

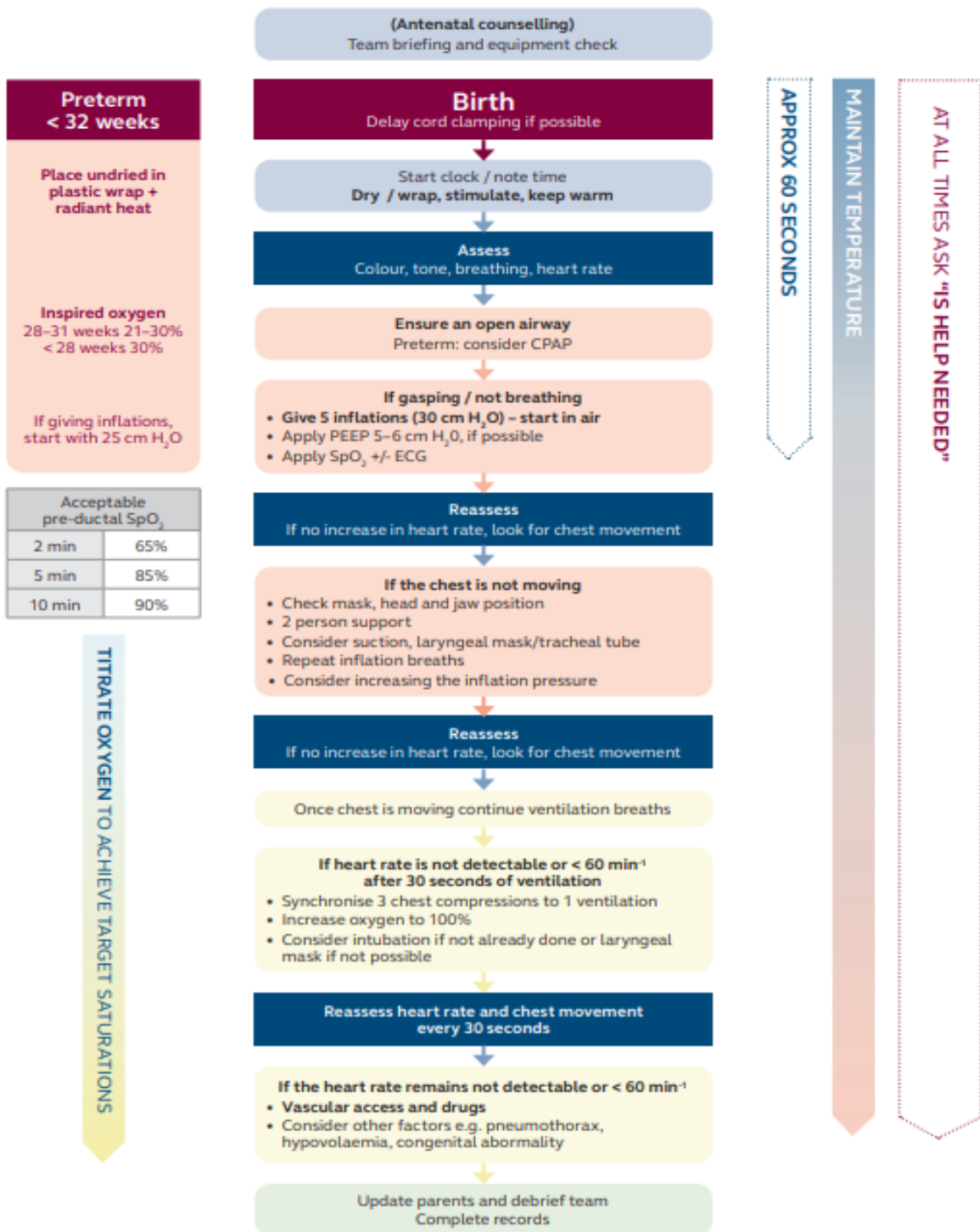
Resuscitation of the Newborn - Full Clinical Guideline

