure an impaired airway and provide adequate ventilation.

The **pulse** may be extremely slow if hypothermia is present, and external cardiac compression may be required. Bradycardia often responds to improved ventilation and oxygenation. **Drugs such as adrenaline and atropine are less effective in HYPOTHERMIA, and must not be repeatedly used**. These drugs may pool in the static circulation of the drowned casualty, and then, after re-warming and circulation has been restored, act as a dangerous bolus of drug as they are circulated.

In hypothermic cardiac arrest, **defibrillation** will be unsuccessful where the core temperature remains low. At 28°C the ventricle may spontaneously fibrillate. Defibrillation may not succeed until the core temperature rises above 30-32°C.

Therefore:

- in ventricular fibrillation give three DC shocks according to current resuscitation guidelines
- if unsuccessful check the core temperature. If below 30°C, commence active re-warming and consider urgent transport to a facility where active re-warming can be provided (ideally an extracorporeal circulation). Meanwhile continue with CPR, postponing further DC shocks until the patient is warmed.
- attach ECG and pulse oximeter.

Secondary survey and transfer to further care

In the presence of time-critical conditions e.g. cardiac arrest, difficulties in airway and ventilation maintenance, and/or major life-threatening trauma, do not waste further time in resuscitation at the scene but transport rapidly to hospital.

If non-time-critical features are present perform a more thorough patient assessment and a brief secondary survey.

If C-spine injury is not an issue, immersion victims should be transported in the recovery position with suction at hand. If C-spine injury cannot be excluded, immobilise on a long board and prepare for side-tilt and suction as required ***(refer to neck and back trauma guideline).***

Cover to prevent further heat loss.

Establish IV access en route to hospital where possible.

Provide a Hospital Alert Message/Information call.

Secondary Drowning

Secondary drowning occurs usually within 4 hours of near-drowning and can also prove fatal. These cases can present up to 24 hours following immersion. Hence, anyone who is remotely suspected of having nearly drowned, or been rescued from water MUST BE TRANSFERRED TO HOSPITAL, however well they appear.

The common problems of secondary drowning are:

- acute respiratory distress syndrome (ARDS)
- cerebral oedema
- renal failure
- infection
- disturbance of electrolytes, acid-base balance, and lung function, along with hypothermia, are the main problems, and there is little to separate sea from fresh water exposure as a particular issue.

Treatment is aimed at preventing cardiac arrest. If this occurs, survival rate decreases from approximately 70-90% to approximately 15%.

Key Points – submersion/immersion

- Ensure own personal safety.
- Successful resuscitations have occurred after prolonged submersion/immersion.
- Near drowning is often associated with hypothermia.
- Special considerations in cardiac arrest treatment in the presence of hypothermia.
- Severe complications may develop several hours after submersion/immersion.

REFERENCES

1 Press E. The health hazards of saunas and spas and how to minimise them. *American Journal of Public Health* 1991;8:1034-7.

2 Goh SH, Low BY. Drowning and Near Drowning-some lessons learnt. *Annals of the Academy of Medicine, Singapore* 1999;28(2):183-8.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

There is one fundamental rule to apply to these cases and that is **NOT** to let limb injuries, however dramatic in appearance, distract the clinician from less visible but life-threatening problems such as airway obstruction, compromised breathing, poor perfusion and spinal injury.

HISTORY

Obtain a history of how the injury was sustained, in particular factors indicating the forces involved.

ASSESSMENT

However dramatic limb injuries appear, **ALWAYS** exclude the presence of other **TIME CRITICAL** injuries by using the **PRIMARY SURVEY**.

Assess and correct deficits with:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)

Evaluate whether the patient is **TIME CRITICAL or NON-TIME CRITICAL** following criteria as per ***trauma emergencies guideline***.

In **TIME CRITICAL** patients, evidence suggests that haemorrhage control, spinal immobilisation if indicated (***refer to neck and back trauma guideline***) and rigid splinting are sufficient treatment of fractures for rapid evacuation to hospital. If a traction splint can be applied very quickly to a femoral shaft fracture, it will contribute to "circulation" care by considerably reducing further blood loss and pain en-route to hospital. However, if application of a traction splint will incur an unacceptable delay, use manual traction where sufficient personnel are available; remember that once traction is applied it should not be released.

LOAD AND GO to the nearest suitable receiving Hospital with a Hospital Alert Message / Information call.

En-route – continue patient **MANAGEMENT** (see below)

In **NON-TIME CRITICAL** patients, perform a more thorough patient assessment and secondary survey.

Specifically asses:

- sites of suspected fracture
- all four limbs for injury to long bones and joints as part of secondary survey
- expose suspected fracture sites in order to assess for swelling and deformity. Where possible avoid unnecessary pain stimulus.
- for intact circulation and nerve function (MSC x 4 – motor, sensation and circulation), distal to the fracture site.
- age of patient; consider greenstick fractures in children, and fractures of wrist and hip in the elderly
- for accompanying illnesses; some cancers can involve bones (e.g. breast, lung and prostate) and result in fractures from minor injuries. Osteoporosis (bone thinning) in elderly females in particular makes fractures more common.
- for pattern of fractures; fractures of the heel in a fall from a height may be accompanied by pelvic and spinal crush fractures. "Dashboard" injury to the knee may be accompanied by a fracture or dislocation of the hip. Humeral fractures from a side impact are associated with chest injuries.

Dislocations

These are very painful and are commonly found affecting the digits, elbow, shoulder and patella. Occasionally the hip may be dislocated where forces of injury are very high. Any dislocation that threatens the neurovascular status of a limb must be treated with some urgency. Such dislocations require prompt reduction.

Amputations

Most frequently involve digits, but can involve part of or whole limbs. Remember the first priority in managing amputated parts is to manage the patient who has sustained the amputation (start with ABCD). They are likely to be in considerable pain and distress so administer IV analgesia as early as possible (***refer to pain management guidelines***). Dressings moistened with water for injection or saline should be applied to the stump paying particular attention to haemorrhage control.

Management of the amputated part should include the removal of any gross contamination, then covering the part with a damp gauze or dressing, securing in a sealed plastic bag and placing the bag on ice. Re-implantation surgery may be possible so it is important that amputated parts are maintained and transported in the best condition possible. Body parts should not be placed in direct contact with ice as this can cause tissue damage; the aim is to keep the temperature low but not freezing.

Partial amputations

These may still result in a viable limb, providing there is minimal crushing damage and survival of some vascular and nerve structures. It is important to arrest any obvious haemorrhage and to immobilise the partially amputated limb in a position of normal anatomical alignment. Where possible dress the injured limb to prevent further contamination.

Pressure alone should be used to arrest haemorrhage if possible.

It is essential that these patients be removed to an appropriate receiving Hospital, ideally with both **ORTHOPAEDIC** and **PLASTIC** surgery facilities.

MANAGEMENT[1-4]

Follow Trauma Emergencies Guideline, remembering to:

- ensure **ABC**'s.
- arrest external haemorrhage through direct or indirect pressure and/or by raising the limb above heart level where appropriate
- administer high concentration oxygen (O_2) via a non-rebreathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%, except for patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***).

Fluid Therapy

Obtain IV access.

Current research shows little evidence to support the routine use of IV fluids in adult trauma patients. In circumstances such as penetrating chest and abdominal trauma, survival worsens with the routine use of IV fluids.[5]

Fluids may raise the blood pressure, cool the blood and dilute clotting factors, worsening haemorrhage. Therefore, current thinking is that fluids should only be given when major organ perfusion is impaired.

If there is visible external blood loss greater than 500mls, fluid replacement should be commenced with a 250ml bolus of crystalloid.

Central pulse **ABSENT**, radial pulse **ABSENT** is an absolute indication for urgent fluid. If the patient has a carotid pulse but no radial pulse then other clinical factors should also be considered before decision on fluid administration.

Central pulse **PRESENT**, radial pulse **ABSENT** is a relative indication for urgent fluid depending on other indications including tissue perfusion and blood loss.

Central pulse **PRESENT**, radial pulse **PRESENT DO NOT** commence fluid replacement,[6] unless there are other signs of poor central tissue perfusion (e.g. altered mental state, cardiac rhythm disturbance).

Reassess vital signs prior to further fluid administration.

DO NOT delay at scene for fluid replacement; wherever possible cannulate and give fluid **EN-ROUTE TO HOSPITAL**.

Specifically consider:

- analgesia if the patient is in pain (***refer to pain management guideline***).[7,8] There appears to be a general reluctance to administer IV analgesia for limb fractures (including neck of femur fractures) in the pre-hospital environment. Pain relief is an important intervention and should be considered as soon as ABCD's have been assessed and potentially life-threatening problems corrected. (***refer to pain management guidelines***).
- in **NON-TIME CRITICAL** patients, immobilise long bone fractures by appropriate splinting. (***see SPLINTAGE below***).

Splintage

The principles of splintage involve:

- arrest of external haemorrhage
- support of the injured area
- immobilisation of the joint above and below the fracture
- re-evaluation and recording of the circulatory and neurological (motor and sensory) function below the fracture **BEFORE** and **AFTER** splintage.[9,10]

Always

Consider realignment of grossly deformed fractures into a position that is as close to normal anatomic alignment as possible. Where deformity is minor and both distal sensation and circulation are intact, then realignment may not be necessary.

Recognise the benefits of vacuum splints, especially if limbs need to be immobilised in an abnormal alignment.

Pad rigid splints to conform to anatomy.

Remove all jewellery from the affected limbs before swelling of the limb occurs.

Check for presence or absence of pulses and muscle function distal to injury after splintage.

Re-assess circulation by checking pulses pre- and post-application of splints. If pulse disappears during splintage then realign limb until pulse returns.

Splinting of Upper Limb[11]

Patient self-splintage is often adequate and can be less painful than attempting to put the limb in a sling.

Fractures of the clavicle and upper limb may be supported in a triangular sling, if this alleviates pain.

Vacuum splints may be well suited to immobilising forearm fractures.

Splints such as short box splints may also be useful.

Splinting of Lower Limb

Ankle and tibial fractures, as well as those fractures around the knee, can be immobilised with either box splints or vacuum splints. Box splints may need padding to be effective in providing adequate immobilisation.

Femoral shaft fractures are best managed by traction splintage (see below). Isolated fractures of the tibia and fibula should **NOT** be immobilised using a traction splint.

Traction Splintage[12,13]

A traction splint is a device for applying longitudinal traction to the femur, using the pelvis and the ankle as static points. Blood loss from femoral shaft fractures can be considerable, involving loss of 500 – 2000 millilitres in volume. If the fracture is open (compound), blood loss is increased.

Correct splintage technique using a traction splint will ease pain, reduce haemorrhage and damage to blood vessels and nerves, and also reduce the risk of embolisation to the brain and lungs of fat globules (fat embolus). It also minimises the risk of a closed fracture being converted to an open one.

By using traction to pull the thigh back from the spherical shape caused by muscle spasm to a cylindrical shape. There is compression of bleeding sites and this reduces blood loss considerably. It also reduces bone fragment movement, and reduces the other complications noted above.

Modern devices such as the Sager, Trac 3 and Donway splints are easy to apply and some now have quantifiable traction, measured on a scale in pounds. The correct amount of traction is best judged by the injured leg being the same length as the un-injured limb.

Ankle, lower leg, knee or pelvic fractures on the same side as the femoral fracture limit the use of a traction splint.

It has been suggested that a fracture of the tibia in the same limb as a femoral shaft fracture may be immobilised using a traction splint, with the traction reduced to about 10lbs so as not to over-displace the tibial fracture. However there is little evidence to support this treatment.

Open fractures

Where fractures are open, bone ends should be irrigated with normal saline and a sterile dressing applied as soon as practicable. Infection following an open fracture can have serious consequences for the future viability and long-term function of the limb. Any gross displacement from normal alignment must, where possible, be corrected, and splints applied. It is important to point out any wounds that were the result of an open fracture to the receiving emergency department staff, especially if bony fragments have now receded.

Neck of Femur fractures

These occur most commonly in the elderly population and are one of the most common limb injuries encountered in the pre-hospital environment. Typical presentation includes shortening and external rotation of the leg on the injured side with pain in the hip and referred pain in the knee. The circumstances of the injury must be taken into account – often the elderly person has been on the floor for some time, which increases the possibility of hypothermia, dehydration, pressure sores and chest infection, so careful monitoring of vital signs is essential. Immobilisation is best achieved by strapping the injured leg to the normal one with foam padding between the limbs. Extra padding with blankets and strapping around the hips and pelvis can be used to provide additional support whilst moving the patient. Appropriate analgesia should be given (***refer to pain management guidelines***).

Additional Information

Fractures may be closed or open. Comminuted fractures involve shattering of the fracture site into multiple fragments. Nerves and blood vessels are placed at risk from sharp bony fragments, especially in very displaced fractures, hence the need to return fractured limbs to normal alignment as rapidly as possible. Fractures around the elbow and knee are especially likely to injure arteries and nerves.

Another potential complication of limb fractures is **compartment syndrome**. Increased pressure within muscular compartments of the fractured limb compromise the circulation causing ischaemia with potentially catastrophic consequences for the limb. The five 'P's of ischaemia are:

1. Pain	out of proportion to the apparent injury, often in the muscle and may not ease with splinting/analgesia
2. Pallor	due to compromised blood flow to limb
3. Paresthesia	changes in sensation and loss of movement
4. Pulselessness	(loss of peripheral pulses) – grave late sign as swelling increases causing complete occlusion of circulation
5. Perishing cold	the limb is cold to the touch

If compartment syndrome is suspected management is as previously described but with increased urgency and a hospital alert as the patient may require immediate surgery.

In the field, it is frequently impossible to differentiate between ligament sprain and a fracture. Immobilisation should be performed, and **ASSUME** a fracture is present until x-ray or expert medical opinion advises otherwise.

In non-time critical patients, full splinting with suitable analgesia (see **Pain Management Guideline**) is essential. In **TIME CRITICAL** patients, however, splintage is often restricted to securing fractured limbs to a longboard or scoop, to allow for rapid evacuation from the scene and immediate hospital transportation.

Always ensure hospital staff are shown any skin wound relating to a fracture and that they appreciate that the underlying fracture was initially an open one. Remember that by applying traction visible bone ends (open fracture) may disappear.

Key Points – Limb Trauma

- **DO NOT** become distracted, by the appearance of limb trauma, from assessing less visible but life-threatening problems, such as airway obstruction, compromised breathing, poor perfusion and spinal injury.
- Limb trauma can cause life-threatening haemorrhage.
- Assess for intact circulation and nerve function distal to the fracture site.
- Any dislocation that threatens the neurovascular status of a limb must be treated with urgency.
- Splintage is fundamental to prevention of further blood loss.
- Limb injuries can be painful and good analgesia should be initiated early.

REFERENCES

[1] Caroline NL. *Emergency Care in the Streets*. Boston, Mass: Little, Brown and Company, 1995.

[2] Greaves I, Porter K, Ryan J. *Trauma Care Manual*. London: Arnold, 2001.

[3] Greaves I, Hodgetts T, Porter K, editors. Emergency Care – A textbook for Paramedics. London: WB Saunders 1997.

[4] Grant HD, Murray RHJ, Bergeron JD. *Emergency Care*. 7th ed. New Jersey: Englewood Cliffs, 1995.

[5] Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.

[6] Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

[7] McEachin CC, McDermott JT, Swor R. Few emergency medical services patients with lower extremity fractures receive pre-hospital analgesia. *Pre-Hospital Emergency Care* 2002;6(4):406-10.

[8] Vassiliadis J, Hitos K, Hill CT. Factors influencing pre-hospital and emergency department analgesia administration to patients with femoral neck fractures. *Emergency Medicine (Freemantle)* 2002;14(3):261-66.

[9] Mihalko WM, Rohrbacher B, McGrath B. Transient peroneal nerve palsies from injuries placed in traction splints. *American Journal of Emergency Medicine* 1999;17(2):160-62.

[10] Herren K. Towards evidence based medicine: bestBETs from Manchester Royal Infirmary. No evidence for collar and cuff or sling in uncomplicated shaft of humerus fractures: Available from: http://www.bestbets.org/cgi-bin/bets.pl?record=00031, 2000.

[11] Carley S. Towards evidence based emergency medicine: bestBETs from Manchester Royal Infirmary. No evidence for either collar and cuff or sling after fracture of the clavicle: Available from: http://www.bestbets.org/cgi-bin/bets.pl?record=00013, 2000.

[12] Wood SP, Vrahas M, Wedel SK. Femur fracture immobilization with traction splints in multisystem trauma patients. *Pre-Hospital Emergency Care* 2003;7(2):241-3.

[13] Abarbanell NR. Prehospital midthigh trauma and traction splint use: recommendations for treatment protocols. *American Journal of Emergency Medicine* 2001;19(2):137-40.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Spinal cord injury (SCI) most commonly affects young and fit people and will continue to affect them to a varying degree for the rest of their lives.

In the extreme, SCI may prove immediately fatal where the upper cervical cord is damaged, paralysing the diaphragm and respiratory muscles.

Partial cord damage, however, may solely affect individual sensory or motor nerve tracts producing varying long-term disability. It is important to note that there are an increasing percentage of cases where the cord damage is only partial and some considerable recovery is possible, providing the condition is recognised and managed appropriately.

The spinal cord runs in the spinal canal down to the level of the second lumbar vertebra in adults.

The amount of space in the spinal canal in the upper neck is relatively large, and injury in this area can be ameliorated if adequate immobilisation is applied. In the thoracic area, the cord is wide, and the spinal canal relatively narrow and injury in this area is likely to completely disrupt and damage the spinal cord.

Spinal shock is a state of complete loss of motor function and often sensory function found sometimes after SCI. This immediate reaction may go on for some considerable time, and some recovery may well be possible.

Neurogenic shock is the state of poor tissue perfusion caused by sympathetic tone loss after spinal cord injury.

Immobilisation – evidence for how to immobilise

A recent Cochrane review found no randomised controlled trials comparing out of hospital spinal immobilisation techniques[1]:

- soft collars do not limit movement[2,3]
- there is variable difference between the various types of semi-rigid collars[2-4]
- addition of side supports and tapes increases immobilisation[2,3]
- combining collar with extrication board improves immobilisation[5]
- the application of devices is more important than the variation of devices[6]
- neutral position needs slight flexion of the neck and the occiput should be raised by two centimetres.[6] Extrication devices are better than extrication boards at reducing rotational movement [7,8]
- patients should spend no longer than 45 minutes on a rigid extrication board[9,10] but padding can extend this[11,12]
- vacuum mattress is more comfortable, and gives better immobilisation[13]
- vacuum mattresses cannot be used for extrication and are vulnerable to damage
- log rolling is not without risk[14] and use of the scoop stretcher may be safer for lifting patients.

Immobilisation – evidence for not immobilising

Penetrating injury to the head has not been shown to be an indication for spinal immobilisation[15,16] and even penetrating injuries of the neck only rarely need selective immobilisation.[17]

A small prospective pre-hospital study[18] indicated that the presence of **ALL** the following criteria can exclude significant spinal injury:

- normal mental status
- no neurological deficit
- no spinal pain or tenderness
- no evidence of intoxication
- no evidence of extremity fracture.

The few missed are often at the extremes of age.[19] Such criteria can be reproducibly undertaken in the out of hospital environment.[20] Mechanism of injury was not shown to be an independent predictor of injury.[21] Criteria were similar for thoraco-lumbar injuries but less specific.[22] Larger trials based in emergency departments (ED's) designed to determine the need for x-rays have drawn similar conclusions.[23,24]

Use of such guidelines can significantly reduce the use of unnecessary immobilisation.[25]

Immobilisation – hazards

The value of routine out of hospital spinal immobilisation remains uncertain and any benefits may be outweighed by the risks of rigid collar immobilisation, including:

1. airway difficulties
2. increased intra-cranial pressure[26-31]
3. increased risk of aspiration[32]
4. restricted respiration[33,34]
5. dysphagia[35]
6. skin ulceration[36-38]
7. can induce pain, even in those with no injury[10,39]

PRIMARY SURVEY

Assess ABCD whilst controlling the spine.

Evaluate whether the patient is **TIME CRITICAL, POTENTIALLY TIME CRITICAL**, or **NON-TIME CRITICAL** following criteria as per **trauma emergencies guideline**.

If patient is TIME **CRITICAL/POTENTIALLY TIME CRITICAL:**

- control the airway
- immobilise the spine
- go to the nearest suitable receiving hospital
- provide a hospital alert message.

En-route continue patient MANAGEMENT (***see below***).

ASSESSMENT

All patients with the possibility of spinal injury should have manual immobilisation commenced at the earliest time, whilst initial assessment is undertaken.

HISTORY

It is vital to determine the mechanism of injury in order to understand the forces involved in causing the injury including: hyperflexion, hyperextension, rotation and compression and combinations of all the above.

Injury most frequently occurs at junctions of mobile and fixed sections of the spine. Hence fractures are more commonly seen in the lower cervical vertebrae where the cervical and thoracic spine meets (C5, 6,7/T1 area) and the thoraco-lumbar junction (T12/L1). 10-15% of patients with one identified spinal fracture will be found to have another.

Road traffic collisions, falls and sporting injuries are the most common causes of SCI. As a group, motorcyclists occupy more spinal injury unit beds than any other group involved in road traffic collisions. Roll over road traffic collisions and the non-wearing of seat belts, causing head to vehicle body contact, and pedestrians struck by vehicles are likely to suffer SCI. Ejection from a vehicle increases the risk of injury significantly.

Certain sporting accidents, especially diving into shallow water, horse riding, rugby, gymnastics and trampolining have a higher than average risk of SCI. Rapid deceleration injury such as gliding and light aircraft accidents also increases the risk of SCI.

Examination

Specific signs of SCI

The patient may complain of:

- neck or back pain
- loss of sensation in the limbs
- loss of movement in the limbs
- sensation of burning in the trunk or limbs
- sensation of electric shock in the trunk or limbs.

If patient is a non-time critical patient, perform a more thorough assessment with a brief secondary survey.

Specifically assess:

- administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-rebreathing mask, using the stoma in laryngectomee and other neck breathing patients. High concentration O_2 should be administered routinely, whatever the oxygen saturation, in patients sustaining major trauma and long bone fracture, except for patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***)
- consider assisted ventilation at a rate of 12–20 respirations per minute if any of the following are present:
  - oxygen saturation (SpO_2) is <90% on high concentration O_2
  - respiratory rate is <10 or >30bpm
  - inadequate chest expansion.
- rapidly assess in the conscious patient sensory and motor function to estimate the level of the cord injury (***see Figure 1***).

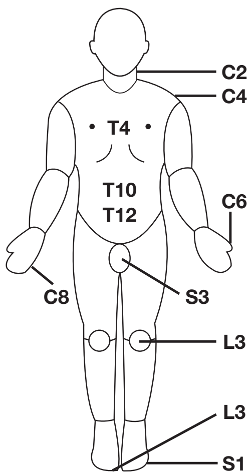


Figure 1 – Spinal Nerves

SENSORY EXAMINATIONS

Examine by	a. light touch b. response to pain
Use	the forehead as the guide to what is normal sensation
Examine	a. upper limbs and hands b. lower limbs and feet
Examine	both sides
T4 Examination	must be carried out in the **MID-AXILLARY** line, **NOT** the **MID-CLAVICULAR** line, as C2, C3 and C4 all supply sensation to the nipple line

Abdominal and chest signs

During the secondary survey, remember that abdominal and chest signs may be unreliable in the presence of SCI.

Assessment in the unconscious patient

It is not possible to fully assess the integrity of the spinal cord in the unconscious patient. The following signs may help:

- diaphragmatic or abdominal breathing
- hypotension (BP often <80-90 mmHg) with bradycardia
- warm peripheries or vasodilatation in presence of low blood pressure
- flaccid (floppy) muscles with absent reflexes
- priapism – partial or full erection of the penis.

NOTE: Spinal injury must always be presumed in the unconscious trauma victim

MANAGEMENT

All patients with a mechanism of injury that suggest the possibility of spinal injury should have manual immobilisation commenced at the earliest time, whilst initial assessment is undertaken.

Management of established spinal cord injury

Evidence is conflicting on the use of early high dose steroids in acute spinal cord injury.[40-42] If benefit exists then steroids need to be given within 8 hours of injury and therefore can be delayed until arrival at hospital.

Neurogenic shock

This is a difficult diagnosis in the out of hospital environment. The aim of shock treatment should be to maintain a blood pressure of approximately 90mmHg systolic.

Fluid Therapy

Obtain IV access.

Current research shows little evidence to support the routine use of IV fluids in adult trauma patients. In circumstances such as penetrating chest and abdominal trauma, survival worsens with the routine use of IV fluids.[43]

Fluids may raise the blood pressure, cool the blood and dilute clotting factors, worsening haemorrhage. Therefore, current thinking is that fluids should only be given when major organ perfusion is impaired.

If there is visible external blood loss greater than 500mls, fluid replacement should be commenced with a 250ml bolus of crystalloid.

Central pulse ABSENT, radial pulse ABSENT **is an absolute indication for urgent fluid. If the patient has a carotid pulse but no radial pulse then other clinical factors should also be considered before decision on fluid administration.**

Central pulse PRESENT, radial pulse ABSENT is a relative indication for urgent fluid depending on other indications including tissue perfusion and blood loss.

Central pulse PRESENT, radial pulse PRESENT **DO NOT** commence fluid replacement,[44] **unless there are other signs of poor central tissue perfusion** (e.g. altered mental state, cardiac rhythm disturbance).

Reassess vital signs prior to further fluid administration.

DO NOT delay at scene for fluid replacement; wherever possible cannulate and give fluid **EN-ROUTE TO HOSPITAL.**

In neurogenic shock, a few degrees of head down tilt may improve the circulation, but remember that in cases of abdominal breathing, this manoeuvre may further worsen respiration and ventilation. This position is also unsuitable for a patient who has, or may have, a head injury.

Atropine may be required if bradycardia is also present but it is important to rule out other causes, e.g. hypoxia, severe hypovolaemia.

When not to immobilise

Blunt trauma

All patients should be initially immobilised if the mechanism of injury suggests the possibility of SCI.

Following assessment it is possible to remove the immobilisation if **ALL** the following criteria are present (***Appendix 1***):

- no alteration in consciousness or mental state and patient is able to fully co-operate with examination
- no evidence of intoxication
- no complaint of spinal pain
- no vertebral tenderness
- no neurological deficit or complaint
- no significant distracting injury.

Spinal pain does not include tenderness isolated to the muscles of the side of the neck.

Children

None of the studies have been validated in children. It is recommended that these guidelines are interpreted with caution in children although there is some evidence to support similar principles.[45,46]

Penetrating trauma

Those with isolated penetrating injuries to limbs or the head do not require immobilisation.

Those with truncal or neck trauma should be immobilised if the trajectory of the penetrating wound could pass near or through the spinal column.

IMMOBILISATION

Cautions

Vomiting and consequent aspiration are serious consequences of immobilisation. Ambulance clinicians must always have a plan of action in case vomiting should occur. The collar will usually need to be removed and manual immobilisation instituted. This may include:

- suction
- head down tilt of the board
- rolling on to side on the board.

Methods

If immobilisation is indicated then the whole spine must be immobilised.

Only two methods are acceptable:

1. manual immobilisation whilst the back is supported
2. collar, head blocks and back support.

There are several acceptable means of back support and the optimal method will vary according to circumstances. The following techniques may be used:

1. **Patient lying supine**
    - log roll patient with manual immobilisation of the neck to enable long extrication board to be used
    - directly lift patient or use a scoop stretcher then insert a vacuum mattress underneath patient.
2. **Patient lying prone**
    - log roll patient with manual immobilisation of the neck to enable long extrication board to be used
    - 2-stage log roll on to a vacuum mattress.
3. **Patient requiring extrication**
    - extrication devices should be used if there is any risk of rotational movement[8,47]
    - rearward extrication on an extrication board
    - slide extrication invariably involves some rotational component and therefore has higher risks in many circumstances.

The techniques for use of devices are described in Pre-Hospital Trauma Life Support (PHTLS) and other manuals.

Precautions

The restless patient

There are many reasons for the patient to be restless and it is important to rule out reversible causes e.g. hypoxia, pain, fear. If, despite appropriate measures the patient remains restless, then immobilisation techniques may need to be modified. The use of restraint can increase forces on the injured spine and therefore a “best possible” approach should be adopted.

Emergency Extrication

If there is an immediate threat to life, for example, fire or airway obstruction that cannot be resolved in-situ, then the Ambulance Clinicians must decide on the relative risks of spinal immobilisation and the other factors.

Rapid extrication techniques with manual immobilisation of the cervical spine are appropriate in these circumstances; this includes side extrication.

Children

In children it is difficult to assess the neutral position but a padded board, straps and collar appear to be the optimal method. [3,48]

Transportation of spinal cases

Driving should balance the advantages of smooth driving and time to arrival at hospital. No immobilisation techniques eliminate movement from vehicle swaying and jarring.[49] The technique of loosening the collar is not supported by evidence.

There is no evidence to show advantage of direct transport to a spinal injury centre.[50]

Patients can tolerate a 30 minute journey on a long extrication board.[10] The receiving ED staff should be told how long the patient has already been on the board so they can make an appropriate judgment on the timing of its removal. The duration of time on the extrication board should be recorded on the clinical record. The extrication board should be removed as soon as possible on arrival in hospital.[51]

If a journey time of greater than 30 minutes is anticipated, the patient should be transferred from the extrication board using an orthopaedic ("scoop") stretcher to a vacuum mattress.[11] It may be appropriate to use a mattress on a board in non-extrication situations.

If a journey time greater than 30 minutes occurs unexpectedly it is not appropriate to add further delay by transferring the patient to a vacuum mattress. The journey should proceed but the ED should be advised of the length of time the patient has spent on the board.

If there is a clear paralysing injury to the spinal cord then the benefits of the back board may be limited, while the risk of pressure sores may be very high. In these circumstances, the use of a vacuum mattress is often preferred. However, as half of cases of spinal injuries have other serious injuries, an unnecessary delay at scene or in transit should be avoided.

AT HOSPITAL

As well as the usual information at the time of handover it is important to give the duration of immobilisation.

Assist in early removal from the extrication board.

Key Points – Spinal Trauma

- Immobilise the spine until it is positively cleared.
- Immobilise the spine of all unconscious trauma victims.
- If the neck is immobilised the thoracic and lumbar spine also need immobilisation.
- Standard immobilisation is by means of collar, headblocks, tapes and spinal board.
- Aspiration of vomit, pressure sores and raised intracranial pressure are major complications of immobilisation.

REFERENCES

1. Kwan I, Bunn F, Roberts I, on behalf of the WHO Pre-Hospital Trauma Care Steering Committee. Spinal immobilisation for trauma patients The Cochrane Database of Systematic Reviews, 2001:CD002803. DOI: 10.1002/14651858.

2. Podolsky S, Baraff LJ, Simon RR, Hoffman JR, Larmon B, Ablon W. Efficacy of cervical spine immobilization methods. *J Trauma* 1983;23(6):461-5.

3. Huerta C, Griffith R, Joyce SM. Cervical spine stabilization in pediatric patients: Evaluation of current techniques. 1987;16(10):1121-1126.

4. McCabe JB, Nolan DJ. Comparison of the effectiveness of different cervical immobilization collars. *Ann Emerg Med* 1986;15:93-96.

5. Chandler DR, Nemejc C, Adkins RH, Waters RL. Emergency cervical-spine immobilization. *Annals of Emergency Medicine* 1992;21(10):1185-1188.

6. De Lorenzo RA. A review of spinal immobilization techniques. *Journal of Emergency Medicine* 1996;14(5):603-613.

7. Howell JM, Burrow R, Dumontier C, Hillyard A. A practical radiographic comparison of short board technique and Kendrick extrication device. *Annals of Emergency Medicine* 1989;18(9):943-946.

8. Graziano AF, Scheidel EA, Cline JR, Baer LJ. A radiographic comparison of pre-hospital cervical immobilization methods. *Annals of Emergency Medicine* 1987;16(10):1127-1131.

[9] Cordell WH, Hollingsworth JC, Olinger ML, Stroman SJ, Nelson DR. Pain and Tissue-Interface Pressures During Spine-Board Immobilization. *Annals of Emergency Medicine* 1995;26(1):31-36.

[10] Chan D, Goldberg R, Tascone A, Harmon S, Chan L. The effect of spinal immobilization on healthy volunteers. *Annals of Emergency Medicine* 1994;23(1):48-51.

[11] Walton R, DeSalvo JF, Ernst AA, Shahane A. Padded vs unpadded spine board for cervical spine immobilization. *Annals of Emergency Medicine* 1995;2(8):725-8.

[12] Lovell ME, Evans JH. A comparison of the spinal board and the vacuum stretcher, spinal stability and interface pressure. *Injury* 1994;25(3):179-180.

[13] Hamilton RS, Pons PT. The efficacy and comfort of full-body vacuum splints for cervical-spine immobilization. *Journal of Emergency Medicine* 1996;14(5):553-559.

[14] McGuire RA, Neville S, Green BA, Watts C. Spinal instability and the log-rolling maneuver. *J Trauma* 1987;27(5):525-31.

[15] Kennedy F, Gonzalez P, Dang C, Fleming A, Sterling-Scott R. The Glasgow Coma Scale and prognosis in gunshot wounds to the brain. *J Trauma* 1993;35(1):75-7.

[16] Kaups KL, Davis JW. Patients with Gunshot Wounds to the Head Do Not Require Cervical Spine Immobilization and Evaluation *Journal of Trauma-Injury Infection & Critical Care* 1998;44(5):865-867.

[17] Barkana Y, Stein M, Scope A, Maor R, Abramovich Y, Friedman Z, et al. Prehospital stabilization of the cervical spine for penetrating injuries of the neck — is it necessary? *Injury* 2000;31(5):305-309.

[18] Domeier RM, Swor RA, Evans RW, Hancock JB, Fales W, Krohmer J, et al. Multicenter prospective validation of pre-hospital clinical spinal clearance criteria. *J Trauma* 2002 53(4):744-50.

[19] Stroh G, Braude D. Can an out-of-hospital cervical spine clearance protocol identify all patients with injuries? An argument for selective immobilization. *Annals of Emergency Medicine* 2001;37(6):609-615.

[20] Sahni R, Menegazzi JJ, Mosesso VNJ. Paramedic evaluation of clinical indicators of cervical spinal injury. *Prehosp Emerg Care* 1997;1(1):16-8.

[21] Domeier RM, Evans RW, Swor RA, Hancock JB, Fales W, Krohmer J, et al. The reliability of pre-hospital clinical evaluation for potential spinal injury is not affected by the mechanism of injury. *Prehosp Emerg Care* 1999;3(4):332-7.

[22] Holmes JF, Panacek EA, Miller PQ, Lapidis AD, Mower WR. Prospective evaluation of criteria for obtaining thoracolumbar radiographs in trauma patients. *Journal of Emergency Medicine* 2003;24(1):1-7.

[23] Hendey GW, Wolfson AB, Mower WR, Hoffman JR, for the National Emergency X-Radiography Utilization Study Group. Spinal Cord Injury without Radiographic Abnormality: Results of the National Emergency X-Radiography Utilization Study in Blunt Cervical Trauma. *Journal of Trauma-Injury Infection & Critical Care* 2002;53(1):1-4.

[24] Stiell IG, Wells GA, Vandemheen KL, Clement CM, Lesiuk H, De Maio VJ, et al. The Canadian C-Spine Rule for Radiography in Alert and Stable Trauma Patients. *JAMA* 2001;286(15):1841-1848.

[25] Muhr MD, Seabrook DL, Wittwer LK. Paramedic use of a spinal injury clearance algorithm reduces spinal immobilization in the out-of-hospital setting. *Prehosp Emerg Care* 1999;3(1):1-6.

[26] Craig GR, Nielsen MS. Rigid cervical collars and intracranial pressure. *Intensive Care Medicine* 1991;17:504-5.

[27] Ferguson J, Mardel SN, Beattie TF, Wytch R. Cervical Collars – a Potential Risk to the Head-Injured Patient. *Injury-International Journal of the Care of the Injured* 1993;24(7):454-456.

[28] Raphael JH, Chotai R. Effects of the cervical collar on cerebrospinal fluid pressure. *Anaesthesia* 1994;49(437-9).

[29] Kolb JC, Summers RL, Galli RL. Cervical collar induced changes in intracranial pressure. *American Journal of Emergency Medicine* 1999;17:135-7.

[30] Hunt K, Hallworth S, Smith M. The effects of rigid collar placement on intracranial and cerebral perfusion pressures. *Anaesthesia* 2001;56:511-513.

[31] Davies G, Deakin C, Wilson A. The effect of a rigid collar on intracranial pressure. *Injury-International Journal of the Care of the Injured* 1996;27(9):647-649.

[32] Butman AM, Schelble DT, Vomacka RW. The relevance of the occult cervical spine controversy and mechanism of injury to pre-hospital protocols: a review of the issues and literature. *Prehospital Disaster Med* 1996;11(3):228-33.

[33] Totten VY, Sugarman DB. Respiratory effects of spinal immobilization. *Prehosp Emerg Care 1999* 3(4):347-52.

[34] Dodd FM, Simon E, McKeown D, Patrick MR. The effect of a cervical collar on the tidal volume of anaesthetised adult patients. *Anaesthesia* 1995;50(11):961-3.

[35] Houghton DJ. Dysphagia caused by a hard cervical collar. *British Journal of Neurosurgery* 1996 10(5):501-502

[36] Hewitt S. Skin necrosis caused by a semi-rigid cervical collar in a ventilated patient with multiple injuries. *Injury* 1994;25(5):323-4.

[37] Black CA, Buderer NMF, Blaylock B, Hogan BJ. Comparative study of risk factors for skin breakdown with cervical orthotic devices. *J Trauma Nurs*;5(3):62-66.

[38] Liew SC, Hill DA. Complication of hard cervical collars in multi-trauma patients. *Aust N Z J Surg* 1994;64(2):139-40.

[39] Chan D, Goldberg RM, Mason J, Chan L. Backboard versus mattress splint immobilization: a comparison of symptoms generated *Journal of Emergency Medicine* 1996;14(3):293-298.

[40] Short DJ, El Masry WS, Jones PW. High dose methylprednisolone in the management of acute spinal cord injury – a systematic review from a clinical perspective. *Spinal Cord* 2000 38(5):273-86.

[41] Bracken MB. Methylprednisolone and acute spinal cord injury: an update of the randomized evidence. *Spine* 2001;15(26 24 Suppl):S47-54.

[42] Bracken MB. Steroids for acute spinal cord injury: The Cochrane Database of Systematic Reviews, 2002:CD001046.

[43] Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.

[44] Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

[45] Browne GJ, Lam LT, Barker RA. The usefulness of a modified adult protocol for the clearance of paediatric cervical spine injury in the emergency department. *Emergency Medicine Australasia* 2003;15(2):133-142.

[46] Slack SE, Clancy MJ. Clearing the cervical spine of paediatric trauma patients. *Emerg Med J* 2004;21(2):189-193.

[47] Howell MA, Guly HR. A comparison of glucagon and glucose in pre-hospital hypoglycaemia. *Journal of Accident and Emergency Medicine* 1997;14:30-2.

[48] Curran C, Dietrich AM, Bowman MJ, Ginn-Pease ME, King DR, Kosnik E. Pediatric Cervical-Spine Immobilization: Achieving Neutral Position? *Journal of Trauma-Injury Infection & Critical Care* 1995; 39(4):729-732.

[49] Manix T. The tying game. How effective are body-to-board strapping techniques? *JEMS* 1995;20(6):44-50.

[50] Jones L, Bagnall A. Spinal injuries centres (SICs) for acute traumatic spinal cord injury.: The Cochrane Database of Systematic Reviews, 2004:CD004442.pub2. DOI: 10.1002/14651858.

[51] Cooke MW. Use of the spinal board within the accident and emergency department. *Emerg Med J* 1998;15(2):108-109.

METHODOLOGY

Refer to methodology section.

APPENDIX 1 – Immobilisation Algorithm

In an adult patient with potential spinal injury can you confirm the following:

Including but not limted to:
- Blunt trauma
- Axial loading
- Fall from height
- Road Traffic Collision

Patient is conscious, alert and able to fully co-operate with examination?

NO → IMMOBILISE

YES ↓

Patient is not under the influence of alcohol or drugs – illicit or prescribed *(including analgesia)*?

NO → IMMOBILISE

YES ↓

Patient has no complaint of spinal pain?
(note: tenderness isolated to the muscles of the side of the neck is not spinal pain)

NO → IMMOBILISE

YES ↓

Patient has no vertebral tenderness nor deformity on palpation?

NO → IMMOBILISE

YES ↓

Patient has no neurologic deficit?

NO → IMMOBILISE

YES ↓

Patient has no painful or distracting injuries?

NO → IMMOBILISE

Distracting pain is any pain that is sufficient to cause the patient to focus upon that pain or that which interferes with patient assessment – including both medical and traumatic aetiologies.

YES ↓

IMMOBILISATION NOT REQUIRED

INTRODUCTION

Thoracic injuries are one of the most common causes of death from trauma, accounting for approximately 25% of such deaths.

Despite the very high percentage of serious thoracic injuries, the vast majority of these patients can be managed in hospital by chest drainage and resuscitation and only 10–15% require surgical intervention.

In the field, the most common problem associated with thoracic injury is hypoxia, either from impaired ventilation or secondary to hypovolaemia from massive bleeding into the chest (haemothorax), or major vessel disruption (e.g.: ruptured thoracic aorta).

HISTORY

The mechanism of injury is an important guide to the likelihood of significant thoracic injury. Injuries to the chest wall usually arise from direct contact, for example, intrusion of wreckage in a road traffic collision or blunt trauma to the chest wall arising from a direct blow. Seat belt injuries come into this category and may cause fractures of the clavicle, sternum and ribs.

If the force is sufficient, the deformity and damage to the chest wall structures may induce tearing and contusion to the underlying lung and other structures. This may produce a combination of severe pain on breathing (pleuritic pain) and a damaged lung, both of which will significantly reduce the ability to ventilate adequately. This combination is a common cause of **hypoxia.**

Blunt trauma to the sternum may induce myocardial contusion, which may result in ECG rhythm disturbances.

Penetrating trauma may well damage the heart, lungs and great vessels, both in isolation or combination. It must be remembered that **penetrating wounds to the upper abdomen and the neck may well have caused injuries within the chest, remote from the entry wound**. Conversely, penetrating wounds to the chest may well involve injury to the liver, kidneys and spleen.

The lung may be damaged with bleeding causing a haemothoraxa or an air leak causing a pneumothorax. Penetrating or occasionally blunt chest injuries may cause a cardiac wound. Blood can leak into the non-elastic surrounding pericardial sack and build up pressure to an extent that the heart is incapable of refilling to pump blood into the circulation. This is known as **cardiac tamponade** and can be rapidly fatal if not relieved at hospital (***see additional information***).

Rapid deceleration injury may induce shearing forces sufficient to rupture great vessels such as the aorta.

