
Neonatal Guidelines

Chapter 1: Neonatal Resuscitation

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Neonatal resuscitation

All healthcare professionals who are involved with the birth of babies or in the management of illness in neonates should be skilled in newborn resuscitation. This would include all midwives, obstetric doctors and staff on the neonatal unit.

All staff should attend a yearly update on newborn resuscitation. It is our aim that all appropriate midwifery and neonatal staff should also complete the Newborn Life Support (NLS) Course.

Physiology of asphyxia in the neonate:

Following an asphyxial insult, the body is deprived of oxygen. Breathing initially becomes deeper and more rapid, but within 2-3 minutes breathing ceases as the higher centres responsible for controlling normal rhythmic respiration are put out of action. The body has a number of automatic reflex responses. Energy is conserved by shutting down the circulation to the kidneys, gut and the skin, while preserving circulation to the vital organs i.e. the heart and the brain. After a latent period of primary apnoea, automatic reflex gasping activity appears, triggered by the spinal centres. These deep reflex gasps are easily distinguishable from normal breaths as they have a frequency of only 6-12 times per minute and involve all the accessory muscles of respiration in a maximal inspiratory effort. The gasping effort may be enough to reverse the hypoxia. However, if the hypoxia continues, this gasping activity will eventually cease as the spinal centres also get depressed. In the human infant, the time to reach this secondary or terminal apnoea is probably around 20 minutes. This sequence can start prior to delivery.

In the term baby, the circulation does not fail before all reflex respiratory activity has ceased, usually about 20 minutes after the onset of the asphyxia. This is largely due to

the reserves of glycogen in the heart. Such reserves are not present in the more vulnerable preterm baby and are not present later in life. Resuscitation is, therefore, easy and straight-forward if it is begun before the baby becomes so anoxic that all reflex activity has ceased. As long as oxygen reaches the lungs it will then be carried to the heart and brain by the circulation and revival will be rapid, automatic and almost always complete within minutes.

If resuscitation is not commenced, even after all spontaneous gasping has ceased, systemic blood pressure will eventually fall to the point where the circulation ceases and the heart-rate falls to zero. Even at this point resuscitation may still be effective, if commenced promptly. The chances of recovery will depend on the length of the secondary apnoea. In practice it is very difficult to tell whether a baby is in primary or secondary apnoea and this is why resuscitation must be commenced effectively in all such infants. In hindsight, it is possible to tell if a baby was in secondary apnoea as the first respiratory activity to recover will be reflex anoxic gasping.

Clearance of lung fluid:

During vaginal birth most fetal lung fluid is absorbed into the circulation by physiological mechanisms. Approximately a third is removed during vaginal delivery by chest compression. If the baby breathes spontaneously at birth, the remainder will clear fairly rapidly (within 1-2 breaths) by reabsorption into the blood stream and lymphatic system. Normally it is not necessary to suction the airways to remove this fluid. Attempting to do so may lead to inappropriate vagal stimulation causing bradycardia. Occasionally, suction will be required if there is thick particulate meconium obstructing the airway in a depressed infant. (See later).

Expansion of the lungs

Following lung expansion, there is a drop in pulmonary resistance and consequently the pulmonary blood flow increases. Hypoxia, acidosis and hypothermia may lead to arrest of this process leading to persistent pulmonary hypertension (PPHN). In PPHN, pulmonary vasoconstriction persists and the right sided pressures may be higher than

the left causing cyanosis due to right to left shunting of blood through a patent foramen ovale and across the ductus arteriosus. Hypoxia, acidosis and hypothermia should therefore be avoided

Air or Oxygen?

In term infants receiving resuscitation with intermittent positive-pressure ventilation, 100% oxygen conferred no advantage over air in the short term and resulted in increased time to first breath or cry or both. Meta-analyses of these studies showed a decrease in mortality with the group for whom resuscitation was initiated with air. (Relative risk 0.71 [CI 0.54 – 0.94], Risk difference -0.05, NNT 20).

There are several good human RCTs in term babies that have showed quicker recovery during resuscitation in air resuscitated group when compared to 100% oxygen. The levels of oxidative stress markers were markedly elevated for prolonged periods in those resuscitated in 100% oxygen. The incidence of BPD was reduced by half in those resuscitated in 30% oxygen as compared 90% oxygen in a randomised trial of preterm babies 24-28 weeks gestation.

The best human study examining long term outcome suggest a odds ratio of 3.85 of serious adverse outcome (death / cerebral palsy) in babies with HIE exposed to hyperoxia.