Reference no.:CG-NICU/3174/23



GUIDELINES
✓ 2021

Newborn life support



1. Introduction

To ensure a standardised approach to resuscitation of newborn babies

2. Aim and Purpose

For midwifery, medical and nursing staff to optimise the outcome of babies requiring resuscitation

3. Definitions, Keywords

ANNP	- Advanced Neonatal Nurse Practitioner
ETT	- Endotracheal Tubes
FBS	- Fetal Blood Sample
FH	- Fetal Heart
GA	- General Anaesthetic
NNU	- Neonatal Unit
PEEP	- Positive End Expiratory Pressure
PIP	- Positive Inspiratory Pressure

4. Key Responsibilities/Duties

The identified lead clinician acts as the link paediatrician for the labour ward and neonatal service, who is responsible for the clinical standards in relation to care of the newborn.

A clinician (doctors, advanced neonatal nurse practitioner, midwives) with advanced neonatal life support skills (including endotracheal intubation) are always available on site.

A consultant paediatrician (or equivalent staff and associate specialist grade) who are trained and assessed competent in advanced neonatal life support to be available to attend as required within 30 minutes

* **When emergency Neonatal resuscitation is required Ring 2222.**

- **Clearly state your location and ask for the NEONATAL resus team**
- **2 members of local staff are to provide basic life support whilst awaiting assistance.**

When further help needed the neonatal consultant on call should be asked to attend. If not in the hospital, they can be contacted through switchboard who have home/mobile phone contact numbers.

5. Resuscitation equipment

Neonatal Resuscitaires are available on Labour Ward, Postnatal ward (Ward 314 RDH, Ward 11 QHB), NNU and the Children's Emergency Dept (which is alongside the adult Emergency Dept). A Resuscitaire would be brought down for labour ward when required in QHB Emergency Department. See Appendix A & B.

A Laerdal, Guedel airways in 3 sizes and a plastic Bag are available within the emergency bags for the On Call Primary Care Midwives. These are monitored through the community on call daily check list.

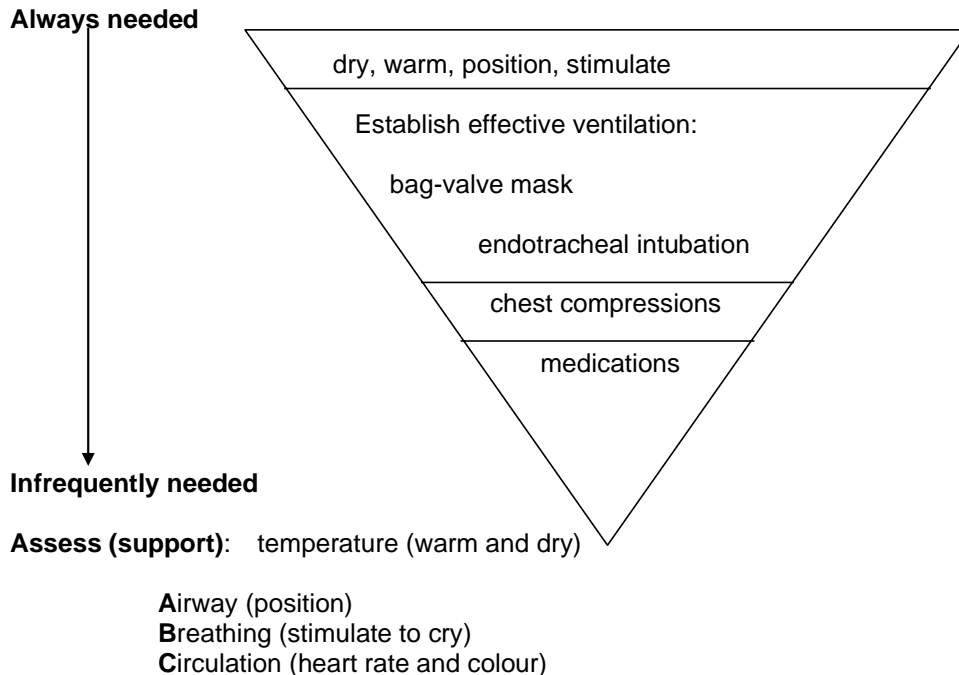
Availability and monitoring of the equipment follows the [Trust Policy and Procedure for Resuscitation POL-CL/1185-024/08 \(Appendix 2\)](#)