The major thoracic injuries likely to present as serious problems in the field will involve either a developing tension pneumothorax, uncontrolled haemorrhage into the chest cavity causing a massive haemothorax, open chest wounds, major flail chest or cardiac tamponade.

ASSESSMENT

Assess:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination).

Evaluate whether patient is **TIME CRITICAL** or **NON-TIME CRITICAL** following criteria as per trauma emergencies guideline.

If patient is **TIME CRITICAL, correct A and B problems, and rapidly transport to nearest suitable receiving hospital**. Send a **Hospital Alert Message**. En-route continue patient management of thoracic trauma (***see below***).

In **NON-TIME CRITICAL** patients perform a more thorough patient assessment with a brief secondary survey.

Patients should normally be transported in the semi-recumbent or upright position, however this may often not be appropriate due to other injuries present or suspected.

MANAGEMENT

Follow **trauma emergencies guideline**, remembering to:

- ensure ABCs and consider immobilisation of cervical spine if indicated (***refer to neck and back trauma guideline***)
- pulse oximetry and ECG monitoring **MUST BE** used as this will assist in recognising hypoxia, but normal readings do not exclude relative hypoxia
- ECG monitoring.

Respiration:

Assess breathing adequacy:

- respiratory rate and volume
- equality of air entry

- administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-rebreathing mask, using the stoma in laryngectomee and other neck breathing patients. High concentration O_2 should be administered routinely, whatever the oxygen saturation, in patients sustaining major trauma and long bone fracture, except for patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***)
- consider assisted ventilation at a rate of 12–20 respirations per minute if any of the following are present:
  - oxygen saturation (SpO_2) is <90% on high concentration O_2
  - respiratory rate is <10 or >30bpm
  - inadequate chest expansion.

NOTE: exercise caution as any positive pressure ventilation may increase the size of a pneumothorax.

Fluid Therapy [1-6]

Obtain IV access.

Current research shows little evidence to support the routine use of IV fluids in adult trauma patients. In circumstances such as penetrating chest and abdominal trauma, survival worsens with the routine use of IV fluids.[1]

Fluids may raise the blood pressure, cool the blood and dilute clotting factors, worsening haemorrhage. Therefore, current thinking is that fluids should only be given when major organ perfusion is impaired.

If there is visible external blood loss greater than 500mls, fluid replacement should be commenced with a 250ml bolus of crystalloid (maximum of 2 litres).

Central pulse **ABSENT**, radial pulse **ABSENT** – is an absolute indication for urgent fluid. If the patient has a carotid pulse but no radial pulse then other clinical factors should also be considered before decision on fluid administration.

Central pulse **PRESENT**, radial pulse **ABSENT –** is a relative indication for urgent fluid depending on other indications including tissue perfusion and blood loss.

Central pulse **PRESENT**, radial pulse **PRESENT – DO NOT** commence fluid replacement,[2] unless there are other signs of poor central tissue perfusion (e.g. altered mental state, cardiac rhythm disturbance).

Reassess vital signs prior to further fluid administration.

DO NOT delay at scene for fluid replacement; wherever possible cannulate and give fluid **EN-ROUTE TO HOSPITAL**.

Specifically consider:

- cover open chest wounds with an Asherman chest seal or adherent non-permeable dressing taped down on three out of four sides to allow some air to escape.
- consider (***refer to Appendix 1*** for assessment and treatment of these conditions):
  - tension pneumothorax
  - flail segments
  - surgical emphysema
  - cardiac tamponade.
- impaling objects, e.g. a knife must be **LEFT IN-SITU** for removal under direct vision in the operating theatre. Any **impaling objects** should be adequately secured prior to transfer to further care. If the impaling object is pulsating, then it should not be completely immobilised, but allowed to pulsate.

Analgesia

Patient's pain should be managed appropriately (***refer to pain management guidelines***); analgesia in the form of Entonox (***refer to Entonox drug protocol for administration and information***) should be used with caution in chest-injured patients as there is significant risk of enlarging a pneumothorax.

Adequate morphine analgesia (***refer to morphine drug protocol for dosages and information***) may improve ventilation by allowing better chest wall movement, but high doses may induce respiratory depression. Careful titration of dosage is therefore required.

Key Points – Thoracic Trauma

- Thoracic injury is commonly associated with hypoxia, either from impaired ventilation or secondary to hypovolaemia from massive bleeding into the chest (haemothorax) or major vessel disruption.
- Pulse oximetry **MUST BE** used as this will assist in recognising hypoxia.
- The mechanism of injury is an important guide to the likelihood of significant thoracic injury.
- Blunt trauma to the sternum may induce myocardial contusion, which may result in ECG rhythm disturbances.
- Impaling objects should be adequately secured; if the object is pulsating, do not completely immobilise, but allow the object to pulsate.
- ECG monitoring

REFERENCES

[1] Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.

[2] Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

[3] Bickell WH, Wall MJJ, Pepe PE, Martin RR, Ginger VF, Allen MK, et al. Immediate versus delayed fluid resuscitation for hypotensive patients with penetrating torso injuries. *N Engl J Med* 1994;331(17):1105-9.

[4] de Guzman E, Shankar MN, Mattox KL. Limited volume resuscitation in penetrating thoracoabdominal trauma. *AACN Clinical Issues* 1999;10(1):61-68.

[5] Pepe PE, Mosesso VNJ, Falk JL. Prehospital fluid resuscitation of the patient with major trauma. *Prehospital Emergency Care* 2002;6(1):81-91.

[6] Stern SA. Low-volume fluid resuscitation for presumed hemorrhagic shock: helpful or harmful? *Current Opinions in Critical Care* 2001;7(6):422-30.

METHODOLOGY

Refer to methodology section.

APPENDIX 1

TENSION PNEUMOTHORAX

This is a rare respiratory emergency which may well require immediate action at the scene or en-route to hospital. A tension pneumothorax occurs when a damaged area of lung leaks air out into the plural space on each inspiration but does not permit the air to exit from the chest via the lung on expiration.

This progressively builds up air under tension on the affected side, collapsing that lung and putting increasing pressure on the heart and great vessels and opposite lung. Coughing and shouting can make the situation worse. If this air is not released externally, the heart will be unable to fill and the other lung will no longer be able to ventilate, inducing cardiac arrest.

Assessment of Tension Pneumothorax

- Tension pneumothorax is mostly related to penetrating trauma but can arise spontaneously from blunt or crushing injury to the chest. This will present rapidly with increasing breathlessness and extreme respiratory distress (respiratory rate often > 30 breaths per minute).
- The chest on the affected side may appear to be moving poorly or not at all. The chest wall on the affected side may appear over expanded. Air entry will be greatly reduced or absent on the affected side and in the absence of shock, the neck veins may become distended. Later on, the trachea and apex beat of the heart may become displaced away from the side of the pneumothorax and cyanosis may appear. Occasionally the patient will present with just rapidly deteriorating respiratory distress.
- The patient may appear shocked as a result of decreased cardiac output. They are usually tachycardic and hypotensive.
- Tension pneumothorax, however, is more commonly seen in the pre-hospital setting in chest-injured patients who are ventilated. Forcing oxygenated air down into the lungs under positive pressure will progressively expand a small, probably undetected, simple pneumothorax into a tension pneumothorax. This will take some minutes and it may well be several minutes after ventilation has commenced before increasing back pressure is noticed, either by the bag becoming harder to squeeze or the ventilator alarm sounding. Once the airway has been checked, the chest must be viewed to see if both sides are moving and auscultated to ensure air entry is present on both sides. The findings of the chest signs described above will confirm the diagnosis.

Management of Tension Pneumothorax

Tension pneumothorax must be decompressed rapidly by needle thoracocentesis.

Treatment must be closely assessed as the procedure may fail. In such an event a further procedure should be carried out.

OTHER TYPES OF CHEST TRAUMA

Flail Chest

Small flail segments may not be detectable. Large flail segments however, may impair ventilation considerably as a result of pain. Splinting with a large pad or a hand supporting and immobilising the flail segment helps reduce pain, and improves ventilatory function. Traditionally, the patient has been turned onto the affected side for transportation, but this **CANNOT** be achieved on a long board. The segment can be immobilised in the boarded patient by manual splinting as described above.

Surgical Emphysema

This produces swelling of the chest wall, neck and face, with a crackling feeling under the fingers when the skin is pressed. This indicates an air leak from within the chest, either from a pneumothorax, ruptured large airway or ruptured larynx.

It requires no specific treatment, but indicates potentially **SERIOUS** underlying chest trauma. It may be gross causing the patient to swell up. If a patient with gross surgical emphysema is continuing to deteriorate, look for a possible underlying tension pneumothorax.

Cardiac Tamponade

The heart is enclosed in a tough, non-elastic membrane, the pericardium.

A potential space exists between the pericardium and the heart itself. If a penetrating wound injures the heart, blood may flow under pressure into the pericardial space. As the pericardium cannot expand, a leak of only 20-30ml of blood can cause compression of the heart, reducing cardiac output and causing tachycardia and hypotension. Further compression reduces cardiac output and cardiac arrest may occur.

Signs of hypovolaemic shock, tachycardia and hypotension, accompanied by either blunt or, more commonly, penetrating chest trauma, may be only the initial evidence of cardiac tamponade. Remember, upper abdominal and posterior chest stab wounds may well have penetrated the heart.

Other signs include distended neck veins and muffled heart sounds when listened to with a stethoscope (sounds are diminished by the layer of blood between the heart and chest wall). The heart cannot fill because of the pressure in the pericardium, hence the neck veins become distended.

In cardiac tamponade, the compressing blood requires rapid evacuation, initially by a long needle attached to a syringe, and then surgically, with an open chest operation, as rapidly as possible.

Patients will die in the field if any unnecessary delay occurs in reaching hospital. If cardiac tamponade is suspected, remove at once to the nearest suitable receiving hospital with ongoing ABC care.

DO NOT waste time at the scene commencing IV lines or infusions with these patients as **ANY DELAY** will threaten their survival. Pericardiocentesis is not recommended as it is rarely successful, has significant complications and delays definitive care.

ADDITIONAL INFORMATION

Chest trauma is treated with difficulty in the field and **prolonged treatment before transportation is NOT indicated if significant chest injury is suspected**. Penetrating trauma, in particular where lung or cardiac wounds are suspected, must be transported **immediately** to a suitable hospital, with resuscitation en-route.

Airway management, oxygenation, assistance with ventilation as required and external haemorrhage control only should be applied in critical chest trauma cases particularly with penetrating injuries. **LOAD AND GO TO NEAREST suitable receiving Hospital**. Specifically consider the need for thoracic surgery intervention.

Remember, any stab or bullet wound to the chest, abdomen or back may penetrate the heart.

Massive haemothorax frequently presents as profound shock with breathing difficulty and reduced air entry in the lower chest on the affected side. The breathlessness is seldom extreme and shock is the overwhelming finding. These patients must be managed as **TIME CRITICAL**, transported rapidly and IV access secured en-route.

Patients with significant chest trauma may often insist on sitting upright and this is especially common in patients with diaphragmatic injury who may get extremely breathless when lying down. In this instance a decision will have to be made as to whether a patient is best managed sitting upright or whether immobilisation on a longboard should be continued.

In the rare incident of gunshot injury to Police personnel using ballistic protection vests, the vest may indeed protect from penetrating injury, but serious underlying blunt trauma, (e.g. pulmonary contusion) may be caused to the thorax. **NEVER UNDER ESTIMATE THESE INJURIES**.

There is a strong link **between serious chest wall injury and thoracic spine injury** – maintain a high index of suspicion.

INTRODUCTION

Coping with pregnant women with major injuries is a rare problem, but demands a special approach. Pregnancy produces physiological changes, particularly in the cardiovascular system:

- cardiac output increases by 20–30% in first 10 weeks of pregnancy
- average heart rate increases by 10 to 15 beats per minute
- both systolic and diastolic blood pressure (BP) fall on average by 10–15mmHg
- **in the supine position the enlarged uterus compresses the inferior vena cava. This reduces venous return to the heart, causing a further drop in BP**
- as the pregnancy develops, the diaphragm becomes splinted and breathing effort, rate and tidal volume are increased.
- both blood volume (45% increase) and numbers of red cells increase, but not in proportion, so the patient becomes relatively **anaemic**
- gastric emptying is delayed and the lower oesophageal sphincter is relaxed, therefore **both vomiting and passive regurgitation are more common** and the airway is at increased risk.

There are three fundamental rules which must be followed at all times when dealing with the pregnant patient:

1. the maternal well-being is essential to the survival of the fetus and thus resuscitation of the mother must always be the priority. Also, remember that **'resuscitating the mother will resuscitate the fetus'**
2. compression of the inferior vena cava by the pregnant uterus (beyond 20 weeks) is a serious potential complication and suitable positioning or manual displacement must be employed (see manual displacement below)
3. signs of shock appear very late during pregnancy and hypotension is an extremely late sign. **Any signs of hypovolaemia during pregnancy are likely to indicate a 35% (class III) blood loss and must be treated aggressively. ESTABLISH LARGE BORE IV CANNULATION EARLY.**

HISTORY

Refer to trauma emergencies guideline.

Enquire about stage of the pregnancy, and any problems so far with the pregnancy. Ask the mother if she has her pregnancy record card with her.

Enquire about the movement of the baby felt by the mother (fetal movements) (***refer to obstetric and gynaecology guidelines***).

ASSESSMENT

Assess and correct deficits with:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)

Specifically assess:

- assess for fetal movement or abdominal pain in the mother
- evaluate whether the patient is **TIME CRITICAL or NON-TIME CRITICAL** following criteria on **trauma emergencies guideline**
- **if patient is TIME CRITICAL, correct A and B problems**, LOAD ON TO LONGBOARD and TRANSPORT **to NEAREST SUITABLE RECEIVING HOSPITAL** with a Hospital Alert Message / Information call

DO NOT MANAGE A PREGNANT FEMALE (>20 weeks) ON HER BACK ON THE LONGBOARD – AIM FOR 30 degree TILT (preferably to left side)

- it is **vital**, therefore, to **tilt the longboard** by propping it up under the **right side** so tilting the mother to her left
- if this is impossible, the uterus should be manually displaced to the left side
- provide a **Hospital Alert Message**
- en-route continue patient **MANAGEMENT** (***see below***)
- **CAUTION**: The usual increase in plasma volume, tachycardia, and lowered BP can mask initial signs of **hypovolaemic shock** until quite significant bleeding has occurred
- reduced blood volume caused by haemorrhage will induce maternal **hypoxia** as well as **hypovolaemia.** This will cause fetal hypoxia due to reduced placental blood flow

- if the mother is dead or develops cardiac/respiratory arrest en-route to hospital, commence adult basic life support (BLS)/advanced life support (ALS) (***refer to BLS/ALS guidelines***) and transport immediately to **nearest suitable receiving hospital** with **Hospital Alert Message** to have an **OBSTETRICIAN ON STANDBY IN THE EMERGENCY DEPARTMENT (ED)** for emergency caesarean section. Caesarean section should ideally be carried out if there is no response within 5 minutes of instituting BLS/ALS. Remember that the prime aim of perimortem caesarean section is to facilitate **MATERNAL** resuscitation (also, with effective BLS/ALS the infant **may** have a chance of survival)
- in non-time critical patients, perform a more thorough patient assessment with brief secondary survey.

MANAGEMENT

Follow Trauma Emergencies Guideline

Specifically consider:

- do not transport supine on a long board. **Tilt the mother to her left side.**

Respiration

- administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-rebreathing mask, using the stoma in laryngectomee and other neck breathing patients. High concentration O_2 should be administered routinely, whatever the oxygen saturation, in patients sustaining major trauma and long bone fracture, except for patients with chronic obstructive pulmonary disease (COPD) (***refer to COPD guideline***)
- consider assisted ventilation at a rate of 12–20 respirations per minute if any of the following are present:
  - oxygen saturation (SpO_2) is <90% on high concentration O_2
  - respiratory rate is <10 or >30bpm
  - inadequate chest expansion.

Fluid Therapy

Obtain IV access (large bore cannula).

Although, current research in non-pregnant women shows little evidence to support the routine use of IV fluids in adult trauma patients,[1] **IN PREGNANCY,** the uterus, and thus the fetus, will often become 'under-perfused' **PRIOR** to the women becoming tachycardic or hypotensive. Hypovolaemia is manifested late in pregnant women, thus the fetus may be compromised if adequate fluid replacement is **NOT** given; therefore fluid replacement should be given earlier.

If there is visible external blood loss greater than 500mls, fluid replacement should be commenced with a 250ml bolus of crystalloid.

Central pulse **ABSENT**, radial pulse **ABSENT –** is an absolute indication for urgent fluid.

Central pulse **PRESENT**, radial pulse **ABSENT** – will normally need fluid replacement in the pregnant patient.

Central pulse **PRESENT**, radial pulse **PRESENT – DO NOT** commence fluid replacement,[2] unless there are other signs of poor central tissue perfusion (e.g. altered mental state, abnormal cardiac rhythm or in the pregnant patient a high index of suspicion of significant blood loss.

Re-assess vital signs prior to further fluid administration.

ADDITIONAL INFORMATION

All pregnant women involved in a traumatic situation, however trivial, require to be assessed in an ED with an obstetric unit.

Abdominal pain after trauma should be presumed to be significant and may be associated with internal blood loss.

Key Points – Trauma in Pregnancy

- Maternal well-being is essential to the survival of the fetus.
- Compression of the inferior vena cava by the pregnant uterus (>20 weeks) is a serious potential complication; tilt the patient 30 degrees to the left side or manually displace the uterus.
- Signs of shock appear very late and hypotension is an extremely late sign. Any signs of hypovolaemia during pregnancy are likely to indicate a 35% (class III) blood loss and must be treated aggressively.
- All trauma is significant.
- If the mother is dead or develops cardiac/respiratory arrest en-route, commence life support and alert the hospital so that an obstetrician can be on standby in the ED for emergency caesarean section.

REFERENCES

1. Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.
2. Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

METHODOLOGY

Refer to methodology section.

INTRODUCTION

The best clinical management for a mother who is experiencing an abnormal labour or delivery is for her to be transferred to further care without delay.

When there is a Midwife on scene it is their responsibility to manage the delivery, and crews should work under their direction. If the Midwife is not present, the decision on whether to move the mother should be based on the principle that any situation which deviates from a normal uncomplicated delivery should result in the mother being transported immediately to hospital. In this situation the crew must alert the hospital via Control en-route. Crews should make an early assessment of the need for additional assistance from a second crew and ensure that the vehicle is requested as soon as possible.

The most important feature of managing an obstetric incident is a rapid and accurate assessment of the mother to ascertain whether there is anything abnormal taking place.

The following maternal assessment process **MUST** be followed in order to allow you to decide whether to **STAY ON SCENE AND REQUEST A MIDWIFE (if not already present)** or **TRANSFER TO FURTHER CARE IMMEDIATELY.**

In maternity cases where delivery is not imminent and there are no complications (refer to maternal assessment flowchart) the mother may be transported to the unit into which she is booked. **The assessment should be repeated en-route and if any complications occur, the condition should be treated appropriately, and the woman's destination revised if necessary**. If the mother is booked into a unit that is not within a reasonable distance or travelling time, crews should base their judgments on the maternal assessment, and take the mother to the most appropriate unit.

MATERNAL ASSESSMENT (refer to appendix 1)

Are the following indications present?

show	a bloodstained mucous discharge from the cervix which is passed from the vagina.
waters broken	rupture of the membranes surrounding the baby.
contractions	usually noticed at 10 minute intervals becoming more frequent. There is usually intermittent pain that accompanies contraction of the uterus.
bleeding	there is a possibility of vaginal bleeding before, during and after labour.

If **ANY** of the above indications are present move on to the next stage of assessment.

If **NONE** of the above indications are present and there are no other medical or traumatic conditions, the management should be discussed with the **BOOKED OBSTETRIC UNIT**. It is useful to obtain the following information:

a. mother's name
b. mother's date of birth
c. age
d. hospital registration number
e. name of consultant
f. history of this pregnancy
g. estimated date of delivery (EDD)
h. previous obstetric history.

Ask to see the mother's own hospital notes which most women keep with them.

Is the mother unwell or injured?

This stage of the assessment is concerned with medical and traumatic conditions that may not be directly associated with pregnancy or labour, and may be due to a pre-existing medical condition or accident. However, it should be remembered that unless the cause is obvious, ***specific pregnancy related conditions should always be considered.***

If the mother presents with an obvious medical or traumatic condition that puts her life in imminent danger, or is having a **trauma/epilepsy related seizure**, the **APPROPRIATE TREATMENT** for that condition must be initiated. She must be transported to the **NEAREST EMERGENCY DEPARTMENT (ED) UNIT** preceded by a Hospital Alert Call remembering to inform the hospital that the patient is pregnant.

If the mother is having a **seizure that is unrelated to either trauma or epilepsy** (refer to Managing Complications: note 2-maternal seizures).

If there are no medical or traumatic conditions present move on to the next stage of assessment.

What is the period of gestation?

The period of gestation is important in determining your course of action. A pregnancy is divided into three "trimesters" each of 13 weeks. It is important to establish the stage in the pregnancy (measured in weeks of duration of the pregnancy). For example, 14/40 on a maternity plan means the mother is 14 weeks into the 40 week duration of pregnancy. The appropriate action for differing lengths of gestation would be:

Less than 20 weeks[1]	**Transport to the nearest ED Dept.**
20-34 weeks[1]	**Transport Immediately To Booked Obstetric Unit** (Refer To Delivery Algorithm, Appendix 2).
35-40 weeks	**Move On To Next Stage Of Assessment.**

[1] Some hospitals use 18 weeks. Check with Control who will find out about local arrangements

If the mother is unable to tell you her length of gestation she will usually be able to tell you when the baby is due. Count the number of weeks remaining before that date and subtract this number from 40. This will give you the period of gestation.

Are there any potential complications?

There are a number of potential complications that warrant **IMMEDIATE** transfer to the **NEAREST OBSTETRIC UNIT,** these complications are:

- severe vaginal bleeding
- prolapsed cord
- continuous severe abdominal/epigastric pain*
- presentation of part of the baby other than the head (e.g. an arm or leg).

The specific appropriate treatment for the above is given in the section of this protocol headed 'Managing Complications'. The mother must be removed to the nearest obstetric unit **WITHOUT DELAY** having first put in a Hospital Alert Call. Commence the appropriate treatment regime as soon as possible.

Continuous severe abdominal or epigastric pain is not the same as labour pain and may be indicative of significant bleeding behind the placenta, without the presence of external blood loss (a condition known as concealed 'placental abruption'). This can lead to an unstable cardiovascular state and fetal death.

Severe epigastric or right upper quadrant pain may be a presenting symptom of severe pre-eclampsia (Refer to pregnancy induced hypertension guideline).

Potential complications that warrant immediate removal to the **BOOKED OBSTETRIC UNIT** (unless delivery is actually in progress) are:

- known multiple births
- known breech presentation
- significant previous history of obstetric complications (e.g. eclampsia, rapid labour, born before arrival).

In cases of **known** multiple births/malpresentation where delivery is actually in progress, or occurs en-route, you should initiate the **DELIVERY PROCEDURE**, i.e.:

- remain on scene
- request a Midwife and second vehicle – with Paramedic if none present *(unless delivery occurs en-route)*
- prepare for delivery
- in cases of multiple birth/breech presentation refer to the 'managing complications' section of this guideline.

If there are none of these complications move on to the next stage of the assessment.

Is delivery imminent?

Delivery will be deemed to be imminent if either of the following are present:

- regular contractions at 1-2 minute intervals and an urge to push or bear down
- crowning or the top of the baby's head/breech presentation visible at the vulva.

If either of the first two indications are present, a visual inspection must be made to observe if crowning is taking place. Remember that if the mother is from a community that is predominantly Buddhist, Hindu or Muslim it may be important to them that they are only examined by a female crew member. **YOU SHOULD RESPECT THE WISHES OF THE MOTHER** who may refuse a visual inspection. However, the safety of the mother and baby must always come first. If there is any difficulty in this respect, inform Control and ensure details are documented thoroughly.

Once you have used the above criteria to establish that delivery is imminent you should:

- remain on scene
- request a Midwife and second vehicle – with Paramedic if none present
- prepare for delivery (***refer to Delivery Procedure***).

If you are dealing with an uncomplicated imminent birth and no Midwife is available or central Ambulance Control (CAC) experience any difficulty in locating a Midwife, the best course of action is to take the mother to the ambulance and go to the nearest obstetric unit, preceded by a hospital alert call. If the labour is so far advanced that delivery occurs on scene, transport both mother and baby to the nearest obstetric unit once the baby has been born and alert Ambulance Control to cancel the second vehicle. If the baby needs resuscitation await the arrival of the second crew who should transport the baby immediately to nearest emergency department.

Re-assessment

In all of the above scenarios it is very important to re-assess the mother at regular intervals. Should the situation change, or if complications occur, then appropriate action should be taken immediately and the treatment/ED regime revised accordingly.

DELIVERY PROCEDURE (refer to Appendix 2)

First Stage of Labour (the cervix is dilating during this stage)

Encourage the mother to lie on her side or sit when in transit, whichever position is the more comfortable for her.

Entonox may give relief from pain. Inhalation should be started as soon as the mother feels the contraction, before the pain is fully established.

REMEMBER the risk of supine hypotension and always discourage a pregnant woman from lying flat on her back.

Second Stage of Labour (starts when the cervix is 'fully dilated' (10cm) and ends with delivery of the baby)

If you have not moved from the home address because birth is imminent, request Control to arrange for a Midwife and second vehicle/Paramedic to attend.

If you are en-route to hospital and delivery appears imminent, pull in and park safely. Inform Control.

Prepare the trolley bed or delivery area with incontinence pads.

Re-assure the mother and tell her what you are doing. Remember to include the woman's partner if present.

Have towels ready, enough to dry the baby and use another to wrap the baby.

Support the mother in a semi-recumbent (or other comfortable) position with padding under her buttocks.

The mother should be discouraged from lying flat on her back because of the risk of supine hypotension.

Encourage her to continue taking entonox as needed to relieve pain and discomfort.

Open and lay out a maternity pack.

Cover mother with a blanket for warmth and modesty.

Some women may be from ethnic communities in which modesty is highly valued for religious reasons. Childbirth may be viewed as an exclusively female area and it will therefore be extremely distressing for them to be attended by men. Every effort should be made to minimise distress. Where possible, female staff should be in attendance.

As the baby's head is delivering, help the mother to avoid pushing by telling her to concentrate on panting or breathing out in little puffs. Entonox may help

Instruct the mother to pant or puff, allowing the head to advance slowly with the contraction. You may consider applying gentle pressure to the top of the baby's head as it advances through the vaginal entrance – this is to prevent very rapid delivery of the baby's head.

Check to see if the umbilical cord is around the baby's neck. If it is, you may gently attempt to loop it over the head. If it is too tight, it is better to deliver the rest of the baby with the cord left in place. A tight cord will not prevent the baby delivering.

Wipe any obvious large collections of mucous from round the baby's mouth and nose.

Quickly and thoroughly dry the baby using a warm towel while you make your initial assessment. Include the head, trunk, axilla and groin.

Remove the now wet towel and wrap the baby in dry towelling.

Hold the baby as it is born and lift it towards the mother's abdomen.

Assess the baby's airway. A crying baby has a clear airway. If the baby is not breathing, confirm that the airway is open. Remember the head is ideally placed in the 'neutral' position ('sniffing the morning air' – i.e. not as extended as in the adult position). **SUCTION IS NOT USUALLY NECESSARY**. If required, use the suction unit on half speed with a CH8 catheter and then only within the oral cavity.

If the baby is not breathing, apply resuscitative measures as per neonatal resuscitation guidelines.

Once the baby is breathing adequately, cyanosis will gradually improve over several minutes. If the cyanosis is not clearing, enrich the atmosphere near the baby's face with a light flow of oxygen.

To divide the cord, apply two cord clamps securely 3cm apart and about 15cm from the umbilicus. Cut the cord between the two clamps.

Ensure the baby remains wrapped and place the baby with its mother in a position where the mother can feed if she wants to and help keep the baby warm (breast feeding will also encourage delivery of the placenta). Reassure the mother and cover her adequately. Await the Midwife and third stage (delivery of the placenta and membranes).

If delivery has occurred en-route to hospital, you should proceed to the nearest obstetric unit once the baby has been delivered, requesting Control to inform the hospital. In this situation it is not necessary to await delivery of the placenta before continuing with your journey. If complications occur put in a Hospital Alert Call via Control.

Third Stage (delivery of the placenta and membranes)

The expulsion of the placenta and membranes may take 15-20 minutes. It will be accompanied by a gush of blood but this should not exceed 200-300mls.

Do not pull the cord during delivery of the placenta as this could rupture the cord, making delivery of the placenta difficult and cause excessive bleeding or inversion of uterus.

Assist the mother in expelling the placenta naturally. The mother may be encouraged to adopt a squatting, upright position to facilitate delivery of the placenta, but only if there has been no delay in delivery of the placenta and **NOT IF THERE IS ANY SIGNIFICANT BLEEDING.**

Deliver the placenta straight into a bowl or plastic bag and keep it, together with any blood and membranes, for inspection by a Doctor or Midwife.

If bleeding continues after delivery of the placenta, palpate the abdomen and feel for the top of the uterus. Massage the top (or 'fundus') of the uterus with a cupped hand, using a circular motion. The fundus will usually be at the level of the umbilicus and should become firm as gentle massage is applied. This may be quite uncomfortable and entonox ***(refer to the entonox drug protocol for administration and information)*** can be offered. Consider the need for fluid replacement (see below) and/or Paramedic back-up.

Administer syntometrine if bleeding is severe ***(refer to the syntometrine drug protocol for dosages and information).***

MANAGING COMPLICATIONS

There are several complications that may arise during pregnancy and/or labour. Should you be presented with any of the conditions outlined below you should adopt the following treatment procedures and transport to hospital.

1. Pre-term Delivery (delivery before 37 weeks)

If the delivery occurs at less than 20 weeks gestation the mother and baby should be transported to the **NEAREST ED DEPARTMENT**.

In the case of a mother who is giving birth at 20-37 weeks every effort should be made to transport the mother to the **BOOKED OBSTETRIC UNIT** (refer to Appendix 2) without delay as the baby will need specialist care once delivered. The mother should be constantly re-assessed en-route and the appropriate action taken should the circumstances change.

In the event that birth is so far advanced that transfer to further care is not possible, request a Midwife plus a second vehicle and inform Control of the situation.

Once the baby is born, utilise the second vehicle to transport the infant **IMMEDIATELY** to the **NEAREST ED or OBSTETRIC UNIT**[2] depending on local arrangements. The infant should be transported even if the Midwife has not yet arrived. Ensure that Control alerts the hospital, giving an ETA and description of the baby's condition. The mother should then be transferred to the **OBSTETRIC UNIT** of the **same hospital as the baby**.

Should delivery take place en-route assess the baby and take appropriate action. Convey mother and baby to the **NEAREST ED or NEAREST OBSTETRIC UNIT**[2] depending on local arrangements. Ensure that Control alert the receiving hospital.

[2]When placing the Alert Call Control will advise you of the local arrangements for units receiving distressed neonates where this is not the Obstetric Unit.

2. Maternal Seizures

Refer to Pregnancy Induced Hypertension (including pre-eclampsia)

3. Prolapsed Umbilical Cord

This is an EXTREME EMERGENCY that requires immediate intervention, rapid removal and transport. In a mother who presents with a prolapsed cord **use two fingers to replace the cord gently in the vagina**, handling the cord as little as possible. Use dry padding to prevent further prolapse. This will keep the cord warm and moist within the vagina and prevent cord spasm.

Occasionally it may not prove possible to replace the cord in the vagina, particularly if a large loop has prolapsed. In these instances keep the cord warm and moist with physiological saline sterile dressings.

Crews should use their professional judgment to determine the best means of removal, ensuring that the safety of the mother is maintained. Ideally the trolley bed should be used, but where necessary and expedient the mother may be helped to walk to the nearest point of access for the trolley bed. Use of the service carrying chair should be avoided if at all possible and if used should be utilised only to convey the mother to the nearest point of access for the trolley bed. Following replacement of the cord or application of the sterile dressings the mother should be positioned on her side *with padding placed under her hips* to raise the pelvis and reduce pressure on the cord. Entonox should be administered to help prevent the urge to push, which also increases pressure on the cord.

The mother should be transported to the **NEAREST OBSTETRIC UNIT** preceded by a Hospital Alert Call ensuring that Control alert the hospital giving an ETA and clear advice that the mother has a prolapsed cord.

4. Post Partum Haemorrhage

The commonest cause of severe haemorrhage immediately after delivery is uterine atony (i.e. poor uterine contraction). If severe haemorrhage occurs following delivery (post-partum) the following treatment regimen should be followed en-route *if possible*:

- Uterine massage – palpate the abdomen and feel for the top (fundus) of the uterus – it is usually at the level of the umbilicus. Massage with a cupped hand using a circular motion.
- Paramedics should initiate the procedure for syntometrine (refer to syntometrine drug protocol). Non-Paramedic crews should not delay transfer to further care by waiting for a Paramedic crew to attend.
- Establish IV access using large bore cannulae.
- If there is visible external blood loss greater than 500mls, fluid replacement should be commenced with a 250ml bolus of crystalloid.

  Central pulse ABSENT, radial pulse ABSENT – **is an absolute indication for urgent fluid.**

  Central pulse PRESENT, radial pulse ABSENT – will normally need fluid replacement in the pregnant patient.

  Central pulse PRESENT, radial pulse PRESENT – **DO NOT** commence fluid replacement,[2] unless there are other signs of poor central tissue perfusion (e.g. altered mental state, abnormal cardiac rhythm or in the pregnant patient a high index of suspicion of significant blood loss.

  Re-assess vital signs prior to further fluid administration.
- If bleeding continues – check for bleeding from tears at the vaginal entrance. Bleeding can be controlled by direct pressure using a gauze or maternity pad.

The mother and baby should be transported to the **NEAREST OBSTETRIC UNIT** immediately. Transfer to further care must be preceded by a Hospital Alert Call via Control. The information passed should include details as to whether the placenta has been delivered or is still in-situ. This information will be valuable to the hospital in determining their treatment.

5. Continuous severe abdominal pain / placental abruption

Major placental abruption is when a large part of the placenta detaches from the uterine wall. Bleeding occurs under the placenta causing significant abdominal and/or epigastric pain. There may be no visible vaginal bleeding ('concealed' abruption). Alternatively there may be a variable amount of vaginal bleeding ('revealed' abruption). Despite little or no visible bleeding, there may be signs of hypovolaemic shock.

It is important that you make a thorough assessment for signs of shock. The mother must be removed to the **NEAREST OBSTETRIC UNIT WITHOUT DELAY** having first put in a Hospital Alert Call. Commence the appropriate resuscitation regimen as soon as possible.

6. Multiple Births – delayed delivery of second or subsequent baby

It is now very unusual for a mother expecting a multiple birth to deliver outside hospital. However, twin pregnancies are at much higher risk of delivering pre-term (i.e. before 37 weeks) – the babies may therefore need resuscitation. Unless delivery is actually in progress, mothers expecting multiple births should be transported to the **BOOKED OBSTETRIC UNIT** without delay. The mother should be constantly re-assessed en-route and the appropriate action taken should the circumstances change.

If delivery is in progress, or occurs en-route, proceed according to the delivery procedure. In most instances the normal pattern of delivery will apply for each baby. The procedure for normal delivery and management of the new-born will apply for the first and all subsequent babies.

Once the first baby has been born and assessed you should make arrangements to transport both mother and baby to the **NEAREST OBSTETRIC UNIT IMMEDIATELY** having put in a Hospital Alert Call. In this situation it is not necessary to await the arrival of the Midwife prior to transfer to further care.

If delivery of the second baby occurs en-route, park the ambulance and make a request via Control for a **SECOND VEHICLE**. Once the second baby has been delivered, utilise both vehicles to transport mother and babies to the nearest obstetric unit.

If any/either baby requires resuscitation, follow the appropriate neonatal resuscitation guideline.

REMEMBER – with a twin delivery, the mother is at increased risk of immediate post-partum haemorrhage due to poor uterine tone (refer to section 4 above).

7. Malpresentation

Breech birth; this is a birth where the feet or buttocks present first during delivery rather than the baby's head. Cord prolapse is more common with a breech presentation (refer to note 3 – prolapsed umbilical cord). In the case of a known breech presentation the mother should be transported to the **BOOKED OBSTETRIC UNIT** unless birth is in progress. The mother should be constantly re-assessed en-route and the appropriate action taken should the circumstances change. If birth is in progress treat as for a normal delivery except for the following points:

- If the mother is on the bed or sofa etc., encourage her to move to the edge. This will enable gravity to help deliver the baby. The mother's legs should be supported (this may look like the McRobert's Position).
- Do not touch the baby or the umbilical cord until the body is free of the birth canal and the nape of the neck is visible. The only exception is when the baby's back rotates to face the floor. Gently hold the baby by its pelvis and rotate the baby back towards the front (take care **NOT** to squeeze the infant's abdomen which could damage internal organs).
- Do not clamp or cut the cord until the **HEAD** is free of the birth canal.
- Once the baby is born, gently **lift** the baby by its feet to facilitate delivery of the head. This should be undertaken as the head is delivering and so as not to over-extend the baby's neck. Care should be taken not to pull the baby.

Once the baby is born treat as for a normal delivery. Breech babies are more likely to be covered in meconium and may require resuscitation. If the baby requires resuscitation, follow the appropriate neonatal resuscitation guideline.

Any other body part presenting; if, upon inspection, a part of the baby is presenting other than the head, buttocks or feet (e.g. one foot or a hand/arm) transport the mother **immediately** to the **NEAREST OBSTETRIC UNIT**. Transfer to further care must be preceded by a Hospital Alert Call via Control.

8. Shoulder Dystocia

This is when delivery of the baby's shoulders is delayed. The baby's anterior shoulder is stuck behind the symphysis pubis. **DO NOT** pull, twist or bend the baby's head. If the shoulders are not delivered within **two** contractions following the birth of the head, then, place a pillow under the mother's head and bring her knees up towards her chest and slightly outwards (McRobert's position).

Alternatively, the mother should be positioned in an "all-fours" position on her hands and knees. A further attempt can be made to deliver the shoulders in either of these positions.

If the shoulders are not delivered following a further **two** contractions the mother should be transferred **immediately** to the **NEAREST OBSTETRIC UNIT**. In this situation it is not necessary to await arrival of the Midwife.

Ideally, the mother should be removed from scene using the trolley bed. However, if necessary, the mother may be helped to walk a **SHORT** distance to the nearest point of access for the trolley bed, but crews should be prepared to deliver the baby as this may precipitate birth. Once on the trolley bed and during transportation the mother should be placed on her side with padding placed under her hips to raise the pelvis.

Transfer to further care must be preceded by a Hospital Alert Call via Control.

Key Points – Birth Imminent (normal delivery and delivery complications)

- For a patient experiencing an abnormal labour or delivery, transfer to further care without delay.
- Undertake a rapid assessment of the patient to ascertain whether there is anything abnormal taking place.
- If the mother presents with an obvious medical or traumatic condition that puts her life in imminent danger treat appropriately.
- The period of gestation is important in informing the appropriate course of action.
- Severe vaginal bleeding, prolapsed cord, continuous severe abdominal/epigastric pain and presentation of part of the baby other than the head (e.g. an arm or leg) warrant **IMMEDIATE** transfer to the **NEAREST OBSTETRIC UNIT**.