There is a plethora of evidence in newborn animal models of asphyxia that exposure to high concentrations of oxygen at resuscitation does not confer any clinical advantage and is potentially harmful at the cellular level due to generation of free oxygen radicals at the time of reperfusion.

In preterm infants at <32 weeks' gestation, initial use of air or 100% oxygen is more likely to result in hypoxaemia or hyperoxaemia, respectively, than initiation of resuscitation with 30% or 90% oxygen and titration to oxygen saturation. There is insufficient evidence in babies born at 32–37 weeks' gestation to define the appropriate oxygen administration strategy.

Treatment recommendation

Resuscitation using a resuscitaire with blender

In term infants receiving resuscitation at birth with positive pressure ventilation, it is best to begin with air rather than 100% oxygen. If despite effective ventilation there is no increase in heart rate or if oxygenation (guided by oximetry) remains unacceptable, use of a higher concentration of oxygen should be considered.

Because many preterm babies of <32 weeks' gestation will not reach target saturations in air, blended oxygen and air may be given judiciously and ideally guided by pulse oximetry. Both hyperoxaemia and hypoxaemia should be avoided. A pragmatic starting point of 40% is acceptable.

Resuscitation using a resuscitaire without blender

If a blend of oxygen and air is not available, resuscitation should be initiated with air. Switch to 100% oxygen if there is poor response. The emphasis should be on effective lung inflation.

Resuscitation with no resuscitaire

Commence resuscitation with Bag/valve/mask using air. The emphasis should be on effective lung inflation.

PREPARATION for babies where there are maternal or fetal risk factors

1. In a high-risk situation ensure there are at least two doctors present (SHO and Registrar or Consultant). Ideally if possible, a consultant should be present at births under 28 weeks gestation.
2. Introduce yourself to the parents. Check the maternal notes and take the relevant history. Explain what is likely to happen e.g. in the case of a pre-term birth it is likely that the baby will require resuscitation and will be admitted to the neonatal intensive care unit etc.

3. Check that the radiant heater is on maximum power and that the towels and blankets are warmed. For premature babies < 28 weeks gestation, ensure you have a large food grade plastic bag available. Ensure a proper size hat along with a range of sizes on either side is available. Delivery room temperature should be at least 26 °C
4. Check that the oxygen supply, connections, the pressure control valves, the Laerdal bag (or neopuff ventilator) and the face masks are handy and working satisfactorily. Preset the pressures to 20/5 in a preterm infant and 30/5 in a term infant. Step up / down pressure and FiO₂ according to response to resuscitation (Heart rate, chest expansion and oxygen saturation).
5. Check that an oxygen saturation monitor is available with appropriate probes and fixation materials
6. In the case of preterm birth, check that transfer and ventilation facilities en route to NNU after stabilisation are in order. In Singleton hospital, check that the incubator transporting the baby to Special Care is ready in the room, warmed to 38°C, and that the oxygen supply is working. Check that the ventilator on the transport incubator is working and a CPAP circuit is available. For premature babies less than 29 weeks make sure the surfactant is out of the fridge and warming to room temperature.
7. Check the suction equipment and set the vacuum control to 10 cms of water.
8. Check the laryngoscope is working, that the light is bright and the bulb (if present) is tightened. For a large baby use a large blade and for a preterm baby make sure that there is a small blade available.
9. Check the availability and sizes of the endotracheal tube and that the ETT fixation system is available. Most average sized term babies need a size 3.5 tube to ensure effective ventilation. Use a size 3 tube for any baby > 1 kg, and a 2.5 tube for smaller babies.
10. If the clinical situation indicates, draw up emergency drugs e.g. Adrenaline, concentration 1:10,000 and prepare catheters.

11. Check that a stethoscope is present and working. Lay out a measuring tape at the head end of the resuscitaire in order to be able to measure the head circumference straight away if condition permits.
12. Close the door to eliminate drafts and try and keep the room as warm as possible.

Preparation for birth of a healthy baby where the midwife is the lead professional

1. Prepare an area for newborn resuscitation with all necessary equipment checked and to hand.
2. Check bag/valve/mask is in good working order with appropriate size mask
3. Pre warm towels.
4. If any problems with resuscitation are anticipated during labour and birth consider calling a 999 ambulance and inform the receiving hospital or inform labour ward co-ordinator if the birth is in a consultant led unit.
5. If available and necessary, check the resuscitaire and all equipment is in good working order.
6. If appropriate take resuscitaire into the birthing room.
7. If baby needs to be transferred to hospital, prepare pod / transfer blanket.

