

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:



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 Release of Organophosphorus (OP) Nerve Agents. London: HMSO, 2004.
- ³ Thermo Electron Corporation. <http://www.thermo.com>.

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http://europa.eu.int/comm/environment/civil/prote/pdf/docs/disaster_med_final_2002/d16.pdf.

METHODOLOGY

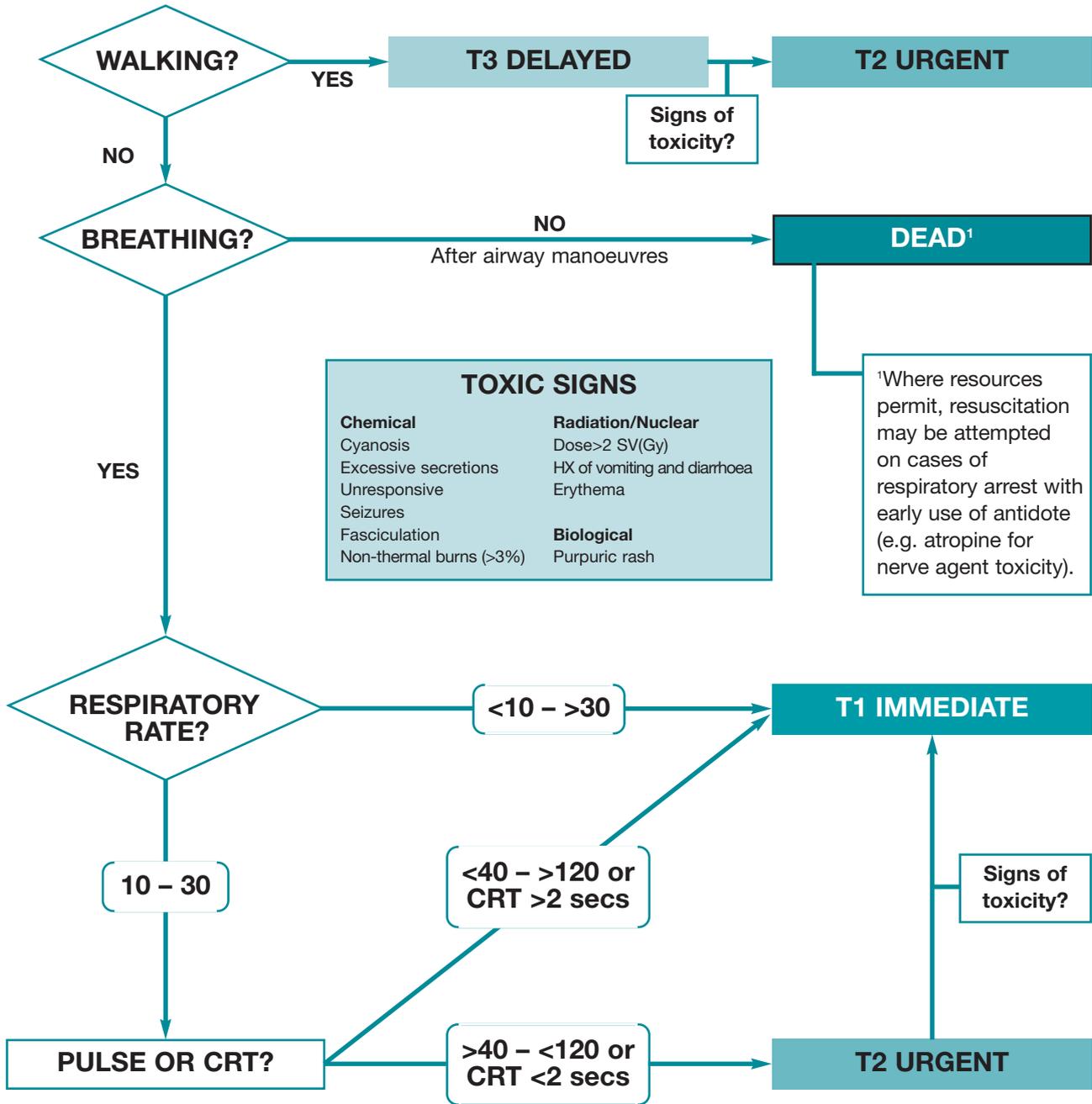
Refer to methodology section.

Chemical, Biological, Radiological and Nuclear Incidents

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.



Chemical, Biological, Radiological and Nuclear Incidents

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 RAD OR NUC	if purpuric rash	-2
	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

Chemical, Biological, Radiological and Nuclear Incidents

Appendix 3 – GLOSSARY OF TERMS: COUNTER-TERRORISM

ACPO(TAM)	Association of Chief Police Officers (Terrorism and Allied Matters)	POLSA	Police Search Adviser
ATO	Ammunition Technical Officer	PPE	Personal Protective Equipment
ATSAC	ACPO(TAM) Strategic Advice Centre (normally established at Scotland Yard)	SAS	Special Air Squadron
AWE	Atomic Weapons Establishment, Aldermaston	SBS	Special Boat Squadron
(CB)IED	(Chemical or Biological) Improvised Explosive Device	SF	Special Forces
CCC	Civil Contingencies Committee	SIO	Senior Investigating Officer
CCCG	Chief Constable's Co-ordinating Group (Strategic Group)	SMC	Senior Military Commander
CMLO	Consequence Management Liaison Officer	SO13	Met Police Anti-terrorist Squad
COBR	Cabinet Office Briefing Room(s) (Central Govt co-ordinating group)	SSA	Senior Scientific Authority
Dstl	Defence, Science & Technology Laboratory, Porton Down – part of the Ministry of Defence	TAG	Technical Assessment Group, Dstl Chemical and Biological Science
EHO	Environmental Health Officer	TRF	Technical Response Force (specialist military/scientific team)
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		