GUIDELINE: **Neonatal Resuscitation**
SCOPE: All staff working in Maternity and the Neonatal Unit
AUTHOR: NNU Quality Co-ordinator

PURPOSE: Safe and effective preparation for assessment and resuscitation of the newborn infant and neonate.

DEFINITIONS: Resuscitation -In the absence of circulation or breathing, the interventions required to aid recovery are termed resuscitation
New Zealand Resuscitation Council – NZRC

GUIDELINE:
Education
All professionals providing intra partum care must assume that even after an apparently normal pregnancy and birth, a baby can be born needing urgent resuscitation. Resuscitation training incorporating the NZRC 2016 Neonatal Resuscitation Guidelines 13.1 -13.10 is therefore mandatory for all such professionals.
All midwives working in the Maternity Unit should attend a minimum 2 hour Neonatal Resuscitation update at least every 12 months (as per Midwifery Council recertification programme mandatory requirements). This update will be incorporated in the "Midwifery Emergency Skills Refresher". If not attending this day, staff will need to ensure they attend another update.
Nurses working in NNU and the Maternity Unit are also recommended to attend an annual update.

The NZRC Neonatal Life Support Course (NLS) is to be available at Gisborne Hospital, and it is recommended that all midwives and NNU staff attend this at least once.

Personnel at birth
At least one person skilled in basic newborn life support should be present at every birth. In higher risk situations the LMC/Core Midwife/Obstetrician should discuss with the Paediatrician on call/NNU staff to evaluate whether a Paediatrician's presence at the birth is advisable.
In the event of the emergency team being called the most experienced person in neonatal resuscitation will continue to lead resuscitation until the paediatrician arrives. This will usually be a midwife or registered nurse.

Prior to birth
Many risk factors significantly increase the likelihood that a baby will require active resuscitation. Important risk factors which increase the risk include:

- Prematurity
- Multiple birth
- Presence of thick meconium stained amniotic fluid
- Breech birth
- Shoulder dystocia

- Abnormal fetal monitoring
- APH
- Maternal compromise

If there are significant risk factors it is advisable to notify the Paediatrician on call/ neonatal staff and discuss a management plan.

Standard precautions
All fluids from patients should be treated as potentially infectious and staff should wear gloves during procedures.

Cord clamping
For an uncomplicated birth delaying cord clamping for a minimum time ranging from one minute until the cord stops pulsing for a term infant and 30 seconds to 3 minutes for a preterm infant is recommended.
If an infant is severely compromised (low heart rate, pale, floppy, not breathing) resuscitation takes priority over delayed cord clamping. The cord must be clamped before cardiac compressions can be done effectively. Cord milking is not recommended.

Drying and Warmth
It is essential that the room or operating theatre is warm, that the baby heater is on, and there are adequate warm towels available to dry and warmly wrap the baby.
A woollen hat is useful to minimise heat loss.
Infants of less than 28 weeks gestation and/or infants weighing less than 1500gr should be covered with Neo-wrap (without drying) to protect from drafts and evaporative heat loss without covering airway. This therapy may not be helpful for babies weighing more than 1500gr.

Equipment
The need for resuscitation cannot always be anticipated. Therefore equipment should be prepared in advance and checked prior to each birth to ensure it is in working order. All staff attending births and newborn infants should be familiar with resuscitation equipment in their department and its use. Equipment should be checked daily and after each resuscitation to ensure that it is in working order.

Masks
Self-inflating Laerdal bags and the Neopuff must be prepared with an appropriate selection of mask sizes available.

Suction
Suction should not be used except when babies show signs of obstruction either to spontaneous breathing or positive pressure ventilation. Suction with a Yankauer suction tube or a size 10 suction tube should be available. If the baby is not breathing and the airway is occluded by debris, gentle suction may be required to clear the airway. Suction should be adjusted to ensure that a negative pressure of 100mmHg when the tubing is occluded is not exceeded. The suction catheter should not be passed more than 5cm from the lips.

Neopuff

The Neopuff requires a compressed gas supply to operate and blended air and oxygen is available for that purpose.

The advantage of using the Neopuff is it provides set Peak Inspiratory Pressure (PIP) and Positive End Expiratory Pressure (PEEP). PEEP assists with lung expansion, helps to establish functional residual capacity and improves oxygenation especially in premature infants.

All staff members should ensure that they receive training and are confident with the use of the Neopuff (T-piece system)

To check and set up the Neopuff you will need the Neopuff, a compressed gas source (the blender) which is connected to the Neopuff, a patent supply line with the T-piece device, and a test lung attached to the patient T-piece. There must be gas flowing through the gas inlet to set all of the pressures which are Peak Inspiratory Pressure (PIP), Peak End Expiratory Pressure (PEEP) and maximum pressure.