What to do at birth? (For meconium-stained liquor see later, premature birth see chapter 2)

At birth of an infant, note the time, start the clock

In a baby who appears compromised, clamp the cord immediately and proceed to resuscitation

In an uncompromised baby, cord clamping should be delayed by at least 1 minute from complete delivery of the infant. The infant should be at the same level as the placenta.

This time should be used to initiate thermal control (drying and wrapping in warm towel for term babies and preterm babies >28 weeks gestation; plastic bag without drying in babies less than 28 weeks gestation). In a well appearing term baby, ensure that the baby has skin to skin contact with mother. Cover the baby with a warm towel and place a hat on the head. Avoid hyperthermia,

Assess the condition of the infant –breathing and heart rate. Listen to the heart rate with a stethoscope. It is not necessary to count this exactly but you should note whether the heart rate is absent, <100 or, >100/min.

Assess the need for additional help, more experienced staff or an ambulance throughout the resuscitation.

When to start resuscitation?

The indications for positive pressure ventilation include:-

1. Apnoea or ineffective respiratory effort.
2. Heart rate less than 100/minute.
3. Persistent central cyanosis in facemask oxygen and a low heart rate.

Airway and breathing:

Transfer the baby to the resuscitaire or prepared flat surface with the baby's head in a neutral position. If the baby is not breathing, perform airway-opening manoeuvres, place the appropriate size mask on the baby's face over the nose and mouth, and inflate the lungs via the bag/valve/mask or T piece (neopuff). Give the initial five breaths as inflation breaths, 30/5, each 2-3 seconds in order to expand the alveoli and establish resting lung volume. The circuit must include a pressure relief valve.

If birth is where the midwife is the lead professional, these initial inflation breaths can be performed with the baby positioned between the mother's legs using bag/valve/mask. If further resuscitation is required and there is a resuscitaire available it should be brought into the birthing room.

If birth occurs outside an obstetric unit and the baby requires more resuscitation than 5 inflation breaths, transfer arrangements should be considered, if not already initiated. All resuscitation measures should be continued during transfer to the appropriate neonatal unit.

Reassess after the inflation breaths by auscultating the heart rate. If the heart rate has improved you can assume that you have inflated the lung and therefore proceed to ventilation breaths. If the heart rate does not respond to inflation breaths the only way to check that the lungs have been inflated successfully is to see chest move in response to your inflation breaths.

Therefore, if there is no increase in the heart rate, check for chest movement.

If you do not see a heart rate response and there is no chest movement with the inflation breaths assess the need for the following in a systematic manner–

- Reposition – ensure neutral position of baby’s head. It is very easy to over extend the neck during resuscitation!!
- Ensure you have gas flow (at least 6 litres / min).
- Re-evaluate the size of the mask and ensure appropriate seal.
- Apply single or double jaw thrust. If you have help it may be easier to use the two person jaw thrust technique.
- Ensure you have inflation pressure of at least 30cm of water and you are delivering long inspiratory times of 2-3 seconds.
- Assess the need to suction the airway under direct vision.
- Assess the need for an oropharyngeal (Guedel) airway?
- Assess the need for higher pressures? Do you need to use a self inflating bag valve mask device?
- At all times evaluate the need for further help.
- Attach the baby to a oxygen saturation monitor if available

If there is a good response to these manoeuvres with an increase in the heart rate, then proceed to ventilation breaths. A rate of 30 ventilation breaths per minute is sufficient. You may need to reduce your inflation pressures appropriately. Watch for the baby’s heart rate, chest movement, breathing effort, oxygen saturations (see guide on flow chart). Assess colour if saturation recording not available and keep on assessing the situation every 30 seconds.

If inadequate response to heart rate or saturations despite good chest movement increase oxygen concentration in a step wise fashion (where a blender is available) using the guide on NLS algorithm (see laminated chart on resuscitaire). If no blender is available, switch to 100% oxygen.

Recently concerns has been expressed that the peak pressure delivered by a Laerdal bag may be far too large and lead to over distension of the lungs, which may contribute to chronic lung disease. It does not deliver effective and measurable positive end expiratory pressure (PEEP). Where possible use a circuit and a T piece that can deliver measured PEEP. The PEEP is required to establish a functional residual capacity. You will need to watch the expansion of the chest during each ventilation breath to decide whether or not the pressures are optimal. With experience you should be able to gauge whether the chest movement is optimal.