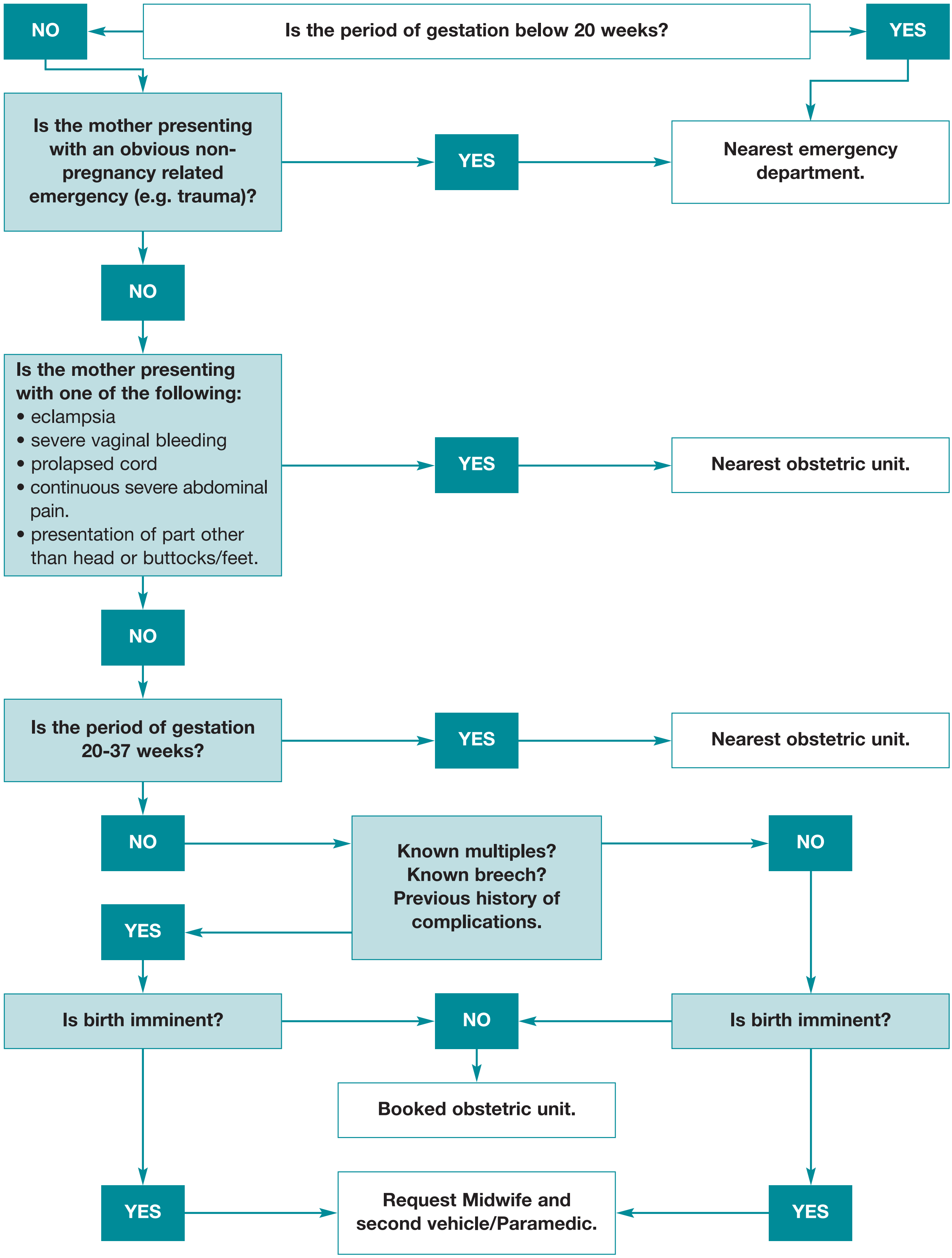
REFERENCES

[1] Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

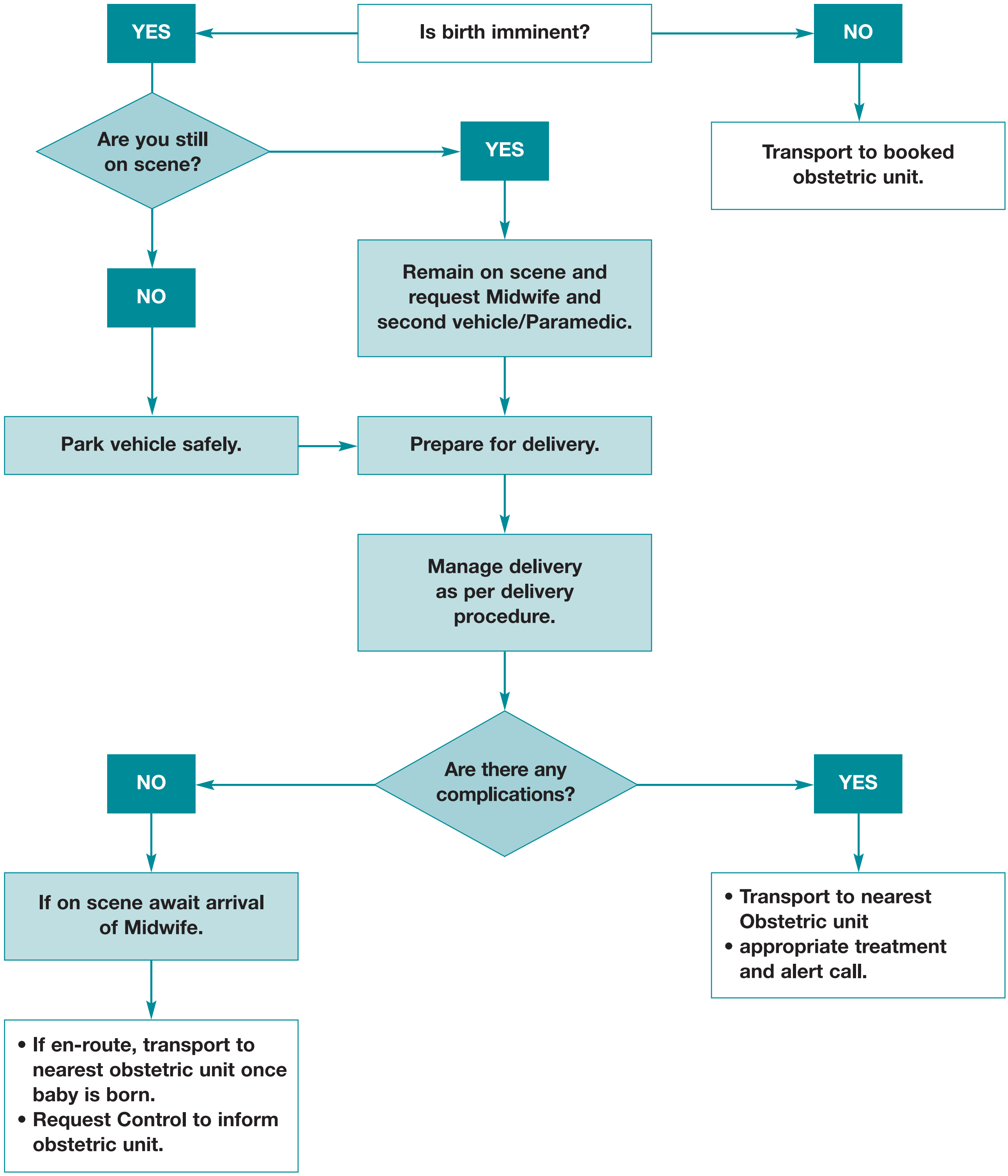
METHODOLOGY

Refer to methodology section.

Appendix 1 – Maternal Assessment



Appendix 2 – Delivery Flowchart



INTRODUCTION

Any female of childbearing age, unless hysterectomised, **MAY** be pregnant, and even the slightest doubt must make one consider if any abdominal pain or vaginal bleeding may be pregnancy related.

Pregnancy is timed from the **FIRST** day of the last period, and from that date lasts up to 42 weeks. The pregnancy is divided into first, second and third trimesters. Each trimester is 13 weeks.

Terms used on shared care ante-natal records i.e. the patient's personal maternity plan (see table 1).

Table 1 – Terms used on shared care ante-natal records

LMP	Last menstrual period.
EDD	Estimated date of delivery – The timing of the pregnancy is written in the notes as 12/40, i.e. 12 weeks has elapsed out of the 40 weeks pregnancy.
T	Term or expected end of pregnancy, therefore T+3 in the notes is 3 days over the EDD.
CEPH	Cephalic (Head).
BR	Breech
G	Gravida, the number of times a woman has been pregnant
P	Parity, the number of times a woman has given birth

ANATOMICAL AND PHYSIOLOGICAL CHANGES IN PREGNANCY

There are a multitude of physiological and anatomical changes during pregnancy that may influence the management of the pregnant patient. These changes include:

- cardiac output increases by 20-30% in the first 10 weeks of pregnancy
- the average maternal heart rate increases by 10-15 beats per minute
- both systolic and diastolic blood pressure fall, on average by 10-15mmHg
- as the fetus enlarges the diaphragm becomes splinted. Breathing effort and rate increase and vital capacity is decreased
- both blood volume (45% increase) and numbers of red cells increase, but not in proportion, so the patient becomes **relatively anaemic**
- due to the increase in blood volume the pregnant patient is able to tolerate greater blood or plasma loss before showing signs of hypovolaemia. This compensation is at the expense of shunting blood away from the uterus and placenta and therefore fetus.

AFTER BIRTH IMMINENT

Resuscitation of the Pregnant Female – special problems

Gastric emptying is delayed in pregnancy due to the progesterone-like effects of the placental hormones. The acidity of the stomach contents increases. Relaxation of the cardiac sphincter makes regurgitation of the stomach contents more likely. **These three factors combined increase both the possibility and severity of aspiration and vomiting.**

Oedema of the larynx and enlargement of the breasts make intubation of the pregnant patient more difficult. Thus, the risks to the airway are markedly increased.

In supine pregnant patients, uterine pressure may cause compression of the inferior vena cava, reducing venous return and **lowering cardiac output by up to 40%. This in turn will reduce blood pressure.** To improve venous return and cardiac output, the patient should be tilted to the left by about 30 degrees. This can be achieved by placing padding below their right side and hip or manually displacing the uterus to the left.

REMEMBER that effective resuscitation of the mother will provide effective resuscitation of the fetus. Life support techniques should be concentrated on the mother in order to optimise fetal prognosis. Arrhythmias should be treated according to standard guidelines.

Cardio-respiratory arrest in pregnancy is very rarely due to a primary cardiac cause. Common causes of sudden maternal death include pulmonary or amniotic fluid embolus.

Early ET intubation and large bore IV cannulae (16G) are recommended

If the mother is in cardio-pulmonary arrest follow adult BLS/ALS guidelines and transport immediately to nearest suitable receiving hospital with **Hospital Alert Message** to have an **OBSTETRICIAN ON STANDBY IN THE EMERGENCY DEPARTMENT** for emergency Caesarean section (in this situation emptying the uterus **MAY** facilitate maternal resuscitation).

Key Points – Effects Of Pregnancy On Maternal Resuscitation

- Any female of childbearing age, unless hysterectomised, **MAY** be pregnant.
- Pregnant women beyond 20 weeks should **ALWAYS** be nursed with 30 degrees lateral tilt (to their left side).
- Gastric regurgitation is more likely and early intubation is preferred.
- Large bore IV cannulae (16G).
- Cardiopulmonary arrest may be caused by pulmonary arrest or amniotic fluid embolism.

METHODOLOGY

Refer to methodology section.

Haemorrhage During Pregnancy (including miscarriage and ectopic pregnancy)

This section covers: bleeding during early and late pregnancy (including miscarriage and ectopic pregnancy)

For **POST PARTUM HAEMORRHAGE** refer to birth imminent (normal delivery and delivery complications) guideline.

For complications associated with **ABORTION** refer to vaginal bleeding: gynaecological causes (including abortion).

INTRODUCTION

Haemorrhage during pregnancy is broadly divided into two types.

Haemorrhage occurring in **early** pregnancy:

1. miscarriage (previously known as spontaneous abortion)

- ectopic pregnancy / ruptured ectopic pregnancy.

2. Haemorrhage occurring in **late** pregnancy ('Antepartum Haemorrhage'):

- placenta praevia
- placental abruption

Haemorrhage may be:

REVEALED	With evident vaginal loss of blood (e.g. miscarriage and placenta praevia).
CONCEALED	Where bleeding occurs within the abdomen or uterus. This presents with little or no external loss, but pain and signs of hypovolaemic shock (e.g. ruptured ectopic pregnancy and placental abruption). **REMEMBER**, pregnant women may appear well even with a large amount of concealed blood loss. Tachycardia may not appear until 30% or more of the circulating volume has been depleted.

NOTE: placental abruption may be a combination of revealed and concealed bleeding

HISTORY

The following should assist with assessing the most common causes of haemorrhage in pregnancy:

Miscarriage

Can sometimes give rise to significant haemorrhage, and is most commonly seen at between 6-14 weeks of gestation, i.e. 6-14 weeks after the first day of the last menstrual period. However, although less usual, it can also occur after 14 weeks. Crampy, supra-pubic pain, backache and blood loss, often with clots, characterises miscarriage. Significant symptoms (including hypotension) without obvious external blood loss may indicate 'cervical shock' due to retained miscarriage tissue stuck in the cervix.

Ectopic

Pregnancy usually presents earlier, at around 6-8 weeks gestation, so usually only one period has been missed. Ectopic pregnancy is more likely if a woman has a history of:

a. having a coil in the uterus

b. having an ectopic pregnancy before

c. is sterilised

d. has had a previous pelvic infection.

Acute lower abdominal pain, slight bleeding or brownish vaginal discharge and signs of blood loss within the abdomen with tachycardia and skin coolness characterise a ruptured ectopic pregnancy. Other suspicious symptoms include: unexplained fainting, shoulder-tip pain or unusual bowel symptoms.

Antepartum haemorrhage

Bleeding in later pregnancy before delivery is described as 'antepartum haemorrhage' and is of two main types:

1. Placenta praevia

This is where the placenta develops low down in the uterus and completely or partially covers the cervical canal. When labour begins, this can cause severe haemorrhage. It occurs in 1 in 200 pregnancies and usually presents at 24-32 weeks with small episodes of painless bleeding. You may be able to check the patient-carried notes for scan results which may confirm a 'low-lying' placenta.

2. Placental abruption

Any vaginal bleeding in late pregnancy or during labour which is accompanied by severe continuous abdominal pain and signs of shock may be due to **placental abruption**. This is where bleeding occurs between the placenta and the wall of the uterus, detaching an area of the placenta from the uterine wall. It can be associated with severe pregnancy induced hypertension (PIH). Placental abruption causes continuous severe abdominal pain, tightening of the uterus, signs of hypovolaemic shock and puts the baby at immediate risk. There may be some external blood loss, but more commonly the haemorrhage is concealed behind the placenta. Where there is a combination of revealed (external) blood loss and concealed haemorrhage, this can be particularly dangerous, as it can lead to an under-estimation of the amount of total blood lost. The woman's abdomen will be tender when felt and the uterus will feel rigid or 'woody' with no signs of relaxation

OVERALL, ABRUPTION IS USUALLY MORE OMINOUS THAN BLEEDING FROM PLACENTA PRAEVIA (because the true amount of bleeding is concealed). It is also associated with Disseminated Intravascular Coagulation (DIC) which can worsen the tendency to bleed.

ASSESSMENT

Assess **ABCD**'s

Evaluate whether the mother has any **TIME CRITICAL** features

Specifically assess:

- **volume of blood loss** is important to assess. Remember a large sanitary towel can absorb about 50ml of blood, and blood loss will appear greater if mixed with amniotic fluid. Take any blood soaked pads to hospital
- **check for signs of shock –** If the mother is tachycardic (pulse >100 beats per minute), hypotensive (Systolic Blood Pressure (SBP) <90 mmHg), with cool sweaty skin, she is clearly shocked and in need of volume replacement (see below). Remember the value of a capillary refill test (CRT). **In otherwise fit young women, symptoms of hypovolaemic shock occur very late, by which stage they are very unwell.**

It is important to ask,

"When did you last feel the baby move?"

Be particularly tactful, so as not to cause alarm, as anxiety in the mother will only exacerbate the situation.

En-route – continue mother **MANAGEMENT** (see below)

Transfer of patients with haemorrhage during pregnancy:

At<20 weeks[1] gestation	The mother should be transported immediately to the **NEAREST EMERGENCY DEPARTMENT OR GYNAECOLOGICAL DEPARTMENT AS APPROPRIATE.**
At >20weeks[1] gestation	The mother should be transferred immediately to the **NEAREST OBSTETRIC UNIT**. Transfer to further care must be preceded by a Hospital Alert Call via Control.

Follow Medical Emergencies Guideline, remembering to:

Ensure **ABC**'s.

- administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%
- obtain IV access (large bore cannulae 16G).

[1]Some hospitals use other cut offs. Check with Control who will find out about local arrangements.

Specifically consider:

Fluid therapy

Obtain IV access (large bore cannula).

Although current research in non-pregnant women shows little evidence to support the routine use of IV fluids in adult trauma patients,[1] **IN PREGNANCY**, the uterus, and thus the fetus, will often become 'under-perfused' **PRIOR** to the women becoming tachycardic or hypotensive. Hypovolaemia is manifested late in pregnant women, thus the fetus may be compromised if adequate fluid replacement is **NOT** given; therefore fluid replacement should be given earlier.

If there is visible external blood loss greater than 500mls, fluid replacement should be commenced with a 250ml bolus of crystalloid.

Central pulse **ABSENT**, radial pulse **ABSENT** – is an absolute indication for urgent fluid.

Central pulse **PRESENT**, radial pulse **ABSENT** – will normally need fluid replacement in the pregnant patient.

Central pulse **PRESENT**, radial pulse **PRESENT – DO NOT** commence fluid replacement,[2] unless there are other signs of poor central tissue perfusion (e.g. altered mental state, abnormal cardiac rhythm) or **in the pregnant patient a high index of suspicion of significant blood loss**.

Reassess vital signs prior to further fluid administration.

In later pregnancy, if the mother is transported on her back, the uterus will compress the abdominal vena cava, causing extreme hypotension and worsening shock. Either manually displace the uterus to the left side of the abdomen, or turn the mother into the left lateral position to avoid this problem.

Provide suitable analgesia in the form of Entonox if required (***refer to Entonox protocol for administration and information***). Opioids may be administered as indicated by the patient's condition (***refer to specific drug protocols***).

Key Points – Haemorrhage During Pregnancy (including miscarriage and ectopic pregnancy)

- Haemorrhage during pregnancy is broadly divided into two categories, occurring in early and late pregnancy.
- Haemorrhage may be revealed (evident vaginal blood loss) or concealed (little or no loss).
- Pregnant women may appear well even when a large amount of blood has been lost.
- Obtain venous access with large bore cannulae (16G).
- Tachycardia may not appear until 30% of circulating volume has been lost.
- In otherwise fit young women, symptoms of hypovolaemic shock occur very late, by which stage the patient is very unwell.

REFERENCES

1 Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.

2 Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

METHODOLOGY

Refer to methodology section.

Pregnancy Induced Hypertension (including eclampsia)

INTRODUCTION

Pregnancy induced hypertension (PIH)

Is a generic term used to define a significant rise in blood pressure during pregnancy, occurring after 20 weeks.

Pre-eclampsia

Is PIH associated with proteinuria. It can occur as early as 20 weeks but more commonly occurs beyond 24-28 weeks. It is more common in first pregnancies, multiple pregnancies, with pre-existing hypertension, diabetes or renal disease. In the UK the diagnosis of pre-eclampsia includes an increase in blood pressure (BP) (above 140/90mmHg), oedema and detection of protein in the patient's urine. Pre-eclampsia is usually diagnosed at routine antenatal visits and may require admission to hospital and early delivery. The disease may be of mild, moderate or severe degree.

The underlying pathophysiology is not fully understood, but pre-eclampsia is primarily a placental disorder associated with poor placental perfusion. This often results in a fetus which is growth-restricted (i.e. smaller than expected because of the poor placental blood flow).

Severe pre-eclampsia

May present in a patient with known mild pre-eclampsia or may present with little prior warning. The BP is significantly raised (i.e. 160/110mmHg) with proteinuria and often one or more of the following symptoms:

1. headache – severe and frontal
2. visual disturbances
3. epigastric pain – often mistaken for heartburn
4. right-sided upper abdominal pain – due to stretching of the liver capsule
5. muscle twitching or tremor
6. other symptoms – nausea, vomiting, confusion.

Severe pre-eclampsia is a 'multi-organ' disease, although hypertension is a cardinal feature, other complications include:

- intracranial haemorrhage and stroke
- renal failure
- liver failure
- abnormal blood clotting (e.g. disseminated intravascular coagulation (DIC)).

Eclampsia

Presents with generalised tonic/clonic convulsions and is one of the most dangerous complications of pregnancy. It occurs in about 1:1500 deliveries, usually beyond 24 weeks and is a significant cause of maternal mortality in the UK. Many patients will have had pre-existing pre-eclampsia (of mild, moderate or severe degree), **but cases of eclampsia can present acutely with no prior warning. ONE THIRD** of cases present for the **FIRST TIME** post-delivery (usually in the first 48 hours).

REMEMBER – although eclampsia is often preceded by severe pre-eclampsia, **IN MANY CASES THE BP WILL ONLY BE MILDLY ELEVATED AT PRESENTATION** (i.e. 140/80-90mmHg). The hypoxia caused during a tonic/clonic convulsion may lead to significant fetal compromise and even death. Convulsions are usually self-limiting, but may be severe and repeated.

MANAGEMENT

Management of mild/moderate pre-eclampsia

In a pregnancy beyond 20 weeks, if blood pressure is 140/90 mmHg or above:

- discuss management directly with the **BOOKED OBSTETRIC UNIT or MIDWIFE**
- consider transfer to obstetric unit for formal assessment.

Management of severe pre-eclampsia and eclampsia

Follow Medical Emergencies Guideline, remembering to:

- ensure **ABCD**'s
- administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an O_2 saturation (SpO_2) of >95%
- remember that treating and resuscitating the mother is also assisting the baby
- check blood glucose level.

Obstetrics & Gynaecological Emergencies

Evaluate whether the patient has any **TIME CRITICAL** features:

- convulsions
- headache – severe and frontal
- visual disturbances
- epigastric pain – often mistaken for heartburn
- right-sided upper abdominal pain – due to stretching of the liver capsule
- muscle twitching or tremor
- confusion.

Severe pre-eclampsia and eclampsia are **TIME CRITICAL EMERGENCIES** for both mother and unborn child.

If delivery is **NOT** in progress transfer the mother immediately to the **NEAREST OBSTETRIC UNIT** preceded by a Hospital Alert Call.

If delivery is in progress call for assistance from a second ambulance and/or Paramedic and prepare for delivery, ensuring that the convulsion is monitored and managed at all times. Remember to position with **LEFT LATERAL TILT**. Immediately following delivery the mother should be transferred to the **NEAREST OBSTETRIC UNIT** preceded by a Hospital Alert Call.

IV access:

- **DO NOT** delay removal to hospital to obtain IV access
- cannulate (large bore 16G) en-route wherever possible.

Management of eclamptic convulsions:

- convulsions are usually generalised and identical to epileptic convulsions
- unless the patient is known to suffer from epileptic or tonic/clonic convulsions, then convulsions in pregnancy must be managed as **ECLAMPSIA**.
- a convulsion is usually 'self-limiting' and will end after 2-3 minutes – manage with standard ABCs, administer high concentration O_2 and position with **LEFT LATERAL TILT**.
- consider administration of diazepam IV/PR (***refer to diazepam protocol for dosages and information***) titrated against effect **ONLY IF** the patient convulses for longer than 2-3 minutes or has a second or subsequent convulsion (in hospital, IV magnesium sulphate will be given and it is better to avoid multiple drugs if possible).

Other considerations:

- caution with "lights and sirens" – strobe lights and noise may precipitate convulsions
- **ALWAYS REMEMBER TO USE LEFT LATERAL TILT PRIOR TO DELIVERY** – use a wedge or pillow under the **RIGHT** buttock and turn her towards her left side.

Key Points – Pregnancy Induced Hypertension (including pre-eclampsia)

- Pregnancy induced hypertension commonly occurs beyond 24-28 weeks but can occur as early as 20 weeks.
- Diagnosis includes an increase in blood pressure above 140/90mmHg, oedema and detection of protein in the patient's urine.
- Eclampsia is one of the most dangerous complications of pregnancy.
- Eclampsia patients present with generalised tonic/clonic convulsions which are usually self-limiting.
- Only administer diazepam if the convulsions are prolonged or recurrent.
- Severe pre-eclampsia and eclampsia are **TIME CRITICAL EMERGENCIES** for both mother and unborn child.

METHODOLOGY

Refer to methodology section.

Vaginal Bleeding – Gynaecological Causes (including abortion)

INTRODUCTION

Vaginal bleeding is likely to result in a call for emergency assistance in a number of specific circumstances:

- if the woman is anticipating a normal menstrual period, and bleeds excessively
- if normal or excessive menstrual bleeding is associated with severe abdominal pain
- if excessive vaginal bleeding is associated with therapeutic abortion
- if vaginal bleeding follows gynaecological surgery or colposcopy
- if vaginal bleeding occurs away from a normal period especially if this is excessive
- if there is excessive vaginal bleeding associated with gynaecological cancers, either before diagnosis or after treatment (i.e. cervix, uterus or vagina).

This guideline includes bleeding related to therapeutic abortion (i.e. pregnancies being terminated). For causes of bleeding in early or late pregnancy, refer to ***haemorrhage during early/late pregnancy (including miscarriage & ectopic pregnancy) guideline.***

The majority of these episodes do not compromise the circulation, but blood loss can be alarming to the woman.

HISTORY

Check the patient's age (this is important, as younger women may be pregnant, and women over 50 years are more at risk of cancers of the uterus and cervix).

Might this be a miscarriage or ectopic pregnancy? If so, what is the period of gestation (***refer to haemorrhage during pregnancy (including miscarriage and ectopic pregnancy) guideline***)?

Is the woman undergoing a pregnancy termination (i.e. having an abortion)?

Abortion can now be undertaken medically with tablets as well as surgically. In rare cases the initial tablet given to prepare the uterus for abortion can lead to haemorrhage. After surgical abortion, bleeding can be heavy if infection develops (usually 7-10 days after the procedure).

Are there any ongoing or previous gynaecological problems (including recent surgery or colposcopy (***see below***).

Colposcopy	Is an outpatient test where the cervix is inspected when a smear has been abnormal. Treatment such as cone biopsy for the abnormal smear may have been undertaken. Heavy bleeding affects very few women in this situation, but classically occurs 7-10 days later. This is also the time for women to develop secondary vaginal bleeding after gynaecological surgery (e.g. hysterectomy).

ASSESSMENT

Assess **ABCD**'s

Evaluate whether the woman has any **TIME CRITICAL** features. These may include:

- any major ABCD problem
- any signs of hypovolaemic shock.

If any of these features are present, **correct A and B problems on scene then transport to Nearest Suitable Receiving Hospital.**

Provide a **Hospital Alert Message / Information Call**.

En-route – continue patient **MANAGEMENT** (***see below***).

If the woman's condition is non-time critical, perform a more thorough patient assessment and a brief secondary survey.

Specifically assess:

- lower abdominal tenderness or guarding
- evidence of blood loss or clots (may be difficult to assess). Ask about number of soaked tampons, towels etc to pass information on to hospital. Look for evidence of blood under the feet or between toes, this implies significant bleeding (the woman may well have wiped her legs prior to your arrival)
- assess temperature **–** is it raised (pyrexia > 37.5C)?

MANAGEMENT

Follow Medical Emergencies Procedure, remembering to:

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION

- **D**ISABILITY (mini neurological examination)
- administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%.

Fluid therapy

Obtain IV access (large bore cannulae)

If there is visible external blood loss greater than 500mls, fluid replacement should be commenced with a 250ml bolus of crystalloid.

Central pulse **ABSENT**, radial pulse **ABSENT** – is an absolute indication for urgent fluid.

Central pulse **PRESENT**, radial pulse **ABSENT** – will normally need fluid replacement in the pregnant patient.

Central pulse **PRESENT**, radial pulse **PRESENT – DO NOT** commence fluid replacement,[1] unless there are other signs of poor central tissue perfusion (e.g. altered mental state, disturbed cardiac rhythm or in the pregnant patient a high index at suspicion of significant blood loss).

Reassess vital signs prior to further fluid administration.

Specifically consider:

- ensure position of comfort
- provide analgesia with Entonox (***refer to Entonox protocol for administration and information***). In severe pain not relieved by Entonox, morphine (***refer to morphine protocols for administration and information***) may be used except in the presence of hypotension
- take any tissues/clots passed with the bleeding to hospital for assessment if the woman may be pregnant/aborting.

Key Points – Vaginal Bleeding - Gynaecological causes (including abortion)

- The majority of vaginal bleeding episodes do not compromise circulation, but blood loss can be alarming to the woman.
- If you suspect a miscarriage or ectopic pregnancy find out what the gestation period is.
- Assess blood loss; ask about number of soaked tampons, towels etc and evidence of blood under patient's feet and between toes.
- Provide analgesia with entonox.
- Take any tissue(s)/clots to the hospital.

REFERENCES

1 Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

METHODOLOGY

Refer to methodology section.

INTRODUCTION

All children have the right to be protected from harm, and their safety and welfare is paramount.

A child is anyone under the age of 18. Children therefore means 'children and young people'.

Safeguarding and promoting the welfare of children is the process of protecting children from abuse or neglect, preventing impairment of their health and development, and ensuring they are growing up in circumstances consistent with the provision of safe and effective care which is undertaken so as to enable children to have optimum life chances and enter adulthood effectively.

The 'Every Child Matters'[1] programme, underpinned by the Children Act 2004[2] aims to improve the outcome for all children in five key areas:

- being healthy
- staying safe
- enjoying and achieving
- making a positive contribution
- achieving economic well being.

The 'Every Child Matters: Change for Children'[1] Green paper was published in 2003 alongside the Victoria Climbié Inquiry Report[3] and led to review and publication of the 'Working Together to Safeguard Children' 2006 document.[4]

Other core documents include the National Service Framework for Children, Young People and Maternity Services[5], which sets out a ten year plan to stimulate long-term and sustained improvement in children's health and well-being. There are many other documents which are important to inform strategy and delivery of services. These are referenced on the Government's website Every Child Matters: Change for Children.[1]

Safeguarding and promoting the welfare of children, and in particular protecting them from significant harm, depends upon effective joint working between agencies and professionals that have different roles and expertise.

Child Protection is a subset of safeguarding and promoting welfare. This refers to the activity which is undertaken to protect specific children who are suffering, or at risk of suffering, significant harm.

Social Services and the Police have statutory authority and responsibility to investigate allegations or suspicions about child abuse. The Ambulance Service must refer all such concerns to social services. However, in circumstances where the child could be described as at immediate risk, cases should be referred to the Police. Children with significant injury should be taken to hospital without delay. To help clinicians recognise where children are at risk, a set of recognition of abuse notes are attached (***refer to Appendix 1***).

OBJECTIVES

1. To ensure all staff are aware of, and can recognise, cases of suspected child abuse, or children at risk of significant harm.
2. To provide guidance enabling operational and Control staff to assess and report cases of suspected child abuse.
3. To ensure that all staff involved in a case of suspected abuse are aware of the possible outcome and of any subsequent actions.

PROCEDURE

Principles of safeguarding children

All health professionals may seek advice from a Designated Nurse or Doctor for Child Protection in their area during normal working hours. Ambulance clinicians may obtain contact information from a Senior Officer in Ambulance Control.

In the reporting of a suspected case of abuse, the emphasis must be on shared professional responsibility and immediate communication. Attempts must be made to work in partnership with the child and family, taking into consideration their race, culture, gender, language and experience of disability.

Although parents/carers should generally be kept informed of the actions required in the interest of safeguarding children, this may not always be practicable for Ambulance Clinicians. It is particularly important that parents should not be informed of an ambulance crew's concerns in circumstances when this may result in a refusal to attend hospital or in any situation where a child may be placed at further risk.

Action when abuse or risk of harm is suspected

There are a number of ways in which Ambulance Clinicians may receive information or make observations which suggest that a child has been abused or is at risk of harm. For example, the nature of an injury to a child might suggest that the child has been abused (e.g. the story given for an injury may be inconsistent with what is observed).

Observations about the condition of other children or adults in the household might suggest risk (e.g. a child living in an environment where domestic violence has taken place). Ambulance clinicians may observe hazards in the home, or find that children have been locked in a room. Signs of distress shown by other children in the home should be recorded.

An ambulance crew will often be the first professionals on scene and their actions and recording of information may be crucial to subsequent enquiries.

When attending a domestic dispute between adults, the presence of children in the household creates a need to notify under child protection. This applies even if the child was not injured in the violent episode on that occasion.

PATIENT ASSESSMENT

Ambulance clinicians should follow the normal history-taking routine, taking particular note of any inconsistency in history and any delay in calling for assistance. They should limit any questions to those of routine history-taking, asking questions only in relation to the injury or for clarification of what is being said. It is important to stop questioning when their suspicions are clarified. They should not question the child, but should listen and react appropriately to instil confidence. They should avoid unnecessary questioning or probing, as this may affect the credibility of subsequent evidence. They should write down exactly what they have been told.

Ambulance clinicians should accept the explanations given, and not make any suggestions to the child as to how an injury or incident may have happened. Similarly, if they are told of abuse, they should not question the child, but should accept what they are being told and act appropriately.

Remember the Ambulance Service is not there to investigate suspicions. The task for Ambulance Clinicians is to be aware of the issues of child abuse (***see Appendix 1)***, but not to be experts in this area. Ambulance clinicians should ensure that any suspicion is passed to the appropriate agency, i.e. staff in the Emergency Department (ED), social services or the Police. This should be achieved by following the guidelines in ***Appendix 2***.

ACTIONS TO BE TAKEN BY AMBULANCE CLINICIANS

If an ambulance crew attend a child and are concerned that the child may have been either physically, sexually, emotionally abused, or neglected, they should take the following actions:

1. If the child is the patient, and the parents/carers agree that he/she is to be conveyed to hospital, they should not let the parents/carers know they are suspicious if this may result in refusal to go to hospital. They should speak to the most senior member of nursing staff on duty and ensure that a copy of their documentation is handed over and a safeguarding children report form completed, with a copy provided to the hospital. This should be done away from a public area and in private if possible. Full details of their concerns or suspicions should be relayed to the receiving nurse, with a recommendation that the Child Protection Register should be consulted. Although individual EDs have access to the Child Protection Register for their area, they may need to ask for assistance if the central register needs to be consulted. Ambulance clinicians should complete a copy of the safeguarding children report form and provide a copy to the ward/clinic staff. They should also inform their site manager.
2. The crew should inform Ambulance Control about the situation so that they can report it. As soon as reasonably possible the crew should fax a copy of the safeguarding children report form (***see Appendix 3***) to Ambulance Control.
3. If the child is the patient and the parents/carers refuse to allow them to be conveyed to hospital, the crew should inform Ambulance Control and complete a safeguarding children report form. Ambulance Control will call the police and contact social services on the 24-hour emergency number, and will also arrange for an Ambulance Officer to attend the scene. Ambulance clinicians should follow the same procedure, also informing their site manager of the circumstances.
4. If the child is not the patient but the circumstances are suspicious, the crew should consider the implications of leaving the child. If the child is accompanying another person (e.g. a parent) who is being conveyed, the crew should inform ED staff of their concerns. If no-one is conveyed to hospital, and the crew leave the scene, they should contact Ambulance Control and inform them of the incident. At the earliest opportunity they should complete the safeguarding children report form and fax it to Ambulance Control.
5. In all cases where abuse of a child is suspected, a safeguarding children report form must be completed and, where the child is conveyed to hospital, a copy provided to the ED or other relevant hospital department. In all cases a copy must be faxed to Ambulance Control. The original form should be retained with the patient report form for recording and archiving.

ACTION TO BE TAKEN BY AMBULANCE CONTROL STAFF

1. On receiving details about a potential case of child abuse from an ambulance crew the senior Control Room Officer should consult the records in the control 'At Risk' register, and contact the 24-hour social services number in that area to start the referral process.
2. The Social Services staff may ask for details of the incident and what the crew consider to be the level of risk. This will include whether the child is at risk of 'significant harm'.
3. When the Control Officer receives the completed form from the crew, she/he should forward a copy to the relevant social services department, and send the original fax to the designated senior manager at Ambulance Headquarters. In addition, patient anonymised copies must be sent to the crew's Station Officer and Training Officer (or Site Manager for Ambulance Clinicians) so that any need for support of the crew by managers can be identified and provided. Ambulance Control must enable clinicians to complete and fax the safeguarding children report form as soon as practicable, utilising Officers to facilitate access to fax machines where that is difficult out of hours.

POLICE ASSISTANCE

The Police have a number of legal powers to protect children. These include the power to gain entry to a building in some circumstances, and the power to remove a child into police protection for up to 72 hours. Any Police Constable may effect this if he/she considers that a child is at risk of 'significant harm'. The child should have a clinical assessment before being taken into Police protection.

In urgent circumstances, where an ambulance crew think that a child is at immediate risk of significant harm, they should inform Ambulance Control, who will request Police attendance.

There may be circumstances where there are concerns for an unborn child, e.g. when a pregnant woman has been physically assaulted. In a situation of this type, advice should be sought initially from Social Services, although the advice given may include reporting the incident to the Police.

ACTIONS TO BE TAKEN BY THE DESIGNATED SENIOR OFFICER

The designated Senior Officer, or her/his deputy, will ensure that all safeguarding children report forms are collected from control daily and a check made to see if the child has come to the attention of the service before. In all cases, a follow-up will be made to the relevant Social Services/Police/PCT department to ensure that information has reached the appropriate persons and to establish what action is planned.

Subsequent Action

Safeguarding children concerns notified by the ambulance service will be subject to enquiries by Social Services departments and will be investigated by Social Services and/or the Police. Ambulance clinicians may be required to assist by giving a statement to clarify their observations. Ambulance clinicians may be requested to attend a case conference, accompanied by a manager and supported by other designated professionals for safeguarding children.

Senior Management Responsibilities

Senior Managers will ensure that any request from a statutory agency for a statement or other information will be communicated through the crew's line manager. They will also ensure that any member of Ambulance Service staff instructed to attend court to give evidence will receive appropriate support and advice from the Trust. This will include ensuring that the documentation is available in good time, allowing time for brief / debrief before and after a Court appearance or case conference, and that the member of staff will be accompanied by an officer.

Key Points – Suspected Cases of Child Abuse

- The safety and welfare of the child is paramount.
- There is a duty to report concerns.
- Staff should not investigate suspicions themselves.
- Police should be involved where there may be an immediate risk to the child.
- Staff should document the circumstances giving rise to their concern as soon as possible.

REFERENCES

[1] HM Goverment. Every Child Matters: Change for Children: London: The Stationery Office. Available from: http://www.everychildmatters.gov.uk/, 2003.

[2] HM Government. Children Act 2004 London: HMSO. Available from: http://www.opsi.gov.uk/acts/acts2004/20040031.htm, 2004.

[3] Lord Laming. The Victoria Climbié Inquiry: Report Of An Inquiry: London: HMSO. Available from: http://www.victoria-climbie-inquiry.org.uk/finreport/finreport.htm, 2003.

[4] HM Government. Working Together to Safeguard Children: A guide to inter-agency working to safeguard and promote the welfare of children: London: HMSO. Available from: http://www.everychildmatters.gov.uk/_files/CCE39E361D6AD840F7EAC9DA47A3D2C8.pdf, 2006.

[5] Department of Health. National Service Framework for children, young people and maternity services: London: HMSO. Available from: http://www.dh.gov.uk/PolicyAndGuidance/HealthAndSocialCareTopics/ChildrenServices/ChildrenServicesInformation/fs/en, 2004.

[6] Department of Health. No Secrets: guidance on developing and implementing multi-agency policies and procedures to protect vulnerable adults from abuse. 2000.

[7] Department of Health. Working Together to Safeguard Children: A guide to inter-agency working to safeguard and promote the welfare of children: London: HMSO. Available from: http://www.dh.gov.uk/assetRoot/04/07/58/24/04075824.pdf, 1999.

[8] Children Act 1989 (c.41) Available from: http://www.opsi.gov.uk/acts/acts1989/Ukpga_19890041_en_1.htm, 1989.

[9] Data Protection Act (1998) London: HMSO. Available from: http://www.opsi.gov.uk/ACTS/acts1998/19980029.htm.

METHODOLOGY

Refer to methodology section.

APPENDIX 1 – SAFEGUARDING CHILDREN

RECOGNITION OF ABUSE

Introduction

For the purposes of safeguarding children procedures, a child is anyone under the age of 18. All children deserve the opportunity to achieve their full potential. They should be enabled to be as physically and mentally healthy as possible, receive maximum benefit from educational opportunities, live in a safe environment, experience emotional well-being, feel loved and valued, become competent in looking after themselves, have a positive image of themselves and have opportunities to develop good interpersonal skills and confidence. If they are denied the opportunity to achieve their potential in this way they are at risk, not only of an impoverished childhood, but of experiencing disadvantage and social exclusion in adulthood.

SIGNIFICANT HARM

The Children Act (1989)[8], now Children Act (2004)[2], introduced the concept of significant harm as the threshold that justifies compulsory intervention in family life in the best interests of the children (***see Table 1***). The Local Authority is under a duty to make enquiries, or cause enquiries to be made, where it has reasonable cause to suspect that a child is suffering, or likely to suffer, significant harm.

There are no absolute criteria on which to rely when judging what constitutes significant harm. Consideration of the severity of ill-treatment may include the degree and the extent of physical harm, the duration and frequency of abuse and neglect, the extent of premeditation and the degree of threat and/or coercion.

Some children may be suffering, or at risk of suffering, significant harm, either as a result of a deliberate act, of a failure on the part of a parent or carer to act or to provide proper care, of the child being beyond parental control, or all of these factors. These children need to be made safe from harm, as well as their other needs being met. Children may be abused in a family or in an institutional or community setting, by those known to them or, more rarely, by a stranger.

Table 1 – Examples of abuse

Physical abuse	Physical abuse may involve hitting, shaking, throwing, poisoning, burning or scalding, suffocating, or otherwise causing physical harm. Physical harm may also be caused when a parent or carer feigns the symptoms of, or deliberately causes ill-health to, a child they are looking after. This situation is commonly described using terms such as 'factitious illness'.
Emotional abuse	Emotional abuse is the persistent emotional ill-treatment of a child so as to cause severe and persistent adverse effects on the child's emotional development. It may involve conveying to children that they are worthless or unloved, inadequate, or valued only insofar as they meet the needs of another person. It may feature age or developmentally inappropriate expectations being imposed on children. It may involve causing children frequently to feel frightened or in danger, or the exploitation or corruption of children.
Sexual abuse	Sexual abuse involves forcing or enticing a child or young person to take part in sexual activities, whether or not the child is aware of what is happening. The activities may involve physical contact, including penetrative or non-penetrative acts. They may include non-contact activities, such as involving children in looking at, or in the production of, pornographic material or watching sexual activities, or encouraging children to behave in sexually inappropriate ways.
Neglect	Neglect is the persistent failure to meet a child's basic physical and / or psychological needs, likely to result in the serious impairment of the child's health or development. It may involve a parent or carer failing to provide adequate food, shelter and clothing, failing to protect a child from physical harm or danger, or the failure to ensure access to appropriate medical care or treatment. It may also include neglect of, or unresponsiveness to, a child's basic emotional needs.

WHO IS VULNERABLE TO ABUSE?

Although any child can potentially be a victim of abuse, there are some groups of children who may be particularly vulnerable. These include children with learning disabilities, severe physical illnesses or sensory impairments. Sources of stress within families may have a negative impact on a child's health, development or well-being, either directly or because they affect the capacity of parents to respond to their child's needs. Sources of stress may include social exclusion, domestic violence, the unstable mental illness of a parent or carer, or drug and alcohol misuse. Parents who appear over-anxious about their child when there is no sign of illness or injury may be a sign of their inability to cope.

Children with special needs

This group of children have particular needs because of a psychological or medical difficulty. For example, deaf or autistic children may demonstrate challenging behaviour, which may or may not be as a result of abuse. Children with special needs are more likely to be abused than children in the general population.

Children in need

Children who are defined as being 'in need' are those whose vulnerability is such that they are unlikely to reach or maintain a satisfactory level of health or development, or their health and development will be significantly impaired, without the provision of services (section 17 (10) of the Children Act 1989[8]), plus those who are disabled. The critical factors to be taken into account in deciding whether a child is in need under the Children Act 1989[8] are what will happen to a child's health or development **without services** being provided. Local Authorities have a duty to safeguard and promote the welfare of children in need.

RECOGNITION OF CHILD ABUSE

Non-accidental injury

For an injury to be accidental it should have a clear, credible and acceptable history and the findings should be consistent with the history and with the development and abilities of the child. When looking at injuries in children you should be aware of the possibility of the injury being non-accidental and consider it in every case, even if you promptly dismiss the idea.

Examples of abuse indicators may be:

- any injury in a non-mobile baby
- accidents / injuries in unusual places, e.g. the buttocks, trunk, inner thighs
- bruises of varying ages
- small deep burns in unusual places or repeated burns and scalds, or 'glove and stocking' burns
- poor state of clothing, cleanliness and/or nutrition
- delayed reporting of the injury.

When assessing an injured child, you should use your clinical knowledge regarding what level of accidental injury would be appropriate for their stage of development. Although stages of development vary (e.g. children may crawl or walk at different ages), injuries can broadly be divided between mobile and non-mobile children.

NON-MOBILE BABIES

Any injury in a non-mobile baby must be considered carefully and have a credible explanation if it is to be considered accidental.

Healthy babies do not bruise or break their bones easily. They do not bruise themselves with their fists or toys, bruise themselves by lying against the bars of a cot, or acquire bruises on the feet when they are held for a nappy change.

Bruising on the ears, face, neck, trunk and buttocks is particularly suspect. Petechial spots (tiny blood spots under the skin) which disappear very rapidly, may indicate attempted smothering. A torn frenulum (behind the upper lip) is rarely accidental in babies, and bleeding from the mouth of a baby should always be regarded as suspicious.