6. Overview

Term infants requiring resuscitation often respond to simple measures:

- Dry
- Warm
- Mild skin stimulation

An inverted pyramid illustrates the relative frequencies and priorities of neonatal resuscitation



7. ANTICIPATING problems and communication are the keys to effective resuscitation.

A paediatrician / Advanced Neonatal Nurse Practitioner should be present wherever problems may occur:

- Preterm deliveries < 36 weeks completed gestation (a pre delivery consultation will occur)
- Emergency caesarean section deliveries
- Instrumental delivery (Kiellands/Ventouse/Forceps for suspected fetal compromise)
- Assisted Vaginal Breech birth
- Suspected Fetal Compromise
- Significant Meconium – [*dark green or black amniotic fluid that is thick or tenacious, or any Meconium stained amniotic fluid containing lumps of meconium-NICE CG190*]
- Expected major fetal abnormality
- Concern for other reasons e.g. maternal drug addiction, pre-eclampsia
- Multiple births
- Elective Caesarean section under general anaesthetic (GA)
- Low lying anterior placenta praevia
- Shoulder dystocia
- Cord prolapse
- 'Flat' baby (primary/terminal apnoea)

A paediatric registrar or above should be called if loss of FH prior to delivery Paediatric attendance will not routinely be required for:

- Elective caesarean section under spinal anaesthetic (unless fetal compromise suspected)
- Instrumental delivery without suspected fetal compromise (except rotational forceps)
- Non-significant meconium

8. Practical aspects of resuscitation

8.1. Before delivery

Check resuscitaire and equipment:

- Heater on
- Oxygen supply connected and set appropriate for gestation
 - Term and infants ≥ 32 weeks Air (21%)
 - 28-32 weeks: 21 – 30% FiO₂
 - <28 weeks: 30% FiO₂
- Bag and mask T piece present
- Set PIP pressure appropriate for gestation (Term; 30cm H₂O, < 32weeks; 25cm H₂O)
- Set PEEP of 5-6cm H₂O
- Laryngoscope illuminating effectively
- Plastic bag for babies <32 weeks gestation

8.2. At Delivery

This section assumes there is no meconium-stained liquor.

- Start clock
- Transfer baby to resuscitaire
- Dry baby and wrap in warm towel
- Assess condition and appropriateness for delayed cord clamping

Breathing: rate and quality

Heart rate: listen to the apex beat with a stethoscope, palpate the brachial or femoral pulse

Colour: look at the trunk, lips and tongue – note if the baby is centrally pink, cyanosed or pale. Peripheral cyanosis is common and in itself does not indicate hypoxaemia

Tone: Is baby floppy or active with well flexed limbs

After assessing colour, tone, breathing and heart rate, resuscitation should follow the neonatal resuscitation algorithm FLOW chart on page 1

8.3. Classification according to initial assessment

Transition	Assessment	Actions
Satisfactory transition: <ul style="list-style-type: none"> • Good tone • Vigorous breathing or crying • HR ≥ 100/min 	<ul style="list-style-type: none"> • Breathing does not require support • HR is acceptable 	<ul style="list-style-type: none"> • Delay cord clamping for at least 60 secs • Dry, wrap to keep warm and keep with mother • Early skin to skin care if stable
Incomplete transition: <ul style="list-style-type: none"> • Reduced tone 	<ul style="list-style-type: none"> • Breathing requires 	<ul style="list-style-type: none"> • Delay cord clamping only if able to