Discontinue ventilation when baby has adequate respiratory effort and able to maintain oxygen saturation (colour) and heart rate. Evaluate clinical background, degree of resuscitation and response, work of breathing, colour and tone to ascertain the need to admit to neonatal unit.

Intubation

Absolute indications for endotracheal intubation are:

- i) Failure of effective ventilation with a face mask
- ii) Infant with suspected diaphragmatic hernia

If intubation is required ensure that a good view of the larynx is obtained. The commonest problem is overextension of the neck and deviation from midline. This should be avoided as this gives a distorted view of the upper airway. The baby should be intubated effectively within 30 seconds. If this is not successful you should go back to mask ventilation until the baby is pink. Do not allow the baby to become hypoxic during an attempt to intubate. In a baby who is preterm and intubated give surfactant as soon as intubation is achieved successfully and tube secured.

The laryngeal mask airway should be considered during resuscitation of the newborn if face-mask ventilation is unsuccessful or not feasible. It could be considered an alternative to face mask IPPV in babies >2Kg or >34 weeks gestation. There is limited evidence to evaluate its use in smaller or more premature babies and it has not been evaluated in the context of meconium, and for those requiring chest compressions and administration of medications. (This is now available in all resuscitaires)

If you do not see a good HR response despite good chest movement proceed to chest compression.

Chest compressions:

If the heart rate remains less than 60/minute despite good chest movement (It is necessary to be absolutely sure about this), proceed to chest compressions. Cardiac compressions should be commenced once 5 effective inflation breaths have been given with adequate chest movement but have not resulted in an improvement in the heart rate (i.e. HR still <60/min). If the HR is rising, another 30 seconds of ventilation breaths can be continued before starting chest compressions.

Chest compressions necessitate the involvement of a second pair of hands. The chest should be encircled in both hands with the thumbs placed on the lower third of the sternum and the fingers over the spine. The landmark to place your thumbs is 1 cm below the imaginary line joining the nipples. Alternatively locate the xiphisternum and go 1 cm up centrally on the sternum. The depth of cardiac compression should be about 1/3 of the “depth of the chest”. Chest compressions should be done at about 90/minute along with ventilation breaths of 30/minute at a ration of 3:1. Allow sufficient relaxation time as the coronary arteries are perfused in diastole. The person doing cardiac massage should give their sole attention to this task. This is the preferred method in all cases.

In a very small pre-term baby cardiac massage can be done with two fingers with the back of the baby well supported.

Reassess every 30 seconds and listen to the heart rate (usually after 15 cycles of 3:1). Try to minimise interruptions to ventilation and compressions. The same person should ideally assess the heart rate throughout the resuscitation. Do not stop cardiac massage until the heart rate is consistently > 60/min and rising.

Drugs:

If the heart rate fails to improve after 30 seconds of good quality cardiac compression, drugs should be considered. If birth has occurred outside an obstetric unit the baby will need to be transferred first. The intravenous route is preferred but if the baby is intubated consider intratracheal adrenaline at the dose of 0.5-1ml/Kg of 1 in 10,000 solution.

Obtain central venous promptly by catheterising the umbilical vein. Prime the umbilical vein catheter (UVC) with saline prior to insertion to prevent an air embolus. Remember this is an emergency CLEAN procedure but not a sterile procedure – so don't waste time gowning up!! Blood should be obtained for a gas and blood sugar measurement when you insert the catheter. Very rarely where umbilical venous access cannot be obtained or fails, intraosseous route is an alternative for drug administration in neonatal resuscitation.

Intravenous adrenaline can then be given in a dose of 0.1 mls per Kg of 1:10,000 (first dose). If hypovolaemia is suspected because of a placental abruption or suspected fetal blood loss give volume e.g. 10 mls per Kg of normal saline or, better still, uncrossmatched "O" rhesus negative blood. In Singleton and Princess of Wales (POW) Hospital, this must be collected from blood bank beforehand if trouble is anticipated. In an emergency, the **porters** should be asked to collect paediatric emergency O negative uncrossmatched blood from the 'Blood Bank Issue Fridge'. **No requisition is necessary.** The blood bank technician should be informed after resuscitation even if the blood is not used. Any unused blood should be returned to the blood bank within 30 minutes so that it could be processed for component use.