Fractures

Fractures may not be obvious on observation and the baby may present only with crying on handling. Often a fracture will not be diagnosed until an x-ray is performed. Fractures in babies are seldom caused by 'rough handling' or putting their legs through the bars of the cot. Babies rarely fracture their skull after a fall from a bed or a chair. Fractures in non-mobile infants should be assessed by an experienced paediatrician to exclude non-accidental injury.

Shaking injuries

When small babies are shaken violently their head and limb movements cannot be controlled, and this results in severe brain damage from haemorrhage inside the skull. Finger bruising on the chest may indicate that a baby has been held tightly and shaken. These babies usually present with collapse or respiratory problems and the diagnosis is only made on further detailed assessment.

Burns and scalds

Accidental burns and scalds are fairly common in older babies (over six months). Burns from grabbing hot objects (e.g. hair tongs, irons etc.) are found on the palms of the hands, and not the back of the hands. Scalds caused by pulling over hot liquids are usually on the front of the face, neck, chest and legs, with multiple splash marks.

MOBILE BABIES AND TODDLERS

Bruising

It is normal for toddlers to have accidental bruises on the shins, elbows and forehead. Bruises in unusual areas such as the back, upper arms, and abdomen do not tend to occur accidentally.

Bruising caused by a hand slap leaves a characteristic pattern of 'stripes' representing the imprint of fingers. Forceful gripping leaves small round bruises corresponding to the position of the fingertips. 'Tramline' bruising is caused by a belt or stick and shows as lines of bruising with a white patch in between. Bites result in small bruises forming part or all of a circle.

Burns and Scalds

Burns are caused by the application to the skin of dry heat and the depth of the burn will depend on the temperature of the object and the length of time it is in contact with the skin.

Abusive burns are frequently small and deep, and may show the outline of the object, whereas accidental burns rarely do so because the child will pull away. For example, a burn reflecting the shape of the soleplate of an iron should be treated with suspicion.

Cigarette burns are not common. They are round, deep and have a red flare round a flat brown crust. The burns usually leave a scar.

Scalds are caused by steam or hot liquids. Accidental scalds may be extensive but show splash marks, unlike the sharp edges of damage done when the child is dunked in hot water (although splash marks may also feature in a non-accidental burn, indicating that the child had tried to escape hot water). The head, face, neck, shoulders and front of the chest are the areas affected when a child pulls over a kettle. If the child turns on the hot water in the bath, the soles of the feet are in contact with the bath and will be less affected than the tops.

Fractures

Children's bones bend rather than break, and require considerable force to damage them. There are various kinds of fractures (***see Table 2***), depending on the direction and strength of the force which caused them.

The diagnosis will usually be radiological unless there is deformity of the bone, and may not be known initially to Ambulance Clinicians. Documentation of the history given is therefore an important part of the initial assessment.

Table 2 – Types of fractures in children

Greenstick	The bones bend rather than break. This is a very common accidental injury in children.
Transverse	The break goes across the bone and occurs when there is a direct blow or a direct force on the end of the bone, e.g. a fall on the hand will break the forearm bones or the lower end of the humerus.
Spiral or oblique	A fracture line which goes right around the bone or obliquely across it is due to a twisting force, which may be a feature in non-accidental injuries.
Metaphyseal	Occur at the extreme ends of the bone and are only seen radiologically. These are caused by a strong twisting force.
Skull fractures	These must be consistent with the history and explanation given. Complex (branched), depressed or fractures at the back of the skull are suspect.
Rib fractures	These do not occur accidentally, except in a severe crushing injury. Any other cause is highly suspicious of non-accidental injury.

Deliberate poisoning and attempted suffocation

These are very difficult to assess and may need a period of close observation in hospital. Deliberate poisoning, such as might be found in a case of a child in whom illness is fabricated or induced by carers with parenting responsibilities (factitious illness), may be suspected when a child has repeated puzzling illnesses, usually of sudden onset. The signs include unusual drowsiness, apnoeic attacks, vomiting, diarrhoea and fits.

OLDER CHILDREN AND ADOLESCENTS

If the injury is accidental, older children will give a very clear and detailed account of how it happened. The detail will be missing if they have been told what to say.

Overdosing and other self-harm injuries must be taken seriously in this age-group, as they may indicate sexual or other abuse (such as exploitation).

NEGLECT

Neglect is more difficult to recognise and define than physical abuse, but its effects can be life-long. When a child is neglected this means his or her basic needs are not met. Neglect comprises both lack of physical care and supervision and a failure to encourage the child in terms of their emotional, physical and educational development. Impairment of growth, intelligence, physical ability and life-expectancy are only a few of the effects of neglect in childhood.

A neglected or abused infant may show signs of poor attachment. They may lack the sense of security to explore, and appear unhappy and whining. There may be little sign of attachment behaviour, and the child may move aimlessly round a room or creep quietly into corners.

In pre-school and school-age children, indicators of neglect may include poor attention span, aggressive behaviour and poor co-operative play. Indiscriminate friendly behaviour to unknown adults is often a feature of children who are deprived of emotional affection. Other signs include repetitive rocking or other self-stimulating behaviour. Personal hygiene may be poor because of physical neglect, and this may lead to rejection by peers.

EMOTIONAL ABUSE

Emotional damage occurs as a result of all forms of abuse, but emotional abuse alone can be difficult to recognise as the child may be physically well cared-for and the home in good condition. Some factors which may indicate emotional abuse are:

- if the child is constantly denigrated before others
- if the child is constantly given the impression that the parents are disappointed in them
- if the child is blamed for things that go wrong or is told they may be unloved / sent away
- if the parent does not offer any love or attention, e.g. leaves them alone for a long time
- if the parent is obsessive about cleanliness, tidiness etc.
- if the parent has unrealistic expectations of the child, e.g. educational achievement / toilet training
- if the child is either bullying others or being bullied him / herself.

Children can be at risk of emotional abuse because of the circumstances of adults in their immediate surroundings, e.g. if there is an atmosphere of domestic violence, adults with mental health problems or a history of drug or alcohol abuse. It cannot be assumed that a child is safe in a care setting, as children in this environment can be subject to exploitation, e.g. for prostitution.

SEXUAL ABUSE (*refer to sexual abuse guideline*)

Although some children are abused by strangers, most are abused by someone known to them. Some are abused by other children, including siblings, who may also be at risk of abuse. The majority of abusers are male, although occasionally women abuse children sexually or co-operate with men in the abusing behaviour.

Both girls and boys of all age groups are at risk. The sexual abuse of a child is often planned and chronic. A large proportion of sexually abused children have no physical signs, and it is therefore necessary to be alert to behavioural and emotional factors that may indicate abuse.

Allegation of abuse by the child

Any allegation of abuse by a child is an important indicator and should always be taken seriously. It is important to note that children may only tell a small part of their experience initially. Adult responses can influence how able a child feels to reveal the full extent of the abuse. If abuse is alleged, the adult being told about the abuse must be careful not to ask probing questions (*see Guidelines and Operational Procedures*).

Physical signs and symptoms

The following symptoms should give cause for concern and further assessment:

- soreness, discharge or unexplained bleeding in the genital area
- chronic vaginal infections
- bruising, grazes or bites to the genital or breast area
- sexually transmitted diseases
- pregnancy, especially when the identity of the father is vague.

Behavioural and emotional indicators

- inappropriate sexual knowledge for the child's age
- overt sexual approaches to other children or adults
- fear of particular people or situations, e.g. bath time or bedtime
- drug and alcohol abuse (older children)
- suicide attempts and self-injury
- running away and fire-setting
- environmental factors and situation of parents (e.g. domestic violence, drug or alcohol abuse, learning disabilities).

These notes have been developed for training purposes and should be read in conjunction with the ambulance service's operational procedure – Suspected Cases of Child Abuse and Report Forms for the Protection of Children and Vulnerable Adults.

APPENDIX 2 – Protection of Children and Vulnerable Adults

GUIDELINES FOR STAFF

These guidelines **summarise** what you need to be aware of if someone tells you they have been abused, or if you suspect that someone has been abused.

The guidelines should be used in conjunction with the Protection of Children and Vulnerable Adults Operational Procedures, Recognition of Abuse notes and Report Forms.

It is your role and responsibility:

- to listen to the person telling you about the abuse
- to ensure their safety and your own safety
- to report the abuse via the appropriate channels
- to keep a detailed record of your observations and / or what you have been told.

If someone tells you they have been abused

If the person is an adult, move to a private place if possible. Let them tell you what happened in their own words. Reassure them that they have done the right thing in telling you about the abuse. Do not ask leading questions as this might affect a subsequent Police enquiry.

Never promise to keep a secret. Tell them as soon as possible that you will have to report to at least one other person, as it is your duty to do this. (This will give them the chance to stop talking if they are not happy for this to happen).

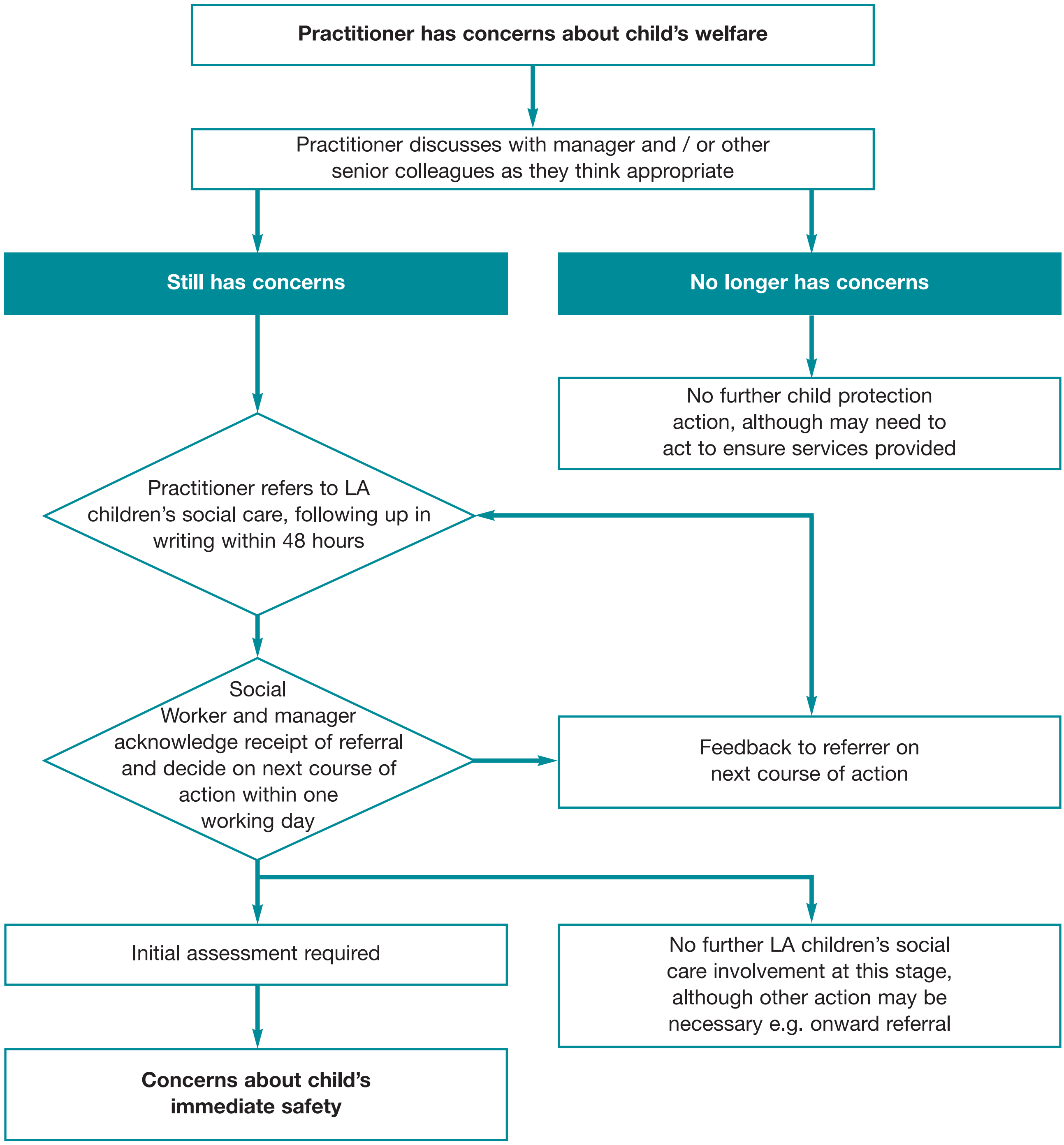
Do not talk to anyone who does not need to know about the allegation or suspicion of abuse, not even the witnesses, if there were any. By inadvertently telling the alleged abuser, for example, you may later be accused of 'corrupting evidence' or 'alerting'.

Reporting

Any allegation or suspicion of abuse must be taken seriously and reported immediately. Complete the report form in as much detail as possible and follow the *Operational Procedure* for reporting the abuse.

Remember: As a health care worker who may come into contact with children and vulnerable adults, you have a duty to report concerns about abuse. If you do not report the abuse you may be putting the victim at greater risk. You may also discourage them from disclosing again, as they may feel they were not believed. This may put other people at risk.

APPENDIX 2 – Child Protection Algorithm[4] – What happens next?[1]



[1] This is included to inform Ambulance Clinicians of the normal procedure for following up a report of suspected abuse. Senior managers should make every effort to provide feedback to Ambulance Clinicians as to what has occurred as a result of them reporting their suspicions.

APPENDIX 3 – Safeguarding children Report Form

Child's...name(s) ....

....

Age / DOB ....

Address ....

....

....

....

Next of kin ....

School / Nursery ....

Date ....

Time ....

CAD no. ....

Crew 1. ....

2. ....

Call sign ....

Concerns *(please tick)*:

- ☐ Physical abuse
- ☐ Sexual abuse
- ☐ Emotional abuse
- ☐ Neglect
- ☐ Parental incapacity

Reason for concern *(please tick)*:

- ☐ Physical signs
- ☐ Inconsistent story
- ☐ Behavioural / developmental signs
- ☐ Environment
- ☐ Disclosure by victim/other person

Please give a written description of your concerns, including the general appearance, state of health, demeanour and behaviour of the child:

Version of events given by the child:

Child too young to speak ☐

Not possible to speak to child alone ☐

Child does not speak English ☐

If child able to speak, what he / she says happened:

....

....

....

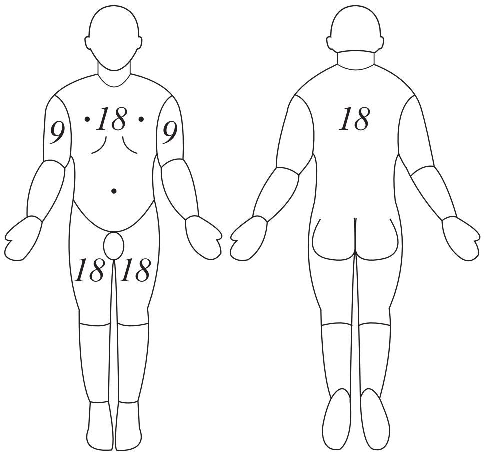
....

....

Please give a description of your findings. If the child has a physical injury, please mark it below using the front and back figure :

Injury = X ?Fracture = #

Burns = O Pain = ●



Details of significant family members, members of staff, friends or other people who are with the child, e.g. childminder:

Home circumstances – is the child:

Fostered	☐ Yes ☐ No	**With a childminder**	☐ Yes ☐ No
Living with parents	☐ Yes ☐ No	**Living with other relatives**	☐ Yes ☐ No

Is the child a resident of a residential care home / hostel? ☐ Yes No ☐

If Yes, please state name and address of the home / hostel ....

....

Do you have concerns about the standard of care received by the child at home or in a residential home / hostel? ☐ Yes ☐ No

Do you have concerns about the welfare of other people there? ☐ Yes ☐ No

If Yes, please include in 'Details of the Environment' below.

....

....

....

List your concerns about the environment or home (including residential care homes / hostels):

General level of care .... Safety ....

Other (please give details) ....

....

Has an adult on scene been aggressive towards the child (or the crew)? ☐ Yes ☐ No

Is there evidence of family / domestic violence? ☐ Yes ☐ No

Do you think the child has suffered / is likely to suffer significant harm if he / she remains in this environment? ☐ Yes ☐ No

Are the parents aware of your concerns? ☐ Yes ☐ No

Child conveyed to hospital ☐

Not conveyed to hospital ☐

Parent / carer conveyed to hospital ☐

Accompanied by other person ☐

....

Hospital ....

Hospital staff signature..

Hospital staff name ....

Crew signature..

Date / Time..

Reported to:

Ambulance Control ☐

Social Services ☐ Police ☐

In person ☐ By telephone ☐

Form sent to ....

☐ By e-mail ☐ Fax ☐ Post

CONSENT (where applicable)

The information contained in this form may be shared between the ambulance service and other agencies, in order to protect you from harm.

Declaration: I consent to the information recorded on this form being shared with other agencies responsible for my ongoing welfare.

Name: .... **Signature:** ....

For advice / support ring ....

When completed this form must be faxed to ....

The Ambulance Service will act in accordance with the Data Protection Act (1998)[10] and the obligations contained therein, within its role as Data Controller.

INTRODUCTION

Attending patients who have been sexually assaulted demands sensitive medical and emotional care from Ambulance Clinicians. It also demands an awareness of forensic aspects of these cases.

HISTORY

History should be limited to identifying the need for medical treatment. It is not appropriate for Ambulance Clinicians to probe the details of the assault. In the worst case scenario this could affect the outcome of Police investigations.

ASSESSMENT

Where necessary, follow the appropriate medical/trauma guidelines.

Where a hospital alert message is passed over the radio, provide details only of injuries present and their management.

It may be appropriate to delay full assessment of some injuries until arrival at the treatment centre, to avoid further distressing the patient and disturbing evidence.

If called to the location of the assault, make every effort to avoid disturbing the scene. Ensure that Police are called promptly so that the scene can be secured.

COMPETENCE AND CONSENT

Patients are likely to be very distressed about the events surrounding sexual assault. They may not want to involve anybody else, and may not consent to disclosure of information to other parties such as the Police. Do **NOT** judge, or give the appearance of judging the patient. Be kind and considerate, and allow the patient space, and as much choice about options for their treatment as possible. They may well feel worthless, guilty and humiliated; dominant controlling behaviour will intensify these feelings.

Reference to the safeguarding children and vulnerable adult policies may be appropriate.

Where a patient is competent to refuse hospital treatment, and does so, then it is important to advise them to seek further medical attention. They may need post exposure prophylaxis and or contraceptive advice, both of which can be provided confidentially.

PROTECTION

For the protection of Ambulance Clinicians, individuals should avoid being alone with the patient where possible. It may be appropriate for the patient to be accompanied in the back of the ambulance by another person as well as a member of the ambulance crew. The ambulance crew should be aware that the patient may be anxious when left alone with a person of the same sex as the assailant. On the other hand, they may be reassured by the presence of a professional person. The wishes of the patient must be considered and attempts made to make them feel reassured and safe.

Encourage the patient to leave the same clothes on as were worn at the time of the assault, and not to throw away or destroy any clothing.

If a blanket is needed for patient modesty or warmth, then this should ideally be one which has not been handled by any other patient or relative. Single use blankets are ideal for this situation. Blankets used should be left with the patient.

Encourage the patient not to bathe or wash until forensic investigations have been completed. Avoid cleaning wounds unless absolutely necessary clinically. If required a lightly applied dry dressing should be used. Any used dressings or swabs should be retained for forensic examination.

It is normal practice to collect saliva and possibly swab the buccal mucosa, therefore, avoid giving the patient drinks until officers have had the opportunity to collect these samples. Similarly do not let the patient brush their teeth.

Forensic analysis will concentrate specifically on those areas affected, such as wounds, mouth, anus and vagina as well as any areas where the victim was kissed, licked or bitten. This may all be contaminated with an assailant's deoxyribonucleic acid (**DNA**) and represent the best opportunity for detecting stranger rapes.

Drug screening for sexual assault should be done as soon as possible, as some drugs have a very short half life, and the Police will need to collect an evidential urine sample.

All of these recommendations are vital to conserve evidence for a successful prosecution of the offender, **BUT** must be conveyed with great tact to the patient who may well want to shower and change.

FURTHER CARE

Encourage all victims of sexual assault to attend treatment centres, and inform the police. Both will be able to provide physical, medical and emotional support.

In some areas special arrangements exist for patients suffering sexual assault to be examined and interviewed in Police or other facilities. Local guidelines should be followed as to the best destination and mode of transport for the patient.

Handover at the care centre should be to an appropriate member of staff, with due regard to the sensitive nature of the information. Handover should not take place in a public area.

DOCUMENTATION

Complete the clinical record in great detail, documenting only facts, not your opinion. Document what the patient says, and your own findings, with relevant timings. This should be done contemporaneously. A Police statement may well be needed later on.

Key Points – Sexual Assault

- Sexual assault may be concurrent with other injuries which will need treating.
- Treatment should avoid disturbing evidence where possible.
- Leave the investigation to the police.
- Accommodate patient wishes where possible.
- Police may have special facilities for dealing with victims.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

All vulnerable adults have the right to be protected from harm and the ambulance service should refer all cases of suspected abuse to the appropriate Social Services Department. Where there are concerns about the standard of care provided in a nursing or residential home, or by a domiciliary care agency, the case will also be referred to the Regional Office of the Commission for Social Care Inspection (CSCI). In circumstances which could be described as an emergency, cases will be referred to the police.

In the reporting of a suspected case of abuse, the emphasis must be on shared professional responsibility and immediate communication. Attempts must be made to meet the needs of the vulnerable person, taking into consideration their race, culture, gender, language and level of disability. To help clinicians recognise cases of abuse a set of notes are attached at ***Appendix 1***.

OBJECTIVES

1. To ensure all clinicians are aware of, and can recognise, cases of suspected abuse of a vulnerable adult.
2. To provide guidance enabling Ambulance Clinicians and Control Officer to assess and report cases of suspected abuse of a vulnerable adult.
3. To ensure that all clinicians involved in a case of reported abuse are aware of the possible outcome and of any subsequent actions.

PROCEDURE

Principles of Adult Protection

The principles of adult protection differ from those of child protection, in that adults have the right to take risks and may choose to live at risk if they have the capacity to make such a decision. Their wishes should not be overruled lightly. For example, most older people are not 'confused'. Similarly, people with learning disabilities or mental health problems may have the capacity to make some decisions about their lives, but not others.

All Local Authorities should have Inter-Agency Adult Protection Procedures which comply with the *'No Secrets'* guidance[1] and many authorities will also have an Interagency Adult Protection Committee. In addition, the CSCI is responsible for inspecting the standard of care provided in nursing homes, residential care homes and by domiciliary care agencies.

Actions when abuse or risk of harm is suspected

There are a number of ways in which ambulance crews may receive information or make observations which suggest that a vulnerable adult has been abused or is at risk of harm. An Ambulance Clinician will often be the first professional on scene and their actions and recording of information may be crucial to subsequent enquiries. It is particularly important that other people who may be present should not be informed of an Ambulance Clinician's concerns in circumstances when this may result in a refusal to attend hospital or in any situation where a vulnerable adult may be placed at further risk (***See Appendix 2***).

PATIENT ASSESSMENT

Ambulance crews should follow the normal history-taking routine, taking particular note of any inconsistency in history and any delay in calling for assistance. If necessary, they should ask appropriate questions of those present to clarify what is being said.

Crews should be aware that someone who is frightened may be reluctant to say what may be the cause of their injury, especially if the person responsible for the abuse is present. It may be helpful to make a note of the person's body language. It is important to stop questioning when suspicions are clarified. Avoid unnecessary questioning or probing, as this may affect the credibility of subsequent evidence.

NOTE: The ambulance service is not there to investigate suspicions. The task for ambulance crews is to ensure that any suspicion is passed to the appropriate agency, i.e. staff in the emergency department, the appropriate local Social Services Department, the Regional Office of CSCI or the police. This should be achieved by following the guidelines below in the section 'actions to be taken by ambulance crews'.

Actions to be taken by ambulance crews

If an Ambulance Clinician comes into contact with a vulnerable adult (***see Appendix 1***) and are concerned that they may have been abused or are at risk of abuse.

If there is another person present and the Ambulance Clinicians are concerned that they may be the abuser, they should not let the person know they are suspicious. If the patient is conveyed to hospital, the clinicians should inform a senior member of the emergency department (ED) staff, or nursing staff if conveying to another department, of their concerns about possible abuse. They should ensure that a copy of the Patient Report Form (PRF) is handed over and a suspected abuse form completed, with a copy left with the ED staff. They should be careful not to do this in a way that would alert the alleged abuser or place the vulnerable adult at risk of further abuse or intimidation. Ambulance Control should be informed of the incident and a copy of the suspected abuse form faxed to them at the earliest opportunity. Patient transport service crews should also inform their site manager.

It is important to ascertain the wishes of the patient and to take into account whether or not they want to be conveyed to hospital. However, the decision not to convey a patient to hospital is one that must not be taken lightly. In some cases the clinicians may assess that the patient clearly does not have the capacity to make a judgement with respect to their need for medical care, and may decide to act under the Doctrine of Necessity (if there is risk to life or limb) or make alternative arrangements for the patient if their condition requires less immediate treatment (e.g. a General Practitioner visit the following day).

If the patient needs to be conveyed to hospital and another person tries to prevent this, crews may need to consider whether to involve the Police. The Ambulance Clinicians should inform Ambulance Control about the situation and complete a reporting form (***See Appendix 3***). Ambulance Control will take any further action (***see below***). A suspected abuse form should be faxed to Ambulance Control at the earliest opportunity.

If the patient is not conveyed to hospital, or if the Ambulance Clinicians have concerns about someone else in the household or on the premises, they should contact Ambulance Control and inform them of their concerns. If the vulnerable person is not the patient but is accompanying someone else to hospital, the clinician should inform ED, or other hospital nursing staff of their concerns. At the earliest opportunity they should complete a suspected abuse form, leaving a copy at the hospital and faxing it to Ambulance Control.

In all cases where abuse of a vulnerable adult is suspected a suspected abuse form must be competed and, where the vulnerable adult is conveyed to hospital, a copy provided to the department. In all cases a copy must be faxed to Ambulance Control. The original form should be sent with the rest of the clinician's documentation for recording and archiving in the usual way.

ACTIONS TO BE TAKEN BY AMBULANCE CONTROL OFFICERS

On receiving details about a potential case of abuse of a vulnerable adult, the senior Control Room Officer should consult any records held in the control room and contact the appropriate Local Authority Social Service Department if the incident occurs during normal working hours.

If the incident occurs 'out of hours', the Control Room Officer should use their judgement as to whether the case can wait until the next working day or whether the emergency 24-hour team needs to be contacted.

If the patient needs to be conveyed to hospital and another person tries to prevent this, the Control Room Officer may need to request police attendance and / or contact Social Services. The Control Room Officer will also arrange for an Ambulance Officer to attend the scene. In some circumstances, they should also inform the Regional Office of the Commission for Social Care Inspection.

As well as reporting the matter to the appropriate Social Service Department, it should also be reported to the Regional Office of the Commission for Social Care Inspection if either of the following conditions apply:

- the alleged abuse has taken place in a nursing or residential care home
- the alleged abuser is employed by a domiciliary care agency (including domiciliary care provided directly by the local authority).

Any observations / concerns about the standards of care provided by any of these services should also be reported to the Regional Office of the Commission for Social Care Inspection, even if this did not directly contribute to the condition of the patient, as other people may be at risk.

The Control Room Officer should make a decision whether also to report the incident to the police and / or ask an Ambulance Officer to attend the scene, based on the information received from the Ambulance Clinician.

When the Control Room Officer receives the completed form from the Ambulance Clinician, they should forward a copy to the relevant Social Services Department, and send the original fax to the designated senior manager at Ambulance Headquarters. If there are concerns about the standards of care in a nursing or residential care home, or the service provided by a domiciliary care agency, a copy should also be sent to the Regional Office of the Commission for Social Care Inspection. In addition, patient anonymised copies must be sent to the Ambulance Clinician's Station Officer and Training

Officer, or PTS site manager so that any need for support of the clinician by managers can be identified and provided. Ambulance Control must facilitate clinicians to complete and fax the suspected abuse form as soon as practicable, utilising Officers to facilitate access to fax machines where that is difficult out of hours.

Subsequent Action

Adult protection concerns notified by the Ambulance Service will be subject to enquiries by Social Services departments, who will co-ordinate an investigation. Investigations may be carried out jointly between Social Services, the Police and healthcare professionals, depending on the circumstances. All cases of institutional abuse will also be referred to the Regional Office of the Commission for Social Care Inspection.

Ambulance clinicians may be required to assist by giving a statement to clarify their observations in more detail. Ambulance clinicians may be requested to attend a case conference or to provide information.

ACTIONS TO BE TAKEN BY THE DESIGNATED SENIOR OFFICER

The Designated Senior Officer, or their deputy, will ensure that all suspected abuse forms are collected from Ambulance Control and a check made to see if the vulnerable adult has come to the attention of the service before. Follow up should be made to the relevant Social Services department to ensure that information has reached the appropriate persons and to establish what action is planned. This information should be relayed back to the Ambulance Clinician who raised the concern.

Senior Management Responsibilities

Senior managers will ensure that any request from a statutory agency for a statement or other information will be communicated through the clinician's line manager. They will also ensure that any member of Ambulance Service instructed to attend court to give evidence will receive appropriate support and advice from the Trust. This will include ensuring the documentation is available in good time, allowing time for brief / debrief before and after a Court appearance or case conference, and that the clinician will be accompanied by an Officer.

Key Points – Suspected Abuse of Vulnerable Adult

- Vulnerable adults have a right to be protected.
- Crews must document the circumstances giving rise to concern as soon as possible.
- The wishes of the patient should be taken into account where possible.
- Clinicians should not investigate allegations.
- Police involvement should be considered.

REFERENCES

[1] Department of Health. No Secrets: guidance on developing and implementing multi-agency policies and procedures to protect vulnerable adults from abuse. 2000.

[2] Data Protection Act (1998) London: HMSO. Available from: http://www.opsi.gov.uk/ACTS/acts1998/19980029.htm.

[3] Lord Chancellor's Department. Who Decides: making decisions on behalf of mentally incapacitated adults. 1997.

[4] General Medical Council. Duties of a Doctor: General Medical Council: London. Available from: http://www.gmc-uk.org/guidance/library/duties_of_a_doctor.asp, 2005.

METHODOLOGY

Refer to methodology section.

APPENDIX 1

PROTECTION OF VULNERABLE ADULTS RECOGNITION OF ABUSE

INTRODUCTION

Abuse is the violation of an individual's human and civil rights by any other person. It can vary from the seemingly trivial act of not treating someone with proper respect to extreme punishment or torture. In the context of vulnerable adults, the recognised forms of abuse include:

- physical abuse
- sexual abuse
- emotional or psychological abuse
- financial or material abuse
- neglect and acts of omission
- discriminatory abuse.

A person may be subject to one or a combination of these.

Abuse can take place in any context. It may occur when a vulnerable adult lives alone or with someone else. It may occur in the vulnerable adult's own home, either when they receive a service there or when the abuser either lives with them or visits them. It may also occur within nursing, residential or day care settings, in hospitals, or in public places.

Causes of abuse

A person may be vulnerable to abuse if they are unable to protect themselves from the actions of others. They may live or come into contact with people who inflict harm upon them or take advantage of their vulnerability to exploit them. In some cases, the place where they live or the services they receive may be of a poor quality. The nature of a person's disability, ability to communicate or mental capacity may increase the likelihood of abuse remaining undiscovered.

Who abuses?

All types of abuse may be inflicted deliberately; some may be as the result of negligence, ignorance, or lack of understanding. The person responsible for the abuse is often known to the person being abused. They may be:

- a family member, friend or neighbour
- someone providing health or social care services
- a volunteer
- another resident or service user
- an occasional visitor or service provider
- a stranger.

The person responsible for the abuse may be misusing alcohol or substances, or may be dependent on the vulnerable adult for housing or emotional support, or may have other special needs themselves.

Who is vulnerable to abuse?

Particular groups of people may be more vulnerable to abuse. These include people from minority ethnic groups, people with physical disabilities, people with learning disabilities, mental health problems, severe physical illnesses, older people, the homeless, people with sensory impairments or those diagnosed as HIV positive. Some people with special needs (e.g. sensory impairment or learning disabilities) may demonstrate challenging behaviour, which may or may not be as a result of abuse.

Abuse within personal relationships

A carer is a person who looks after an ill, disabled or frail relative, friend or neighbour at home. Some vulnerable people are themselves carers, and may find themselves being abused by the person they care for. The risk of abuse may increase if a vulnerable person is living or in contact with someone who has a history of violence, including domestic violence, or a history of sexual offences. The abuse of alcohol or other substances may also be a factor. Older people, people with disabilities and people with mental health needs often find themselves in unequal power relationships and this may lead to a situation where there is exploitation and abuse.

Institutional abuse

Abuse can take place in hospitals, day care, residential homes, nursing homes, hostels and sheltered housing. People living in their own homes may also be abused by staff employed to provide support to them. Abusive behaviour may be part of the accepted custom within an organisation, or it may be carried out by an individual member of staff or a particular staff group. It may be difficult to draw a line between poor quality care and abuse, and it is important that the Regional Office of the Commission for Social Care Inspection is informed of any concerns about poor standards of care.

Institutional abuse is more likely to occur if staff are inadequately trained, poorly supervised or work where there are inadequate staffing levels. It is also more likely to occur if staff feel powerless to influence practice and feel afraid of losing their job if they report any concerns.

Is abuse a crime?

Statutory offences have been created which specifically protect those who may be incapacitated in various ways. Examples of actions which may constitute criminal offences are assault and rape, theft, fraud or other forms of financial exploitation, and certain forms of discrimination, whether on racial or gender grounds.

Alleged criminal offences differ from all other non-criminal forms of abuse, in that the responsibility for initiating the action rests with the state in the form of the police and the Crown Prosecution Service. This is usually done by working in partnership with health and social care colleagues. When a complaint about alleged abuse suggests that a criminal offence may have been committed, it is imperative that reference should be made urgently to the Police by the person receiving the complaint. In the Ambulance Service, this should be undertaken by Ambulance Control on behalf of the clinician.

What degree of abuse justifies intervention?

The law, as it stands, does not give a definition of the degree of abuse of a vulnerable adult that requires intervention. However, in determining how serious or extensive abuse must be to justify intervention, *'No Secrets'*[1] suggests that a useful starting point can be found in *'Who Decides?'*[3] Building on the concept of 'significant harm' introduced in the Children Act (1989), the Law Commission suggested that: *"'harm' should be taken to include not only ill-treatment (including sexual abuse and forms of ill-treatment which are not physical), but also the impairment of physical or mental health; and the impairment of physical, intellectual, emotional, social or behavioural development".*

The seriousness or extent of abuse is often not clear when anxiety is first expressed. Once reported, Social Services will take the lead in co-ordinating an investigation, including making a judgement on the level of intervention required, based on the details of the case. In making any assessment of seriousness they consider the following factors:

- the vulnerability of the individual
- the nature and extent of the abuse
- the length of time it has been occurring
- the impact on the individual and
- the risk of repeated or increasingly serious acts involving this or other vulnerable adults.

Disclosure

No problem arises where patients give informed consent to their information being disclosed to a third party.

Nevertheless, statute, case law and professional guidance recognises that confidentiality may be breached in exceptional cases and with appropriate justification. The GMC in its guidance Duties of a Doctor[4] states:

"Disclosure may be necessary in the public interest where a failure to disclose information may expose the patient, or others, to risk of death or serious harm. In such circumstances you should disclose information promptly to an appropriate person or authority."

ABUSE OF VULNERABLE ADULTS

In *No Secrets*[1] and *Who Decides?*[3], a 'vulnerable adult' is defined as any person over the age of 18 who is, or may be, in need of community care services by reason of mental or other disability, age or illness. Vulnerable adults may be unable to take care of themselves and are therefore unable to protect themselves against significant harm or exploitation.

Types of abuse

Abuse may consist of a single act or repeated acts. It may be an act of neglect or a failure to act. It may occur when a vulnerable person is persuaded to enter into a financial or sexual transaction to which he or she has not consented, or cannot consent. Abuse can occur in any relationship and may result in significant harm to, or exploitation of, the person subjected to it.

Physical abuse

Physical abuse is non-accidental harm to the body, for example:

- being hit, slapped, pushed, shaken, kicked, bitten, burned or scalded
- purposely under- or over-medicating or other misuse of medication

- deliberately being underfed, being given alcohol or a substance that is known to cause harm (e.g. sugar for diabetic)
- being confined, locked up or otherwise physically restrained.

Some indicators of physical abuse are:

- any injury not explained by the history given
- different versions of the cause of an injury given to different people
- any self-inflicted injury
- unexplained fractures, lacerations, bruises or burns
- weight loss, dehydration, complaints of hunger
- untreated medical problems
- poor personal hygiene including incontinence.

Sexual abuse

Sexual abuse is the involvement of someone in sexual activities which they do not have the capacity to understand, have not consented to, or to which they were pressurised into consenting. It can also include the involvement of people in sexual activities where one party is in a position of trust, power or authority, or where a sexual relationship is outside law and custom. Sexual abuse can include:

- rape or sexual assault
- unwanted touching or being forced to touch another person in a sexual manner
- being subject to sexual innuendoes and harassment
- not having a choice about someone of the same sex to undertake intimate personal care.

Indicators of sexual abuse include:

- full or partial disclosure, or hints, about sexual abuse
- inappropriate sexualised behaviour
- torn, stained or blood-stained underclothing or bedding
- pain, itching or bruising in the genital area, thighs and/or upper arms
- sexually transmitted disease, urinary tract infection and vaginal infection
- obsession with washing
- pregnancy in a person who is unable to give consent to sexual relations.

Emotional or psychological abuse

Emotional or psychological abuse is any action which has an adverse effect on an individual's mental well-being, causing suffering and affecting their quality of life. This may include the threat that other types of abuse could take place. Psychological abuse can include:

- living in a culture of fear and coercion
- being bullied, controlled or intimidated
- being humiliated, ridiculed or blamed
- being threatened with harm or abandonment
- being isolated or deprived of contact
- being withdrawn from services or supportive networks
- having no choice about who to live with or spend time with
- being consistently ignored.

Abuse occurs where there is a power imbalance and a person may be reacting to living in fear because of threats and coercion.

Indicators of psychological abuse include:

- self harm
- emotional withdrawal and symptoms of depression
- unexplained fear or defensiveness
- severe lack of concentration.

Financial abuse

Financial abuse is the theft or misuse of money or personal possessions, and can include:

- money being withheld or stolen
- goods or services purchased in someone's name without their consent
- being deliberately overcharged for goods or services
- misuse or misappropriation of property, possessions or benefits
- money being borrowed by someone who is providing a service to the vulnerable adult.

Indicators of financial abuse include:

- someone being dependent on the vulnerable adult for the provision of accommodation (this may also apply to other forms of abuse)
- a person lacking goods or services which they can afford
- a person living in poorer circumstances than other members of a household
- a person being encouraged to spend their money on items intended for communal use in a residential home
- benefits being absorbed into the household income and not being used for the vulnerable person.

Neglect and acts of omission

A person will suffer if his or her physical and / or emotional needs are being neglected. Examples of neglect can include:

- failing to respond to a person's needs or preventing someone else from meeting their needs
- ignoring someone's medical or physical care needs
- failing to provide access to appropriate health, social care or educational services
- withholding necessities of life such as medication, adequate hygiene, nutrition or heating
- preventing someone from interacting with others.

When a professional or paid care provider does not ensure that the appropriate care, environment or services are provided to those in their care, they may be open to a charge of 'wilful neglect'. It should be noted, however, that adults have the right to choose their own lifestyle in their own home (including self-neglect) if they have the capacity to make such a decision. However, the judgement as to whether an individual has the capacity to make decisions leading to on-going significant self neglect is more complex than those surrounding a single event with regard to consent to treatment and may well be outside the competencies of Ambulance Clinicians. If Ambulance Clinicians are concerned that the level of self neglect is such that it is/would lead to significant impairment of health, they should consider breaking confidentiality and allowing appropriately trained and competent staff from Social Services to make an assessment as to the individual's capacity. Any such breech of confidentiality should be carefully and fully documented.

Indicators of neglect can include:

- neglect of accommodation, including inadequate heating and lighting
- failure to provide basic personal care needs
- inadequate or unsuitable food
- failure to give medication or giving too much medication
- failure to ensure appropriate privacy and dignity.

Discriminatory abuse

Discriminatory abuse includes ill-treatment motivated by racism, sexism, homophobia or on the basis of religion or disability. This can include:

- harassment
- denying people their rights
- belittling or humiliating people
- not providing appropriate food
- preventing access to places of worship
- preventing people from carrying out cultural or religious practices
- regarding someone as being intrinsically different from other human beings.

Indicators of discriminatory abuse include:

- lack of self-esteem
- emotional withdrawal and symptoms of depression
- self harm.

NOTE: These notes should be read in conjunction with The Ambulance Service's operational procedure - Suspected Abuse of Vulnerable Adults and reporting forms for the Protection of Vulnerable Adults.

APPENDIX 2

PROTECTION OF CHILDREN & VULNERABLE ADULTS

Guidelines for Ambulance Clinicians

These guidelines summarise what you need to be aware of if someone tells you that they have been abused, or if you suspect that someone has been abused. The guidelines should be used in conjunction with the Protection of Children and Suspected Abuse of Vulnerable Adults Operational Procedures, Recognition of Abuse notes (Appendix 1) and suspected abuse form (Appendix 3).

It is your role and responsibility:

- to listen to the person telling you about the abuse
- to ensure their safety and your own safety
- to report the abuse via the appropriate channels
- to keep a detailed record of your observations and / or what you have been told.

If someone tells you that they have been abused

If the person is an adult, move to a private place if possible. Let them tell you what happened in their own words. Reassure them that they have done the right thing in telling you about the abuse. Do not ask leading questions as this might affect a subsequent Police enquiry.

Never promise to keep a secret. Tell them as soon as possible that you will have to report to at least one other person, as it is your duty to do this. (This will give them the chance to stop talking if they are not happy for this to happen.)

Do not talk to anyone who does not need to know about the allegation or suspicion of abuse, not even the witnesses, if there were any. By inadvertently telling the alleged abuser, for example, you may later be accused of 'corrupting evidence' or 'alerting'.

Reporting

Any allegation or suspicion of abuse must be taken seriously and reported immediately. Complete a suspected abuse form in as much detail as possible and follow the appropriate Operational Procedure for reporting the abuse.

NOTE: As a health care worker who may come into contact with children and vulnerable adults, you have a duty to report concerns about abuse. If you do not report the abuse you may be putting the victim at greater risk. You may also discourage them from disclosing again, as they may feel they were not believed. This may put other people at risk.

APPENDIX 3
PROTECTION OF VULNERABLE ADULTS
SUSPECTED ABUSE – REPORT FORM

Patient's name .... **Address** ....

