

## RESUSCITATION OF THE NEWBORN

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For most newborn babies a clear airway and a warm environment are all that is required. However, 25% of all deliveries are at increased risk of requiring resuscitation, and a further number of babies require resuscitation after a normal birth with no apparent risk factors. For these babies effective and efficient basic and advanced life support must be readily available.

### High Risk Deliveries

These include:

#### *Delivery difficulties*

Fetal distress, meconium staining, abnormal presentation, prolapsed cord, antepartum haemorrhage, forceps or Ventouse deliveries and Caesarean births.

#### *Maternal factors*

Diabetes, drug addiction, fever, heavy sedation, pre-eclampsia or other illness.

#### *Fetal factors*

Multiple pregnancy, preterm labour (<37 weeks), postmaturity, small-for-dates, rhesus disease or fetal abnormality.

#### *Obstetrician or midwife expressing concern*

## Equipment for Resuscitation

- \* Resuscitation surface with tilting mechanism plus dry, warmed towel.
- \* Overhead radiant heater and light
- \* Oxygen source
- \* Clock or watch with minutes and seconds
- \* Equipment to provide intermittent positive pressure ventilation including - a face mask (preferably made of clear material so that the baby's colour can be observed), a paediatric self-inflating bag (500ml) with a blow-off valve set at 40cmH<sub>2</sub>O and an oxygen reservoir.
- \* A supply of appropriately sized Guedel airways
- \* A straight bladed laryngoscope and tracheal tubes of sizes 2.5, 3.0 and 3.5
- \* Suction apparatus (set at 50-100cmH<sub>2</sub>O) with suction catheters sizes 8 and 10.
- \* Drugs - naloxone (400mcg/ml or 20mcg/ml), vitamin K<sub>1</sub> and adrenaline.

## Basic Life Support

Immediately after delivery, any excess fluid should be wiped off the baby. The baby should then be wrapped in a warm, dry towel. When pink and breathing regularly the baby should be handed back to the mother.

Those babies not responding to being touched, for whatever reason, should be transferred immediately to the resuscitation area, under a radiant heater

and the clock started. The baby should be placed flat or slightly head-down, with the head in the neutral position.

### Administration of Oxygen and Assisted Ventilation

If the baby is breathing inadequately, oxygen should be given immediately, initially just blown over the face. If the breathing is persistently shallow or is absent or the heart rate is less than 100, bag and mask ventilation should be performed.

A transparent, soft face mask covering the baby's face from the bridge of the nose to the cleft of the chin should be used (figure 1). A rate of about 30-40 breaths/minute with pressures of up to 30cm H<sub>2</sub>O is usually sufficient; however, a higher pressure may be required for the first few breaths to expand the lungs. This can be achieved by obstructing the pressure relief valve. An oxygen concentration of 100% should be used.

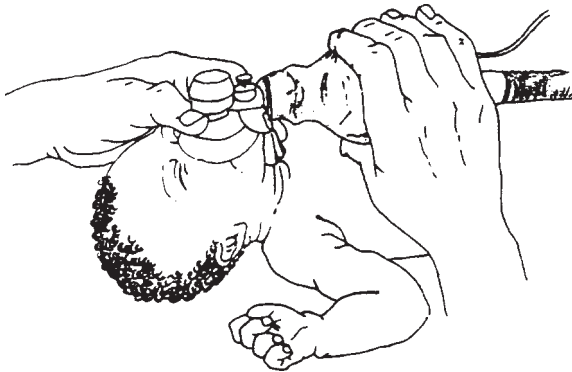


Figure 1. Transparent, soft face mask.

If there is not adequate expansion of the chest, the head should be repositioned and/or a Guedel airway inserted. Babies requiring mask ventilation for more than two minutes should have an orogastric tube inserted, aspirated and then removed to minimise gastric inflation.

For the healthy baby suctioning of the mouth and nasopharynx is not required. However, if there are copious secretions or meconium this may be important. (Meconium aspiration - see later). Vigorous suctioning in the healthy baby may lead to bradycardia and laryngospasm, and delay the onset of respiration.