If there is no response, consider Sodium Bicarbonate 4.2% intravenously in a dose of 2 mmols per Kg (4 mls per Kg) slowly over 1 minute. This should be followed by 0.3 mls/ Kg 1:10,000 adrenaline IV after 3 minutes or so. After each drug flush the line with 1-2 mls of 0.9% saline.

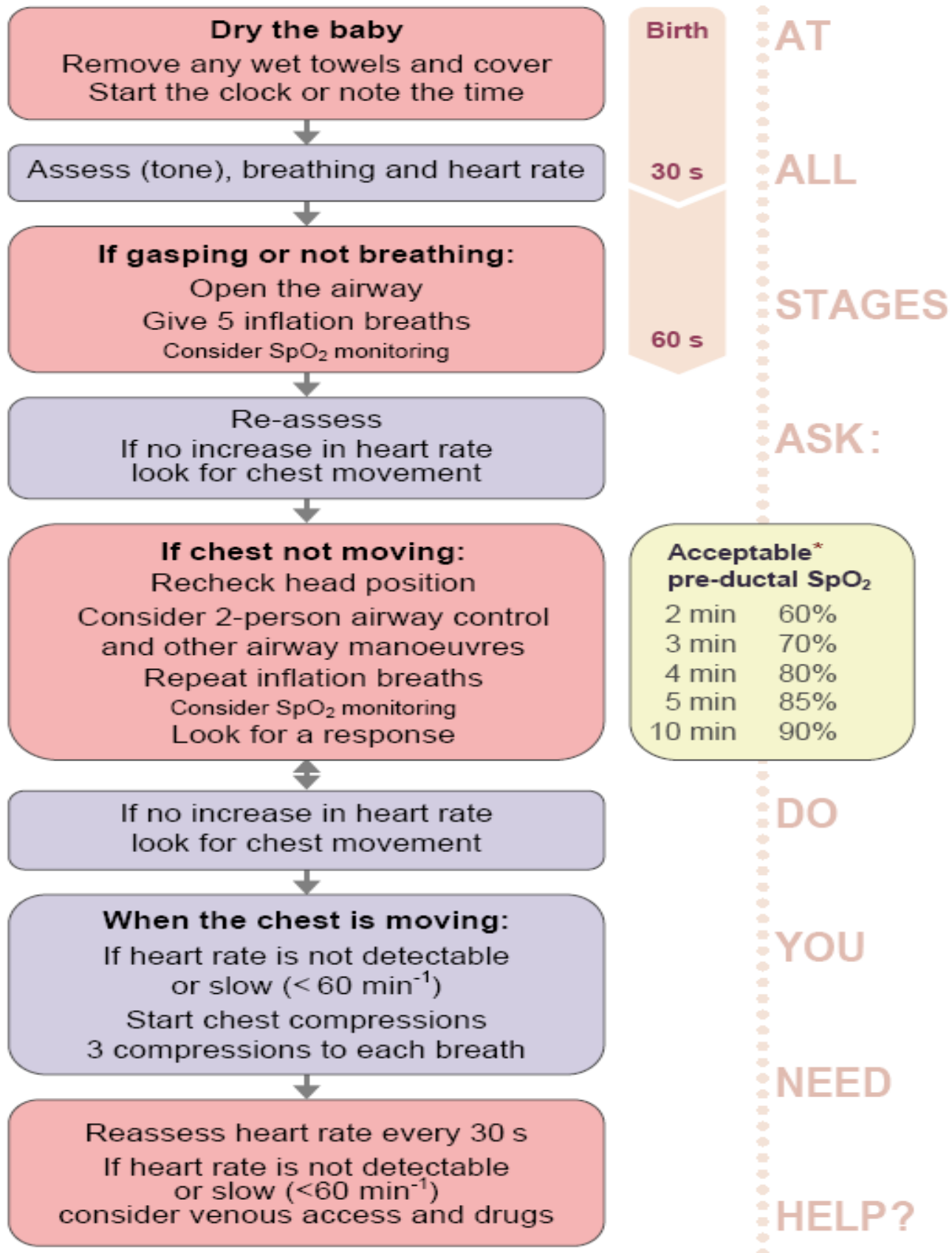
Correct hypoglycaemia if blood sugar is less than 2.6 mmol /litre on PCX by giving 2.5mls/kg of 10% dextrose. Avoid giving IV dextrose routinely as hyperglycaemia is known to be associated with poor outcome during a hypoxic ischemic insult.