Age / DOB ....

....

....

Date .... **Crew 1.** ....

.... **2.** ....

Time ....

CAD / ref no .... **Call sign** ....

Concerns *(please tick)*:

- **Physical abuse** ☐
- **Sexual abuse** ☐
- **Emotional abuse** ☐
- **Financial abuse** ☐
- **Neglect** ☐
- **Discriminatory abuse** ☐

In your opinion, why is the person Vulnerable? *(please tick)*:

- **Older person** ☐
- **Physical disability** ☐
- **Learning disability** ☐
- **Mental health problem** ☐
- **Other** ☐

Reason for concern *(please tick)*:

- **Physical signs** ☐
- **Inconsistent story** ☐
- **Behavioural signs** ☐
- **Environment** ☐
- **Disclosure by victim / other person** ☐

Is the patient a resident of a nursing / residential care home / hostel? (*please tick*): ☐ Yes ☐ No

If Yes, please state name and address of the home / hostel: ....

....

Do you have concerns about the standard of care received by the patient at the home / hostel?
☐ Yes ☐ No

Do you have concerns about the welfare of other residents? ☐ Yes ☐ No

If Yes, please include in 'Details of the Environment' below.

Does the patient use a Day Care Service? (*please tick*): ☐ Yes ☐ No

If Yes, please state address where the service is based (if known): ....

....

Do you have concerns about the standard of care received by the patient at the Day Care Service?

☐ Yes ☐ No

Do you have concerns about the welfare of other service users? ☐ Yes ☐ No

If Yes, please include in 'Details of the Environment' below.

Does the patient receive a service in their home from a domiciliary care agency? ☐ Yes ☐ No

If Yes, please state name and address of the agency (if known): ....

....

Local Authority area: ....

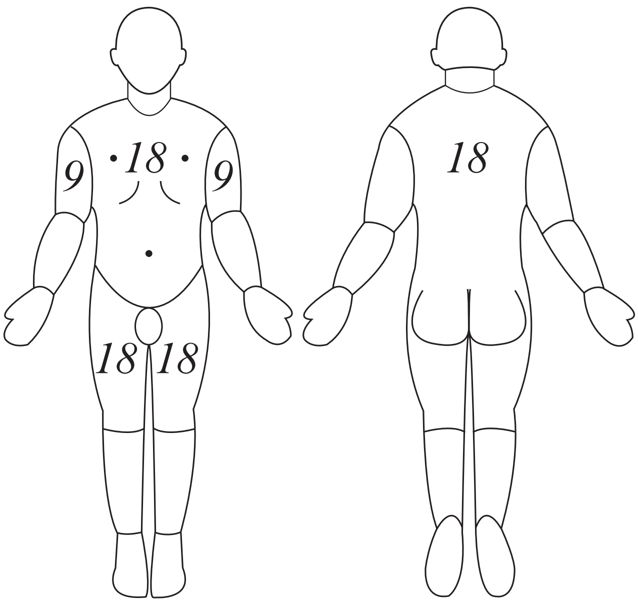
Do you have any concerns about the standard of service provided by that agency? ☐ Yes ☐ No

If Yes, please include in 'Details of the Environment' below.

Please give a written description of your concerns, including the general appearance, condition and behaviour of the patient (give an example if possible):

Version of events given by the victim (and what they want to be done about the situation):

Please give a description of your findings. If the patient has a physical injury, please mark it below using the front and back figure :



Injury = X

?Fracture = #

Burns = O

Pain = ●

Details of significant family members, members of staff, friends or other people who are with the patient:

Details of the Environment (including concerns about nursing / residential care homes / hostels / Day Care Services / Domiciliary Care Agencies):

Patient conveyed to hospital ☐

Accompanied by ....

Hospital ....

Hospital staff signature ....

Hospital Staff Name ....

Crew signature ....

Date / Time ....

Not conveyed to hospital ☐

Reported to: Control ☐

Social Services ☐ Police ☐

In person ☐ By telephone ☐

Form sent to ....

☐ By e-mail ☐ Fax ☐ Post

CONSENT (where applicable)

The information contained in this form may be shared between the Ambulance Service and other agencies, in order to protect you from harm.

Declaration: I consent to the information recorded on this form being shared with other agencies responsible for my ongoing welfare.

Name: .... **Signature:** ....

The Ambulance Service will act in accordance with the Data Protection Act (1998)[2] and the obligations contained therein, within its role as Data Controller.

For advice / support, ring ....

When completed, this form must be faxed to ....

on ....

INTRODUCTION

Recognising the signs and symptoms of serious illness in a child is much more important than seeking a diagnosis.

The most important skill in managing paediatric emergencies is patient assessment. Good assessment allows the child with actual or potential life-threatening illness or injury to be rapidly identified and managed.

Early recognition and management of developing respiratory distress, circulatory impairment or decreased level of consciousness will alert the Ambulance Clinician to the need for transferring the child rapidly to hospital for further urgent assessment and treatment.

Adults often suffer sudden cardiac arrest while fairly well perfused and in a relatively normal metabolic state, because the heart suddenly stops with an arrhythmia. A child, in contrast, is much more likely to have a cardiac arrest because of hypoxia, the heart eventually stopping because of the severity of the hypoxia and acidosis. In this situation a child is much less likely to respond to resuscitation as the body is already so metabolically abnormal. **Thus if a child is to have a good chance of survival, it is essential that their illness is recognised long before cardiac arrest occurs.**

Recognition of the seriously ill or injured child involves the identification of a number of key signs affecting the child's airway, breathing, circulatory or neurological systems. **If these signs are present, the child must be regarded as time critical.**

ASSESSMENT

Primary Assessment

Airway – Assessment of the Airway

Check the airway for obstruction, foreign material or vomit.

Position the head to open the airway

The younger the child the less head extension will be required. A newborn will require the head to be in the neutral position and a small child will "sniff the morning air". If trauma is suspected, a jaw thrust should be used.

Abnormal upper airway sounds should be sought:

- inspiratory noises (**stridor**) indicate airway obstruction near the larynx
- a snoring noise (**stertor**) may be present when there is obstruction in the pharynx – e.g. massive tonsils.

Breathing – Assessment and Recognition of Potential Respiratory Impairment

Measure the respiratory rate

Rapid breathing rate (tachypnoea) in a child at rest indicates that increased ventilation is due to:

- airway problems
- lung problems
- circulatory problems
- metabolic problems.

Table 1 – Normal Respiratory Rate

Age	Respiratory Rate
<1 year	30 – 40 breaths per minute
1–2 years	25 – 35 breaths per minute
2–5 years	25 – 30 breaths per minute
5–11 years	20 – 25 breaths per minute

Recession (indrawing, retraction)

Children have pliable rib cages so when respiratory effort is high, indrawing is seen between the ribs (intercostal recession) and along the costal margins where the diaphragm attaches (subcostal recession). In tiny babies even the sternum itself may be drawn in (sternal recession) – as children get older, the rib cage becomes less pliable and signs of accessory muscle use (see below) will be seen. Recession in older children may suggest that there is severe respiratory difficulty.

Accessory Muscle Use

As in adult life, the sternomastoid muscle may be used as an accessory respiratory muscle when the work of breathing is increased. In infants this may cause the head to bob up and down with each breath.

Flaring of the Nostrils

This is a subtle sign that is easily missed. It indicates significant respiratory distress.

Inspiratory or Expiratory Noises

Wheezing indicates **lower** airway narrowing and is most commonly heard on expiration. The **volume** of stridor or wheezing is **NOT** an indicator of severity and indeed may diminish with increasing distress because less air is being moved.

Inspiratory noises (**stridor**) can indicate an imminent danger to the airway due to reduction in airway circumference to approximately 10% of normal.[1]

Grunting is produced by exhalation against a partially closed laryngeal opening (glottis). This is a sign of severe respiratory distress and is characteristically seen in infants.

Effectiveness of Breathing – chest expansion and breath sounds.

Note the degree of chest expansion on both sides of the chest and whether it is equal.

Auscultate the chest with a stethoscope.

A silent chest is a pre-terminal sign, as it indicates that very little air is going in or out of the chest.

Pulse oximetry

This can be used at all ages to measure oxygen saturation (readings are less reliable in the presence of shock, hypothermia and some other conditions such as carbon monoxide poisoning and severe anaemia).

Table 2 – The effects of respiratory inadequacy on other systems.

Heart Rate	• Tachycardia or eventually bradycardia may result from hypoxia and acidosis. • Bradycardia in a sick child is a pre-terminal sign.
Skin Colour	• **Flushed skin may be noted due to increased respiratory effort in early stages.** • Skin pallor may be due to vasoconstriction due to hypoxia. • Cyanosis is pre-terminal sign of hypoxia.
Mental Status	• The hypoxic child will be agitated, drowsy. • Drowsiness gradually increases and eventually leads to unconsciousness. Agitation may be difficult to identify due to the child's distress. Parents may be helpful in making this assessment.

Circulation – Recognition of Potential Circulatory Failure (Shock)

Assessment of the circulation may be very difficult in children as each physical sign may have a number of confounding variables. It is important to make an assessment of all the signs below and take each into account when assessing whether a child is shocked.

Heart Rate:

- **tachycardia** may result from circulatory volume loss. The rate, particularly in infants, can be very high (up to 220 beats per minute)
- **bradycardia** will be apparent before cardiac arrest (***see above***).

Table 2 – Normal Heart Rate

Age	Heart Rate
<1 year	110 – 160 beats per minute
1–2 years	100 – 150 beats per minute
2–5 years	95 – 140 beats per minute
5–11 years	80 – 120 beats per minute

Pulse Volume:

- peripheral pulses will become weak then absent with advancing shock
- children shut down their circulation segmentally, and increasing shock will result in cool /cold skin, initially distally and becoming more proximal as shock advances
- there is no validated relationship between the presence of certain peripheral pulses and the systemic blood pressure in children.

Capillary Refill:

- this should be measured on the forehead, sole of the foot or sternum
- a capillary refill time of >2 seconds indicates poor perfusion, although this may be influenced by a number of factors, particularly cold.

Blood pressure:

- should not routinely be measured in pre-hospital care as it is complex to undertake correctly and may delay on scene time
- varies with age
- it drops very late in shock in children and thus other signs of circulatory inadequacy will be present long before hypotension occurs
- hypotension is a pre-terminal sign.

Table 3 – The effects of circulatory inadequacy on other systems

Respiratory Rate	• A rapid respiratory rate but without recession, may be due to circulatory insufficiency leading to poor tissue perfusion which results in acidosis. • Tachypnoea is due to the body trying to correct the metabolic abnormality.
Skin	• Mottled, cold, pale skin indicates poor perfusion.
Mental Status	• Initially, in shock, the child will become agitated and, as it progresses, drowsy. The child may ultimately become unconscious as a result of poor cerebral perfusion.

Disability – Recognition of Potential Central Neurological Failure

Level of Consciousness/ Alertness

A	**A**lert
V	**R**esponds to voice
P	**R**esponds to painful stimulus
U	**U**nresponsive

Response to a painful stimulus:

Pinch a digit or pull frontal hair; a child who is unconscious or who only responds to pain has a significant degree of coma (***refer to Glasgow Coma Scale – Appendix 1***).

Posture:

Observe the child's posture; children may be:

- **floppy (hypotonic) –** any child with new onset of floppiness must be assumed to be seriously ill until proven otherwise
- **stiff (hypertonic) or back arching (opisthotonic) –** new onset stiffness must be regarded as a sign of severe cerebral upset
- **decerebrate or decorticate posturing –** indicates serious cerebral abnormality.

Pupils:

- pupil size and reaction must be tested
- pupils should be equal and of a normal size and react briskly to light
- any abnormality or change in the pupil size or reaction may be significant.

Table 4 – The effects of central neurological impairment on other systems.

Respiratory System	• An abnormal respiratory pattern (hyperventilation, Cheyne-Stokes breathing or apnoea) may indicate cerebral malfunction.
Circulatory System	• Bradycardia may be due to dangerously raised intracranial pressure • Blood glucose level in any seriously ill child.

NOTE: the whole assessment should take less than two minutes unless intervention is required.

Frequent re-assessment of **ABCD**'s is necessary to assess the response to treatment or to detect deterioration.

MANAGEMENT

INTRODUCTION

Any child believed to have a serious problem involving:

- **A**irway
- **B**reathing
- **C**irculation
- **D**isability

must be considered to have a **TIME CRITICAL** condition and receive immediate management of airway, breathing and circulation, and be rapidly transferred to an appropriate receiving hospital with a suitable pre-alert message.

Remember: A and **B** problems should be corrected on scene and **C** problems managed en-route to further care.

AIRWAY MANAGEMENT

- the child's airway should be managed in a stepwise manner
- if epiglottitis is possible then extreme caution must be exercised.

Manual manoeuvres, chin lift/extension, or jaw thrust in cases of trauma:

- it is important not to place pressure on the soft tissues under the chin and in front of the neck, as this may obstruct the airway.

Aspiration, removal of any foreign body:

- finger sweeps should be avoided as they may push material further down the airway or damage the soft palate
- paediatric suction catheters should be used where available.

Oropharyngeal airway (OPA):

- ensure the OPA is of the appropriate size and inserted using the correct technique. Discontinue insertion or remove if the child gags (***refer to paediatric resuscitation charts***)

Nasopharyngeal airway:

- correct sizing is essential
- care should be taken not to cause trauma to the tonsillar/adenoidal tissue in small children, a smaller size may be required.

Endotracheal intubation:

- the hazards associated with intubation in children are considerable and the disadvantages usually outweigh the advantages. It should **ONLY** be attempted where other more basic methods of ventilation have failed (***refer to paediatric resuscitation charts for ET sizes***).

Needle cricothyroidotomy:

- surgical airways should not be performed in children under 12 years of age
- needle cricothyroidotomy is a method of last resort
- the initial oxygen (O_2) flow rate in litres per minute should be set equal to the child's age in years and gradually increased until the chest wall moves adequately.

Refer to foreign body airway obstruction in children guideline.

BREATHING MANAGEMENT

Ensure adequate oxygenation:

- adequate oxygenation is essential to all very sick children; administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients to maintain an oxygen saturation of 95%
- high concentration O_2 should be administered routinely, whatever the oxygen saturation, in children with sickle cell disease or a history of cardiac disease
- if the child is distressed by the presence of a mask, ask the parent to help by holding the mask as close to the face as possible. If this still produces distress, wafting O_2 across the face directly from the tubing (with the facemask detached from the tubing) is better than nothing
- consider assisted ventilation at a rate equivalent to the normal respiratory rate for the age of the child (***refer to paediatric resuscitation charts for normal values***) if:
  - the child is hypoxic (SpO_2 is <90%) and remains so after 30-60 seconds on high concentration O_2
  - respiratory rate is <half normal or >three times normal
  - expansion is inadequate.

- ensure a good mask seal with an appropriate size mask. Avoid hyperventilation to reduce the risk of gastric insufflation or causing barotrauma. The bag-valve-mask should have a pressure release valve as an added safety measure. If this is not available **extreme** care must be taken not to cause over expansion of the lungs. No bag smaller than 500ml volume should be used for bag valve mask ventilation unless the child is less than 2.5kg (preterm baby size).

Wheezing

The management of asthma is discussed elsewhere (***refer to asthma in children guideline***)

CIRCULATION MANAGEMENT

Arrest external haemorrhage

NOTE: Do not waste time on the scene attempting to gain intravenous (IV) or intraosseous (IO) access. This should be done en-route unless delay is unavoidable e.g. entrapment.

Cannulation:

Attempt cannulation with the widest bore cannula that can be confidently placed. The vehicle can be stopped briefly to allow for venipuncture and disposal of the sharp with transport being recommenced before the IV dressing is applied. The intraosseous route may be required where venous access has failed on two occasions or no suitable vein is apparent within a reasonable timeframe. The intraosseous route is the preferred route for vascular access in all cases of cardiac arrest in young children.

Blood glucose level should be measured in all children in whom vascular access is being obtained and must be measured in children with decreased conscious level (***refer to decreased level of consciousness guideline***).

Fluid administration

Fluids should be:

- 0.9% saline or Hartmann's solution when treating shock
- where possible warmed
- measured in millilitres and documented as volume administered, not the volume of fluid chosen
- generally administered as boluses rather than "run in".

Handover at the receiving unit must include details of volume and type of fluid administered.

Fluid volumes

Central pulse **ABSENT,** radial pulse **ABSENT** is an absolute indication for urgent fluid.

Central pulse **PRESENT**, radial pulse **ABSENT** is an indication for urgent fluid depending on other indications including tissue perfusion and blood loss.

Central pulse **PRESENT**, radial pulse **PRESENT – DO NOT** commence fluid replacement[2] **UNLESS** there are other signs of circulatory failure (cold peripheries, delayed capillary refill time, mottled skin, weak thready pulse) then commence 20ml/kg bolus of crystalloid.

- 20ml/kg should be given as a bolus to restore vital signs to normal
- no more than three boluses should be given except on medical advice.

Exceptions:

- in diabetic hyperglycaemia special caution is required (***refer to glycaemic emergencies in children***)
- if evidence of heart failure or renal failure give bolus of 10ml/kg and stop if patient deteriorates. Transfer to hospital as a priority
- in hypoglycaemia fluid should be withheld unless life threatening shock is present when 10ml/kg should be administered over 10-15 minutes (***refer to glycaemic emergencies in children guideline***)
- if there are exceptional circumstances, e.g. long transfer time, on-line advice should be obtained.

DISABILITY MANAGEMENT

The aim of management of any child with a cerebral insult is to minimise further insult by optimising their circumstances.

"Treat the treatable"; apart from the above, in pre-hospital care this generally means management designed to:

- prevent hypoxia (***see above***)
- normalise circulation (but do not overload)
- check for and treat hypoglycaemia (***refer to glycaemic emergencies in children guideline***).

Other conditions which can be treated before hospital and are discussed elsewhere include:

- convulsions (***refer to convulsions in children guideline***)
- opiate poisoning (***refer to naloxone protocol for dosages and information***)
- meningococcal septicaemia (***refer to meningococcal septicaemia in children guideline***).

SUMMARY

Primary assessment of the child will determine **whether the child is time critical or not.**

Immediate correction of A and B problems must be undertaken without delay at the scene. C problems can be corrected en-route to hospital.

Children who are found to be seriously ill must be considered **TIME CRITICAL and MUST BE taken to the nearest suitable receiving hospital without delay.**

A Hospital Alert Message should be given whenever a seriously ill child is transported.

NOTE: paediatric drug doses are expressed as mg/kg, (***refer to specific drug protocols for dosages and information***). These protocols **MUST** be checked prior to **ANY** drug administration, no matter how confident the practitioner may be.

ADDITIONAL INFORMATION

Remember that the patient history may give you valuable insight into the cause of the current condition. The following may be of great help in your diagnosis:

- relatives, carers or friends with knowledge of the child's history
- packets or containers of medication or evidence of administration devices (e.g. inhalers, spacers etc.)
- medic alert type jewellery (bracelets or necklets) which detail the child's primary health risk (e.g. diabetes, anaphylaxis etc) but also list a 24 hour telephone number to obtain a more detailed patient history
- also ***refer to safeguarding children guideline***.

Key Points – Medical Emergencies in Children

- The patient history may give you valuable insight into the cause of the current condition.
- The airway can usually be controlled without the need for intubation.
- Hypoxia and hypovolaemia need urgent correction in the seriously ill child.
- Always check the blood glucose in seriously ill children or those with a decreased level of consciousness.
- A and B should be corrected on scene and C problems managed en-route to further care.

SELECT BIBLIOGRAPHY

[1] Walls RM, editor. *Manual of emergency airway management* Philadelphia: Lippincott Williams and Wilkins, 2000.

Revell M, Porter K, Greaves I. Fluid Resuscitation in Pre-hospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

Phillips B, Zideman D, Garcia-Castrillo L. European Resuscitation Council Guidelines 2000 for Paediatric Advanced Life Support: a statement from the Paediatric Life Support Working Group and approved by the executive committee of the European Resuscitation Council. *Resuscitation* 2001;48(3):231-34.

Resuscitation Council (UK). Resuscitation Guidelines 2005: Resuscitation Council (UK): Available from:http://www.resus.org.uk/pages/guide.htm, 2005.

Maconochie I. Capillary refill time in the field – it's enough to make you blush! *Pre-hospital Immediate Care* 1998;2:95-96.

Jewkes F, Lubas P, McCusker K, editors. *Pre-hospital Paediatric Life Support* 2nd ed. London: Blackwells, 2005.

Group ALS. *Pre-hospital paediatric life support.* London: BMJ Publishing Group, 1999.

Advanced Life Support Group. *Advanced paediatric life support: the practical approach.* 3rd ed. London: BMJ Books, 2000.

METHODOLOGY

Refer to methodology section.

APPENDIX 1 – Glasgow Coma Scale and modified Glasgow Coma Scale.

GLASGOW COMA SCALE	
Item	**Score**
Eyes Opening:	
Spontaneously	4
To speech	3
To pain	2
None	1
Motor Response:	
Obeys commands	6
Localises pain	5
Withdraws from pain	4
Abnormal flexion	3
Extensor response	2
No response to pain	1
Verbal Response:	
Orientated	5
Confused	4
Inappropriate words	3
Incomprehensible sounds	2
No verbal response	1

MODIFICATION OF GLASGOW COMA SCALE FOR CHILDREN UNDER <4 YEARS OLD	
Item	**Score**
Eyes opening:	as per adult Scale
Motor response:	as per adult Scale
Best verbal response:	
appropriate words or social smiles, fixes on and follows objects	5
cries, but is consolable	4
persistent irritable	3
restless, agitated	2
Silent	1

INTRODUCTION

Every year approximately 700 children die as a result of accidents in England and Wales.[1] About half of them die as a result of motor vehicle incidents. Fatalities as a result of cycle and pedestrian incidents are most common in children.

While the law states that all children should be restrained in vehicles,[2,3] this is often not complied with and ejection also causes a significant number of deaths and serious injuries.

A third of childhood fatalities occur in the home. Burns and falls are the main cause of death in this environment.

It is a truism that **MOST** child deaths could be regarded as avoidable if injury prevention methods had been rigorously applied.

The basic principles of the ABC approach to paediatric trauma management are very similar to those of the adult. There are, however, areas of difference in terms of anatomy, relative size and physiological response to injury. This guide is intended to highlight those differences.

BASIC TRAUMA APPROACH

Scene:

- triage if more than one casualty.

Situation:

- observe and note mechanisms of injury (MOI)
- always look for evidence of children such as toys or child seats that may indicate that a child has been ejected from a vehicle or wandered off from the scene but may still require medical attention.

ASSESSMENT

Primary Survey – Rapid In-depth primary survey (60-90 seconds)

- **A**irway with cervical spine control (see C-spine collar)
- **B**reathing
- **C**irculation
- **D**isability
- **E**xposure, Examine and Evaluate

The management of a child suffering a traumatic injury requires a careful approach, with an emphasis on explanation, reassurance and honesty. Trust of the carer by the child makes management much easier.

If possible, it is helpful to keep the child's parents/carers close by for reassurance, although their distress can exacerbate that of the child!

Stepwise Primary Survey Assessment

As for all trauma care, a systematic approach, managing problems as they are encountered before moving on.

Airway Assessment

Initial spinal immobilisation is mandatory using manual methods at first; subsequent use of a correctly sized cervical collar, head blocks and forehead/chin tapes on a long board is ideal, although, a compromise using less formal measures, such as manual immobilisation may be necessary (***refer to neck and back trauma guideline***).

In a small child, the size of the occiput may result in the head being flexed forward and it may be appropriate to consider using a small amount of padding under the shoulders to return the head to the neutral position.

Airway obstruction may result from vomit, blood or foreign material. Gentle aspiration under direct vision should be used. Blind finger sweeps are contra-indicated.

If an airway adjunct is needed, then an oropharyngeal airway can be inserted directly with down pressure on the tongue. A nasopharyngeal airway can also be used, but with adenoidal tissue there is the potential for bleeding.

Burns are a special case (***refer to burns and scalds in children guideline***). Looking for soot in the nostrils and mouth, erythema and blistering of the lips with a hoarse voice may indicate potential airway injury.

There may be a need to progress to endotracheal (ET) intubation, but only if trained and airway reflexes are absent. If airway reflexes are present then rapid sequence intubation will be required; either initiate emergency transfer to further care or bring such skills to the scene e.g. immediate care Doctor (***refer to paediatric resuscitation charts for ET sizes***). The next step on the airway ladder is needle cricothyroidotomy.

Administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-rebreathing mask, using the stoma in neck breathing patients. High concentration O_2 should be administered routinely, whatever the oxygen saturation, in patients sustaining major trauma and long bone fracture.

High flow oxygen through a tightly fitting oxygen mask with a reservoir is the ideal, although a compromise, even to the point of the mask being held close but not in contact may be needed. All efforts should be made to increase the level of inspired oxygen.

Breathing Assessment

The chest wall in a child is very elastic and it is quite possible to have significant injury without there being apparent external signs on the chest wall.

The chest should be inspected for pattern bruising and for the rate and adequacy of breathing. Chest wall movement and the presence of any wounds should be sought.

Palpation may reveal some crepitus suggesting fractured ribs or surgical emphysema. Poor excursion may suggest an underlying pneumothorax.

Auscultation should reveal good bilateral air entry and the absence of any added sounds. Areas to be listened to:

- above the nipples in the mid-clavicular line
- in the mid-axilla under the armpits
- at the rear of the chest, below the shoulder blades.

Table 1 – Normal Respiratory Rate

Age	Respiratory Rate
<1 year	30 – 40 breaths per minute
1–2 years	25 – 35 breaths per minute
2–5 years	25 – 30 breaths per minute
5–11 years	20 – 25 breaths per minute

Assess for a tension pneumothorax (***refer to thoracic trauma guideline and below***)

Remember to consider a tension pneumothorax if there is:

- severe and increasing breathlessness
- absent or greatly reduced breath sounds on one side of the chest
- distended neck veins (difficult in children)
- in ventilated patients, increasing resistance to ventilation with reduced or absent air entry on one side of the chest
- tracheal deviation (late sign).

Assess for a haemothorax (***refer to thoracic trauma guideline***).

For sucking chest wounds (***refer to thoracic trauma guideline***).

Inadequate ventilation resulting in hypoxia and hypercarbia may be tolerated for a prolonged period before rapid progression to cardiac arrest. Treatment should be based on restoring ventilation, possibly by augmenting respiratory effort with bag-valve-mask ventilation using high flow oxygen.

- consider assisted ventilation at a rate equivalent to the normal respiratory rate for the age of the child (***refer to paediatric resuscitation charts for normal values***) if:
  - SpO_2 is <90% on high concentration O_2
  - respiratory rate is <half normal or >three times normal
  - expansion is inadequate.

Circulation Assessment

A normal mental state with good skin colour and temperature are useful crude indicators of adequate circulation. A normal capillary refill time (<2 seconds) can be another useful indicator.

In the first instance, assess for evidence of significant external haemorrhage and apply direct pressure to stop any loss.

Feel for radial or brachial pulse rate and volume (depending on age and see table). Tachycardia with a poor pulse volume suggests shock. Bradycardia can also occur in the shocked child but is a **PRE-TERMINAL SIGN**.

Table 2 – Normal Heart Rate

Age	Heart Rate
<1 year	110 – 160 beats per minute
1–2 years	100 – 150 beats per minute
2–5 years	95 – 140 beats per minute
5–11 years	80 – 120 beats per minute

Immobilisation of major long bone fractures on a longboard or by application of traction to femoral fractures in older children can help control bleeding.

Vascular access should be gained, where possible, en-route to hospital, not prolonging the time on scene. The widest possible cannula for identifiable veins should be used.

The administration of a fluid bolus at a rate of 20ml/Kg body weight has been the standard treatment while observing for a physiological response. This was then repeated until a physiologically normal state was restored. This has become controversial with the adoption of the concepts behind hypotensive resuscitation in adults[4] and recent paediatric guidelines now recommend **5ml/Kg** bolus administration until an effect is observed.

Disability / Level of Consciousness Assessment

Note: the initial level of consciousness on the AVPU Scale and the time of this assessment, together with information on the pupil size, shape, symmetry and response to light, and whether the child was moving some or all limbs.

A	Alert
V	Responds to voice
P	Responds to painful stimulus
U	Unresponsive

If the child does not score **A** then the patient should be considered **time critical**. A formal GCS (**see below**)[5] en-route may be valuable to the receiving hospital but should only be recorded if it can be accurately done. A misleading score is worse than a simple AVPU with a description of progression.

If there is no movement, then ask the patient to "wiggle" their fingers and toes, paying particular note to movements peripheral to any injury site.

Stepwise Disability Management

Confusion or agitation in the injured child may arise directly from a head injury, but equally may be secondary to hypoxia from airway impairment, impaired breathing or hypoperfusion due to blood loss and shock.

The management of any child with changed level of alertness is based on ensuring an adequate airway, oxygenation, ventilation and circulation.

A plasma blood glucose level in a child with a changed level of alertness is mandatory and the need is not restricted to those with diabetes. If the child is hypoglycaemic then for treatment **refer to glycaemic emergencies in children guideline.**

Evaluate

Children are prone to rapid heat loss when exposed for examination and immobilisation during trauma care. Investing in protecting the child from a cold environment during the primary survey is very important. Exposing a child can also have lasting negative psychological effects.

EVALUATE patient as TIME CRITICAL or NON-TIME CRITICAL at the end of the rapid **PRIMARY SURVEY**, on the basis of the following criteria:

A and B problems should have been identified and addressed as encountered during the primary survey. In the presence of any difficulties, rapid packaging and urgent transport, immobilised on a long board, to nearest suitable Emergency Department is indicated.

Consideration should be given to the need for a **HOSPITAL ALERT** en-route.

If there is no apparent problem with the Primary Survey then the situation may be less time critical and there may be value in a more careful Secondary Survey. This should take no more than a few minutes and should not significantly delay the transfer to definitive care. A large part can be done while in transit to hospital.

Secondary Survey

This is a systematic and careful review of each part of the injured child looking for less clinically critical and/or occult injuries.

Head:

- re-check the pupil size, shape, symmetry and response to light
- assess and palpate for bruising, lacerations or tenderness over the scalp. Significant blood loss can occur through a scalp laceration and this should be guarded against.

Conscious level:

- assess the neurological status using the standard Glasgow Coma Scale (***refer to Glasgow Coma Scale – Appendix 1***)
- in smaller children the speech component may require modification to allow for their relative lack of maturity and this is also listed
- a GCS of <8 is the definition of coma, however a GCS of <12 in a child post-trauma that is not rapidly returning to normal mandates meticulous airway management, optimising of the ventilation and cerebral perfusion and a formal investigation of brain injury using a computerised tomography (CT) scan.

Neck:

- it is often impractical to clinically clear a cervical spine of a child in the pre-hospital environment.
- immobilisation in the older and more cooperative patient (***refer to neck and back trauma guideline***).

Chest:

- changes to the respiratory function and chest may evolve with time. At this stage, a more thorough assessment is indicated, looking particularly for evidence of pattern bruising, rib fractures, instability and surgical emphysema (skin "crackling")
- listening for breath sounds needs to be in all areas. A trauma patient is often supine and the pneumothorax will be anterior and, more deceptively, the haemothorax will be more posterior.

Abdomen:

- pattern bruising, particularly in relation to the use of a lap seat belt is helpful
- feeling for tenderness in all four abdominal quadrants is informative but an awareness that many serious abdominal injuries have a delayed presentation is important
- triage is dynamic.

Pelvis:

- traditionally the pelvis was "sprung" by lateral compression or front to back pressure to assess its stability. It is now felt that the risk of exacerbating the bleeding outweighs the benefits of compressing the pelvis to assess for potential fractures. Such injuries should be assumed from the mechanism and other associated pattern injuries.

Limbs:

- look for wounds and evidence of fractures. Dress and immobilise any injuries found. A simple MSC check for **ALL** four limbs may be valuable (***see below***):

M	MOTOR	Test for movement
S	SENSATION	Apply light touch to evaluate sensation
C	CIRCULATION	Assess pulse and skin temperature

ANALGESIA IN TRAUMA

Injured children may require analgesia (***refer to management of pain in children guideline***) once their life threatening problems have been resolved in the same humanitarian way adults do. This should be via the IV route and titrated to effect, administer morphine sulphate (***refer to morphine drug protocols for dosages and administration***).

NOTE: paediatric drug doses are expressed as mg/kg, (***refer to specific drug protocols for dosages and information***). These protocols **MUST** be checked prior to **ANY** drug administration, no matter how confident the practitioner may be.

SUMMARY

Read the scene for mechanism of injury and manage in a manner similar to the adult trauma process. Remember that there are anatomical and physiological differences as the assessment progresses through the airway, breathing, circulation and disability areas.

Children can physiologically compensate very well and so can conceal serious injury unless a high index of suspicion is retained. Agitation and/or confusion may indicate primary brain injury, but could just as readily be due to inadequate ventilation and cerebral perfusion.

DEFG (**DON'T EVER FORGET GLUCOSE**) in terms of assessment of an altered mental state.

Key Points – Trauma Emergencies in Children

- Detect time critical problems early.
- Toys or child seats may indicate that a child has been involved in the incident and ejected from a vehicle or wandered off from scene.
- Drug doses are expressed as mg/kg. Refer to specific drug protocols for dosages and information. These protocols **MUST** be checked prior to **ANY** drug administration, no matter how confident the practitioner may be.
- Continuously re-assess ABCD, AVPU.
- Provide hospital alert.

REFERENCES

1. Quan L, Seidel JS, editors. *Pediatric advanced life support: instructor's manual*. Dallas: American Heart Association, 1997.
2. The Motor Vehicles (Wearing of Seat Belts by Children in Rear Seats) Regulations 1989:1989 No. 1219
3. The Motor Vehicles (Wearing of Seat Belts by Children in Front Seats) Regulations, 1993 1993 No. 31
4. Revell M, Porter K, Greaves I. Fluid Resuscitation in Pre-hospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).
5. Teasdale G, Jennett B. ASSESSMENT OF COMA AND IMPAIRED CONSCIOUSNESS: A Practical Scale. The Lancet 1974;304(7872):81-84.
6. Stiell IG, Wells GA, Vandemheen KL, Clement CM, Lesiuk H, De Maio VJ, et al. The Canadian C-Spine Rule for Radiography in Alert and Stable Trauma Patients. *JAMA* 2001;286(15):1841-1848.

METHODOLOGY

Refer to methodology section.

APPENDIX 1 – Glasgow Coma Scale and modified Glasgow Coma Scale

GLASGOW COMA SCALE

Item	Score
Eyes Opening:	
Spontaneously	4
To speech	3
To pain	2
None	1
Motor Response:	
Obeys commands	6
Localises pain	5
Withdraws from pain	4
Abnormal flexion	3
Extensor response	2
No response to pain	1
Verbal Response:	
Orientated	5
Confused	4
Inappropriate words	3
Incomprehensible sounds	2
No verbal response	1

MODIFICATION OF GLASGOW COMA SCALE FOR CHILDREN UNDER <4 YEARS OLD

Item	Score
Eyes opening:	as per adult Scale
Motor response:	as per adult Scale
Best verbal response:	
appropriate words or social smiles, fixes on and follows objects	5
cries, but is consolable	4
persistent irritable	3
restless, agitated	2
Silent	1

INTRODUCTION

Anaphylaxis in children is becoming increasingly common. Nut allergy is frequently seen and other allergies including drug allergies are not uncommon (**see Table 1**). Allergy to penicillin is over diagnosed and is less common that it would appear. This may be particularly so in children who have been given penicillin as part of treatment for a (usually viral) infection and then developed a rash. The chances are that the rash is due to the infection, but such children are frequently labelled penicillin allergic. Rarer allergies such as latex allergy have been seen in children as young as 2 years of age. This has obvious implications for equipment use.

Table 1 – Common precipitants

Food-induced anaphylaxis	Food is the most common cause of anaphylaxis, particularly peanuts, tree nuts (e.g. hazel, brazil, walnut), fish and shellfish. Facial oedema, laryngeal oedema and respiratory difficulty usually predominate.
Insect sting-induced anaphylaxis	Insect stings are the second most common cause. Bees may leave a venom sac which should be scraped off (not squeezed). Injected allergens commonly result in cardiovascular compromise, with hypotension and shock predominating.
Drug-induced anaphylaxis	Medications, particularly penicillin, account for a large percentage of anaphylactic reactions. Slow release drugs prolong absorption and exposure to the allergen.
Other causes	Latex, and exercise.

For background and pathphysiology of anaphylaxis ***refer to anaphylaxis/allergic reactions in adults guideline***.

Main points include:

1. the importance of a good history e.g. exposure to a known allergen.
2. the lack of a good evidence base on which to base management.
3. the importance of adrenaline in treatment.

ASSESSMENT

Assess **ABCD**'s:

Anaphylaxis in children may present in even more diverse ways than adults, making diagnosis more difficult. There may be a history of exposure to a known allergen. Signs include (but do not have to be present):

- airway obstruction
- rhinitis and conjunctivitis
- wheezing
- angio – oedema
- urticaria
- skin flushing or pallor
- cardiovascular collapse
- abdominal pain, diarrhoea and vomiting.

They may be of rapid or slow onset, and may be biphasic or rarely may even be delayed for a few hours.

The child, parent or carer may carry an adrenaline pen and /or wear "Medic Alert" type jewellery (bracelets or necklets) – ask if they do.

Paediatric pens contain either 300mcg (approximating to the 250mcg dose below) or 125 mcg of adrenaline.

MANAGEMENT[1]

Quickly remove the triggering source (if possible).

If signs of anaphylaxis are identified, immediately correct A and B problems.

Administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%.

Administer **adrenaline** (***refer to adrenaline protocol for administration and information***),

NOTE: Intravenous adrenaline should not generally be administered by Paramedics. It may be considered in exceptional circumstances **after** on line medical advice from a Doctor and given under ECG monitoring, It is potentially very dangerous.

Provide a pre-alert and transport to the nearest suitable hospital as an emergency case.

Continue management en-route.

Intramuscular **chlorphenamine** should be given to counteract histamine release (***refer to chlorpheniramine protocol for administration and information***).

Salbutamol may be given to counteract wheezing (***refer to salbutamol protocol for administration and information***).

Fluid therapy

Central pulse **ABSENT**, radial pulse **ABSENT** – is an absolute indication for urgent fluid.

Central pulse **PRESENT**, radial pulse **ABSENT –** is an indication for urgent fluid depending on other indications including tissue perfusion and blood loss.

Central pulse **PRESENT**, radial pulse **PRESENT – DO NOT** commence fluid replacement[2] **UNLESS** there are other signs of circulatory failure (cold peripheries, delayed capillary refill time, mottled skin, weak thready pulse) then commence 20ml/kg bolus of crystalloid.

Reassess vital signs prior to further fluid administration.

Hydrocortisone may be administered after severe attacks or to patients who are asthma sufferers, once other management is under way and if time allows (***refer to hydrocortisone protocol for administration and information***). This is particularly important in patents with asthma who may be predisposed to severe anaphylaxis. Hydrocortisone helps avoids **LATE** sequelae.

Place the patient in a position of comfort.

Warn carers that some children with even moderately severe attacks may suffer an early recurrence of symptoms and some should be observed for 24 hours. Certain children are predisposed:

- severe slow onset reactions with unknown allergen
- severe asthmatic component or in severe asthmatics
- possible continuing absorption of the allergen
- previous history of biphasic reactions.

Key Points – Anaphylaxis in children

- Anaphylaxis may be difficult to diagnose.
- Remove the allergen.
- Epinephrine is the mainstay of treatment.
- Reactions may recur.
- Hydrocortisone is not part of the immediate treatment.

REFERENCES

1. Chamberlain D. Emergency medical treatment of anaphylactic reactions. Project Team of the Resuscitation Council (UK). *J Accid Emerg Med* 1999 16(4):243-247.
2. Revell M, Porter K, Greaves I. Fluid Resuscitation in Pre-hospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Asthma is one of the commonest of all medical conditions requiring hospitalisation in children and a significant mumber of children will die of asthma each year. These guidelines are concerned with an acute asthma attack.

HISTORY

The patient may have a history of increased wheezing or breathlessness, often worse late at night or early in the morning, associated with allergy, infection or exertion as a trigger.

Upper respiratory tract infections often also trigger asthma attacks in children.The child may be known to have asthma and may be on regular medications (usually inhalers: a "preventer" and /or "reliever") and sometimes montelukast (Singulair).

An asthma "plan" may be available, these are formed by the Doctor and patient/parent to control daily symptoms as well as exacerbations.

Most younger children have their medications delivered by a spacing device, they come in various shapes and sizes.

A few children will have home nebulisers.

Children who have been previously admitted to hospital, particularly intensive care, are at risk of developing severe or life threatening symptoms again and a history of this should be sought. There is an increased risk of death in this group.

If a child is suffering from a first episode of "asthma", an inhaled object should be considered as part of the differential diagnosis, particularly if wheezing is unilateral. It will not, however, cause problems if the child who has inhaled a foreign body is treated for asthma.

ASSESSMENT

Primary Survey

This should be undertaken as part of the routine assessment of recognition of the seriously ill child (***refer to recognition of the seriously ill child guideline***). Remember to exclude the presence of pneumothorax – **this is a rare complication of asthma.**

Respiratory Examination

Refer to recognition of the seriously ill child for details of examination of the respiratory system under "**B**reathing".

Asthma usually presents to the Ambulance Service in one of two forms (***see Table 1***):

1. Life Threatening	2. Acute Severe
• SpO_2 <85% in air • silent chest • poor respiratory effort • altered consciousness • cyanosis • peak flow <33% of predicted (if attempted – not usually appropriate).	• oxygen saturations (SpO_2) less than 92% in air • too breathless to talk or feed • heart rate > 130 (2-5 years), >120 (5-18 years) (**NOTE**: salbutamol causes tachycardia – this is **NOT** included in this definition) • respiratory rate >50 breaths per minute (2-5 years), >30 breaths per minute (5-18 years) • use of accessory muscles/marked respiratory distress • peak flow (if done) 33% – 50% predicted (may be too difficult for some children when ill).

MANAGEMENT[1]

General:

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients. High concentration O_2 should be administered routinely, whatever the oxygen saturation.
- transport without delay to hospital.
- check peak flow if practical (take the best of three readings); this is often impractical in children during an attack and should not be pursued if it causes distress or worsening of the condition.