<ul style="list-style-type: none"> • Inadequate breathing or apnoeic • HR slow <100/min 	<p>support</p> <ul style="list-style-type: none"> • Slow HR may indicate hypoxia 	<p>appropriately support infant</p> <ul style="list-style-type: none"> • Call for help • Dry, stimulate, wrap to keep warm • Open airway – inflate lung and ventilate • Assess response in heart rate and breathing • Apply saturation probe
<p>Poor / failed transition:</p> <ul style="list-style-type: none"> • Floppy, Pale • Inadequate breathing or apnoeic • HR very slow <60/min 	<ul style="list-style-type: none"> • Breathing requires support • Very Slow HR may suggest significant hypoxia 	<ul style="list-style-type: none"> • Delay cord clamping only if able to appropriately support infant • Call for help • Dry, stimulate, wrap to keep warm • Open airway – inflate lung and ventilate • Assess response in heart rate and breathing • Apply saturation probe

8.4. On-going care Post Resuscitation

- If there is prompt response to resuscitation, admission is not usually required. However, consider admission carefully if other markers suggest significant fetal compromise e.g. FBS or Cord gas with a pH ≤ 7.0 or BE ≥ -12 and discuss with senior colleague if in doubt
- Where the clinical picture at birth was poor and the infant responds to resuscitation, admission to the NNU for ongoing care is indicated

9. ABC of Resuscitation (See Flow chart page 1)

9.1. Temperature control

- Keep the baby dry and warm

This reduces the risk of hypoglycaemia acidosis and minimises oxygen consumption

9.2. Airway

- Position baby face upwards with head in the neutral position.
- Additional airway opening manoeuvres (jaw thrust or oral airway) may be required.
- If airway thought to be blocked e.g. blood clot or thick meconium, suction under direct vision with a negative pressure of 5-10 kPa to gently clear airway.
- Avoid deep pharyngeal suction as vagal stimulation can cause bradycardia or laryngospasm

9.3. Breathing

9.3.1. Mask ventilation

Indication:

- Shallow irregular respiration with heart rate <100/minute and falling
- Apnoea

Choose a mask big enough to cover the face from the bridge of the nose to below the mouth.

On resuscitaires ensure the T-piece system is connected to the O2 outlet. If using a resuscitaire with an option for air/ O2 blending, set initial mixture to appropriate for gestation (see 8.1) and adjust according to clinical response. Ensure blow off valve on resuscitaire is set at the correct pressure for gestation (see 8.1). The hole on the connector is occluded with your finger to allow the pressure to build up and ventilation is delivered by releasing and re-occluding the hole on the connector at the desired rate.

The initial (inflation) breaths delivered are to achieve a resting lung volume. An appropriate inflation pressure applied for 2-3 seconds and repeated 5 times will adequately aerate the lungs of most babies. Subsequent (ventilation) breaths should be given at around 30 breaths/minute.

If the chest is not moving, reposition baby and ensure airway is open and repeat process.

If using a self-inflating bag with the mask, the circuit is usually connected to the auxiliary O2 outlet on the resuscitaire that delivers just O2. Ensure the reservoir is attached to the bag. The bag usually has a blow off valve that operates at 30-40cm H₂O. If a greater inflation pressure is necessary, put your finger on top of the valve to override it. Squeeze bag to achieve adequate chest expansion and establish a rate of 30-40 breaths/minute.

9.3.2. Tracheal intubation

Indication:

- Asystole or apnoea that does not respond promptly to bag and mask ventilation

For small babies use size 2.5 mm (ETT)

For term babies use 3.0-3.5 mm ETT

- To be done by competent Paediatrician and confirm intubation using Co2 detector

Hold the first inflation for 2 or 3 seconds to allow proper expansion of the lungs and establish a functional residual capacity. After the first few breaths establish a rate of 30-40 per minute with inspiratory times of approximately 0.5-1s. If there is poor chest movement the pressure can be increased sequentially up to 40 cm H₂O.