Ensure that adequate ventilation and cardiac compressions are continued throughout these procedures and that the baby is kept as warm as possible.

N.B> In the hospital setting and in babies greater than 36 weeks gestation with evolving moderate to severe encephalopathy (requiring prolonged resuscitation >10 minutes), consider the appropriateness of therapeutic hypothermia. This could be initiated by switching off any active source of heating on the resuscitaire.

Ensure that the parents receive adequate support and information as they will be extremely frightened and listening to everything that is going on.

Newborn Life Support



SPECIAL SITUATIONS

Preterm birth: See chapter 2

Meconium staining of the liquor:

Passing meconium before delivery may be a sign of fetal hypoxia. There is no role for suctioning of the baby's airways at the perineum to prevent meconium aspiration syndrome as this is usually an antenatal event. If the baby is breathing and pink at birth, nothing more needs to be done.

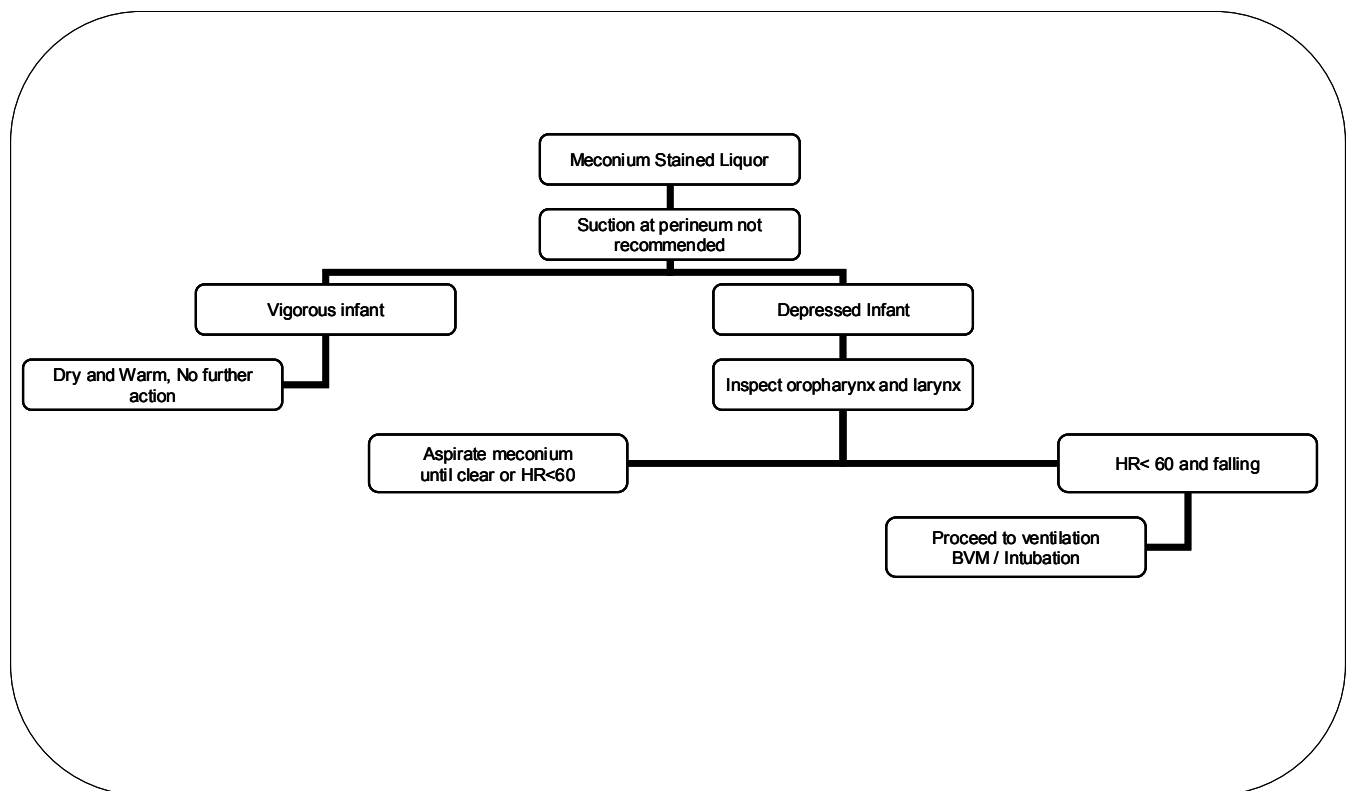
If the baby is born with thick meconium, floppy and with no respiratory effort, postpone drying the baby while the oropharynx is visualized with a laryngoscope and any visible meconium removed. If there is meconium below the cords and a skilled intubator present, the trachea should then be intubated with a suction tube and the lower airway suctioned. This may need to be repeated until the airway is clear or if the HR falls below 60/min when oxygenating the baby takes priority. The resuscitation is then continued as detailed above.