## Advanced Life Support

### Indications for Tracheal Intubation

1. Difficulty in ventilation by mask
2. Prolonged bag/mask ventilation
3. Continued bradycardia during bag/mask ventilation
4. During external chest compression (ECC)
5. Meconium aspiration (see later)

Prolonged attempts at intubation should be avoided. Most newborn babies can be successfully oxygenated by bag and mask, while experienced help is requested.

All equipment should be available on the resuscitation trolley including tracheal tubes :

- size 2.5 for < 750g (<26 weeks)
- size 3.0 for 750-2000g (26-34 weeks)
- size 3.5 for >2000g (34 weeks +)

Use a Cole's tube or a straight sided tube (uncut or cut to 9 or 10cm). If a Cole's tube is used, it should be exchanged for a straight sided tracheal tube if ventilation is to be continued after initial resuscitation to avoid possible airway damage.

During intubation the baby's head should be in the neutral position, the laryngoscope blade should be positioned either in the vallecula or posterior to the epiglottis and the tracheal tube should be inserted with 2.0cm beyond the cords (figures 2 and 3).

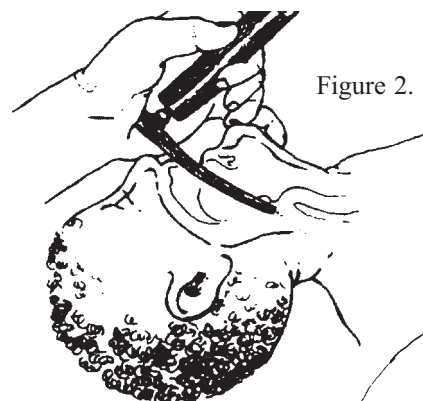


Figure 2.

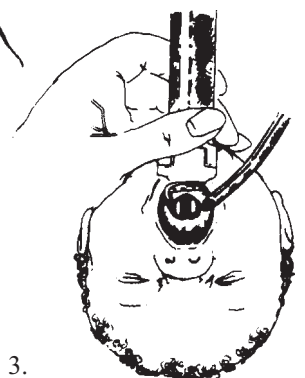


Figure 3.

The chest should be examined for bilateral movement and this confirmed by listening with a stethoscope. If there is air entry on one side only, the tube is probably in the right main bronchus and should be withdrawn slowly until bilateral air entry is heard. If no air entry is heard and the baby remains blue and bradycardic the intubation is likely to have been oesophageal. The baby should be extubated immediately and 100% oxygen administered by bag and mask before re-intubation. If there is any doubt about the position of the tracheal tube it should be removed. Attempts at intubation should only take 20-30 seconds.

The first few inflations may require higher pressures, sustained for at least one second. The pressure relief valve may need to be obstructed (with care!) for a few inflations. When the tracheal tube is in the correct position it should be firmly secured. If the tube is to remain in place following resuscitation, its position should be confirmed, preferably by chest X-Ray.

As soon as the baby's colour improves, the oxygen concentration should be reduced to minimise the risk of retinopathy.

### External Chest Compression (ECC)

If the baby has a bradycardia of less than 60-80 beats per minute, it must be oxygenated by bag and mask, or intubated and external cardiac massage started (figure 4).

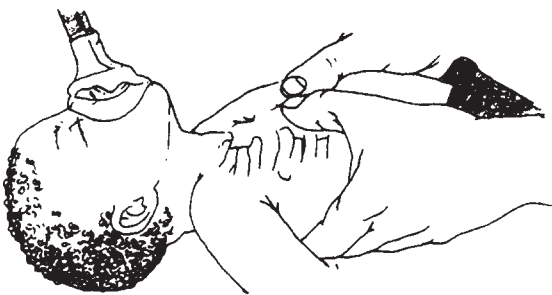


Figure 4. Oxygenation by bag & mask and external cardiac massage.

This can either be with the tips of two fingers over the junction of the middle and lower thirds of the sternum, or with the hands around the chest, compressing the sternum with two thumbs at a rate of 100-120 bpm, to a depth of 2cm. If the ventilation is by bag and mask, the ECC and ventilation should be coordinated in a 3:1 ratio (figure 5).