Following intubation check for:

- bilateral chest movement
- breath sounds bilateral and equal on auscultation
- absence of breath sounds over the stomach

9.3.3. Resuscitation using Auto breath infant Resuscitator (Derby site only)

For resuscitation of the extremely preterm infant or during a prolonged resuscitation, the paediatricians may decide to use the Autobreath facility when available. This should ONLY be used by an experienced operator. See appendix A

9.4. Circulation

9.4.1. Cardiac compression

Indication:

- heart rate <60/minute despite effective ventilation

This may be performed in one of two ways:

Encircle chest with both hands so that fingers lie behind the baby and thumbs are opposed over the mid-sternum.

Place two fingers over sternum 1 cm below the inter nipple line.

Depress sternum at a rate of 90 compressions/minute to 1/3 the depth of the chest. Give three chest compressions for every breath, which will be 30 breaths a minute and reassess after 30 seconds

9.5. Drugs

Indication:

- If the heart rate remains below 60/minute despite airway control, effective ventilation, and effective chest compressions for 30 seconds.

Adrenaline

- Intravenous (via umbilical venous catheter) is preferred route, intraosseous is an alternative
- Intra-tracheal (down the endotracheal tube if intubated and no other access available)
- **Doses: 20 mcg/kg (0.2 ml/kg of 1:10,000) intravenously or 100 mcg/kg (1ml/kg of 1:10,000) via endotracheal tube.**
- Adrenaline 20 mcg/kg Intravenous is given every 3-5 minutes if there is no response and HR remains < 60/min.

Glucose

- In a prolonged resuscitation to reduce likelihood of hypoglycaemia
- **Dose 2.5ml/kg 10% Glucose solution intravenous or intraosseous**

Volume replacement

- Indicated if no response to resuscitation especially if any evidence of hypovolaemia. Use 0.9% saline or group O Rh negative blood when significant acute blood loss is suspected
- **Doses: 10 ml/kg over 5-10 minutes intravenous or intraosseous**

Sodium bicarbonate

- May be considered in a prolonged unresponsive resuscitation to reverse intracardiac acidosis.
- **Doses: 1-2 mmol/kg (2-4ml/kg of 4.2% solution) by slow intravenous injection**

Naloxone

- Indicated only for persisting apnoea related to maternal opiate analgesia in an otherwise well baby.
- It does not improve cardiac performance and should not be given to an asphyxiated baby or a baby whose heart rate is <60/minute or if mother is opiate dependent.
- **Doses: 200mcg or alternatively 60mcg/kg intramuscular as a single dose**

10. Actions in event of poor initial response to resuscitation

1. Check for technical fault
 - is oxygen connected?)
 - is ETT in the trachea?) If in doubt
 - is ETT down one bronchus?) remove ETT
 - is ETT blocked?) and replace ETT
 - check blow off valve set at 30cms H₂O)
 - check flow rate of oxygen at 8 -10L/min.)

2. Does the baby have a lung pathology
 - pneumothorax
 - diaphragmatic hernia
 - hypoplastic lungs
 - hydrops

3. If the baby has good chest movement has there been:
 - fetal haemorrhage: consider plasma or group 0 Rh -ve blood 10-20 mls/kg.
 - has there been severe asphyxia.

11. Resuscitation of the preterm infant

Preterm babies are likely to be deficient in surfactant and may require relative higher inflation pressures than term babies. Start resuscitation with a pressure of 25 cm H₂O water but increase if this does not produce satisfactory chest wall movement

12. When should resuscitation be stopped

- The need for continuing resuscitation should be reviewed when the heart rate has been undetectable for > 10mins after delivery, taking into account clinical factors and effectiveness of resuscitation
- Stopping resuscitation should be discussed and occur if there has been no response after 20 minutes and reversible problems have been excluded. This decision should be made by a senior paediatrician in agreement with team members.