Following resuscitation, pass a nasogastric tube into the stomach and aspirate the stomach to remove any swallowed meconium. If this is not done the baby may vomit later and re-aspirate. If there is meconium below the cords this indicates that the baby had passed through primary apnoea to the gasping stage and should be admitted to NICU. In practice, it is usually the pulmonary hypertension that causes the ventilatory problem rather than meconium per se. These babies can be extremely difficult to manage and may have multi-organ failure. If a baby has aspirated meconium it should be admitted to the neonatal unit, even if it appears to pick up quickly.

In the presence of significant meconium, remember:

Screaming babies - have an open airway

Floppy babies - have a look



Administration of neonatal drugs - use of naloxone in infants:

Naloxone (Narcan) is an opioid antagonist which may be able to reverse the effects of Pethidine or Morphine given during labour. This is not a drug for resuscitation. For the clinical situation of a newborn with respiratory depression after maternal opiate exposure, the focus needs to remain on effective ventilation and airway support for the persistently apnoeic newborn. It should only be given if, after resuscitation, the baby is pink and with a good heart rate >100 but there is poor or no respiratory effort due to opiates given to the mother prior to the birth of the baby.

The dose of Narcan is 200micrograms or if weight is available 100 micrograms/kg, given intramuscularly. Use the adult Narcan preparation of 400 micrograms /ml.

Opiates accumulate progressively in the unborn baby after administration to the mother. Naloxone 200micrograms IM given to the baby will usually reverse any opiate effect and the effect of this dose lasts up to 24 hours. However, in the neonate, the opiates require a longer time for elimination from the body (up to 48hours) and may outlast the effect of naloxone. Therefore, babies who respond to the single dose of Naloxone need observation in hospital for at least 48 hours to

ensure that they do not succumb to further respiratory depression, once the effect of Naloxone wears off. Careful observations of the respiratory rate need to be made and if the baby has been delivered outside an obstetric unit, transfer to a hospital for continuing observation of the neonate should be arranged.

When to stop resuscitation?

Births in hospital

In a term infant, it is appropriate to consider stopping resuscitation if there is no detectable HR at birth AND there is no HR after 10 minutes of **good quality continuous** resuscitation. In this situation the neurological outcome, should the baby survive, is extremely poor. The decision to continue resuscitation when the heart rate is zero for longer than 10 minutes is often complex and may be influenced by issues such as presumed aetiology of the arrest, gestation of the baby, potential reversibility of the situation and the parent's previously expressed feeling about acceptable risks of morbidity. This issue is now further complicated by the availability of therapeutic hypothermia. Always discuss with the consultant before discontinuing.

The evidence of outcome when the heart rate is <60 / minute at birth and persists after 10-15 minutes of continuous and adequate resuscitative efforts at delivery is insufficient to guide decisions as to whether to withhold or continue resuscitation. This should be decided by an experienced clinician after discussion with the parents and the rest of the professional team.

Births outside an obstetric unit

All resuscitation measures should be continued during transfer to the appropriate neonatal unit.

Any decision to discontinue resuscitation should be made in the receiving hospital by the neonatal doctor and/or after discussion with the neonatal consultant.

When not to start resuscitation?

1. If the baby is obviously macerated or known to have died in-utero.
2. If there are known to be lethal congenital abnormalities and this course of action has to be agreed previously between the Obstetrician and the parents (Although beware!—sometimes antenatal diagnosis may be inaccurate!)
3. A baby of <23 weeks gestation.

NB. *Take care when listening for the heart rate. It is easy to miss a very slow heart rate*

What to do if resuscitation is not effective?

If resuscitation is not effective the following possibilities should be considered:-

1. Check equipment, gas supply, adequacy of oxygen
2. ET tube is not in the trachea – consider visualizing the larynx to confirm if this is the case. Also consider that the tube might be in the right main bronchus. In this situation the air entry on the right is better than on the left. Withdraw the tube to an appropriate length to correct the problem.
3. Consider that the baby may have a pneumothorax – air entry will be unequal and the apex beat may be displaced.
4. Consider that there may be hypoplastic lungs, particularly if there is a history of prolonged rupture of membranes or oligohydramnios or fetal abnormality such as absent kidneys.
5. Consider that there may be another diagnosis such as a diaphragmatic hernia – in this situation the apex beat is usually displaced to the right and the abdomen is scaphoid.