The recommended settings for **preparation for resuscitation** of a term infant:

- Gas flow at 10L/min
- Maximum pressure relief valve set at 50 cm/water
- PIP set at 30 cm/water
- PEEP set at 5 -8 cm/water

The settings for **preparation for resuscitation** should be adjusted accordingly for a preterm infant to:

- PIP set 20 -25 cm/water
- PEEP set at 5 cm/water

Pressures required for adequate ventilation are variable, unpredictable and should be individualised.

Too low an inflation pressure is ineffective and too high a pressure is dangerous and can cause barotrauma.

Self-inflating (Laerdal)

Inflation and ventilation is achieved by delivering positive pressure to the open airway with a 250ml or 500ml Laerdal self-inflating bag. This will be attached to the blender to facilitate a known percentage of oxygen being used.

Prior to use, staff should check that the pressure relief valve is functioning correctly.

RESUSCITATION

The baby is assessed at birth by observing

- **Tone**
- **Breathing**
- **Heart rate**

The baby is dried and wet linen removed and the baby is wrapped in a warm towel while assessment and resuscitation is occurring.
The time should be noted or the clock on the resuscitaire started to enable accurate assessment of age.

If the baby is not breathing the midwife/nurse resuscitator should summon urgent assistance.
New born Life Support Algorithm is available in each birthing room and is the guide for resuscitation.

<u>Positioning</u>
The baby's head should be placed in the neutral position or slightly extended (sniffing) position to open the airway. Chin support and jaw thrust may be required. Rarely, a Laryngeal Mask Airway (LMA) or Oropharyngeal (Guedel) airways may be required.

<u>Pulse Oximetry</u>
For babies who require resuscitation and/or respiratory support, pulse oximetry is recommended to monitor heart rate and oxygenation. The sensor should be placed on the infant's **right** hand or wrist and the oximeter is switched on.

<u>Ventilation</u>
All babies who are apnoeic or not breathing effectively despite appropriate positioning, should have ventilation commenced.

The NZRC guideline states -*The aim of ventilation is initially to clear lung liquid, establish lung aeration and enable gas exchange. The optimal strategy for this in newborns needing resuscitation has not been established, but some studies suggest that sustained initial breaths and positive end expiratory pressure are helpful, particularly in premature lungs.*

In view of the vital importance of establishing air entry to the lungs and identifying chest movement, inflation breaths will continue to be included in neonatal resuscitation education.

The first 5 breaths should be slow, deep inflation breaths (2-3 seconds each) with the self-inflating Laerdal bag or the Neopuff, with sufficient pressure to move the infant's chest adequately.

This is followed by more normal sized breaths at a rate of 40 – 60 per minute. The goal is appropriate, not excessive chest expansion.

After 30 seconds of effective ventilation, breathing and heart rate are re-assessed.

If the baby has not responded to inflation breaths and 30 seconds of ventilation, staff should consider dialling 777 and stating Neonatal Emergency to call the emergency resuscitation team and on call paediatrician urgently stating the location where the paediatrician is needed and briefly the reason for the call.

New born resuscitation focuses on the initiation of lung inflation and maintenance of subsequent ventilation until effective spontaneous breathing is established.

Effective ventilation is confirmed by

1. **Increase in heart rate**
2. **A slight rise and fall of the chest and upper abdomen with each inflation**
3. **Oxygenation improves**

Supplemental Oxygen

Oxygen is mixed with air through a blender. This allows a specific concentration of oxygen to be given to the baby between room air (21% Oxygen) and 100% oxygen. It is administered via the Neopuff or the Laerdal bag and mask.

It is recommended that regardless of gestation, the goal of oxygen administration is to aim for oxygen saturations resembling those of healthy term babies

For term infants air should be used initially.

If the lower end of the target range is not met despite respiratory support then supplemental oxygen is used for ventilation until saturations reach 90% and are maintained at that level which will usually require a reduction in oxygen concentration given.

Preterm infants of less than 32 weeks will probably require supplementary oxygen so resuscitation should be commenced with 30% oxygen and the concentration of supplemental oxygen adjusted according to the infant's saturations.

In all cases the first priority is to ensure adequate inflation of the lungs followed by increasing the concentration of inspired oxygen only if needed.

Target saturations

Time from birth	Target saturations for newborn infants during resuscitation
1 min	60-70
2 min	65-85
3 min	70-90
4 min	75-90
5 min	80-90
10 min	85-90

Achieving the set PIP and PEEP on the manometer of the Neopuff is not a sign of effective ventilation – an increase in heart rate, chest/abdominal movement, and improvement in colour are indications of successful ventilation.

