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.

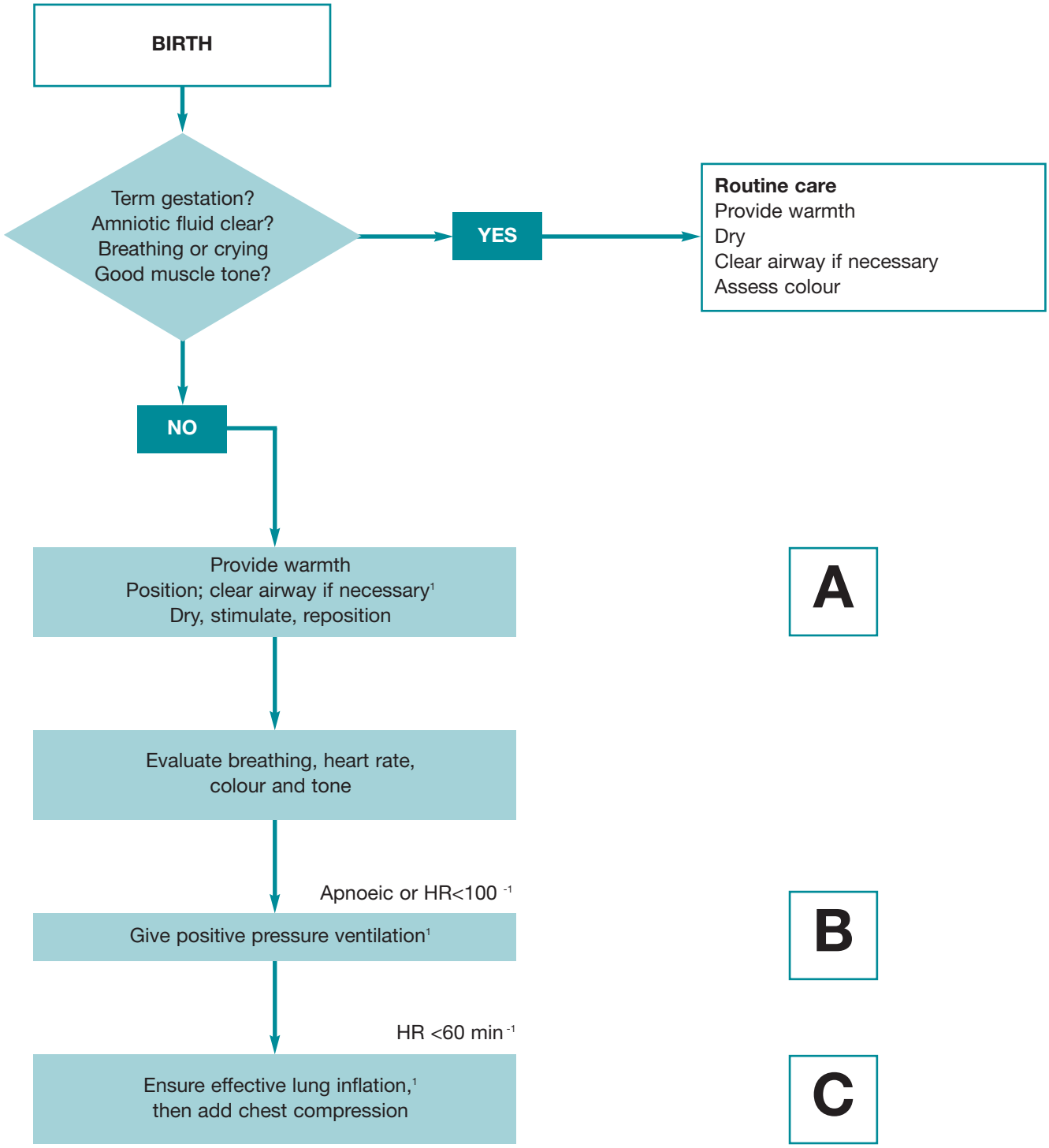
METHODOLOGY

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 – Newborn Resuscitation Algorithm



[1]Consider supplemental oxygen at any stage if cyanosis persists.