Effectiveness of resuscitation:

Most term infants will not need resuscitation and for the majority who do, the outcome should be satisfactory as long as the steps detailed above are followed. Babies with no risk factors and those who respond quickly to simple steps of resuscitation can be observed closely on postnatal ward. Babies with underlying risk factors who require prolonged resuscitation should be admitted to the neonatal unit.

Following resuscitation:

- Maintain temperature and airway support as required
- Ensure early intravenous access if indicated and maintain normal blood sugar levels.
- The case notes must be completed thoroughly by all staff involved.
- It is also helpful to **record the time at which the heart rate was first noted to be >100/ min, the time of the baby's first gasp and time to establish regular spontaneous breathing.** This gives useful information for prognosis.
- A paired cord arterial and venous blood sample should be obtained to determine the level of acidosis present at birth.
- An early blood gas on the baby will also help to determine the effectiveness of resuscitation. A blood glucose and lactate measurement should be documented with the blood gases.
- All other relevant documentation should be completed e.g. transfer/incident forms.

Talking to parents:

Support, time and information should be given to the parents who will be very distressed by events. It is important that the team caring for the newborn baby informs the parents of the baby's progress. At delivery, adhere to local plans for routine care and, if possible, hand the baby to the mother at the earliest opportunity. If resuscitation is required inform the parents of the procedures undertaken and why they were required. Record carefully all discussions and decisions in the mother's notes prior to delivery and in the baby's records after birth. Where there is a high risk of failure e.g. very preterm babies, or profound fetal distress from an abruption, It is important to counsel parents as to the possibility of unsuccessful resuscitation.

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Appendix 1: Deferred Clamping of the Umbilical Cord

Recommended Practice

1. Clamping of the umbilical cord should be deferred for a **minimum of 60 seconds** unless there are contraindications. Indications include delivery by Caesarean section, instrumental delivery and preterm birth without fetal compromise. If a paediatrician is present or anticipated at delivery the delivering obstetric doctor should discuss cord clamping with the paediatrician.
2. Uterotonics should be given as usual.
3. **It is important to keep the baby warm.** For term and preterm babies over 28 weeks gestation, dry and wrap as soon as the baby is delivered. Keep the baby at or lower than the level of the uterus.
4. For preterm babies under 28 weeks gestation undergoing deferred cord clamping, the obstetrician / scrubbed midwife should put the baby without drying from feet to neck into a sterile plastic bag until the deferred cord clamping procedure is complete. If temperature control measures cannot be ensured, deferred cord clamping should **not** be undertaken.
5. Early cord clamping (less than 30 seconds post delivery) should be undertaken in cases of placenta praevia or morbidly adherent placenta, placental abruption, vasa praevia, or tight nuchal cord. If the neonate is in unexpectedly poor condition at delivery the attending paediatrician may wish immediate access to the infant in which case immediate clamping is appropriate following rapid milking of the cord three times towards the umbilicus.
6. There is no evidence of benefit of deferment beyond 120 seconds. The actual duration of deferment should be recorded in the delivery note / operation note and if early clamping (less than 30 seconds post delivery) takes place, the reason for this variation should be documented for audit purposes.
7. Where there is need for substantial cord blood samples e.g. stem cell harvesting, the risks and benefits should be discussed with the mother and a plan agreed and documented.

8. Audit of practice and outcomes should take place.

Background

- NICE Guidance (2007) is compatible with deferred clamping of the umbilical cord as part of the active management of the third stage. More recent UK and international guidelines from RCOG, ILCOR, UKRC, WHO and FIGO including a Cochrane review of April 2011 and RCOG Statements of April and November 2011 support deferred clamping. Autotransfusion has been found to consistently provide a significant proportion (10-20%) of neonatal blood volume.
- There is strong evidence that this practice reduces neonatal anaemia, reduces respiratory morbidity, improves recovery from sepsis, and there is emerging evidence of long-term benefits for the child.
- There are particular benefits in preterm infants, with outcomes of reduced anaemia, necrotising enterocolitis and intraventricular haemorrhage.
- Umbilical cord gases are minimally affected by deferred cord clamping.

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