ABC of Resuscitation

A D MILNER

RESUSCITATION AT BIRTH

High risk deliveries

<i>Delivery</i>	<i>Fetal</i>
Fetal distress	Multiple pregnancy
Abnormal presentation	Preterm
Prolapsed cord/antepartum haemorrhage	Small for dates
Meconium staining	Rhesus isoimmunisation
High forceps	Abnormal baby
<i>Maternal</i>	<i>Obstetrician</i>
Heavy sedation	Worried!
Drug addiction	
Diabetes	
Chronic illness	

The priority of all those responsible for the care of babies at birth must be to ensure that adequate resuscitation facilities are available. Sadly, some babies have irreversible brain damage by the time of delivery, but it is unacceptable that any damage should occur after delivery because equipment is inadequate or staff insufficiently trained.

All babies at increased risk should be delivered in a unit with full respiratory support facilities. These deliveries must always be attended by a doctor who is solely responsible for the care of the baby and skilled in resuscitation. Whenever possible there should also be a trained assistant who can provide additional help if necessary. The list of babies at increased risk is relatively long—they make up about 25% of all deliveries—and will include about two thirds of those requiring resuscitation. The remaining one third of resuscitations occur in babies born after a normal uneventful labour who have no apparent risk factors. Therefore labour ward staff must be able to provide adequate resuscitation until further help can be obtained.

Equipment

The padded platform on which the baby is nursed can be either flat or have a head down tilt. Wall mounting is satisfactory and certainly cheaper than the trolley models, provided, of course, that a unit is available for each delivery area. It is essential to have an overhead heater with an output of 3-500 watts, mounted about 1 metre above the platform. This must have a manual control as servo systems are slow to set up and likely to malfunction when the baby's skin is wet. These heaters are essential, as even in environments of 20-24°C the core temperature of an asphyxiated wet baby can drop by 5°C in as many minutes. Facilities must be available for manual face mask resuscitation, endotracheal tube resuscitation, and umbilical vein catheterisation. Additional equipment includes an overhead light, a clock with a second hand, suction equipment, a stethoscope, and preferably an electrocardiographic monitor.

Equipment for resuscitation

Padded shelf	Clock	Face mask system
Overhead heater	Stethoscope	Endotracheal tube
Overhead light	Electrocardiographic monitor	system (2.0-3.5 mm)
Oxygen cylinder (± wall supply)	Laryngoscope	Umbilical vein catheter set
Suctions (50-100 cm H ₂ O)		Syringes—1, 10, 20 ml

Procedure at delivery

In most units it is standard policy to suck out the pharynx as soon as the face appears, using either a mucous extractor or a suction catheter. This is almost always unnecessary, unless the amniotic fluid is meconium or blood stained. Aggressive pharyngeal suction can also delay the onset of spontaneous respiration for a considerable time. Once the baby is delivered the attendant should wipe any excess fluid off the baby, using a warm towel to reduce evaporative heat loss, at the same time examining the child for major external congenital abnormalities, such as spina bifida and severe microcephaly. Most babies will start breathing during this period, as the median time for the onset of spontaneous respiration is only 10 seconds. They can then be handed to their parents. If necessary the baby can be encouraged to breathe by skin stimulation—for example, flicking the baby's feet. Those not responding must be transferred immediately to the Resuscitaire.

Resuscitation procedure

Check first for respiratory efforts. If these are present and perhaps vigorous but producing no tidal exchange the airway is obstructed. This can often be overcome by extending the baby's neck. If the baby has choanal atresia or Pierre Robin syndrome (cleft palate and micrognathia) obstruction will continue until an airway is inserted.

If respiratory efforts are feeble or totally absent count the heart rate over 10-15 seconds using the stethoscope. When the heart rate is over 80 beats/min it is sufficient to repeat skin stimulation and if this fails to proceed to face mask resuscitation.

Face mask resuscitation—Only face masks consisting of a soft continuous ring provide an adequate seal. Most standard neonatal manual resuscitation devices fail to produce adequate tidal exchange when the pressure limiting device is unimpeded. Thus, a satisfactory outcome almost always depends on the inflation pressure stimulating the baby to make inspiratory efforts (Head's paradoxical reflex). This poor performance is related to the short inspiratory time (one third to half a second) provided by the devices. Tidal exchange can be increased by using a 500 ml rather than a standard 250 ml reservoir, which allows inflation pressure to be maintained for one second.

More satisfactory tidal exchange can be achieved by bleeding oxygen directly into the face mask at 4-6 l/min and occluding the outlet from the face mask as if it were an endotracheal T piece. Obviously it is essential to incorporate a pressure valve into the inspiratory lines so that the pressures cannot exceed 30 cm H₂O. The baby's lungs can then be inflated at rates of about 30 per minute, allowing 1 second for each part of the cycle. Listen to the baby's chest within 5-10 inflations to check that there is bilateral air entry and that the heart rate is satisfactory. If the heart rate falls below 80 beats/min proceed immediately to endotracheal intubation.