- adminster **salbutamol**[2] (***refer to salbutamol protocol for dosages and information***) via an oxygen driven nebuliser, running at 6 – 8 litres per minute. Consider adding **ipratropium bromide** (***refer to ipratropium bromide protocol for dosages and information***) to the salbutamol if symptoms life threatening
- if the child becomes exhausted, bag-valve-mask ventiation will be necessary and in-line nebulisation using a **T**-piece should be used if available
- pulse oximetry is essential and ECG monitoring useful. Regular observation must be documented
- if there is no improvement after 5–10 minutes after the initial nebuliser, give a further dose of nebulised salbutamol (***refer to salbutamol protocol for dosages and information***). Ipratropium bromide (***refer to ipratropium bromide protocol for dosages and information***) should be administered at this time if it has not been given during the first nebuliser
- repeat or continuous nebulised salbutamol can be given until arrival at hospital. In children under the age of one year, salbutamol should only be repeated if there has been a positive reponse to the first dose. Ipratropium should be tried if salbutamol does not work – it is often more effective in very young children
- consider administering **hydrocortisone IV** (***refer to hydrocortisone protocol for dosages and information***) if there is a delay getting to hospital (30 minutes or more), but not if it will compromise other therapy or monitoring. Steroids take time to take effect, so this may help the course of the illness most in hospital.

NOTE: Advice from paediatric respiratory consultants regarding the use of parenteral (subcutanoeus or intramuscular) adrenaline is that it is **NOT** recommended in children.

Provide a hospital alert message if the asthma is severe or life threatening.

Take a peak flow reading **AFTER** treatment if possible to confirm improvement.

Complete the patient clinical record form.

Special Cases

In children under the age of one year, salbutamol should only be repeated if there has been a positive reponse to the first dose. Ipratropium is given up to every two hours in children. Given travelling times this is likely to make Ipratropium a single dose drug.

Further Care

Remember the need to support the parents/guardians/carers of affected children.

Be clear with instructions and answers to both children and parents.

AT HOSPITAL

Give clear and concise details about the patient and any treatment given.

Handover a completed Patient Clinical Record.

Key Points – Paediatric Asthma

- Asthmatic children require high concentration oxygen therapy.
- Assessment of severity is important.
- Mainstay of treatment is nebulised salbutamol.
- Ipratropium should be used in severe cases.
- There is no place for parenteral epinephrine in treating asthma in children.

REFERENCES

1. British Thoracic Society, Scottish Intercollegiate Guidelines Network. The BTS/SIGN British Guideline on the Management of Asthma. *Thorax* 2003;58(Supplement I):i1-i94.
2. Becker AB, Nelson NA, Simons FE. Inhaled salbutamol (albuterol) vs injected epinephrine in the treatment of acute asthma in children. *Journal of Pediatrics* 1983;102:465-9.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

Burns and scalds are relatively common in children. General principles of care are similar to those of adults and this section should be read in conjunction with the management of adult burns.

Scalds, flame or thermal burns, chemical and electrical burns, will all produce a different burn pattern. Inhalation of smoke or toxic chemicals from a fire may cause serious accompanying complications.

As with adult burns, some cases can be complicated by serious injury:

- resulting from falls from a height in fires
- injuries sustained as a result of road traffic accidents, where the vehicle has ignited after an accident
- from explosion, which can induce flash burns and other serious injuries due to the effect of the blast wave and flying debris.

Inhalation of super-heated smoke, steam or gases in a fire, can induce significant major airway swelling and problems in children. This can occur even where steam has been inhaled from a kettle; this has been known to cause fatal airway obstruction.

Non-accidental injury should always be borne in mind when burns have occurred in small children, in particular where the mechanism of injury described does not match the injury sustained, or there is inconsistency in the history (***refer to safeguarding children guideline***).

It is vitally important to remove the heat source and cool the injured area for not more than 10 minutes.

HISTORY

Record the following information:

- what happened?
- when did it happen?
- were any other injuries sustained?
- are any circumstances present that increase the risk of airway burns (confined space, prolonged exposure)?
- any evidence of co-existing or precipitating medical conditions.

ASSESSMENT

Ensure safety of yourself the patient and the scene.

Assess **ABCD**'s.

Specific checks should be made for signs of airway burns, including:

- soot in the nasal cavity and mouth cavities
- cough and hoarseness
- coughing up blackened sputum
- difficulty with breathing and swallowing
- blistering around the mouth and tongue
- scorched hair, eyebrows or facial hair.

Assess breathing rate for depth and any increasing breathing difficulty or audible sounds.

The above assessments and records are mandatory in managing burns in children.

It should be noted that the smaller airways in children may make the management of the patient more difficult. Early and rapidly developing airway swelling may soon make intubation very difficult, so rapid transfer to further care is essential, pre-alerting the receiving unit, which ideally should be the local Burns Unit.

Calculation of Burn Area

The Rule of Nines does not work in patients under the age of 14 because of different body proportions.

Local guidance or charts should be used; a rough guide is to assume that the size of the patient's hand, including the digits, equals 1% of the surface area of the child.

If patient is non-time critical, perform a more thorough patient assessment with a brief Secondary Survey.

THE TIME THE BURN OCCURRED is **IMPORTANT** to **DOCUMENT**, as is time and volume of **ALL** infusions, as all subsequent fluid therapy is calculated from the time of the burn onwards.

In **ELECTRICAL** burns it is important to search for **entry and exit sites**. Assess ECG rhythm. The extent of burn damage in electrical burns is often impossible to assess fully at the time of injury.

In **SCALDS**, the **skin contact time and temperature** of the burning fluid determines the depth of the burn. Scalds with boiling water are frequently of extremely short duration as the water flows off the skin rapidly. Record the type of clothing, e.g. wool retains the hot water. Those resulting from hot fat and other liquids that remain on the skin will cause significantly deeper and more serious burns. Also the **time to cold water and removal of clothing** is of significant impact and should be included in pre-arrival advice from Control.

In **CHEMICAL** burns, it is vital to note the **nature of the chemical.** Alkalis in particular may cause deep, penetrating burns, sometimes with little initial discomfort. Certain chemicals such as phenol or hydrofluoric acid can cause poisoning by absorption through the skin and therefore must be irrigated with **COPIOUS**[1] amounts of water.

CIRCUMFERENTIAL (Encircling completely a limb or digit) full thickness burns, may be "limb threatening", and require early in hospital incision/release of the burn area along the length of the burnt area of the limb (escharotomy).

MANAGEMENT

In any situation where smoke inhalation may have occurred, administer high concentration oxygen (O_2) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients. High concentration O_2 should be administered routinely, whatever the oxygen saturation in all but the smallest burns.

- consider assisted ventilation at a rate equivalent to the normal respiratory rate for the age of the child (***refer to paediatric resuscitation charts for normal values***) if:
  - SpO_2 is <90% on high concentration O_2
  - respiratory rate is <half normal or >three times normal
  - expansion is inadequate.

Should intubation become impossible, needle cricothyroidotomy is the management of choice.

- if the child is wheezing as a result of smoke inhalation, nebulisation with **salbutamol** and an O_2 flow of at least 6-8 litres per minute will frequently improve symptoms (***refer to the drug protocols for dosages and information***). It is important, wherever possible, to obtain a peak flow reading both before and after nebulisation, to assess and record its effect

Vascular access will be necessary if:

- the child requires intravenous analgesia (***see below***)
- the burn is more than one hour old and greater than 10% of the surface area.

Intravenous access in children may be difficult. The intraosseous route should be considered (remember to use local anaesthetic if the child is conscious). Wherever possible, the burn area should be avoided but can be used if no alternative is available.

If an area greater than 25% of the body surface is affected and the time from injury to hospital is likely to be in excess of an hour, then the following fluid therapy should commence:

- Crystalloid should be used in the following initial doses:-
  - 12 years and over – 1000 mls
  - 5 to 11 years – 500 mls
  - Less than 5 years – 10 mls per kg (calculated from tape)

If the burn is complicated by other traumatic injury, then resuscitation should take precedence and management of the other injuries must be the priority.

No creams or lotions should be applied to burns prior to assessment by the hospital team.

Burns should be covered with cling-film; wrapping may have a constricting effect so smaller pieces are better than a circumferential sheet. This avoids removal of the dressing each time the wound needs examining, and reduces pain from contact or draughts. Continue to irrigate over the cling-film or gel based dressing whilst ensuring the rest of the child is warmly wrapped. Be aware of the potential for hypothermia induced by continual irrigation of large areas of the body. It is rare to need more than 10 minutes irrigation except for chemicals that adhere to the skin, for example phosphorus. Cling-film may be applied, followed by wet gauzes to produce cooling by evaporation.

Water gels should be used with caution and only if <12.5% body surface area (BSA) is burnt due to the potential for hypothermia.

- **in alkali burns**, irrigate with water en-route to hospital, as it may take hours of irrigation to neutralise the alkali. This also applies to eyes that require copious and repeated irrigation with water or saline.
- **chemical** burns should **NOT** be wrapped in cling-film but covered with wet dressings (***refer to CBRN guideline***).

Analgesia *(refer to management of pain in children)*

If the burn area is small, cooling and **paracetamol** (***refer to paracetamol protocol for dosages and information***) may be all that is required.

Significant burns or scalds may require **Entonox** (***refer to*** Entonox ***protocol for administration and information***) if the child is able to co-operate, or **oral morphine sulphate** (***refer to oral morphine sulphate protocol for dosages and information***). Intravenous analgesia (**morphine sulphate**) (***refer to morphine sulphate protocol for dosages and information***) is appropriate for larger burns and should be given early.

Burns to face, hands, perineum, must be taken directly to a specialist Burns Unit with paediatric expertise, if available.

Key Points – Burns and Scalds in Children

- Warm the child and cool the burn.
- Do not cool the burn for more than 10 minutes.
- Burnt children require early effective analgesia.
- Always remember child abuse.
- Remember they may have other injuries.
- Treat other injuries as normal.

REFERENCES

[1] Cooke MW, Ferner RE. Chemical burns causing systemic toxicity. *Arch Emerg Med* 1993;10(4):368-71.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

A convulsion is a period of involuntary muscular contraction, often followed by a period of profound lethargy and confusion and sometimes profound sleep.

Most convulsions in children under the age of 5 years will be due to febrile convulsions. The first convulsion can be very frightening for the parents.

Children with learning disabilities or congenital syndromes may have epilepsy as part of the condition.

Convulsions can occur for various reasons (***see Table 1***).

Table 1 – Reasons for convulsions

Epilepsy	In pre-hospital care, the majority of episodes attended are convulsions occurring in patients known to have epilepsy. These patients are usually on anti-epileptic medication, (e.g. phenytoin sodium valproate (Epilim), carbamazepine (Tegretol), and Lamotrigine (Lamictal). Urinary incontinence and tongue biting often accompany a full epileptic convulsion (tonic/clonic).
Febrile convulsions	The other most common ambulance emergency involving convulsions are febrile convulsions. These tend to occur in children (between 6 months and 5 years) with an infection accompanied by a rapid rise in temperature, and may recur in subsequent pyrexial illnesses. Most children who have febrile convulsions **DO NOT** go on to develop epilepsy later in life.
Hypoglycaemia	Convulsions may be a presenting sign of **HYPOGLYCAEMIA** and should be considered in **ALL** patients, especially known diabetics and children. An early blood glucose level reading is essential in all actively convulsing patients (including known epileptics).
Hypoxia	Any patient suffering from hypoxia, regardless of cause, may convulse. The cause may be very simple which is why good A and B maintenance is important prior to drug therapy.
Hypotension	Severe hypotension can trigger a convulsion. This may be seen with syncope or a vasovagal attack where the patient remains propped up. In these instances there will usually be a clear precipitating event and no prior history of epilepsy. Once the patient is laid flat and the blood pressure is restored the convulsion will generally stop.

There are a significant number of other causes of convulsions and these include:

1. cerebral tumour
2. electrolyte imbalance
3. drug overdose
4. cardiac arrhythmias.

It is important not to label a patient as epileptic unless there is a confirmed diagnosis.

HISTORY

Is the child known to have a confirmed diagnosis of epilepsy?

If so, are they on medication, and are they taking it appropriately?

Have they had convulsions recently?

Have they had a high temperature in the last 24 hours?

Is the child **DIABETIC** (could this be secondary to hypoglycaemia)?

Is there any history of head injury?

Is there any evidence of alcohol ingestion or drug/ toxic substance usage (including inhaled volatile agents)?

ASSESSMENT

Assess **ABCDE**'s.

Evaluate whether there are any TIME CRITICAL features present: These may include:

- any major ABCD problems
- serious head injury
- status epilepticus
- underlying infection, e.g. meningitis

If any of these features are present, **CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSPORT** to **Nearest Suitable Receiving Hospital –** in these cases the ease and safety with which the patient can be moved whilst still convulsing should be considered and treatment may need to begin in situ. With small children it may be best to carry the child to the ambulance and continue assessment and treatment en-route.

Provide a **Hospital Alert Message / Information call.**

En-route – continue patient **MANAGEMENT** (***see below***).

If no **TIME CRITICAL** problems are present, perform a more thorough assessment and a brief Secondary Survey.

Assess type of convulsion if still convulsing – is this a generalised convulsion, tonic-clonic, focal or one-sided?

Tonic-clonic

- assess for focal neurological loss before, during or after the convulsion
- assess for raised temperature (child may feel hot after a convulsion) and any sign of a rash, (possible meningitis)
- assess for mouth/tongue injury, incontinence.

MANAGEMENT

Follow ***management of the seriously ill child guideline***, remembering to:

- administer high concentration oxygen (O_2) (***refer to oxygen protocol for administration and information***) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO_2) of >95%.
- all patients who are convulsing, post ictal or have a convulsion secondary to a head injury (even if they appear fully recovered) should receive high concentration oxygen
- establish if any treatment e.g. rectal diazepam has already been administered
- consider IV/IO access if convulsions persist or recur.

Specifically consider:

- position for airway security, comfort and protection from dangers, especially the head
- do not attempt to force an oropharyngeal airway into a convulsing child. A nasopharyngeal airway is a useful adjunct in such patients
- apply pulse oximetry and monitor
- check blood glucose level to exclude hypoglycaemia. If blood glucose <4.0mmol or hypoglycaemia is clinically suspected, give oral glucose, **glucose 10%** IV or **glucagon** IM (***refer to relevant glucose drug protocols) (refer to glycaemic emergencies in children guideline***)
- if the child convulses repeatedly in close succession or has one convulsion lasting >5 minutes then administer **diazepam** (***refer to diazepam protocol for dosages and information***)
- if the child can be moved, despite the convulsion, it is important to reach hospital for definitive care as rapidly as possible
- in the pyrexial child (temp > 37.5°C) who has ceased convulsing and regained consciousness, remove excess clothing and administer **paracetamol** (***refer to paracetamol protocol for dosages and information***) to reduce pyrexia and make the child more comfortable. Tepid sponging is associated with increased patient distress and generally unnecessary if the above advice is followed
- **correct A and B problems on scene then commence transport immediately to Nearest Suitable Hospital**
- provide a **Hospital Alert Message / Information Call**
- at the hospital, provide a comprehensive verbal handover, and a completed patient report form to the receiving hospital staff
- if child is left at home then leave a copy of the patient record form at home and give advice to carers regarding actions if further convulsions occur or carers become concerned

- some children may have a specific protocol developed by the Doctor and patient/carer to be enacted when a convulsion occurs, ask if one exists.

ADDITIONAL INFORMATION

Post ictal

Is the term given to patients who have had a convulsion but are now in the recovery phase. Convulsions are extremely disorientating, even for epileptics who may suffer them regularly. It is not uncommon for patients to act out of character when post ictal. This may include verbal or physical aggression. Oxygen therapy and a calm approach are important; remember, when the patient recovers they may be a completely different person.

Febrile convulsions

A febrile convulsion typically presents as a grand mal convulsion, although, as with all such episodes, the exact nature may vary from patient to patient.

Transport all children with a first febrile convulsion or under 1 year of age to an Emergency Department, even if the convulsion has ceased on your arrival at the scene, because of the risk of serious underlying illness and because the parent (or carer) will be very frightened.

In patients who have a history of febrile convulsions (which have previously been investigated and management advice given) it is reasonable to consider contacting the General Practitioner (GP) to agree management rather than transporting the child to hospital but **ONLY** if child appears well, the parents are confident with this **AND** the patient has **not** had:

- 2 or more convulsions in rapid succession
- a convulsion lasting in excess of ten minutes.

A thorough examination should be performed on any patient who is to be left at home. Any signs of potentially serious underlying illness require assessment in hospital.

If the patient is not removed to hospital the G.P. **MUST** be informed.

Status Epilepticus

Patients with persistent and continual convulsions are in **STATUS EPILEPTICUS,** and need aggressive ABC care and rapid transport to hospital. Administer diazepam IV or PR where IV access cannot be rapidly achieved (***refer to diazepam protocol for dosages and information***). **NOTE:** this is a medical emergency and the child must be removed to hospital as rapidly as possible.

Epilepsy

A number of patients with diagnosed epilepsy, who have repeated convulsions and a well documented history of this, may present regularly to the Ambulance Service.

If they are **fully recovered and not at risk**, and **in the care of a responsible adult**, consideration may be given to not transferring them routinely to hospital unless they wish to travel. These cases must have vital signs recorded on a disclaimer form, along with the explanation given to the parents/guardian. Patients and the responsible adult should be advised to contact either the GP if the child feels generally unwell or 999 if there are repeated convulsions.

The reasons for the decision not to transport must be documented on a disclaimer form, which must be signed by the parent/guardian. Ensure contact is made with the patient's GP particularly in cases where the patient has made repeated calls.

It is important wherever possible to obtain contact details of any witnesses to a convulsion in the above circumstances and pass this to the receiving Hospital.

Key points – Convulsions in children

- Febrile convulsions most common type of convulsion in under fives.
- Most convulsions settle spontaneously without drug therapy.
- Hypoxia causes convulsions – check A and B.
- Always check blood glucose level.
- Provide a hospital alert message for status epilepticus.

METHODOLOGY

Refer to methodology section.

Dealing with the Death of a Child (Including Sudden Unexpected Death in Infancy (SUDI)

INTRODUCTION

Being called to a death of a child or infant is one of the most difficult experiences that ambulance clinicians encounter. They are usually the first professionals to arrive at the scene, and, at the same time as making difficult judgements about resuscitation, they have to deal with the devastating initial shock of the parents/carers.

Despite the recent fall in incidence, sudden unexpected death in infancy (SUDI) remains the single largest category of death in infants from one month to one year. It may also occasionally occur in older children. A specific cause is found for about half of all SUDI, either from a careful investigation of the circumstances or from post mortem examination and tests.

It is estimated that about 10% of SUDI may arise from some form of maltreatment by carers. This means that the police should be informed about all cases of SUDI to carry out an investigation. However it should be remembered that the large majority of SUDI arise from natural causes, and parents/carers should always be treated with compassion and sensitivity.

This document draws on the experience of ambulance clinicians throughout the country. The guidelines it sets out are in accord with the recommendations of the Kennedy Report[1.]

MULTI-AGENCY APPROACH

The Kennedy Report[1] requires a multi-agency approach to the management of SUDI, in which all the professionals involved keep each other informed and collaborate.

Objectives

The main objectives for ambulance clinicians when called to deal with the sudden unexpected death of an infant are:

- resuscitation (***refer to child resuscitation guidelines***) should be attempted in all cases, unless there is a condition unequivocally associated with death or a valid advance directive (***refer to recognition of life extinct by ambulance clinician guideline***)
- it may be very difficult to feel a pulse in a sick infant (***refer to medical and trauma emergencies in children***), so the absence of peripheral pulses is not by itself a reliable indication of death. Similarly, a sick infant may have marked peripheral cyanosis and cold extremities
- it is better for parents/carers to know that resuscitation was attempted but failed, than to be left feeling that something that might have saved their infant was not done
- once resuscitation has been initiated, the infant should be transported at once to the nearest suitable emergency department, with resuscitation continuing en-route.

Care of the family

The initial response of professionals (and you will probably be the first on the scene) will affect the family profoundly.

The parents/carers have just suffered one of the worst shocks that life can offer, and may exhibit a variety of reactions, such as overwhelming grief, anger, confusion, disbelief or guilt, so be prepared to deal with any of these feelings with sympathy and sensitivity, remembering some reactions may be directed at you as a manifestation of their distress.

Think before you speak. Chance remarks cause a lasting impression and may cause offence e.g. ***"I'm sorry he looks so awful"***.

Avoid any criticism of the parents/carers, either direct or implied.

Ask the infant's name and use it when talking about the infant (try to avoid referring to the infant as ***"it"***).

If possible, do not put children in body bags. It is known that relatives do not perceive very traumatic events in the way that unrelated onlookers might and it is important they are allowed to see, touch and hold their loved one.

Explain what you are doing at every stage.

Allow the parents/carers to hold the infant if they so wish (unless there are obvious indications of trauma), as long as it does not interfere with clinical care.

The parents/carers will need to accompany you when you take the infant to hospital. If appropriate, offer to take one or both in the ambulance. Alternatively ensure that they have other means of transport, and that they know where to go.

If they have no telephone, offer to help in contacting a relative or friend who can give immediate support, such as looking after other children or making sure the premises are secure.

Document:

- when you arrive
- the situation in which you find the infant e.g. position in cot, bedding, proximity to others, room temperature, etc.,
- a quick description from the parents/carers of the events leading up to their finding the infant dead, e.g. when last seen alive, health at that time, position when found, etc. The police and a paediatrician will want to go into these things in greater detail, but what the parents/carers say initially may be particularly valuable in the investigation.

Write all this information down as soon as you have the opportunity, giving times and other details as precisely as possible.

Communication with other agencies

After you have arrived at the house and confirmed that the infant is dead or moribund, inform the police (if this is an agreed procedure).

Advise the parents/carers that the death, being unexpected, has to be reported to the coroner, and that they will be interviewed by the coroner's officer and the police.

Share the information you have collected with the police and with relevant health professionals.

Participate in the design, implementation and audit of your area's multi-agency protocol, in which the ambulance clinicians have an important role.

Find out about the multi-disciplinary case discussion, which should be convened by the paediatrician about eight weeks after the death, and attend it if possible.

Transferring the infant

Always take the infant to the nearest appropriate emergency department, not direct to a mortuary. This should apply even when the infant has clearly been dead for some time and a doctor has certified death at home (it may occasionally be necessary to remind a doctor that taking the infant to a hospital is now the preferred procedure, as recommended by the Kennedy Report).[1]

The main reasons for taking the infant to the hospital rather than the mortuary are that at hospital an immediate examination can be made by a paediatrician, early samples can be taken for laboratory tests and parents/carers can talk with a paediatrician and be put in touch with other support services.

Forewarn the emergency department of your arrival, asking them to be ready to take over resuscitation if you have set it in progress.

Support for ambulance clinicians

The death of a child is very distressing for all those involved, and opportunities for debriefing or counselling should be available for ambulance clinicians.

It is usual (and important) to sit down and "have a cup of tea" with others involved in the resuscitation attempt.

Some clinicians will feel ongoing distress. This is normal but should be recognised and other forms of therapy, from informal support from colleagues, to formal counselling, may be required.

Most local paediatricians or the medical director of the ambulance service would be happy to discuss the episode further if required.

The failed resuscitation of a child weighs heavily on most people's shoulders and it is very important to remember that that vast majority of children who arrest outside hospital will die, whoever is there, or whatever is done. Such an outcome is almost never the fault of those attempting resuscitation; they will have done their best.

CONCLUSION

Many parents/carers have told the Foundation for the Study of Infant Deaths how important the actions and attitudes of ambulance clinicians were to them, and most speak very highly of the way they and their infant were treated. Your role is not only essential for immediate practical reasons, but also has a great influence on how the family deals with the death long after the initial crisis is over.

Key Points – Dealing With the Death of a Child (Including Sudden Unexpected Death in Infancy)

- SUDI is one of the most emotionally traumatic and challenging events.
- Resuscitation should always be attempted unless there is a condition unequivocally associated with a death or a valid advance directive.
- Communication and empathy are essential, and the family must be treated with compassion and sensitivity throughout.
- Ensure the family is aware of where you are taking their infant.
- Collect information pertaining to the situation in which you find the baby, history of events, and any significant past medical history.
- Follow agreed protocols with regards to interagency communication and informing the police.
- When appropriate explain to the family that the death, being unexpected, has to be reported to the coroner, and that they will be interviewed by the coroner's office and the police.

REFERENCE

1 Royal College of Pathologists and the Royal College of Paediatrics and Child Health. Sudden unexpected death in infancy. Report of a working group convened by the Royal College of Pathologists and the Royal College of Paediatrics and Child Health. Chair: Baronness Helena Kennedy QC. London: Royal College of Pathologists and the Royal College of Paediatrics and Child Health, 2004.

METHODOLOGY

Refer to methodology section.

Both hypoglycaemia (low blood glucose level) and hyperglycaemia (high blood glucose level) occur in children.

HYPOGLYCAEMIA

INTRODUCTION

A low blood glucose level is defined as <4.0mmol/L, but it must be remembered that the clinical features of hypoglycaemia may be present at higher levels. Clinical judgement is as important as a blood glucose reading. The reversal of hypoglycaemia is an important pre-hospital intervention. Hypoglycaemia if left untreated may lead to the patient suffering permanent brain damage and may even prove fatal.

Causes of hypoglycaemia

DIABETES MELLITUS
Diabetes mellitus (DM) may be due to a relative excess of insulin over available glucose in the management of DM as in adults However, the classical symptoms of hypoglycaemia in an adult may NOT be present and children may have a variety of odd symptoms with low blood sugars. Listen to the parents and if in any doubt check a blood glucose level.

OTHER CAUSES OF 'LOW' BLOOD GLUCOSE LEVELS:
Seriously ill or injured babies and sometimes children may burn up all their liver stores of glycogen and become hypoglycaemic. This is why it is crucial to check the blood glucose level in any child with a decreased conscious level (***refer to decreased level of consciousness guideline***).

- there are also some rare metabolic illnesses of profound hypoglycaemia in children (usually babies). They, too, cannot mobilise any more sugar from the liver.

MANAGEMENT OF HYPOGLYCAEMIA

If the child is conscious, where possible, give **oral glucose tablets, gel or drinks**. It can be very difficult to gain cooperation e.g. in aggressive, confused toddlers and unfortunately parents are only likely to call you if they are having a problem.

Dextrose 40% gel MAY be given (***refer to Dextrose 40% gel protocol for dosages and information***) in children with a decreased level of consciousness it should be applied to the buccal mucosa and care taken to avoid aspiration.

Glucagon may be used intramuscularly (***refer to*** **glucagon** ***protocol for dosages and information***) while vascular access is sought. It may be life-saving in a difficult situation though is not popular with hospital paediatricians, because it often causes severe vomiting which can make it impossible for the child to take oral fluids /food.

Intravenous **glucose 10%** may be given (***refer to glucose 10% protocol for dosages and information***). The dose may be titrated to the response and less may be required. Glucose 50% must **NOT** be used as it may cause brain damage, even in older children.

If you are so close to the hospital that treatment need not be carried out, do give a pre-alert that the child is hypoglycaemic, so that they can have suitable glucose solutions ready to give on arrival.

Hypoglycaemia in NON diabetic children and babies.

The same principles and treatment apply as for diabetics but remember they have already burnt up their liver stores of glycogen, so glucagon is much less likely to work. If the situation is desperate, it is worth a try but attempts to obtain vascular (remember intraosseous) access should be continued because it cannot be expected that glucagon will have a significant effect.

HYPERGLYCAEMIA

Causes of hyperglycaemia

DIABETES MELLITUS (DM)
For background of the pathophysiology of this illness, ***refer to glycaemic emergencies guideline***.

Diabetes mellitus can occur in infants. Such children may be very difficult to manage, so called "brittle". They may have a special protocol, ask and listen to the parents.

Type 1 (insulin dependent) DM is nearly universal in children though occasional Type 2 (non insulin dependent) DM is now seen, usually in association with severe obesity.

DIABETIC KETOACIDOSIS (DKA)1
Diabetic Ketoacidosis (DKA) in new diabetics may occur relatively rapidly in children, sometimes without a long history of the classical symptoms. Severe acidosis and Kussmaul's breathing (deep sighing respiration) are common.

True shock (circulatory failure) as opposed to dehydration, is relatively uncommon in children with DKA. The severity of the raised glucose is not a good indicator of the onset of DKA and certainly most children with a blood glucose level of <11 are unlikely to have DKA. Nevertheless children with quite severe DKA (perhaps with blood glucose levels in the 20s) may still appear quite well. It is important to know whether illness is due to DKA in children because the fluid management is crucial. If children are given fluid too fast in DKA they can get cerebral oedema and die. This is a much more common complication than in adults particularly in very small children and adolescents (ketone meter, where available, may be useful in a diabetic child in differentiating DKA from infection).

OTHER CAUSES OF 'RAISED' BLOOD GLUCOSE LEVELS:

- spurious testing – the child's fingers may have been in contact with sugary things like sweets before testing
- quite commonly, suddenly seriously acutely ill or convulsing children may have a raised blood glucose level on testing with a glucose meter. This is usually due to the stress of the physical problem. It should be reported to the hospital so that it can be rechecked when the crisis is over. It requires no other treatment.

MANAGEMENT OF HYPERGLYCAEMIA[2]

Assess and start to correct:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)
- **E**vacuation

Usually **NO** active treatment will be required except timely medical attention and good handover.

Uncommonly the child will be shocked with evidence of circulatory collapse.

Administer high concentration oxygen (O_2) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients. High concentration O_2 should be administered routinely, whatever the oxygen saturation

Obtain intravenous access (intraosseous if the child is in a life threatening situation and only this is possible).

In **extremely exceptional** circumstances (where there is tachycardia and a prolonged capillary refill time) intravenous saline may be given **very slowly** in a dose not exceeding 10ml/kg. Excessive fluid administration may cause cerebral oedema.

Key Points – Glycaemic Emergencies

- Both high and low blood glucose levels occur in children.
- Usually, in hyperglycaemia, no active treatment will be required except timely medical attention and good handover.
- Administer high concentration O_2 therapy.
- In hypoglycaemia administer glucose: in conscious children administer oral glucose tablets, gel or drinks; in children with a decreased level of consciousness apply Dextrose 40% gel to the buccal mucosa, taking care to avoid aspiration; glucagon may be used intramuscularly; intravenous glucose 10% titrated to the response.

REFERENCES

[1] Dunger DB, Sperling MA, Acerini CL, Bohn DJ, Daneman D, Danne TPA, et al. European Society for Paediatric Endocrinology/Lawson Wilkins Pediatric Endocrine Society Consensus Statement on Diabetic Ketoacidosis in Children and Adolescents. *Pediatrics* 2004;113(2):e133-140.

[2] National Collaborating Centre for Women's and Children's Health. Type 1 diabetes – diagnosis and management of type 1 diabetes in children and young people. London: RCOG Press, 2004.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

There are 3 main types of poisoning in children:

1. accidental ingestion of a poisonous substance or medicine by an inquisitive child (common)
2. deliberate ingestion (overdose) of (usually a medicine) in a mentally distressed child who needs help
3. deliberate poisoning of children, a type of child abuse which is extremely unlikely to be discovered by the ambulance service, but if it is suspected it must be reported following the safeguarding children guideline. It will not be discussed further (***refer to the safeguarding children guideline***).

HISTORY

Accidental ingestion

This usually occurs with young children. Ingestion of tablets is common but almost anything, however unpalatable and incredible to the adult palate, may be ingested. The event may not be obvious and may only be found on detailed questioning of the child, if old enough to give a history.

Take a history of:

- the event e.g. when did it happen?
- the drug/substance ingested
- the quantity of the drug/substance ingested
- collect all suspected drugs/substances
- mode of poisoning e.g. ingestion, inhalation
- any other factors that may be relevant
- has any treatment occurred yet?

A rapid mental health assessment should be undertaken including assessment of suicide risk.

ASSESSMENT

Assess **ABCD**'s

- try to find out what, if anything, has been ingested and take the substance to hospital. This includes berries and plants
- gather up tablets/medicines etc., and try to estimate the maximum amount that may have been consumed
- ask about **ALL** tablets in the house however apparently inaccessible.

Evaluate if there are any **TIME CRITICAL** features present. These may include:

- impaired ABCDs
- decreased level of consciousness and respiration are often combined in overdose (***refer to decreased level of consciousness guideline***)
- extreme hypotension (BP <70 mmHg) is common in sedative and anti-depressant overdose
- arrhythmias (***refer to cardiac rhythm disturbance guideline***)
- convulsions (***refer to fitting guideline***)
- hypothermia – especially if the child has been unconscious for a time (***refer to hypothermia guideline***)
- hyperthermia

If any of these features are present, **CORRECT A AND B PROBLEMS ON SCENE THEN COMMENCE TRANSFER** to nearest suitable receiving hospital

Provide a **Hospital Alert Message / Information call.**

MANAGEMENT

Follow Medical Emergencies Guidelines, remembering to:

Start correcting:

- **A**IRWAY
- **B**REATHING
- **C**IRCULATION
- **D**ISABILITY (mini neurological examination)
- oxygen saturation and ECG monitoring should be undertaken unless it is certain that the child has not taken a harmful substance
- ensure adequate ventilation. If respiration and levels of consciousness are decreased, and drugs such as morphine, heroin or other related drugs are suspected, provide respiratory support to relieve respiratory depression. Consider the use of naloxone (IV/IM) to reduce respiratory depression (***refer to naloxone protocol for dosages and administration***). Be aware that naloxone can induce sudden recovery with severe agitation and acute withdrawal symptoms
- establish IV access as appropriate en-route to hospital.

- if the child is exposed to chemicals, remove the child from the source of chemical at once. In the case of **SKIN CONTAMINATION** with chemicals, remove clothing with care **NOT** to contaminate rescuers, and **IRRIGATE** with generous amounts of water
- if the child has decreased consciousness (***refer to decreased level of consciousness guideline***) **ALWAYS** check blood glucose level and correct if low (blood glucose <4.0mmol/l) with glucose 10% IV (***refer to glucose 10% protocol for dosages and information***). Glucagon is often not effective in overdoses.
- collect any **MEDICINE CONTAINERS** or **ACTUAL MEDICINES** for inspection at hospital
- if the child vomits, retain a sample, if possible, for inspection at hospital
- **NEVER** induce vomiting
- in the case of swallowed caustics and petroleum products dilute by giving a glass of **milk** at the scene wherever possible
- activated charcoal may be of benefit if given within one hour of ingestion. However, at present, it is not routinely recommended for use in pre-hospital care because of the difficulty of administration and the risks of aspiration (which are exacerbated by the risk of motion sickness).

Specifically consider:

- transfer all children who have ingested a substance to hospital
- **take a sample to hospital, unless it is specifically verified on Toxbase[1] to be harmless and it is certain that ingestion was accidental**
- **the health visitor or General Practitioner must always be informed**
- unknown plants and tablets can usually be identified
- if a young person has taken a deliberate overdose of **anything** (even if it is known to you to be harmless), they must be transferred to hospital. They require a mental health assessment
- refer to **table 1** for specific substance management.

Table 1 – Specific substance management

Alcohol (ethanol)	Common in young teenagers. Can cause severe hypoglycaemia even in teenagers. **ALWAYS check the blood glucose levels** in any child or young person with a decreased conscious level especially, in children and young adults who are "drunk", as hypoglycaemia (blood glucose <4.0mmol/l) is common and requires treatment with oral glucose, glucose 10% IV (***refer to glucose 10% protocol for dosages and information***). **NOTE:** Glucagon is not effective in alcohol induced hypoglycaemia.
Tricyclic antidepressants	Poisoning with these drugs may cause decreased consciousness, profound hypotension and cardiac arrhythmias. Newer anti-depressants such as fluoxetine (Prozac) and paroxetine (Seroxat) have different effects. ECG monitoring and IV access should be established early in the treatment of tricyclic overdose. The likelihood of fitting is high; this should be treated as per convulsions guidelines.
Iron	Iron pills are regularly used by large numbers of the population including pregnant mothers. In overdose, especially in children, they are exceedingly dangerous. They may cause extensive damage to the liver and gut and these children will require hospital assessment and treatment. Charcoal is contra-indicated as it may interfere with subsequent treatment.
Paracetamol	Remember that many analgesic drugs contain paracetamol and a combination of codeine or dextropropoxyphene. This, in overdose, creates two serious dangers for the child. The codeine and dextropropoxyphene are both derived from opioid drugs. This in overdose, especially if alcohol is involved, may well produce profound respiratory depression. **This can be reversed with naloxone** (***refer to naloxone protocol for dosages and administration***). The secondary problem is the paracetamol that, even in modest doses, may induce severe liver and kidney damage in susceptible children. There is no evidence of this initially and this may lull the child's carers, the child, and Ambulance Clinicians into a false sense of security. It frequently takes 24 to 48 hours for the effects of paracetamol damage to become apparent and urgent blood paracetamol levels are required to assess the child's level of risk.
Non-harmful substances	Always check the substance(s) is non-harmful and document.

Key Points – Overdose and Poisoning in Children

- All overdoses in children and adolescents must be transferred to hospital.
- Alcohol often causes hypoglycaemia even in adolescents.
- **NEVER** induce vomiting.
- If the child vomits, retain a sample, if possible, for inspection at hospital.
- Bring the substance or substances and any containers for inspection at hospital. Try and estimate the maximum amount ingested.

REFERENCE

[1] The National Poisons Information Service (NPIS). TOXBASE Available from: http://www.spib.axl.co.uk/.

METHODOLOGY

Refer to methodology section.

INTRODUCTION

The following sequence is that followed by those with a duty to respond to paediatric emergencies (***see Appendix 1***).

MANAGEMENT

1. Safety

Ensure that you, the child and any bystanders are safe

2. Check responsiveness:

Gently stimulate the child and ask loudly ***"Are you all right?"*** **- DO NOT** shake infants, or children with suspected cervical spinal injuries.

a. If the child responds (by answering or moving):

- leave the child in the position found (provided the child is not in further danger)
- check the child's condition
- summon help if necessary
- re-assess the child regularly.

b. If the child does not respond:

- summon help if necessary
- open the child's airway by tilting the head and lifting the chin:
  - with the child in the position found, place your hand on the forehead and gently tilt the head back
  - at the same time, with your fingertip(s) under the point of the child's chin, lift the chin. Do not push on the soft tissues under the chin as this may block the airway
  - if you still have difficulty in opening the airway, try the jaw thrust method: place the first two fingers of each hand behind each side of the child's mandible (jaw bone) and push the jaw forward. Both methods may be easier if the child is turned carefully onto his back
- when there is a risk of back or neck injury, establish a clear upper airway by using jaw thrust or chin lift alone in combination with manual in-line stabilisation of the head and neck by an assistant (if available). If life threatening airway obstruction persists despite effective application of jaw thrust or chin lift, add head tilt a small amount at a time until the airway is open; establishing a patent airway takes priority over concerns about a potential back or neck injury.

3. Keeping the airway open

Look, listen and feel for normal breathing by putting your face close to the child's face and looking along the chest:

- look for chest movements
- listen at the child's nose and mouth for breath sounds
- feel for air movement on your cheek.

Look, listen and feel for no more than 10 seconds before deciding that breathing is absent.

a. If the child IS breathing normally

- turn the child onto his side into the recovery position (see below) taking appropriate precautions if there is any chance of injury to the neck or spine
- check for continued breathing.

b. If the child is NOT breathing or is making agonal gasps (infrequent, irregular breaths):

- carefully remove any obvious airway obstruction
- turn the child carefully on to his back taking appropriate precautions if there is any chance of injury to the back or neck
- give 5 initial rescue breaths
- while performing the rescue breaths note any gag or cough response to your action. These responses, or their absence, will form part of your assessment of 'signs of a circulation', which will be described later.

Rescue breaths for a child over 1 year of age:

- ensure head tilt and chin lift
- use a bag valve mask device, if available, (with a mask appropriate to the size of the child) and inflate the chest steadily over about 1–1.5 seconds watching for chest rise
- maintaining head tilt and chin lift, watch the chest fall as air comes out
- repeat this sequence 5 times. Identify effectiveness by seeing that the child's chest has risen and fallen in a similar fashion to the movement produced by a normal breath.

Rescue breaths for an infant:

- ensure a neutral position of the head and apply chin lift
- use a bag valve mask device if available (with a mask appropriate to the size of the child) and inflate the chest steadily over about 1–1.5 seconds sufficient to make the chest visibly rise

- maintain head tilt and chin lift, watch the chest fall as air comes out
- repeat this sequence 5 times.

Rescue breaths for a child over 1 year of age if no bag valve mask is available:

- ensure head tilt and chin lift
- pinch the soft part of the nose closed with the index finger and thumb, with the hand on the forehead
- open the mouth a little, but maintain the chin upwards
- take a breath and place your lips around the mouth, making sure that you have a good seal
- blow steadily into the mouth over about 1–1.5 seconds watching for chest rise
- maintain head tilt and chin lift, take your mouth away from the child and watch for his chest to fall as air comes out
- take another breath and repeat this sequence five times. Identify effectiveness by seeing that the child's chest has risen and fallen in a similar fashion to the movement produced by a normal breath.

Rescue breaths for an infant if no bag valve mask is available

- ensure a neutral position of the head and a chin lift
- take a breath and cover the mouth and nasal apertures of the infant with your mouth, making sure you have a good seal. If the nose and mouth cannot be covered in the older infant seal only the infant's nose or mouth with your mouth (if the nose is used, close the lips to prevent air escape)
- blow steadily into the child's mouth and nose over 1–1.5 seconds, sufficient to make the chest visibly rise
- maintain head tilt and chin lift, take your mouth away from the child and watch for the chest to fall as air comes out
- take another breath and repeat this sequence five times.

If you have difficulty achieving an effective breath, the airway may be obstructed:

- open the child's mouth and remove any visible obstruction. **DO NOT** perform a blind finger sweep
- ensure that there is adequate head tilt and chin lift but also that the neck is not over extended
- if head tilt and chin lift has not opened the airway, try the jaw thrust method
- make up to 5 attempts to achieve effective breaths. If still unsuccessful, move on to chest compressions.

4. Assess the child's circulation:

Take no more than 10 seconds to look for signs of a circulation. This includes any movement, coughing, or normal breathing (not agonal gasps – these are infrequent, irregular breaths) check the pulse **but ensure you take no more than 10 seconds to do this**:

- in a child over 1 year— feel for the carotid pulse in the neck
- in an infant — feel for the brachial pulse on the inner aspect of the upper arm.

a. If you are confident that you can detect signs of a circulation within 10 seconds:

- continue rescue breathing, if necessary, until the child starts breathing effectively on his own
- turn the child on to his side (into the recovery position) if he remains unconscious taking appropriate precautions if there is any chance of injury to the neck or spine
- re-assess the child frequently.

b. If there are no signs of a circulation OR no pulse OR a slow pulse (less than 60/min with poor perfusion) OR you are not sure:

- start chest compressions
- combine rescue breathing and chest compressions.

For all children, compress the lower third of the sternum:

- to avoid compressing the upper abdomen, locate the xiphisternum by finding the angle where the lowest ribs join in the middle
- compresss the sternum one finger's breadth above this
- compressions should be sufficient to depress the sternum by approximately one-third of the depth of the chest
- release the pressure, then repeat at a rate of approximately 100 a minute
- after 15 compressions, tilt the head, lift the chin and give two effective breaths
- continue compressions and breaths in a ratio of 15:2.