If the Neopuff needs adjusting during use, a second person will be required to do this efficiently.

Chest compressions

Once the baby has been adequately ventilated for 30 seconds and the heart rate remains or falls below 60, then chest compressions co-ordinated with ventilation should be given at the rate of 120 per minute in **a ratio of 3 compressions to 1 breath** for a further 30 seconds and reassessed. If still < 60 compressions should continue until the heart rate improves.

Intubation

Usually there will not be personnel present at the birth who are able to intubate. Although ventilation is much more effective via an ET tube, successful resuscitation can be managed with a self-inflating bag or Neopuff until a Paediatrician or person skilled in intubation is present. It is important that staff are familiar with the procedure so they can assist effectively.

Meconium stained amniotic fluid

If the baby is vigorous (breathing, crying, good muscle tone), suctioning is not indicated.
If the baby is floppy and not breathing the infant should not be stimulated to breathe. The baby should be taken to the resuscitaire where there is suction available.
If they are floppy and not breathing ***they need suctioning of the pharynx and proceeding with resuscitation. If there is a skilled person available suction the trachea under direct vision before ventilation*** (see guideline *Management of meconium stained amniotic fluid*.)

Medications

The main medications used in resuscitation are

- Adrenalin -1:10,000 (paediatric preparation)
- Sodium Bicarbonate 8.4% solution

These are located in the caesarean section cot resuscitation box, medical store room at the entrance of the Delivery Unit, and in NNU.

Volume expanders (usually Normal Saline 0.9%) may be indicated and would be administered on NNU.

Staff should familiarise themselves with these medications by performing daily checks.

Emergency Resuscitation

In the event of urgent advanced infant resuscitation, **dial 777 and state Neonatal Emergency stating the location where the paediatrician is needed and briefly the reason for the call.**

NNU staff may be able to provide immediate assistance but this cannot be assumed and baby should **not be taken directly to the NNU** unless the staff are prepared as there may be nowhere for the baby to be placed and the delay could contribute to the problem.

Cord blood gases

Cord blood gases should be obtained if resuscitation has been required and following all emergency LSCS's or instrumental births for fetal compromise, and the results obtained and recorded in the clinical record (see guideline *umbilical cord blood gas analysis*).

Additional staff

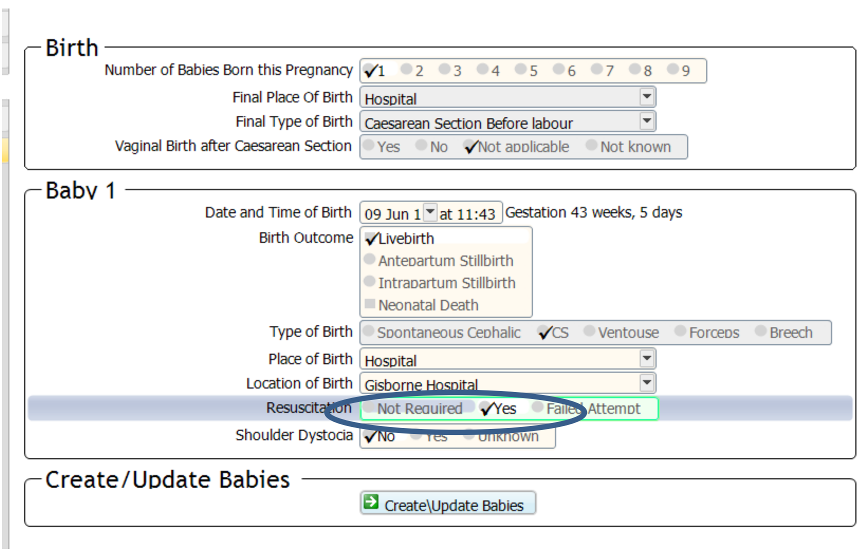
Staff not directly involved in resuscitation can assist with supporting family, collecting any equipment required and opening security doors.