13. APGAR Score

This will be assessed and recorded in the neonatal and maternal notes

14. Paired Cord Blood samples

If any baby is delivered with anticipated or unexpected fetal distress, paired cord blood samples should be taken at the time of birth, or as soon after as possible. Please consider sending the placenta for histology and examination if the cause of fetal distress is unknown. Also consider a maternal Kleihauer if fetal anaemia is suspected. See also Fetal monitoring in labour guideline

15. Documentation and Discussion

The actions taken including timings and the outcome of the resuscitation should be documented in the neonatal notes or **Neonatal Resuscitation Documentation Form** for babies requiring post basic airway manoeuvres (**See Appendix D**). This should also include discussions with the parents. Early discussion and explanation with parents regarding neonatal resuscitation is paramount.

16. Home Birth

Equipment available: (full list available [Trust Policy and Procedure for Resuscitation POL-CL/1185-024/08 \(Appendix 2\)](#))

- Guedel airways – 3 sizes
- Ambubag with face masks – 2 sizes
- Disposable laryngoscope
- Plastic bag (for use if <32 weeks gestation). Once placed in the bag, where possible the baby should be placed ideally skin[bag] to skin with the mother.

Identify a safe area for resuscitation and ensure surroundings are warm

Breathing: rate and quality

Heart rate: listen to the apex beat with a stethoscope, palpate the brachial or femoral pulse

Colour: look at the trunk, lips and tongue – note if the baby is centrally pink, cyanosed or pale. Peripheral cyanosis is common and in itself does not indicate hypoxaemia

Tone: Is baby floppy or active with well flexed limbs

After assessing colour, tone, breathing and heart rate, resuscitation should follow the neonatal resuscitation algorithm FLOW chart on page 1 and section 8.3

Babies in Incomplete or poor/failed Transition (8.3 Table) are likely to require further help.

- **Call for paramedic support for transfer to hospital**
- **Communicate with labour ward co-ordinator / NNU**
- **Do not move until baby stable enough to transport or if directed by the neonatal consultant**

Meconium

To proceed with standard NLS approach and if unable to move the chest despite airway manoeuvres, then consider suction under direct vision. See guideline: Management of the neonate with meconium-stained liquor in all care settings

17. Staff Training

The expectations in relation to staff training are identified in the maternity service's [training needs analysis](#): see Training Needs Analysis guideline.

18. References

- Newborn resuscitation and support of transition of infants at birth Guidelines. Resuscitation Council UK 2021
- UHDB Trust Policy and Procedure for Resuscitation POL-CL/1185-024/08

19. Documentation Controls

Reference Number CG-NICU/4127/23	Version: 1		Status Final	
Version / Amendment History	Version	Date	Author	Reason
	1	July 2022	Dr B Subramaniam Dr D Muogbo	Joint UHDB guideline and updated in line with RCUK 2021. Replaces guideline WC/OP/56N & Neonatal/03:16/R3
Intended Recipients: All staff with responsibility for care of the newborn.				
Training and Dissemination: Cascaded electronically through senior sisters/midwives/doctors Published on Intranet Training through mandatory Study Day				
Development of Guideline: Dr Bala Subramaniam/Dr D Muogbo Job Title: Consultant Neonatologist/Consultant Paediatrician				
Consultation with: Resuscitation Group, maternity guideline group, paediatric pharmacists				
Linked Documents: Meconium stained liquor guideline Trust Policy and Procedure for Resuscitation				
Keywords: Neonatal, Newborn, resuscitation, life support, NLS				
Business Unit Sign Off			Group:Paeds BU Date:Feb 23	
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Date of Upload			March 2023	
Review Date			March 2026	
Contact for Review			Dr B Subramaniam, Dr D Muogbo	