Lone rescuers may use a ratio of 30:2, particularly if they are having difficulty with the transition between compression and ventilation.

Although the rate of compressions will be 100 times a minute, the actual number delivered per minute will be less than 100 because of pauses to give breaths. The best method for compression varies slightly between infants and children.

Chest compressions in infants

The lone rescuer should compress the sternum with the tips of 2 fingers.

If there are 2 or more rescuers, use the encircling technique.

Place both thumbs flat side by side on the lower third of the sternum (as above) with the tips pointing towards the infant's head.

Spread the rest of both hands with the fingers together to encircle the lower part of the infant's rib cage with the tips of the fingers supporting the infant's back.

Press down on the lower sternum with the two thumbs to depress it approximately one-third of the depth of the infant's chest.

Chest compression in children over 1 year of age

Place the heel of one hand over the lower third of the sternum (as above).

Lift the fingers to ensure that pressure is not applied over the child's ribs.

Position yourself vertically above the child's chest and, with your arm straight, compress the sternum to depress it by approximately one-third of the depth of the chest.

In larger children or for small rescuers, this may be achieved most easily by using both hands with the fingers interlocked.

5. Continue resuscitation until:

- the child shows signs of life (spontaneous respiration, pulse, movement)
- you become exhausted.

RECOVERY POSITION

An unconscious child whose airway is clear and who is breathing spontaneously should be turned onto his side into the recovery position:

- the child should be placed in as near a true lateral position as possible with his mouth dependent to allow free drainage of fluid
- the position should be stable. In an infant, this may require the support of a small pillow or a rolled-up blanket placed behind his back to maintain the position
- it is important to avoid any pressure on the chest that impairs breathing
- it should be possible to turn the child onto his side and to return him back easily and safely, taking into consideration the possibility of cervical spine injury
- the airway should be accessible and easily observed
- the adult recovery position is suitable for use in children.

Key Points – Paediatric Basic Life Support

- If the child is not breathing, carefully remove any obvious airway obstruction but **DO NOT** perform a blind finger sweep. Give 5 initial rescue breaths. Blow steadily into the mouth over about 1–1.5 seconds watching for chest rise.
- If there are no signs of circulation, pulse, or no or a slow pulse (<60/bpm with poor perfusion) or you are not sure start at a rate chest compressions of approximately 100 a minute.
- Continue compressions and breaths in a ratio of 15:2.

BIBLIOGRAPHY

[1] Berg RA, Hilwig RW, Kern KB, Ewy GA. "Bystander" Chest Compressions and Assisted Ventilation Independently Improve Outcome From Piglet Asphyxial Pulseless "Cardiac Arrest". *Circulation* 2000;101(14):1743-1748.

[2] Babbs CF, Nadkarni V. Optimizing chest compression to rescue ventilation ratios during one-rescuer CPR by professionals and lay persons: children are not just little adults. *Resuscitation* 2004;61(2):173.

[3] Dorph E, Wikc L, Steend PA. Effectiveness of ventilation–compression ratios 1:5 and 2:15 in simulated single rescuer paediatric resuscitation. *Resuscitation* 2002;54(3):259-264.

[4] Whyte SD, Wyllie JP. Paediatric basic life support: a practical assessment. *Resuscitation* 1999;41(2):153.

[5] Clements F, McGowan J. Finger position for chest compressions in cardiac arrest in infants. *Resuscitation* 2000;44(1):43.

[6] Stevenson AGM, McGowan J, Evans AL, Graham CA. CPR for children: one hand or two? *Resuscitation* 2005;64(2):205.

[7] Samson R, Berg R, Bingham R, PALS Task Force. Use of automated external defibrillators for children: an update. An advisory statement from the Pediatric Advanced Life Support Task Force, International Liaison Committee on Resuscitation. *Resuscitation* 2003;57(3):237-243.

[8] Berg RA, Hilwig RW, Kern KB, Babar I, Ewy GA. Simulated mouth-to-mouth ventilation and chest compressions (bystander cardio-pulmonary resuscitation) improves outcome in a swine model of pre-hospital pediatric asphyxial cardiac arrest. *Critical Care Medicine* 1999; 27(9):1893-1899.

[9] Tang W, Weil MH, Jorgenson D, Klouche K, Morgan C, Yu T, et al. Fixed-energy biphasic waveform defibrillation in a pediatric model of cardiac arrest and resuscitation. *Critical Care Medicine* 2002.;30(12):2736-2741.

METHODOLOGY

The methodology describing the development process of the international cardio-pulmonary resuscitation treatments recommendations on which this guideline is based is fully described in the publications listed below.

Morley PT, Zaritsky A. The evidence evaluation process for the 2005 International Consensus Conference on cardio-pulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. *Resuscitation* 2005;67(2-3):167-170.

Zaritsky A, Morley PT. The Evidence Evaluation Process for the 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. *Circulation* 2005;112(22_suppl):III-128-130.

APPENDIX 1 – Paediatric Basic Life Support Algorithm

UNRESPONSIVE?

↓

Summon help if appropriate

↓

Open airway

↓

NOT BREATHING NORMALLY?

↓

5 rescue breaths

↓

STILL UNRESPONSIVE?
(no signs of a circulation)

↓

15 chest compressions
2 rescue breaths

INTRODUCTION

Most of the changes in paediatric guidelines for 2005 have been made for simplification and to minimize differences between adult and paediatric protocols.

Age definitions:

- an infant is a child under one year old
- a child is between one year and puberty.

These guidelines are not intended to apply to the resuscitation of newborn (***refer to neonatal resuscitation guideline***).

SEQUENCE OF ACTIONS

1. Establish basic life support

2. Oxygenate, ventilate, and start chest compression:

Provide positive pressure ventilation with high inspired oxygen concentration.

Provide ventilation initially by bag and mask. Ensure a patent airway by using an airway manoeuvre as described in the ***child basic life support guideline.***

Provide compressions and ventilation in ratio of 15 compressions to 2 ventilations. The compression rate should be 100 per minute and the ventilation rate about 10 per minute.

In most circumstances, tracheal intubation should be avoided in children. The technique is difficult and used only rarely; the skill is very difficult to acquire and maintain. The position of the tube cannot always be verified outside hospital, tubes are often misplaced, on-scene times are extended, fixation of the small tubes is difficult and they often become displaced during the subsequent journey. Intubation should be considered only when the journey to hospital is likely to be prolonged or where there is an appreciable risk of aspiration (for example after drowning).

Compressions should be continuous when the trachea is intubated. Take care to ensure that ventilation remains effective.

3. Attach a defibrillator or monitor:

Assess and monitor the cardiac rhythm.

If using a defibrillator, place one defibrillator pad or paddle on the chest wall just below the right clavicle, and one in the left anterior axillary line.

Pads or paddles for children should be 8-12cms in size, and for infants should be 4.5cms. If larger pads or paddles only are available, then for infants it may be more appropriate to apply the pads or paddles to the front and back of the chest.

Place monitoring electrodes in the conventional positions.

4. Assess rhythm and check for signs of circulation:

Look for signs of circulation. These include responsiveness, coughing, and normal breathing.

Check the pulse:

- child – feel for the carotid pulse in the neck
- infant – feel for the brachial pulse on the inner aspect of the upper arm.

Take no more than 10 seconds for the pulse check

Assess the rhythm on the monitor:

- non ventricular fibrillation VF/non-ventricular tachycardia VT (asystole or pulseless electrical activity)
- VF/pulseless VT.

5. Non-shockable (asystole, pulseless electrical activity - PEA)

This is the more common finding in children.

Perform continuous CPR:

- ventilate with high concentration oxygen
- if ventilating with bag-mask give 15 chest compressions to 2 ventilations for all ages
- if the patient is intubated, chest compressions can be continuous as long as this does not interfere with satisfactory ventilation
- the compression rate should be 100 per minute and the ventilation rate about 10 per minute.

NOTE: Once there is return of spontaneous circulation (ROSC) the ventilation rate should be 12–20 per minute. Measurement of exhaled CO_2 should be used if possible to ensure correct tracheal tube placement if the child has been intubated.

Administer adrenaline:

- obtain circulatory access. Insert a peripheral venous cannula or an intraossous needle. Do not delay finding a vein – if in doubt use the intraosseous route

- once circulatory access has been established, give adrenaline 10 micrograms/kg (0.1mls/kg of 1 in 10,000 solution)
- given a lack of evidence for the effectiveness of adrenaline given by the ET route, this route of administration is no longer recommended.

Continue CPR

Repeat the cycle:

Give 10 micrograms/kg of **adrenaline** (***refer to adrenaline for further information***) every 3 to 5 minutes (i.e. every other loop), while continuing to maintain effective chest compression and ventilation without interruption. The dose should be 10 micrograms/kg for all subsequent doses, i.e. high dose adrenaline should not be used.

If the airway is protected by tracheal intubation, provide chest compressions without pausing for ventilation. Provide a ventilation rate of approximately 10 per minute and a compression rate of 100/minute.

When circulation is restored, ventilate the child at a rate of 12 to 20 breaths per minute.

Consider and correct reversible causes: 4Hs 4Ts

1. **H**ypoxia
2. **H**ypovolaemia
3. **H**yper/hypocalaemia
4. **H**ypothermia

1. **T**ension pneumothorax
2. **T**amponade
3. **T**oxic/therapeutic disturbance
4. **T**hromboembolism

5. Shockable (VF/Pulseless VT)

This is less common in paediatric practice but likely when there has been a witnessed and sudden collapse. It is commoner in children with heart disease.

Defibrillate the heart:

- give 1 shock of 4 Joules/kg if using a manual defibrillator
- if using an AED, in a child under the age of 8 years use paediatric attenuation (according to the manufacturer's instructions) whenever possible use the adult shock energy (150-200 Joules biphasic; 360 monophasic)
- if using an AED in a child over the age 8 years use the adult shock energy.

Resume CPR:

- without re-assessing the rhythm or feeling for a pulse resume CPR **immediately**, starting with chest compressions.

Continue CPR for 2 minutes:

Then pause briefly to check the monitor

If still VF/pulseless VT give a second shock at 4 Joules/kg if using a manual defibrillator **OR** the adult shock energy for a child over 8 years using an AED **OR** a paediatric attenuated adult shock energy for a child between 1 year and 8 years

Resume CPR immediately after the second shock.

Consider and treat reversible causes (see above: 4Hs and 4Ts).

Continue CPR for 2 minutes:

Pause briefly to check the monitor:

If still VF/ pulseless VT:

- give adrenaline 10 micrograms/kg followed immediately by a third shock
- resume CPR immediately and continue for another 2 minutes.

Pause briefly to check the monitor

If still VF / pulseless VT

- give an intravenous or intraosseous bolus of amiodarone (***refer to amiodarone for further information***) 5 millgramsg/kg and an immediate further (4th) shock
- continue giving shocks every 2 minutes, minimising the breaks in chest compressions as much as possible
- give adrenaline before every other shock (i.e. every 3-5 minutes) until return of spontaneous circulation.

After each 2 minutes of uninterrupted CPR, pause briefly to assess the rhythm.

If still in VF/VT

- continue CPR with the shockable rhythm (VF/VT) sequence.

If asystole

- continue CPR and switch to the non-shockable (asystole / PEA) sequence as above.

If an organised rhythm appears at any time, check for a central pulse:

- If there is return of a spontaneous circulation (ROSC) continue post-resuscitation care
- If there is **NO** pulse, and there are no other signs of a circulation, give adrenaline 10 micrograms/kg and continue CPR as for the non-shockable sequence as above.

Key Points – Paediatric Advanced Life Support

- Changes in guidelines have been made for simplification and minimise the difference between adult and paediatric protocols.
- One defibrillating shock rather than three stack shocks should be used.
- The use of manual defibrillators (with suitable electrodes) simplifies the administration of the correct shock energy.
- If using an AED paediatric attenuation should be used whenever possible but an unmodified AED may be used in children older than one year.
- If an AED is the only machine available it may be used in infants under the age of one year.

BIBLIOGRAPHY

1 Efrati O, Ben-Abraham R, Barak A, Modan-Moses D, Augarten A, Manisterski Y, et al. Endobronchial adrenaline: should it be reconsidered? Dose response and haemodynamic effect in dogs. *Resuscitation* 2003;59(1):117-122.

2 Newth CJL, Rachman B, Patel N, Hammer J. The use of cuffed versus uncuffed endotracheal tubes in pediatric intensive care. *The Journal of Pediatrics* 2004;144(3):333.

3 Khine HH, Corddry DH, Kettrick RG, Martin TM, McCloskey JJ, Rose JB, et al. Comparison of Cuffed and Uncuffed Endotracheal Tubes in Young Children during General Anesthesia. *Anesthesiology* 1997;86(3):627-631.

4 van Alem AP, Chapman FW, Lank P, Hart AAM, Koster RW. A prospective, randomised and blinded comparison of first shock success of monophasic and biphasic waveforms in out-of-hospital cardiac arrest. *Resuscitation* 2003;58(1):17.

5 Atkins DL, Jorgenson DB. Attenuated pediatric electrode pads for automated external defibrillator use in children. *Resuscitation* 2005;66(1):31.

6 Berg RA, Chapman FW, Berg MD, Hilwig RW, Banville I, Walker RG, et al. Attenuated adult biphasic shocks compared with weight-based monophasic shocks in a swine model of prolonged pediatric ventricular fibrillation. *Resuscitation* 2004;61(2):189.

7 Clark CB, Zhang Y, Davies LR, Karlsson G, Kerber RE. Pediatric transthoracic defibrillation: biphasic versus monophasic waveforms in an experimental model. *Resuscitation* 2001;51(2):159.

8 Tang W, Weil MH, Jorgenson D, Klouche K, Morgan C, Yu T, et al. Fixed-energy biphasic waveform defibrillation in a pediatric model of cardiac arrest and resuscitation. *Critical Care Medicine* 2002.;30(12):2736-2741.

9 Perondi MBM, Reis AG, Paiva EF, Nadkarni VM, Berg RA. A Comparison of High-Dose and Standard-Dose Epinephrine in Children with Cardiac Arrest. *N Engl J Med* 2004;350(17):1722-1730.

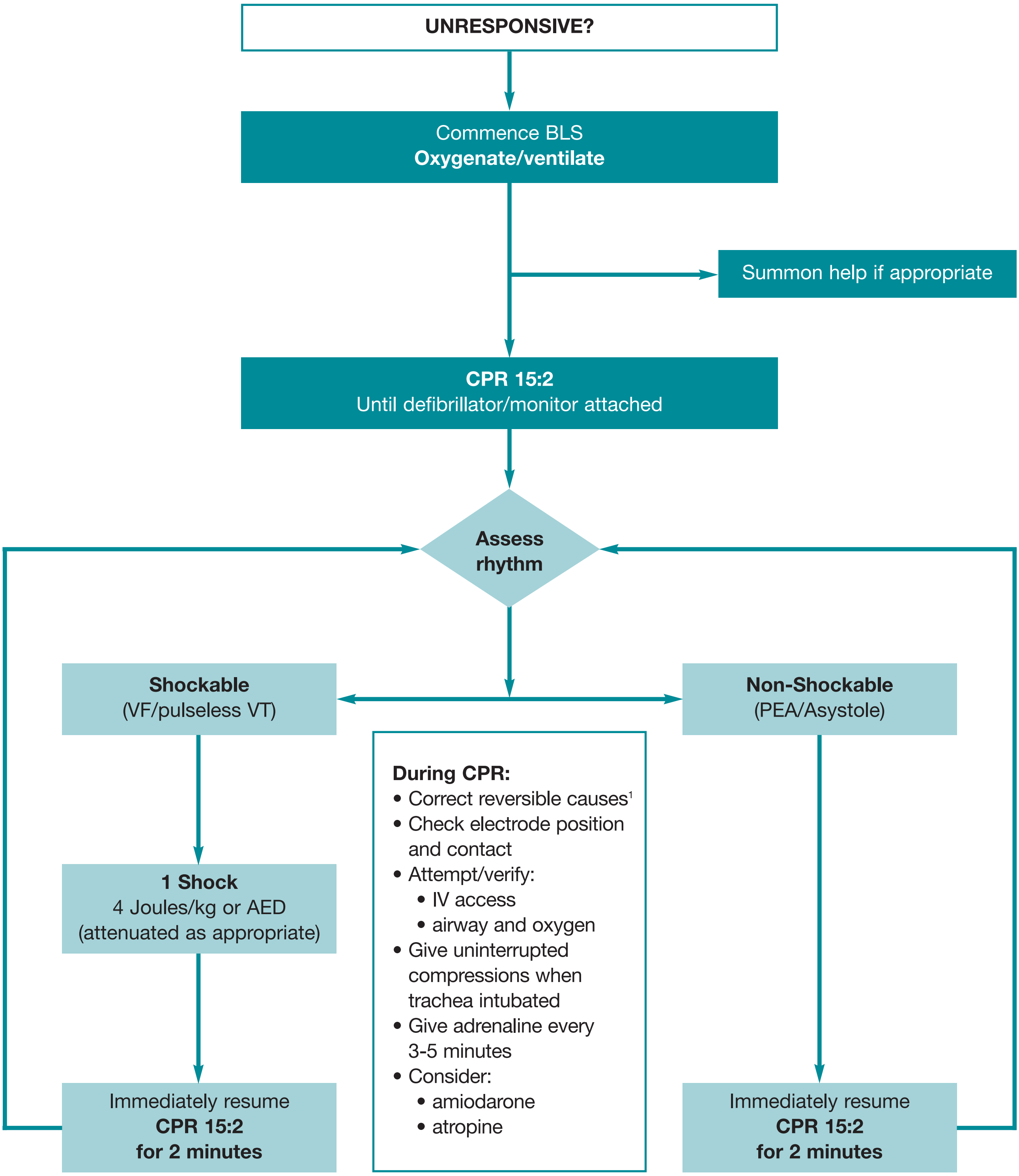
10 Patterson MD, Boenning DA, Klein BL, Fuchs S, Smith KM, Hegenbarth MA, et al. The use of high-dose epinephrine for patients with out-of-hospital cardio-pulmonary arrest refractory to pre-hospital interventions. *Pediatr Emerg Care* 2005;21:227-237.

METHODOLOGY

The methodology describing the development process of the international cardio-pulmonary resuscitation treatments recommendations on which this guideline is based is fully described in the publications listed below.

Zaritsky A, Morley PT. The Evidence Evaluation Process for the 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. *Circulation* 2005;112(22_suppl):III-128-130.

APPENDIX 1 – Paediatric Advanced Life Support Algorithm



[1]**Reversible Causes**

Hypoxia	Tension pneumothorax
Hypovolaemia	Tamponade, cardiac
Hypo/hyperkalaemia/metabolic	Toxins
Hypothermia	Thrombosis (coronary or pulmonary)

Child Foreign Body Airway Obstruction (FBAO)

INTRODUCTION

The majority of choking events in infants and children occur during play or whilst eating when a carer is usually present.

Events are frequently witnessed, and interventions are usually initiated when the child is conscious.

Foreign body airway obstruction (FBAO) is characterised by the sudden onset of respiratory distress associated with coughing, gagging, or stridor (**Table 1**).

Similar signs and symptoms may also be associated with other causes of airway obstruction such as laryngitis or epiglottitis, which require different management.

Recognition of FBAO

When a foreign body enters the airway the child reacts immediately by coughing in an attempt to expel it.

A spontaneous cough is likely to be more effective and safer than any manoeuvre a rescuer might perform.

- if coughing is absent or ineffective and the object completely obstructs the airway, the child will rapidly become asphyxiated.

Active interventions to relieve FBAO are therefore required only when coughing becomes ineffective, but they then need to be commenced rapidly and confidently.

Suspect FBAO if:

- the onset was very sudden
- there no other signs of illness
- there are clues to alert the rescuer, for example a history of eating or playing with small items immediately prior to the onset of symptoms.

MANAGEMENT

Relief of FBAO

1. Safety

Rescuers should take care not to place themselves in any danger and consider the safest action to manage the choking child.

2. Actions are determined by effectiveness of coughing.

If the child is coughing effectively no external manoeuvre is necessary. Encourage the child to cough and monitor continuously.

If the child's coughing is (or is becoming) ineffective summon help if appropriate and determine the child's conscious level.

Conscious child with FBAO:

If the child is still conscious but has absent or ineffective coughing, give back blows. If back blows do not relieve the FBAO, give chest thrusts to infants or abdominal thrusts to children. These manoeuvers increase intrathoracic pressure and may dislodge the foreign body.

Unconscious child with FBAO:

If the child with FBAO is, or becomes, unconscious, place him on a firm, flat surface. Proceed as follows:

a. Open the Airway:

- open the mouth and look for any obvious object
- if one is seen, make an attempt to remove it with a single finger sweep.

DO NOT attempt blind or repeated finger sweeps - these can impact the object more deeply into the pharynx and cause injury.

Table 1 - General Signs of Foreign Body Airway Obstruction

GENERAL SIGNS OF FOREIGN BODY AIRWAY OBSTRUCTION	
Witnessed episode	
Coughing or choking	
Sudden onset	
Recent history of playing with or eating small objects	
Ineffective coughing	**Effective coughing**
• Unable to vocalise	• Crying or verbal response to questions
• Quiet or silent cough	• Loud cough
• Unable to breathe	• Able to breathe before coughing
• Cyanosis	• Fully responsive
• Decreasing level of consciousness	

b. Attempt ventilation:

- open the airway and make 5 attempts to ventilate the lungs
- assess the effectiveness of each ventilation: if it does not make the chest rise, reposition the head before making the next attempt.

c. Perform chest compression and CPR:

- if there is no response to 5 attempts at ventilation (moving, coughing, spontaneous breaths) proceed to chest compressions without further assessment of the circulation
- follow the sequence for single rescuer CPR for approximately 1 minute
- when the airway is opened for attempted ventilation, look to see if the foreign body can be seen in the mouth
- if an object is seen, attempt to remove it with a single finger sweep
- if it appears that the obstruction has been relieved, open and check the airway as above. Perform ventilation if the child is not breathing
- if the child regains consciousness and exhibits spontaneous effective breathing, place him in a safe side-lying (recovery) position and monitor breathing and conscious level, transfer to hospital.

NOTES ON TECHNIQUES

1. Back blows

In an infant:

- support the infant in a head-downwards, prone position, to enable gravity to assist removal of the foreign body
- a seated or kneeling rescuer should be able to support the infant safely across his lap
- support the infant's head by placing the thumb of one hand, at the angle of the lower jaw, and one or two fingers from the same hand at the same point on the other side of the jaw
- do not compress the soft tissues under the infant's jaw, as this will exacerbate the airway obstruction
- deliver up to 5 sharp back blows with the heel of one hand in the middle of the back between the shoulder blades
- the aim is to relieve the obstruction with each blow rather than to give all 5.

In a child over 1 year of age:

- back blows are more effective if the child is positioned head down
- a small child may be placed across the rescuer's lap as with an infant
- if this is not possible, support the child in a forward-leaning position and deliver the back blows from behind.

3. Chest thrusts

If back blows fail to dislodge the object, and the child is still conscious, use chest thrusts for infants or abdominal thrusts to children. **Abdominal thrusts (Heimlich manoeuvre) must not be used in infants.**

Chest thrusts for infants:

- turn the infant into a head-downwards supine position. This is achieved safely by placing the free arm along the infant's back and encircling the occiput with the hand
- support the infant down your arm, which is placed down (or across) your thigh
- identify the landmark for chest compression (lower sternum approximately a finger's breadth above the xiphisternum)
- deliver 5 chest thrusts. These are similar to external chest compressions but sharper in nature and delivered at a slower rate.

Abdominal thrusts for children over 1 year:

- stand or kneel behind the child. Place your arms under the child's arms and encircle his torso
- clench your fist and place it between the umbilicus and xiphisturnum
- grasp this hand with the other hand and pull sharply inwards and upwards
- repeat up to 5 times
- ensure that pressure is not applied to the xiphoid process or the lower rib cage as this may result in abdominal trauma.

4. Re-assessment

Following the chest or abdominal thrusts, re-assess the child:

- if the object has not been expelled and the victim is still conscious, continue the sequence of back blows and chest (for infant) or abdominal (for children) thrusts

- do not leave the child at this stage. Arrange transfer to hospital
- if the object is expelled successfully, assess the child's clinical condition. It is possible that part of the object may remain in the respiratory tract and cause complications
- abdominal thrusts may cause internal injuries and all victims so treated should be assessed further.

Key Points – Child Foreign Body Airway Obstruction

- FBAO is a potentially treatable cause of death, often occurs whilst playing or eating.
- Characterised by sudden onset of respiratory distress.
- If coughing effectively, encourage child to cough.
- If coughing is ineffective give back blows initially, if ineffective give chest thrusts to infants and abdominal thrusts to children.
- Abdominal thrusts can cause serious internal bleeding therefore patients should be assessed in hospital.
- Avoid blind finger sweeps.

BIBLIOGRAPHY

Refer to child basic life support.

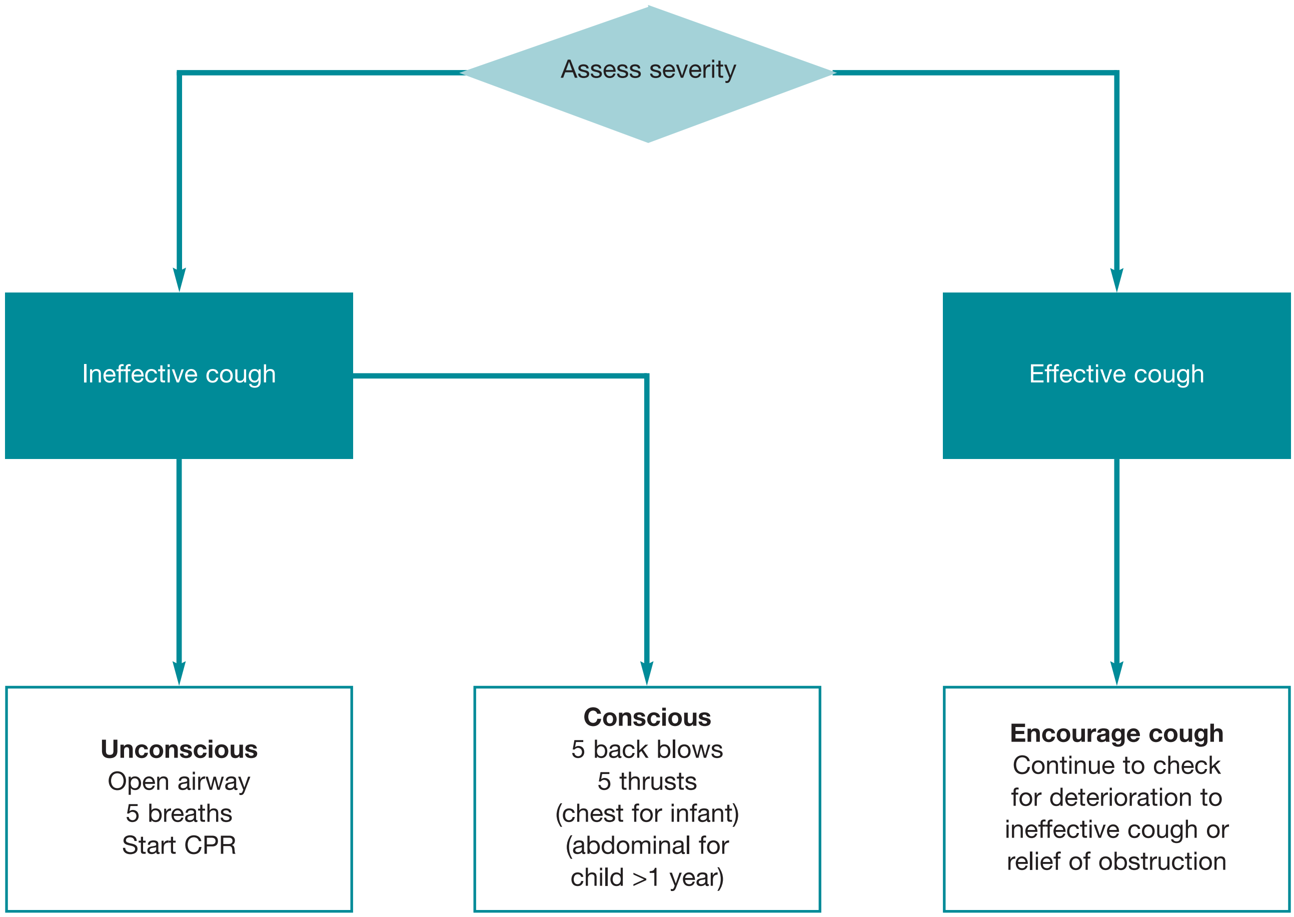
METHODOLOGY

The methodology describing the development process of the international cardio-pulmonary resuscitation treatments recommendations on which this guideline is based is fully described in the publications listed below.

Morley PT, Zaritsky A. The evidence evaluation process for the 2005 International Consensus Conference on cardio-pulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. *Resuscitation* 2005;67(2-3):167-170.

Zaritsky A, Morley PT. The Evidence Evaluation Process for the 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. *Circulation* 2005;112(22_suppl):III-128-130.

APPENDIX 1 - Paediatric Foreign Body Airway Obstruction (FBAO)



INTRODUCTION

Passage through the birth canal is a hypoxic experience for the fetus since respiratory exchange through the placenta is prevented for the 50–75 seconds duration of the average contraction. Most babies tolerate this well, but those few that do not may require help to establish normal breathing at delivery.

Newborn life support is intended to provide this help and comprises the following elements:

1. drying and covering the baby to conserve heat
2. assessing the need for any intervention
3. opening the airway
4. lung aeration
5. rescue breathing
6. chest compression.

Physiology

In the face of hypoxia in utero, the neural centres responsible for breathing become depressed and spontaneous breathing ceases. The baby can maintain an effective circulation in the face of hypoxia however, so the most urgent requirement of any asphyxiated baby at birth is that the lungs are aerated. Then, provided the circulation is intact, oxygenated blood will be conveyed from the lungs to the heart and onwards to the brain. The neural centres responsible for breathing will recover and the baby will breathe spontaneously.

Merely aerating the lungs is sufficient for the majority of cases. Where cardiac function has deteriorated to an extent that the circulation is inadequate, a brief period of chest compression may be needed. In a very small number of cases, lung aeration and chest compression will not be sufficient; the outlook in this group is poor.

SEQUENCE OF ACTIONS (*see appendix 1*)

1. Keep the baby warm and assess

Babies are small and born wet. They become cold very easily, particularly if they remain wet and in a draught. A healthy baby will be born blue but will have a good tone, will cry within a few seconds of delivery, will have a good heart rate (normally 120 – 150 per minute), and will become pink within the first 90 seconds or so. A less healthy baby will be blue, will have less good tone, may have a slow heart rate (less than 100 per minute) and may not establish adequate breathing by 90–120 seconds. An ill (very hypoxic) baby will be born pale and floppy, not breathing and with a very slow heart rate.

Whatever the problem, first ensure that the cord is clamped and then dry the baby. Remove wet towels and cover the baby with dry ones.

Drying the baby will provide sufficient stimulation and allow time to assess the baby's colour, tone, breathing and heart rate. Re-assess these parameters regularly, particularly the heart rate, every 30 seconds or so. The first signal of improvement will be an increase in heart rate.

Assess heart rate by listening with a stethoscope. Palpating the umbilical vessels or a peripheral pulse is not so reliable. If the environment is noisy or very cold, however, it may be a good alternative and may save unwrapping the baby so much.

Decide whether help is required (and likely to be available) or whether rapid evacuation to hospital is indicated. If transferring to hospital follow pre-alert procedure.

Once the baby is in the ambulance, the patient compartment should be kept as warm as can be tolerated. This may be uncomfortable for the attendant and mother but will help the baby, especially if pre-term.

2. Airway

The airway must be open for a baby to breathe effectively.

The best way to achieve this is to place the baby on his back with the head in a neutral position i.e. with the head neither flexed nor extended.

If the baby is very floppy it may be necessary to apply chin lift or jaw thrust.

3. Breathing

If the baby is not breathing adequately by about 90 seconds **give five inflation breaths**. Until birth the baby's lungs have been filled with fluid. Aeration of the lungs in these circumstances is likely to require sustained application of pressures of about 30 centimetres of water for 2–3 seconds. These are inflation breaths. Bag–valve-mask devices for use in the newborn should incorporate a safety device that allow this pressure to be generated yet prevents higher pressures that might damage the lungs.

If the heart rate increases you can assume that you have successfully aerated the lungs. If the heart rate increases but the baby does not start breathing, continue to provide regular breaths at a rate of about 30–40 per minute until the baby starts to breathe on his own. These ventilation breaths do not need as long an inspiratory time – approximately one second. Continue to monitor the heart rate. If the rate should drop below 100 it suggests insufficient ventilation. In that case increase the rate of inflation or use a longer inspiratory time.

If the heart rate does not increase following inflation breaths, either you have not aerated the lungs or the baby requires more than lung aeration alone. It is most likely that you have not aerated the lungs effectively. If the heart rate does not increase, and the chest does not move with each inflation you have not aerated the lungs; in this situation consider:

1. Is the head in the neutral position?
2. Do you need jaw thrust?
3. Do you need a longer inflation time?
4. Do you need help with the airway from a second person?
5. Is there obstruction in the oropharynx (laryngoscope and suction)?
6. Do you need a Guedel airway?

Check the baby's head is in the neutral position; that breaths are at the correct pressure and applied for the correct time and the chest moves with each breath. If the chest still does not move, consider an obstruction in the oropharynx that may be removable under direct vision.

If the heart rate remains slow (less than 60 beats per minute) following five inflation breaths, or the heart beat is absent despite good passive chest movements in response to inflations, start chest compressions.

If the baby is not vigorous at birth or does not respond very rapidly to bag-valve-mask ventilation, rapid transportation to hospital with a pre-alert is indicated.

If the mother has received pethidine or any other opiate within the previous four hours and the baby does not breathe adequately, give naloxone intramuscularly (***refer to naloxone drug protocol for dosages and information***) and support the respiration until it takes effect. **NEVER** give naloxone to babies of mothers who are addicted to opiates or on a treatment programme to treat addiction. It may precipitate a severe withdrawal reaction in the neonate and induce seizures. Support the respiration of the baby and transport urgently to hospital.

4. Circulation

Almost all babies needing help at birth will respond to successful lung inflation with an increase in heart rate followed soon by normal breathing. In some cases, however, chest compressions are necessary.

Chest compressions should only be started once you are sure that the lungs have been successfully aerated.

In babies, the most efficient method of delivering chest compressions is to encircle the lower chest with both hands in such a way that the two thumbs can press on the lower third of the sternum, at a point just below an imaginary line joining the nipples, with the fingers over the spine at the back.

Compress the chest quickly and firmly in such a way as to reduce the antero-posterior diameter of the chest by about a third.

The ratio of compressions to inflations in newborn resuscitation is 3:1

Meconium

1. Attempts to aspirate meconium from the nose and mouth of the baby while the head is still on the perineum does not prevent aspiration of meconium and is no longer recommended.
2. Attempts to aspirate meconium from the airways of vigorous babies after birth also fails to prevent aspiration.
3. If babies are born through thick meconium and are unresponsive at birth, the oro-pharynx should be inspected and cleared of meconium. If a suitable laryngoscope is available the larynx and trachea should also be cleared.

ADDITIONAL INFORMATION

1. There is no evidence to suggest that any one concentration of oxygen is better than another when starting resuscitation. Air has also been shown to be effective. Whenever possible, additional oxygen should be available if there is not a rapid improvement in the baby's condition.
2. It is no longer recommended that adrenaline be given by the ET tube.

Key Points – Neonatal Life Support

- Passage through the birth canal is a hypoxic experience and some babies may require help to establish normal breathing at delivery.
- Babies become cold very easily, dry the baby, remove any wet towels and replace with dry ones, once in the ambulance keep the compartment as warm as possible.
- Ensure the airway is open by placing the baby on his back with the head in a neutral position; if the baby is very floppy it may be necessary to apply chin lift or jaw thrust.
- If the baby is not breathing adequately by about 90 seconds give five inflation breaths.
- If the mother has received opiates within the previous four hours and the baby does not breathe adequately, administer naloxone; **NEVER** administer naloxone to babies of mothers who are addicted to opiates or on a treatment programme to treat addiction, as this may precipitate a severe withdrawal reaction in the neonate and induce seizures.
- If chest compressions are necessary compress the chest quickly and firmly at a ratio of 3:1 compressions to inflations.

REFERENCES

[1] Vain NE, Szyld EG, Prudent LM, Wiswell TE, Aguilar AM, Vivas NI. Oropharyngeal and nasopharyngeal suctioning of meconium-stained neonates before delivery of their shoulders: multicentre, randomised controlled trial. *The Lancet* 2004;364,(9434):597-602.

[2] Wiswell TE, Gannon CM, Jacob J, Goldsmith L, Szyld E, Weiss K, et al. Delivery Room Management of the Apparently Vigorous Meconium-stained Neonate: Results of the Multicenter, International Collaborative Trial. *Pediatrics* 2000;105(1):1-7.

METHODOLOGY

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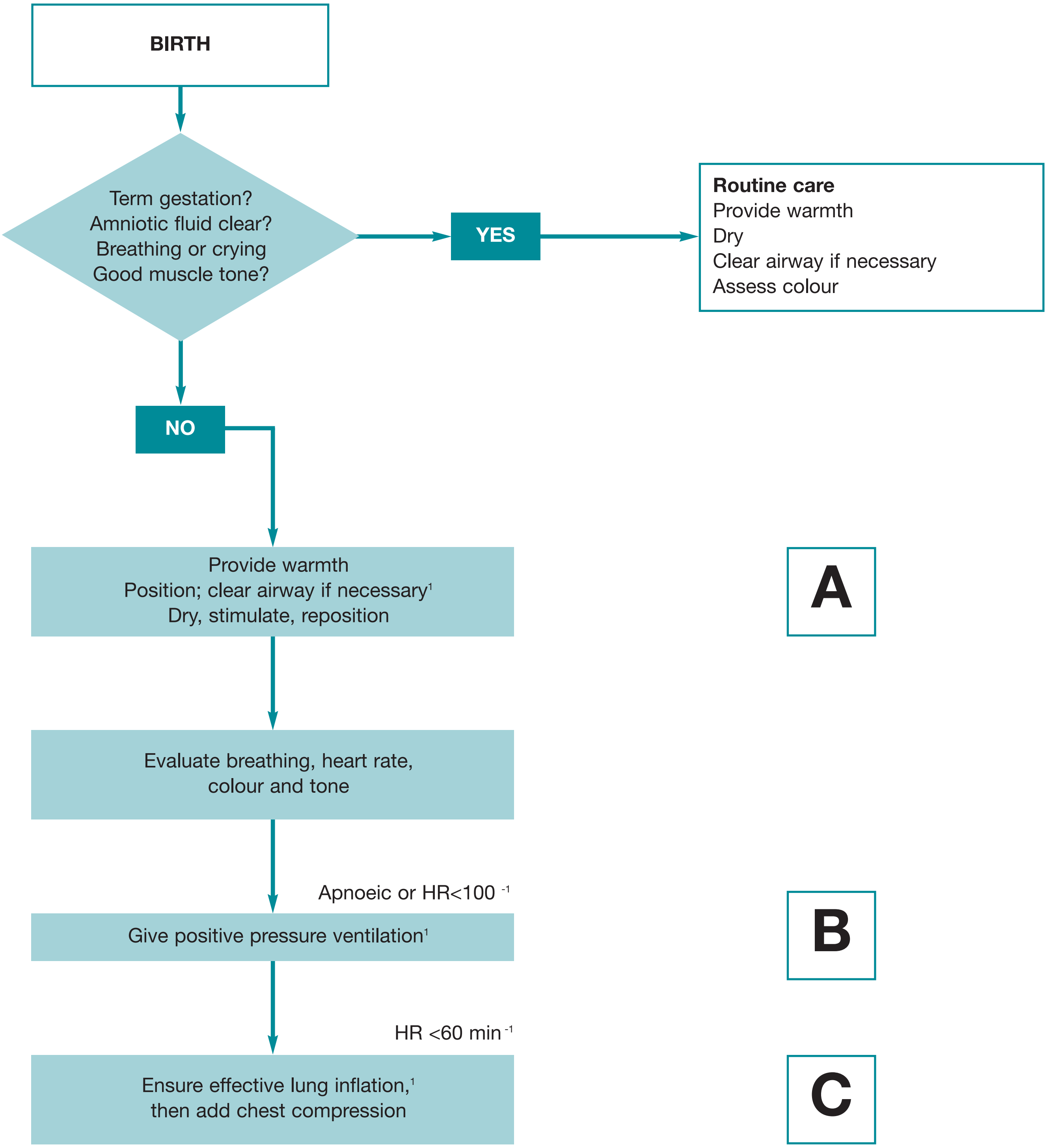
Zaritsky A, Morley PT. The Evidence Evaluation Process for the 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. *Circulation* 2005;112(22_suppl):III-128-130.

APPENDIX 1 – Newborn Resuscitation Algorithm



[1]Consider supplemental oxygen at any stage if cyanosis persists.