Documentation

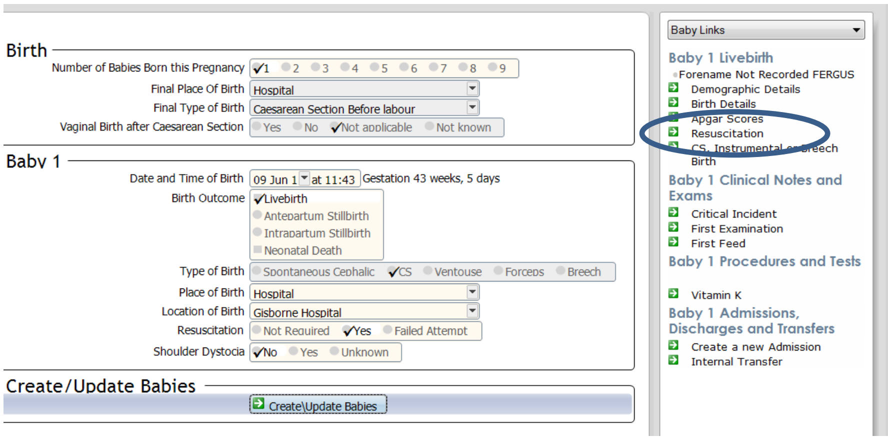
Details of neonatal resuscitation including times and personnel involved, must be documented in MCIS. The Neonatal Summary sheet can also be completed. Additional information should be recorded in the clinical records.

An incident report should be submitted for all babies requiring extensive resuscitation or with apgar score < 7 at 5 minutes of age.

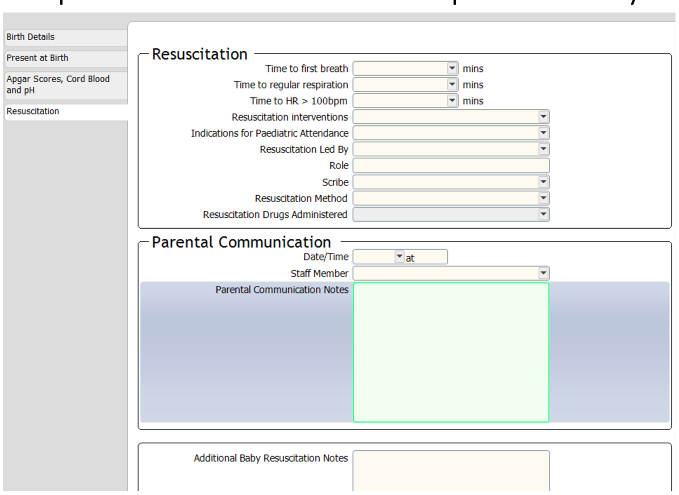
In order to document resuscitation of the baby in MCIS it must first be noted that the baby required resuscitation.



A form will then be available in the Baby links to the right when the baby record has been created



Complete the resuscitation details requested and any narrative then save and close.



<u>Parents</u>

If the baby has required resuscitation the parents should be spoken to as soon as possible, and assisted to see their baby promptly if admitted to NNU. Information given to them regarding the condition of their baby and subsequent care should be clearly documented. The Paediatrician will usually speak with the parents of infants who required extensive resuscitation and ongoing neonatal care.

<u>Post resuscitation de-briefing</u>:

Following any active neonatal resuscitation, there should be a focus on creating a supportive environment for the health professionals involved. A debriefing may be arranged if felt necessary by those involved in the resuscitation which should be organised within 72 hours of the event wherever possible. This may be organised by the Lead Maternity Carer at the birth, or by midwifery/neonatal team leader/s or paediatrician/s as appropriate.

Ongoing Care

If there has been severe respiratory depression the baby should be referred to the neonatal team. If the baby responded well to resuscitation then Transitional care may be appropriate (see *Referral of inpatients to the paediatric service* and *Transitional care* guidelines).

Babies who have required any resuscitation should be observed closely in the next few hours. The baby will be at **greater risk of hypoglycaemia of the newborn** as he may have depleted fuel reserves due to fetal distress or hypoxia. Optimal thermal management and early frequent breast feeding will help prevent neonatal hypoglycaemia. The baby should have the appropriate feeding chart and frequent assessment to ascertain whether blood glucose testing is indicated.

Early discharge (within 24 hours of birthing) may be contraindicated if the baby has required resuscitation or has had low Apgar scores (less than 7 at 5 minutes).

ASSOCIATED DOCUMENTS:

Maternity and NNU guideline - The referral of inpatient neonates to the Paediatric service
Maternity and NNU guideline - Management of infants born with meconium stained amniotic fluid.
Maternity and NNU guideline – Transitional care
Maternity and NNU guideline - Umbilical cord blood gas analysis

REFERENCES:

http://www.nzrc.org.nz/assets/Uploads/Guidelines/Algorithms/Newborn-Life-Support-Jan-2016.pdf

Neonatal Resuscitation Guidelines; Australian and New Zealand Resuscitation Councils (2016) Available at http:www.resus.org.au

Authorised by:

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CCM
Women, Child and Youth

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