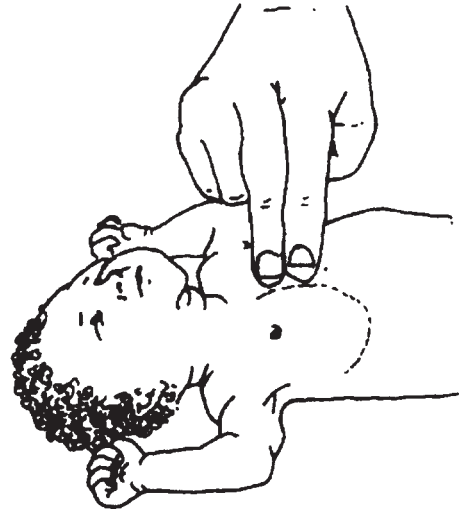


Figure 5. Two finger external cardiac massage

This should be continued until a heart rate of > 100 and spontaneous respirations have occurred. Resuscitation efforts should not be continued beyond half an hour unless the baby is making at least occasional respiratory efforts.

### Drugs

**Adrenaline:** if after 10-15 seconds of ECC there is no response the baby should be given 10mcg/kg (0.1ml/kg of 1:10000) adrenaline. This can be given via an umbilical venous catheter, via a peripheral vein, or, less efficiently down the tracheal tube.

**Sodium bicarbonate:** 3 mMol/kg over 2-3 minutes through an umbilical catheter if there is no response to ECC and effective ventilation. A 4.8% solution (8.4% mixed with an equal volume of 10% dextrose) should be used (0.5 mMol/ml), given at a rate not exceeding 2.0ml/min.

**Naloxone:** 10 mcg/kg intravenously or 60 mcg/kg intramuscularly should be given to all babies whose respiration is depressed by the use of opiates in the mother pre delivery.

**Glucose:** administration should be considered after prolonged resuscitation, as glycogen stores may be depleted. Give 5ml/kg of 10% dextrose.

Drugs are very much a last line measure in resuscitation of the newborn, and should only be used after ensuring that the baby is well oxygenated.

### Failure to Respond to Resuscitation

If resuscitation is not succeeding, the tracheal tube position should be rechecked, and airway pressure increased. The possibility of pneumothorax, intrauterine infection or unrecognised hypovolaemia should be considered. Rarer causes of poor response include the presence of congenital anomalies such as choanal atresia, diaphragmatic hernia or pulmonary hypoplasia.

### Meconium Aspiration Syndrome

The cords should be visualised in all babies where meconium has been seen in the amniotic fluid before delivery. The nose and mouth should be suctioned on the perineum as soon as the head has been delivered, and after transfer to the resuscitation surface, the pharynx should be suctioned under direct vision. If there is thick meconium in the larynx, the trachea should be intubated and suctioned via a catheter, or the endotracheal tube removed while being suctioned directly. This can be continued, unless the heart rate falls below 60 bpm, until there is no more present. In this situation only, the baby should not undergo bag/mask ventilation as a first line procedure.

### Preterm Resuscitation

Babies less than 32 weeks may do better if a more active resuscitation policy is adopted. However there is no proof that routine intubation of all very preterm babies leads to decreased morbidity. In fact unskilled intervention in a lively preterm baby may predispose to interventricular haemorrhage.

### Apgar Scoring

Apgar Scoring is a means of scoring the severity of the asphyxia. A score of 0, 1, or 2 is given to five parameters; heart rate, respiratory effort, muscle tone, response to stimulation and colour. It is usually determined at one and five minutes and at eight minutes if the scores are low. It should be repeated at 5 minute intervals until a score of 7 is reached. Particular emphasis should be placed on the heart rate and respiratory effort.

Resuscitation should never be postponed to calculate the Apgar score.

Table 1. Apgar scoring				
	0	1	2	
Heart Rate	Absent	≤100	>100	
Respiratory Effort	Absent	Weak, cry or shallow	Good strong cry	
Muscle Tone	Limp	Some flexion	Active well flexed	
Reflex/Irritability	None	Grimace	Cry	
Colour	Pale/blue	Body pink Extremities blue	Pink	

In conclusion, most babies require no resuscitation at birth and can be handed directly to the mother. Those that do require resuscitation, almost always require only drying and being kept warm, suction, and facial oxygen, or possibly bag and mask ventilation for a few breaths. Intubation and the administration of drugs are very rarely required, but should be readily available, especially for high risk births.