Appendix A

Resuscitaire Equipment Checklist**Top of Resuscitaire**

Equipment (Resuscitaire Pack 1)	Quantity
Child Bag & Mask, size 1 & 0 face mask	1
Face masks sizes 00	1
Oxygen tubing with T-piece connected	1
Suction tubing with 10ch suction catheter attached	1
Yankauer suction catheter	1
Laryngoscope, miller straight blade size 0 (single use)	1
Laryngoscope, miller straight blade size 1 (single use)	1
Paediatric Stethoscope	1
Baby towels	2

Main Drawer

Equipment	Quantity
Oxygen tubing - Corrugated White	1
FOR AUTOBREATH ONLY - Drager medical Breathing circuit (preterm) ONLY TO BE USED BY SENIOR PAEDIATRICIAN	1 in box in drawer
Suction tubing	1
Suction catheters - sizes 8ch & 10ch	5 of each
Cord clamps	2
Identification bands	2
Assorted hats - various sizes	

Resuscitaire Pack 2

Contents	Quantity
Plastic bag or plastic neowrap for preterm infant <32 wks	1
ET tube size 2.5 mm	1
ET tube size 3.0 mm	1
ET tube size 3.5 mm	1
ET tube introducer - small 2.0 mm	1
Scissors	1
Spare face masks 1, 0, 00	1 of each size
Airways sizes 000, 00, 0	1 of each size

Checks and stocking of equipment must be carried out once daily and recorded on the appropriate checklist on labour ward.

Appendix B

Emergency Neonatal Resuscitation Checklist

Top of trolley

Equipment
Laminated copies of content
Checklist - Signatures
Drugs & dosages for neonatal use plus ETT length / size guide
Neonatal Resuscitation Documentation Forms

Drawer 1

Equipment	Quantity
UVC insertion kit (blades x2, forceps, blue bung, umbilical tie, chlorhexidine 0.05%, tape for securing)	1
Box containing 0.9% NaCl	1
Box containing water for injection	1
UVC's size 4 & 5	3 of each
Sterile Gauze	2
Sterile fields	2

Drawer 2

Equipment	Quantity
Resus drug box	1
0.9% NaCl 500 ml	1
10% Glucose 500 ml	1

Drawer 3

Equipment	Quantity
Box containing assorted needles, rapid dispenser valve, sterets	2 of each
Box containing assorted cannulas, bloodletting needles,	2 of each
Assorted blood bottles	2 of each
Assorted syringes	2 of each
I.O Needle 18g	1

Drawer 4

Equipment	Quantity
Pneumothorax kit containing needle aspiration box (assorted)	1
Laryngeal mask	1
Bottle of sterile water 1 litre	1
Small sterile bottles	2
NG insertion kit containing NG tubes size 3 and 3.5	2 of each

The EZ-IO is located on NICU

Appendix C

Resuscitation with Auto breath Infant Resuscitator (Derby site only)

To be used by a Paediatric SpR or above.

The autobreath facility will allow the operator to deliver PEEP. When confident in its use, this mode should ensure adequate lung inflation and avoid over distension. It is most likely to be used in situations where gentle resuscitation and ongoing respiratory support will be required e.g. babies ≤ 27 weeks.

Setting Up

- Use appropriate patient breathing circuit (should be in a sealed bag in resuscitaire drawer)
- Connect the circuit to the **Patient Outlet** connector and the exhalation valve control line tubing to the **Exh Valve** connector
- Turn the Autobreath Infant Resuscitator **On** using **On/Off** switch
- Use **Patient Supply Flow Rate** control to adjust to desired flow rate. Set **Blender** for the desired Air/O₂ mix
- Adjust **Rate (BPM)**. Note that a fixed ratio of 1:2 (Ti:Te) will be given - rates of 40-60 are likely to be most appropriate but will need to be adjusted according to clinical need
- Occlude patient outlet end and observe **Airway Pressure** gauge. Adjust **Airway Pressure Relief** to give desired peak inspiratory pressure (start at 16-18cmH₂O) and **PEEP** for end expiratory pressure (start 4-6cmH₂O)