BIRTH

Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
3.5kg	**110-160**	**30-40**	**70-90**

AIRWAY	
Oropharyngeal Airway: 000	
Endotracheal Tube:	**3.0mm (Diameter)**
	10cm (Length)
Laryngeal Mask:	**1**

CARDIAC ARREST – DEFIBRILLATION	
Manual Defibrillation	**13 Joules**
Automatic External Defibrillation – Paediatric attenuation device if available	

CARDIAC ARREST – DRUGS

DRUGS	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE	N/A	N/A	**N/A**	N/A
AMIODARONE	N/A	N/A	**N/A**	N/A

FLUID

	VOLUME	ROUTE
BOLUS OF CRYSTALLOID	**70ml**	IV/IO

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS	N/A	N/A	**N/A**	N/A
ATROPINE – BRADYCARDIA	100mcg 100mcg 100mcg	100mcg/ml 200mcg/ml 600mcg/ml	**1.0ml** **0.50ml** **0.17ml**	IV/IO IV/IO IV/IO
BENZYL PENICILLIN	300 milligrams 300 milligrams	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**5.0ml** **1.0ml**	IV/IO IM
DIAZEMULS	N/A	N/A	**N/A**	N/A
DIAZEPAM – repeat once **ONLY**	2.5 milligrams	2.5 milligrams in 2.5ml	**1 x 2.5ml tube**	PR
GLUCAGON	0.1 milligams	1 milligram per vial	**0.1 vial**	IM
GLUCOSE 10%	1.8g	0.1gml=10%	**18.0ml**	IV/IO
HYDROCORTISONE	N/A	N/A	**N/A**	N/A
IPRATROPIUM	N/A	N/A	**N/A**	N/A
MORPHINE	N/A	N/A	**N/A**	N/A
MORPHINE (ORAL)	N/A	N/A	**N/A**	N/A
NALOXONE (NOTE: cautions) First dose Subsequent doses	 200mcg N/A	 400mcg/ml N/A	 **0.50ml** **N/A**	 **IM ONLY** N/A
PARACETAMOL	N/A	N/A	**N/A**	N/A
SALBUTAMOL	2.5 milligrams	2.5 milligrams in 2.5ml	**2.5ml**	Neb

1 MONTH

Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
4.4kg	**110-160**	**30-40**	**70-90**

AIRWAY	
Oropharyngeal Airway: 00	
Endotracheal Tube:	**3.0mm (Diameter)**
	10cm (Length)
Laryngeal Mask:	**1.0**

CARDIAC ARREST – DEFIBRILLATION	
Manual Defibrillation	**20 Joules**
Automatic External Defibrillation – Paediatric attenuation device if available	

CARDIAC ARREST – DRUGS

DRUGS	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE	44 micrograms (all doses)	1:10,000	**0.44ml**	IV/IO
AMIODARONE	21 milligrams	300 milligrams in 10mls	**0.7ml**	IV/IO

FLUID

	VOLUME	ROUTE
BOLUS OF CRYSTALLOID	**90ml**	IV/IO

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	50mcg	1:1,000	**0.05ml**	IM
ATROPINE – BRADYCARDIA	100mcg 100mcg 100mcg	100mcg/ml 200mcg/ml 600mcg/ml	**1.0ml** **0.50ml** **0.17ml**	IV/IO IV/IO IV/IO
BENZYL PENICILLIN	300 milligrams 300 milligrams	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**5.0ml** **1.0ml**	IV/IO IM
DIAZEMULS	1.3 milligrams	5 milligrams/ml emulsion	**0.26ml**	IV/IO
DIAZEPAM – repeat once **ONLY**	2.5 milligrams	2.5 milligrams in 2.5ml	**1 x 2.5ml tube**	PR
GLUCAGON	500mcg	1 milligram per vial	**0.5 vial**	IM
GLUCOSE 10%	2.2g	0.1g/ml=10%	**22.0ml**	IV/IO
HYDROCORTISONE	18 milligrams	100 milligrams in 1ml	**0.18ml**	IV/IO
IPRATROPIUM	125mcg	500mcg in 2ml	**0.50ml-1.0ml**	Neb
MORPHINE	N/A	N/A	**N/A**	N/A
MORPHINE (ORAL)	N/A	N/A	**N/A**	N/A
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 44mcg 440mcg	 400mcg/ml 400mcg/ml	 **0.11ml** **1.1ml**	 IV/IO IV/IO
PARACETAMOL	88 milligrams	various preparations	**—**	Oral
SALBUTAMOL	2.5 milligrams	2.5 milligrams in 2.5ml	**2.5ml**	Neb

3 MONTHS

Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
6kg	**110-160**	**30-40**	**70-90**

AIRWAY

Oropharyngeal Airway: 00	
Endotracheal Tube:	**3.5mm (Diameter)**
	11cm (Length)
Laryngeal Mask:	**1.5**

CARDIAC ARREST – DEFIBRILLATION

Manual Defibrillation **25 Joules**

Automatic External Defibrillation – Paediatric attenuation device if available

CARDIAC ARREST – DRUGS

DRUGS	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE	60mcg (**all** doses)	1:10,000	**0.60ml**	IV/IO
AMIODARONE	30 milligrams	300 milligrams in 10mls	**1.0ml**	IV/IO

FLUID

	VOLUME	ROUTE
BOLUS OF CRYSTALLOID	**120ml**	IV/IO

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	50mcg	1:1,000	**0.05ml**	IM
ATROPINE – BRADYCARDIA	120mcg 120mcg 120mcg	100mcg/ml 200mcg/ml 600mcg/ml	**1.2ml** **0.60ml** **0.20ml**	IV/IO IV/IO IV/IO
BENZYL PENICILLIN	300 milligrams 300 milligrams	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**5.0ml** **1.0ml**	IV/IO IM
DIAZEMULS	1.8 milligrams	5 milligrams/ml emulsion	**0.36ml**	IV/IO
DIAZEPAM – repeat once **ONLY**	2.5 milligrams	2.5 milligrams in 2.5ml	**1 x 2.5ml tube**	PR
GLUCAGON	0.5 milligrams	1 milligram per vial	**0.5 vial**	IM
GLUCOSE 10%	3.0g	0.1g/ml=10%	**30.0ml**	IV/IO
HYDROCORTISONE	24 milligrams	100 milligrams in 1ml	**0.24ml**	IV/IO
IPRATROPIUM	125-250mcg	500mcg in 2ml	**0.50ml-1.0ml**	Neb
MORPHINE	N/A	N/A	**N/A**	N/A
MORPHINE (ORAL)	N/A	N/A	**N/A**	N/A
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 60mcg 600mcg	 400mcg/ml 400mcg/ml	 **0.15ml** **1.5ml**	 IV/IO IV/IO
PARACETAMOL	(60-62.5mg)-(120-125mg)	various preparations	**—**	Oral
SALBUTAMOL	2.5 milligrams	2.5 milligrams in 2.5ml	**2.5ml**	Neb

6 MONTHS	Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
	7.8kg	**110-160**	**30-40**	**70-90**

AIRWAY	
Oropharyngeal Airway: 00	
Endotracheal Tube:	**4.0mm (Diameter)**
	12cm (Length)
Laryngeal Mask:	**1.5**

CARDIAC ARREST – DEFIBRILLATION

Manual Defibrillation **40 Joules**

Automatic External Defibrillation – Paediatric attenuation device if available

CARDIAC ARREST – DRUGS

DRUGS	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE	80mcg (**all** doses)	1:10,000	**0.80ml**	IV/IO
AMIODARONE	39 milligrams	300 milligrams in 10mls	**1.3ml**	IV/IO

FLUID

	VOLUME	ROUTE
BOLUS OF CRYSTALLOID	**160ml**	IV/IO

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	120mcg	1:1,000	**0.12ml**	IM
ATROPINE – BRADYCARDIA	156mcg 156mcg 156mcg	100mcg/ml 200mcg/ml 600mcg/ml	**1.6ml** **0.78ml** **0.26ml**	IV/IO IV/IO IV/IO
BENZYL PENICILLIN	300 milligrams 300 milligrams	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**5.0ml** **1.0ml**	IV/IO IM
DIAZEMULS	2.3 milligrams	5 milligrams/ml emulsion	**0.46ml**	IV/IO
DIAZEPAM – repeat once **ONLY**	2.5 milligrams	2.5 milligrams in 2.5ml	**1 x 2.5ml tube**	PR
GLUCAGON	0.5 milligrams	1 milligram per vial	**0.5 vial**	IM
GLUCOSE 10%	3.9g	0.1g/ml=10%	**39.0ml**	IV/IO
HYDROCORTISONE	31 milligrams	100 milligrams in 1ml	**0.31ml**	IV/IO
IPRATROPIUM	125-250mcg	500mcg in 2ml	**0.50ml-1.0ml**	Neb
MORPHINE	N/A	N/A	**N/A**	N/A
MORPHINE (ORAL)	N/A	N/A	**N/A**	N/A
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 78mcg 800mcg	 400mcg/ml 400mcg/ml	 **0.19ml** **2.0ml**	 IV/IO IV/IO
PARACETAMOL	(60-62.5mg)-(120-125mg)	various preparations	**—**	Oral
SALBUTAMOL	2.5 milligrams	2.5 milligrams in 2.5ml	**2.5ml**	Neb

9 MONTHS

Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
8.9kg	**110-160**	**30-40**	**70-90**

AIRWAY	
Oropharyngeal Airway: 00	
Endotracheal Tube:	**4.0mm (Diameter)**
	12cm (Length)
Laryngeal Mask:	**1.5**

CARDIAC ARREST – DEFIBRILLATION	
Manual Defibrillation	**40 Joules**
Automatic External Defibrillation – Paediatric attenuation device if available	

CARDIAC ARREST – DRUGS

DRUGS	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE	90mcg (**all** doses)	1:10,000	**0.90ml**	IV/IO
AMIODARONE	45 milligrams	300 milligrams in 10mls	**1.5ml**	IV/IO

FLUID

	VOLUME	ROUTE
BOLUS OF CRYSTALLOID	**180ml**	IV/IO

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	120mcg	1:1,000	**0.12ml**	IM
ATROPINE – BRADYCARDIA	178mcg 178mcg 178mcg	100mcg/ml 200mcg/ml 600mcg/ml	**1.8ml** **0.89ml** **0.30ml**	IV/IO IV/IO IV/IO
BENZYL PENICILLIN	300 milligrams 300 milligrams	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**5.0ml** **1.0ml**	IV/IO IM
DIAZEMULS	2.7 milligrams	5 milligrams/ml emulsion	**0.53ml**	IV/IO
DIAZEPAM – repeat once **ONLY**	2.5 milligrams	2.5 milligrams in 2.5ml	**1 x 2.5ml tube**	PR
GLUCAGON	0.5 milligrams	1 milligram per vial	**0.5 vial**	IM
GLUCOSE 10%	4.5g	0.1g/ml=10%	**45.0ml**	IV/IO
HYDROCORTISONE	36 milligrams	100 milligrams in 1ml	**0.36ml**	IV/IO
IPRATROPIUM	125-250mcg	500mcg in 2ml	**0.50ml-1.0ml**	Neb
MORPHINE	N/A	N/A	**N/A**	N/A
MORPHINE (ORAL)	N/A	N/A	**N/A**	N/A
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 88mcg 880mcg	 400mcg/ml 400mcg/ml	 **0.22ml** **2.2ml**	 IV/IO IV/IO
PARACETAMOL	(60-62.5mg)-(120-125mg	various preparations	**—**	Oral
SALBUTAMOL	2.5 milligrams	2.5 milligrams in 2.5ml	**2.5ml**	Neb

12 MONTHS

Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
9.8kg	**110-150**	**25-35**	**80-95**

AIRWAY	
Oropharyngeal Airway:	**00 or 0**
Endotracheal Tube:	**4.5mm (Diameter)**
	13cm (Length)
Laryngeal Mask:	**1.5**

CARDIAC ARREST – DEFIBRILLATION
Manual Defibrillation 40 Joules
Automatic External Defibrillation – Paediatric attenuation device if available

CARDIAC ARREST – DRUGS

DRUGS	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE	100mcg (**all** doses)	1:10,000	**1.0ml**	IV/IO
AMIODARONE	51 milligrams	300 milligrams in 10mls	**1.7ml**	IV/IO

FLUID

	VOLUME	ROUTE
BOLUS OF CRYSTALLOID	**200ml**	IV/IO

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	120mcg	1:1,000	**0.12ml**	IM
ATROPINE – BRADYCARDIA	196mcg 196mcg 196mcg	100mcg/ml 200mcg/ml 600mcg/ml	**2.0ml** **0.98ml** **0.33ml**	IV/IO IV/IO IV/IO
BENZYL PENICILLIN	600 milligrams 600 milligrams	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**10.0ml** **2.0ml**	IV/IO IM
DIAZEMULS	3.0 milligrams	5 milligrams/ml emulsion	**0.59ml**	IV/IO
DIAZEPAM – repeat once **ONLY**	5 milligrams	5 milligrams in 2.5ml	**1 x 5ml tube**	PR
GLUCAGON	0.5 milligrams	1 milligram per vial	**0.5 vial**	IM
GLUCOSE 10%	4.9g	0.1g/ml=10%	**49.0ml**	IV/IO
HYDROCORTISONE	39 milligrams	100 milligrams in 1ml	**0.39ml**	IV/IO
IPRATROPIUM	125-250mcg	500mcg in 2ml	**0.50ml-1.0ml**	Neb
MORPHINE	0.98-2.0 mg	10 milligrams in 10ml	**0.98ml-2.0ml**	IV/IO
MORPHINE (ORAL)	1.96 milligrams	10 milligrams in 5ml	**0.98ml**	Oral
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 100mcg 1000mcg	 400mcg/ml 400mcg/ml	 **0.25ml** **2.5ml**	 IV/IO IV/IO
PARACETAMOL	(120-125mg)-(240-250mg)	various preparations	**—**	Oral
SALBUTAMOL	2.5 milligrams	2.5 milligrams in 2.5ml	**2.5ml**	Neb

18 MONTHS	Average Weight 11.1kg	Heart Rate 100-150	Respiration Rate 25-35	Systolic Blood Pressure 80-95

AIRWAY	
Oropharyngeal Airway:	**00 or 0**
Endotracheal Tube:	**4.5mm (Diameter)**
	13cm (Length)
Laryngeal Mask:	**2.0**

CARDIAC ARREST – DEFIBRILLATION	
Manual Defibrillation	**50 Joules**
Automatic External Defibrillation – Paediatric attenuation device if available	

CARDIAC ARREST – DRUGS

DRUGS	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE	110mcg (**all** doses)	1:10,000	**1.1ml**	IV/IO
AMIODARONE	57 milligrams	300 milligrams in 10mls	**1.9ml**	IV/IO

FLUID

	VOLUME	ROUTE
BOLUS OF CRYSTALLOID	**220ml**	IV/IO

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	120mcg	1:1,000	**0.12ml**	IM
ATROPINE – BRADYCARDIA	222mcg 222mcg 222mcg	100mcg/ml 200mcg/ml 600mcg/ml	**2.2ml** **1.1ml** **0.37ml**	IV/IO IV/IO IV/IO
BENZYL PENICILLIN	600 milligrams 600 milligrams	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**10.0ml** **2.0ml**	IV/IO IM
DIAZEMULS	3.3 milligrams	5 milligrams/ml emulsion	**0.66ml**	IV/IO
DIAZEPAM – repeat once **ONLY**	5 milligrams	5 milligrams in 2.5ml	**1 x 5ml tube**	PR
GLUCAGON	0.5 milligrams	1 milligram per vial	**0.5 vial**	IM
GLUCOSE 10%	5.6g	0.1g/ml=10%	**56.0ml**	IV/IO
HYDROCORTISONE	45 milligrams	100 milligrams in 1ml	**0.45ml**	IV/IO
IPRATROPIUM	125-250mcg	500mcg in 2ml	**1.0ml**	Neb
MORPHINE	1.1-2.2mg	10 milligrams in 10ml	**1.1-2.2ml**	IV/IO
MORPHINE (ORAL)	2 milligrams	10 milligrams in 5ml	**1.0ml**	Oral
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 112mcg 1120mcg	 400mcg/ml 400mcg/ml	 **0.28ml** **2.8ml**	 IV/IO IV/IO
PARACETAMOL	(120-125mg)-(240-250mg)	various preparations	**—**	Oral
SALBUTAMOL	2.5 milligrams	2.5 milligrams in 2.5ml	**2.5ml**	Neb

2 YEARS

Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
12.2kg	**95-140**	**25-30**	**80-100**

AIRWAY	
Oropharyngeal Airway:	**0 or 1**
Endotracheal Tube:	**5mm (Diameter)**
	14cm (Length)
Laryngeal Mask:	**2.0**

CARDIAC ARREST – DEFIBRILLATION

Manual Defibrillation **50 Joules**

Automatic External Defibrillation – Paediatric attenuation device if available

CARDIAC ARREST – DRUGS

DRUGS	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE	120mcg (**all** doses)	1:10,000	**1.2ml**	IV/IO
AMIODARONE	60 milligrams	300 milligrams in 10mls	**2.0ml**	IV/IO

FLUID

	VOLUME	ROUTE
BOLUS OF CRYSTALLOID	**240ml**	IV/IO

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	120mcg	1:1,000	**0.12ml**	IM
ATROPINE – BRADYCARDIA	244mcg 244mcg 244mcg	100mcg/ml 200mcg/ml 600mcg/ml	**2.4ml** **1.2ml** **0.41ml**	IV/IO IV/IO IV/IO
BENZYL PENICILLIN	600 milligrams 600 milligrams	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**10.0ml** **2.0ml**	IV/IO IM
DIAZEMULS	3.7 milligrams	5 milligrams/ml emulsion	**0.73ml**	IV/IO
DIAZEPAM – repeat once **ONLY**	5 milligrams	5 milligrams in 2.5ml	**1 x 5ml tube**	PR
GLUCAGON	0.5 milligrams	1 milligram per vial	**0.5 vial**	IM
GLUCOSE 10%	6.1g	0.1g/ml=10%	**61.0ml**	IV/IO
HYDROCORTISONE	49 milligrams	100 milligrams in 1ml	**0.49ml**	IV/IO
IPRATROPIUM	250mcg	500mcg in 2ml	**1.0ml**	Neb
MORPHINE	1.2-2.4mg	10 milligrams in 10ml	**1.2ml-2.4ml**	IV/IO
MORPHINE (ORAL)	2.4 milligrams	10 milligrams in 5ml	**1.2ml**	Oral
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 124mcg 1240mcg	 400mcg/ml 400mcg/ml	 **0.31ml** **3.1ml**	 IV/IO IV/IO
PARACETAMOL	(120-125mg)-(240-250mg)	various preparations	**—**	Oral
SALBUTAMOL	2.5 milligrams	2.5 milligrams in 2.5ml	**2.5ml**	Neb

3 YEARS	Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
	14.4kg	**95-140**	**25-30**	**80-100**

AIRWAY	
Oropharyngeal Airway: 1	
Endotracheal Tube:	**5mm (Diameter)**
	14cm (Length)
Laryngeal Mask:	**2.0**

CARDIAC ARREST – DEFIBRILLATION	
Manual Defibrillation	**60 Joules**
Automatic External Defibrillation – Paediatric attenuation device if available	

CARDIAC ARREST – DRUGS				
DRUGS	**DOSE**	**CONCENTRATION**	**VOLUME**	**ROUTE**
ADRENALINE	150mcg (**all** doses)	1:10,000	**1.5ml**	IV/IO
AMIODARONE	72 milligrams	300 milligrams in 10mls	**2.4ml**	IV/IO

FLUID		
	VOLUME	**ROUTE**
BOLUS OF CRYSTALLOID	**280ml**	IV/IO

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	120mcg	1:1,000	**0.12ml**	IM
ATROPINE – BRADYCARDIA	288mcg 288mcg 288mcg	100mcg/ml 200mcg/ml 600mcg/ml	**2.9ml** **1.4ml** **0.48ml**	IV/IO IV/IO IV/IO
BENZYL PENICILLIN	600 milligrams 600 milligrams	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**10.0ml** **2.0ml**	IV/IO IM
DIAZEMULS	4.3 milligrams	5 milligrams/ml emulsion	**0.86ml**	IV/IO
DIAZEPAM – repeat once **ONLY**	5 milligrams	5 milligrams in 2.5ml	**1 x 5ml tube**	PR
GLUCAGON	0.5 milligrams	1 milligram per vial	**0.5 vial**	IM
GLUCOSE 10%	7.2g	0.1g/ml=10%	**72.0ml**	IV/IO
HYDROCORTISONE	57 milligrams	100 milligrams in 1ml	**0.57ml**	IV/IO
IPRATROPIUM	250mcg	500mcg in 2ml	**1.0ml**	Neb
MORPHINE	1.4-2.9mg	10 milligrams in 10ml	**1.4-2.9ml**	IV/IO
MORPHINE (ORAL)	2.8 milligrams	10 milligrams in 5ml	**1.4ml**	Oral
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 144mcg 1440mcg	 400mcg/ml 400mcg/ml	 **0.36ml** **3.6ml**	 IV/IO IV/IO
PARACETAMOL	(120-125mg)-(240-250mg)	various preparations	**—**	Oral
SALBUTAMOL	2.5 milligrams	2.5 milligrams in 2.5ml	**2.5ml**	Neb

4 YEARS

Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
16.4kg	**95-140**	**25-30**	**80-100**

AIRWAY	
Oropharyngeal Airway: 1	
Endotracheal Tube:	**5mm (Diameter)**
	15cm (Length)
Laryngeal Mask:	**2.0**

CARDIAC ARREST – DEFIBRILLATION	
Manual Defibrillation	**70 Joules**
Automatic External Defibrillation – Paediatric attenuation device if available	

CARDIAC ARREST – DRUGS

DRUGS	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE	170mcg (**all** doses)	1:10,000	**1.7ml**	IV/IO
AMIODARONE	81 milligrams	300 milligrams in 10mls	**2.7ml**	IV/IO

FLUID

	VOLUME	ROUTE
BOLUS OF CRYSTALLOID	**320ml**	IV/IO

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	120mcg	1:1,000	**0.12ml**	IM
ATROPINE – BRADYCARDIA	328mcg 328mcg 328mcg	100mcg/ml 200mcg/ml 600mcg/ml	**3.3ml** **1.6ml** **0.55ml**	IV/IO IV/IO IV/IO
BENZYL PENICILLIN	600 milligrams 600 milligrams	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**10.0ml** **2.0ml**	IV/IO IM
DIAZEMULS	4.9 milligrams	5 milligrams/ml emulsion	**0.98ml**	IV/IO
DIAZEPAM – repeat once **ONLY**	5 milligrams	5 milligrams in 2.5ml	**1 x 5ml tube**	PR
GLUCAGON	0.5 milligrams	1 milligram per vial	**0.5 vial**	IM
GLUCOSE 10%	8.2g	0.1g/ml=10%	**82.0ml**	IV/IO
HYDROCORTISONE	66 milligrams	100 milligrams in 1ml	**0.66ml**	IV/IO
IPRATROPIUM	250mcg	500mcg in 2ml	**1.0ml**	Neb
MORPHINE	1.6-3.3mg	10 milligrams in 10ml	**1.6ml-3.3ml**	IV/IO
MORPHINE (ORAL)	3.2 milligrams	10 milligrams in 5ml	**1.6ml**	Oral
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 164mcg 1640mcg	 400mcg/ml 400mcg/ml	 **0.41ml** **4.1ml**	 IV/IO IV/IO
PARACETAMOL	(120-125mg)- (240-250mg)	various preparations	**—**	Oral
SALBUTAMOL	2.5 milligrams	2.5 milligrams in 2.5ml	**2.5ml**	Neb

5 YEARS	Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
	18.5kg	**80+120**	**20-25**	**90-100**

AIRWAY	
Oropharyngeal Airway: 1	
Endotracheal Tube:	**5.5mm (Diameter)**
	15cm (Length)
Laryngeal Mask:	**2.0**

CARDIAC ARREST – DEFIBRILLATION	
Manual Defibrillation	**70 Joules**
Automatic External Defibrillation – Paediatric attenuation device if available	

CARDIAC ARREST – DRUGS

DRUGS	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE	190mcg (**all** doses)	1:10,000	**1.9ml**	IV/IO
AMIODARONE	93 milligrams	300 milligrams in 10mls	**3.1ml**	IV/IO

FLUID

	VOLUME	ROUTE
BOLUS OF CRYSTALLOID	**370ml**	IV/IO

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	120mcg	1:1,000	**0.12ml**	IM
ATROPINE – BRADYCARDIA	370mcg 370mcg 370mcg	100mcg/ml 200mcg/ml 600mcg/ml	**3.7ml** **1.9ml** **0.62ml**	IV/IO IV/IO IV/IO
BENZYL PENICILLIN	600 milligrams 600 milligrams	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**10.0ml** **2.0ml**	IV/IO IM
DIAZEMULS	5.5 milligrams	5 milligrams/ml emulsion	**1.1ml**	IV/IO
DIAZEPAM – repeat once **ONLY**	5 milligrams	5 milligrams in 2.5ml	**1 x 5ml tube**	PR
GLUCAGON	0.5 milligrams	1 milligram per vial	**0.5 vial**	IM
GLUCOSE 10%	9.3g	0.1g/ml=10%	**93.0ml**	IV/IO
HYDROCORTISONE	74 milligrams	100 milligrams in 1ml	**0.74ml**	IV/IO
IPRATROPIUM	250mcg	500mcg in 2ml	**1.0ml**	Neb
MORPHINE	1.9-3.7mg	10 milligrams in 10ml	**1.9-3.7ml**	IV/IO
MORPHINE (ORAL)	3.8 milligrams	10 milligrams in 5ml	**1.9ml**	Oral
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 184mcg 1840mcg	 400mcg/ml 400mcg/ml	 **0.46ml** **4.6ml**	 IV/IO IV/IO
PARACETAMOL	(120-125mg)- (240-250mg)	various preparations	**—**	Oral
SALBUTAMOL	2.5 milligrams	2.5 milligrams in 2.5ml	**2.5ml**	Neb

Paediatric Guidelines

6 YEARS

Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
20.6kg	80-120	20-25	80-110

AIRWAY	
Oropharyngeal Airway: 1	
Endotracheal Tube:	**6mm (Diameter)**
	16cm (Length)
Laryngeal Mask:	**2.5**

CARDIAC ARREST – DEFIBRILLATION	
Manual Defibrillation	**80 Joules**
Automatic External Defibrillation – Paediatric attenuation device if available	

CARDIAC ARREST – DRUGS

DRUGS	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE	200mcg (**all** doses)	1:10,000	**2.0ml**	IV/IO
AMIODARONE	102 milligrams	300 milligrams in 10mls	**3.4ml**	IV/IO

FLUID

	VOLUME	ROUTE
BOLUS OF CRYSTALLOID	**400ml**	IV/IO

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	250mcg	1:1,000	**0.25ml**	IM
ATROPINE – BRADYCARDIA	412mcg 412mcg 412mcg	100mcg/ml 200mcg/ml 600mcg/ml	**4.1ml** **2.1ml** **0.69ml**	IV/IO IV/IO IV/IO
BENZYL PENICILLIN	600 milligrams 600 milligrams	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**10.0ml** **2.0ml**	IV/IO IM
DIAZEMULS	6.3 milligrams	5 milligrams/ml emulsion	**1.3ml**	IV/IO
DIAZEPAM – repeat once **ONLY**	10 milligrams	10 milligrams in 2.5ml	**1 x 10ml tube**	PR
GLUCAGON	0.5 milligrams	1 milligram per vial	**0.5 vial**	IM
GLUCOSE 10%	10.3g	0.1g/ml=10%	**103.0ml**	IV/IO
HYDROCORTISONE	82 milligrams	100 milligrams in 1ml	**0.82ml**	IV/IO
IPRATROPIUM	250mcg	500mcg in 2ml	**1.0ml**	Neb
MORPHINE	2.1-4.1mg	10 milligrams in 10ml	**2.1ml-4.1ml**	IV/IO
MORPHINE (ORAL)	4.2 milligrams	10 milligrams in 5ml	**2.1ml**	Oral
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 208mcg 2080mcg	 400mcg/ml 400mcg/ml	 **0.52ml** **5.2ml**	 IV/IO IV/IO
PARACETAMOL	(400-500mg)	various preparations	**—**	Oral
SALBUTAMOL	5 milligrams	5 milligrams in 2.5ml	**2.5ml**	Neb

7 YEARS	Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
	23kg	**80-120**	**20-25**	**90-110**

AIRWAY	
Oropharyngeal Airway: 1 or 2	
Endotracheal Tube:	**6mm (Diameter)**
	16cm (Length)
Laryngeal Mask:	**2.5**

CARDIAC ARREST – DEFIBRILLATION	
Manual Defibrillation	**90 Joules**
Automatic External Defibrillation – Paediatric attenuation device if available	

CARDIAC ARREST – DRUGS

DRUGS	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE	230mcg (**all** doses)	1:10,000	**2.3ml**	IV
AMIODARONE	114 milligrams	300 milligrams in 10mls	**3.8ml**	IV

FLUID

	VOLUME	ROUTE
BOLUS OF CRYSTALLOID	**460ml**	IV

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	250mcg	1:1,000	**0.25ml**	IM
ATROPINE – BRADYCARDIA	460mcg 460mcg 460mcg	100mcg/ml 200mcg/ml 600mcg/ml	**4.6ml** **2.3ml** **0.77ml**	IV IV IV
BENZYL PENICILLIN	600 milligrams 600 milligrams	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**10.0ml** **2.0ml**	IV IM
DIAZEMULS	7.0 milligrams	5 milligrams/ml emulsion	**1.4ml**	IV
DIAZEPAM – repeat once **ONLY**	10 milligrams	10 milligrams in 2.5ml	**1 x 10ml tube**	PR
GLUCAGON	0.5 milligrams	1 milligram per vial	**0.5 vial**	IM
GLUCOSE 10%	11.5g	0.1g/ml=10%	**115.0ml**	IV
HYDROCORTISONE	92 milligrams	100 milligrams in 1ml	**0.92ml**	IV
IPRATROPIUM	250mcg	500mcg in 2ml	**1.0ml**	Neb
MORPHINE	2.3-4.6mg	10 milligrams in 10ml	**2.3ml-4.6ml**	IV
MORPHINE (ORAL)	4.6 milligrams	10 milligrams in 5ml	**2.3ml**	Oral
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 232mcg 2320mcg	 400mcg/ml 400mcg/ml	 **0.58ml** **5.8ml**	 IV IV
PARACETAMOL	480-500mg	various preparations	**—**	Oral
SALBUTAMOL	5 milligrams	5 milligrams in 2.5ml	**2.5ml**	Neb

8 YEARS

Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
25.8kg	**80-120**	**20-25**	**90-110**

AIRWAY	
Oropharyngeal Airway: 1 or 2	
Endotracheal Tube:	**6.5mm (Diameter)**
	17cm (Length)
Laryngeal Mask:	**2.5**

CARDIAC ARREST – DEFIBRILLATION	
Manual Defibrillation	**100 Joules**
Automatic External Defibrillation – Paediatric attenuation device if available	

CARDIAC ARREST – DRUGS

DRUGS	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE	260mcg (**all** doses)	1:10,000	**2.6ml**	IV
AMIODARONE	129 milligrams	300 milligrams in 10mls	**4.3ml**	IV

FLUID

	VOLUME	ROUTE
BOLUS OF CRYSTALLOID	**500ml**	IV

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	250mcg	1:1,000	**0.25ml**	IM
ATROPINE – BRADYCARDIA	516mcg 516mcg 516mcg	100mcg/ml 200mcg/ml 600mcg/ml	**5.2ml** **2.6ml** **0.86ml**	IV IV IV
BENZYL PENICILLIN	600 milligrams 600 milligrams	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**10.0ml** **2.0ml**	IV IM
DIAZEMULS	7.8 milligrams	5 milligrams/ml emulsion	**1.6ml**	IV
DIAZEPAM – repeat once **ONLY**	10 milligrams	10 milligrams in 2.5ml	**1 x 10ml tube**	PR
GLUCAGON	1.0 milligrams	1 milligram per vial	**1 vial**	IM
GLUCOSE 10%	12.9g	0.1g/ml=10%	**129.0ml**	IV
HYDROCORTISONE	100 milligrams	100 milligrams in 1ml	**1.0ml**	IV
IPRATROPIUM	250mcg	500mcg in 2ml	**1.0ml**	Neb
MORPHINE	2.6-5.2mg	10 milligrams in 10ml	**2.6ml-5.2ml**	IV
MORPHINE (ORAL)	5.2 milligrams	10 milligrams in 5ml	**2.6ml**	Oral
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 260mcg 2600mcg	 400mcg/ml 400mcg/ml	 **0.65ml** **6.5ml**	 IV IV
PARACETAMOL	480-500mg	various preparations	**—**	Oral
SALBUTAMOL	5 milligrams	5 milligrams in 2.5ml	**2.5ml**	Neb

9 YEARS

Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
28.6kg	**80-120**	**20-25**	**90-110**

AIRWAY	
Oropharyngeal Airway: 1 or 2	
Endotracheal Tube:	**6.5mm (Diameter)**
	17cm (Length)
Laryngeal Mask:	**2.5**

CARDIAC ARREST – DEFIBRILLATION	
Manual Defibrillation	**120 Joules**
Automatic External Defibrillation – Paediatric attenuation device if available	

CARDIAC ARREST – DRUGS				
DRUGS	**DOSE**	**CONCENTRATION**	**VOLUME**	**ROUTE**
ADRENALINE	290mcg (**all** doses)	1:10,000	**2.9ml**	IV
AMIODARONE	144 milligrams	300 milligrams in 10mls	**4.8ml**	IV

FLUID		
	VOLUME	**ROUTE**
BOLUS OF CRYSTALLOID	**580ml**	IV

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	250mcg	1:1,000	**0.25ml**	IM
ATROPINE – BRADYCARDIA	572mcg 572mcg 572mcg	100mcg/ml 200mcg/ml 600mcg/ml	**5.7ml** **2.9ml** **0.95ml**	IV IV IV
BENZYL PENICILLIN	1.2g 1.2g	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**20.0ml** **4.0ml**	IV IM
DIAZEMULS	8.58 milligrams	5 milligrams/ml emulsion	**1.7ml**	IV
DIAZEPAM – repeat once **ONLY**	10 milligrams	10 milligrams in 2.5ml	**1 x 10ml tube**	PR
GLUCAGON	1.0 milligrams	1 milligram per vial	**1 vial**	IM
GLUCOSE 10%	14.3g	0.1g/ml=10%	**143.0ml**	IV
HYDROCORTISONE	110 milligrams	100 milligrams in 1ml	**1.1ml**	IV
IPRATROPIUM	250mcg	500mcg in 2ml	**1.0ml**	Neb
MORPHINE	2.9-5.7mg	10 milligrams in 10ml	**2.9ml-5.7ml**	IV
MORPHINE (ORAL)	5.8 milligrams	10 milligrams in 5ml	**2.9ml**	Oral
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 288mcg 2880mcg	 400mcg/ml 400mcg/ml	 **0.72ml** **7.2ml**	 IV IV
PARACETAMOL	480-500mg	various preparations	**—**	Oral
SALBUTAMOL	5 milligrams	5 milligrams in 2.5ml	**2.5ml**	Neb

10 YEARS

Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
31.8kg	**80-120**	**20-25**	**90-110**

AIRWAY	
Oropharyngeal Airway:	**2 or 3**
Endotracheal Tube:	**7mm (Diameter)** **18cm (Length)**
Laryngeal Mask:	**3**

CARDIAC ARREST – DEFIBRILLATION

Manual Defibrillation **130 Joules**

Automatic External Defibrillation – Paediatric attenuation device if available

CARDIAC ARREST – DRUGS

DRUGS	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE	320mcg (**all** doses)	1:10,000	**3.2ml**	IV
AMIODARONE	159 milligrams	300 milligrams in 10mls	**5.3ml**	IV

FLUID

	VOLUME	ROUTE
BOLUS OF CRYSTALLOID	**640ml**	IV

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	250mcg	1:1,000	**0.25ml**	IM
ATROPINE – BRADYCARDIA	600mcg 600mcg 600mcg	100mcg/ml 200mcg/ml 600mcg/ml	**6.0ml** **3.0ml** **1.0ml**	IV IV IV
BENZYL PENICILLIN	1.2g 1.2g	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**20.0ml** **4.0ml**	IV IM
DIAZEMULS	9.5 milligrams	5 milligrams/ml emulsion	**1.9ml**	IV
DIAZEPAM – repeat once **ONLY**	10 milligrams	10 milligrams in 2.5ml	**1 x 10ml tube**	PR
GLUCAGON	1.0 milligrams	1 milligram per vial	**1 vial**	IM
GLUCOSE 10%	15.9g	0.1g/ml=10%	**159.0ml**	IV
HYDROCORTISONE	130 milligrams	100 milligrams in 1ml	**1.3ml**	IV
IPRATROPIUM	250mcg	500mcg in 2ml	**1.0ml**	Neb
MORPHINE	3.2-6.4mg	10 milligrams in 10ml	**3.2ml-6.4ml**	IV
MORPHINE (ORAL)	6.4 milligrams	10 milligrams in 5ml	**3.2ml**	Oral
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 320mcg 3200mcg	 400mcg/ml 400mcg/ml	 **0.8ml** **8.0ml**	 IV IV
PARACETAMOL	480-500mg	various preparations	**—**	Oral
SALBUTAMOL	5 milligrams	5 milligrams in 2.5ml	**2.5ml**	Neb

11 YEARS

Average Weight	Heart Rate	Respiration Rate	Systolic Blood Pressure
35.3kg	80-120	20-25	90-110

AIRWAY	
Oropharyngeal Airway:	**2 or 3**
Endotracheal Tube:	**7.0mm (Diameter)** **18cm (Length)**
Laryngeal Mask:	**3**

CARDIAC ARREST – DEFIBRILLATION
Manual Defibrillation **140 Joules**
Automatic External Defibrillation – Paediatric attenuation device if available

CARDIAC ARREST – DRUGS

DRUGS	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE	350mcg (**all** doses)	1:10,000	**3.5ml**	IV
AMIODARONE	177 milligrams	300 milligrams in 10mls	**5.9ml**	IV

FLUID

	VOLUME	ROUTE
BOLUS OF CRYSTALLOID	**700ml**	IV

DRUG	DOSE	CONCENTRATION	VOLUME	ROUTE
ADRENALINE – ANAPHYLAXIS repeat once **ONLY**	250mcg	1:1,000	**0.25ml**	IM
ATROPINE – BRADYCARDIA	600mcg 600mcg 600mcg	100mcg/ml 200mcg/ml 600mcg/ml	**6.0ml** **3.0ml** **1.0ml**	IV IV IV
BENZYL PENICILLIN	1.2g 1.2g	600 milligrams in 9.6ml 600 milligrams in 1.6ml	**20.0ml** **4.0ml**	IV IM
DIAZEMULS	11 milligrams	5 milligrams/ml emulsion	**2.2ml**	IV
DIAZEPAM – repeat once **ONLY**	10 milligrams	10 milligrams in 2.5ml	**1 x 10ml tube**	PR
GLUCAGON	1.0 milligrams	1 milligram per vial	**1 vial**	IM
GLUCOSE 10%	17.7g	0.1g/ml=10%	**177.0ml**	IV
HYDROCORTISONE	140 milligrams	100 milligrams in 1ml	**1.4ml**	IV
IPRATROPIUM	250mcg	500mcg in 2ml	**1.0ml**	Neb
MORPHINE	3.5-7.1mg	10 milligrams in 10ml	**3.5ml-7.1ml**	IV
MORPHINE (ORAL)	7 milligrams	10 milligrams in 5ml	**3.5ml**	Oral
NALOXONE (**NOTE:** cautions) First dose Subsequent doses	 352mcg 3520mcg	 400mcg/ml 400mcg/ml	 **0.88ml** **8.8ml**	 IV IV
PARACETAMOL	480-500mg	various preparations	**—**	Oral
SALBUTAMOL	5 milligrams	5 milligrams in 2.5ml	**2.5ml**	Neb

METHODOLOGY – GUIDELINE DEVELOPMENT PROCESS

This section outlines the overall methodology used in the development of the UK Ambulance Service Clinical Practice Guidelines 2006. The Joint Royal Colleges Ambulance Liaison (JRCALC) guideline development committee, a sub-committee of JRCALC, is responsible for the development of clinical practice guidelines for UK Ambulance Clinicians, including registered Paramedics. The committees comprise representatives of the Royal Medical Colleges, British Paramedic Association, Ambulance Service Association, Royal College of Nursing, and all UK ambulance services.

The overall guideline process is illustrated in Figure 1. Guidance is based on current best evidence and this edition comprises one hundred guidelines and protocols. The review process is iterative, building on the foundation of previous editions, and as such, some guidelines have a stronger evidence base than others; detailed search strategies are appended to some guidelines.

The guideline development process is partially funded with a grant from the Department of Health, although, individual ambulance services provide the majority of support by allowing staff to participate in the review process, attend consensus meetings and JRCALC committee meetings.

Methodology – Guideline Development Process

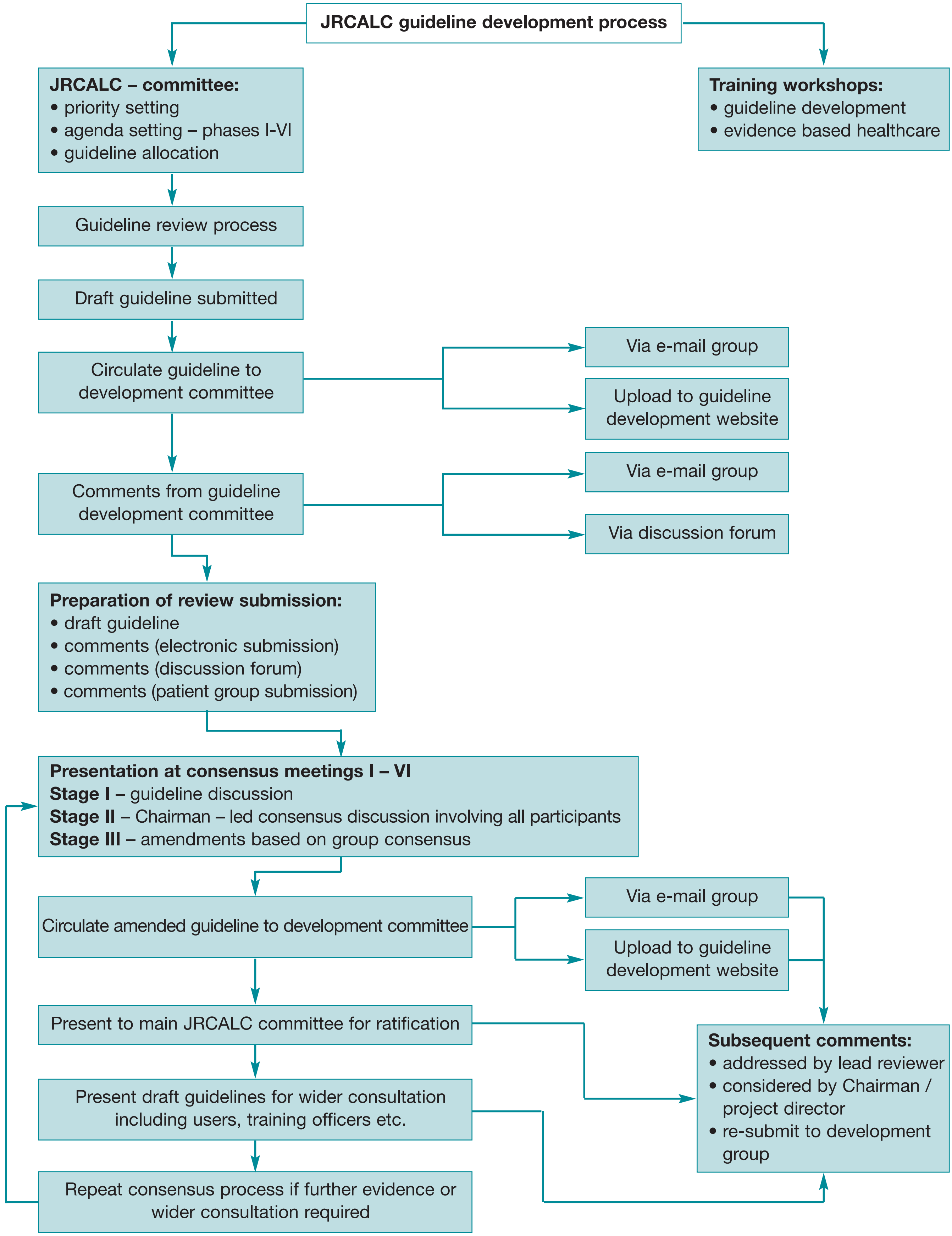


Figure 1 – Guideline Development Process