Endotracheal intubation—Most non-anaesthetists find a straight bladed laryngoscope preferable for performing intubation. This must be held in the left hand and the baby's neck gently extended, if necessary by the assistant. Pass the laryngoscope down, making sure that it is in the mid line, until the epiglottis comes into view. The tip of the blade can then be positioned either proximal to or immediately over the epiglottis so that the cords are brought into view. Gentle backward pressure may need to be applied over the larynx at this stage. As the airway tends to be fluid filled the upper airway may have to be cleared with the suction catheter held in the right hand.

Once the cords are visible pass the endotracheal tube, using the right hand, and remove the laryngoscope blade, taking care that this does not displace the tube out of the larynx. Then attach the endotracheal tube either to a T piece system, incorporating a 30-40 cm H₂O blow off valve in the inspiratory line, or to a neonatal manual resuscitation device. If a T piece is

Drugs for emergency use

Sodium bicarbonate	— 8.4%
Dextrose	— 10%
Adrenaline	— 1/10 000
Naloxone	— 200 µg

used maintain the initial inflation pressure for two to three seconds, which will help lung expansion. The baby can subsequently be ventilated at a rate of 30 per minute, allowing about 1 second for each inflation.

Inspect the chest during the first few inflations, looking for evidence of chest wall movement, and confirm by auscultation that oxygen is entering both lungs. If there is no air entry the most likely cause is that the endotracheal tube is lying in the oesophagus. If this is suspected remove the endotracheal tube immediately and reintubate. If auscultation reveals that oxygen is entering only one lung, usually the right, try withdrawing the endotracheal tube by 1 cm while listening over the left lung. If this leads to dramatic improvement the tip of the endotracheal tube was lying in the right main bronchus. If there is no improvement the possible causes include pneumothorax, diaphragmatic hernia, or pleural effusion.

Severe bradycardia—If the heart rate falls below 30 beats/min external cardiac massage must be started by compression over the junction of the lower and middle third of the sternum, using the tips of two fingers or by placing a hand round the chest and compressing it between the thumb and fingers at a rate of 100-120 compressions per minute. This will achieve about three compressions for every ventilation. If there is no dramatic improvement within 10-15 seconds the umbilical vein should be catheterised using a 5 French gauge catheter. This is best achieved by transecting the cord 2-3 cm away from the abdominal skin and inserting a catheter until there is a free flow of blood up the catheter. The baby should then be given 3 mmol of sodium bicarbonate per kg body weight over two to three minutes. This is best provided by mixing 8.4% solution mixed with an equal volume of 10% dextrose, injecting a total of 20 ml to a term baby and 10 ml to a small baby, while continuing external cardiac massage and intermittent positive pressure ventilation. Those who fail to respond or who are in asystole require 1 ml of 1 in 10 000 adrenaline. This can be given either intravenously or injected directly down the endotracheal tube.

It is reasonable to continue with this regimen for 20 minutes, even in those who are born in apparent asystole, provided a fetal heart beat was noted within 15 minutes of delivery. Resuscitation efforts should not be continued beyond half an hour unless the baby is making at least intermittent respiratory efforts.

Intravenous naloxone (40 µg) should be given to all babies who become pink and have an obviously satisfactory circulation on resuscitation but fail to start adequate respiratory efforts. There is often a history of recent maternal opiate sedation. Some authorities recommend that an additional 200 µg should be given intramuscularly to prevent relapse.

Meconium aspiration—Direct laryngoscopy should be carried out immediately after birth whenever there is meconium staining. If this shows meconium in the pharynx and trachea intubate the child immediately and place a piece of gauze over the open end of the endotracheal tube. Then suck up the free fluid while removing the endotracheal tube and then reintubate. Provided the baby's heart rate remains about 60 beats/min this procedure can be repeated until meconium is no longer recovered.

Preterm resuscitation

Babies with a gestation of greater than 32 weeks do not differ from full term babies in their requirement for resuscitation. Under this gestation they may have a lower morbidity and mortality if a more active intervention policy is adopted. There is, however, no evidence that a rigid policy whereby all babies with a gestation of less than 28 or 30 weeks are routinely intubated leads to improved outcome. Indeed, unless the operator is extremely skilful, intervention may produce severe hypoxia in a previously lively pink baby and produce conditions which may well predispose to intraventricular haemorrhage. A reasonable compromise would therefore seem to be to start face mask resuscitation at 15-30 seconds unless the baby has entirely adequate respiratory efforts and to proceed to intubation if the baby has not achieved satisfactory respiratory efforts by 30-60 seconds.

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