Clinical Practice Guidelines: Resuscitation/Newborn

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Resuscitation – Newborn

July, 2022

The vast majority of newborns (defined as patients immediately postpartum) transition to extrauterine life without complication. Approximately 15% require supplementary cares such a stimulation, airway positioning or positive pressure ventilation.[1] The delivery of chest compressions is typically uncommon and occurs in less than 0.3% of newborns following birth.[2,3]

There are major physiological changes that occur as the newborn acclimatises to the environment outside of the uterus, namely lung aeration and changes to pulmonary circulation. The occurrence of these processes facilitates pulmonary gas exchange which is a central determinant of successful adaptation to independent life.[1] Immediately following birth, newborns must be assessed to determine the adequacy of their postnatal transition and identify if resuscitative measures are required.

Assessment of the newborn should include:

- **Observing the tone/colour:** Newborns that present with limp muscle tone and minimal activity are highly likely to require ventilatory support. Peripheral cyanosis is common and is not independently an indication of hypoxia. Colour, while an important aspect of assessment, is an unreliable marker of oxygenation which is more accurately assessed using pulse oximetry.[1]
- **Adequacy of breathing:** Determine the depth, symmetry and work/effort of the newborn. The presence of recession, retraction or irregular respirations (gasping or grunting) are reliable predictors that immediate resuscitation is required.
- **Measurement of heart rate:** The heart rate of the newborn is the most sensitive predicator of the requirement to perform resuscitation. This should be determined through either auscultation, palpation of the umbilical cord or pulse oximetry. The presence of a slow heart rate < 100/min indicates that resuscitative measures are required.

Clinical features

- **No signs of life:**
  - Limp muscle tone
  - Slow (< 30/min) or irregular respirations (e.g. gasping)
  - Pulse cannot be confidently auscultated or identified on palpation of the umbilical cord
- **Signs of inadequate perfusion:**
  - Centrally pale or blue (cyanosed)
  - Pulse less than 100 BPM
- **Inadequate respiratory effort:**
  - Rib/sternal recession
  - Retraction or indrawing
  - Persistent expiratory grunting

Risk assessment

- Annually, the Queensland Ambulance Service (QAS) attends approximately 350 newborns, a small proportion of which require resuscitative cares.[4] Births that occur in the out-of-hospital environment are associated with higher rates of newborn hypothermia. During resuscitation, it is imperative that the temperature of the newborn is regulated and maintained. This can be achieved with the use of blankets and placing a beanie on the newborn's head to minimise heat loss.
- If active resuscitation of the newborn is required, delayed cord clamping (> 60 seconds post birth) is recommended. If immediate resuscitative measures are required and cannot be performed effectively due to the positioning of the newborn, immediate cord clamping is appropriate. Delayed cord clamping has been shown to marginally improve the survival outcomes of preterm newborns (< 34 weeks gestation), however its effect on full term newborns appears negligible.[5,6] Ambulance clinicians should adopt a pragmatic approach when determining when to perform this intervention during resuscitation.
- Commencing resuscitation in extremely preterm newborns (< 20 weeks) is not recommended as resuscitation of this age group are considered futile. Where there is any doubt or confusion regarding the gestation of the newborn, resuscitation must be commenced and the *QAS Clinical Consultation and Advice Line* contacted for consultation.

Risk assessment *(cont.)*

- The use of naloxone in newborns during resuscitation is contraindicated. This includes instances where intrauterine opiate exposure/overdose is suspected to have occurred during pregnancy.

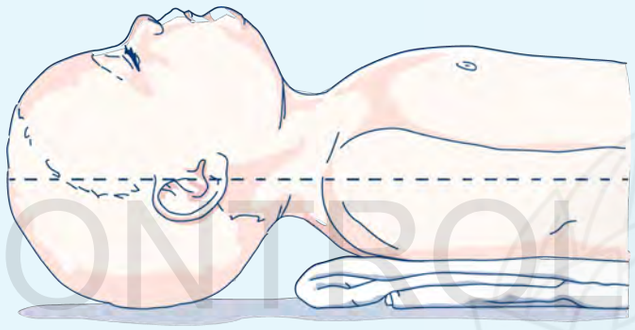
Preterm newborns (< 34 weeks gestation) special considerations

- Preterm newborns require additional methods of thermal care to ensure appropriate temperature regulation occurs. Ambulance clinicians should consider immediately placing the preterm newborn (excluding the head) within the reclosable plastic bag provided in the QAS Maternity Kit without drying beforehand.
- Early CCP attendance should be considered for all preterm newborns.
- The use of positive end-expiratory pressure (PEEP) is recommended in preterm newborns to improve functional reserve capacity.

Additional information

Airway

- The newborn should be placed supine with their head supported in a neutral position (avoiding flexion/extension of the neck). This can be achieved by placing appropriate padding (i.e. towel or blanket) behind the shoulder blades of the newborn.



Appropriate neutral position

- During resuscitation some newborns may require supplementary jaw support to facilitate good ventilation.[7] Where scene resourcing permits, bag-valve mask ventilation should be performed using the two-person technique with one clinician anteriorly displacing the mandible and holding the mask in place.
- The routine use of oropharyngeal airways is not recommended in newborns with standard facial anatomy. This adjunct has been found to obstruct ventilation thereby reducing subsequent respiratory function.[8] The use of this device should be limited to settings where structural airway abnormalities are identified or in instances where two-person ventilation techniques fail to improve ventilation.
- Routine suctioning of the mouth, nose or oropharynx is not required in majority of newborns and may delay oxygenation. Suctioning should only be performed on newborns showing obvious signs of obstruction that requires urgent removal. If required, suctioning should be performed in the mouth first followed by the nose. When performing suctioning, ambulance clinicians should ensure it is brief and care is taken to ensure airway trauma does not occur.

Breathing

- Positive pressure ventilations must be immediately commenced if absent or inadequate respirations are identified. The early provision of supplementary ventilations in apnoeic newborns is pivotal in avoiding subsequent morbidity and mortality.[9]
- Intermittent positive pressure ventilation (IPPV) should be performed at a rate of 40–60 breaths per minute, with an inspiratory time of 0.5 seconds.
- Initial IPPV should begin without the use of supplemental oxygen on room air for the first 30 seconds of resuscitation. If the heart rate of the newborn remains < 100 beats per minute (BPM), high concentration oxygen should then be utilised.
- Ambulance clinicians should apply 5 cmH2O of positive end expiratory pressure (PEEP) when ventilating newborns to establish functional residual capacity.
- Pulse oximetry should be placed on the right hand (pre-ductal) during resuscitation. Note, acceptable SpO2 readings in newborns are significantly lower than other patient cohorts following birth. The following table provides the oxygen saturation targets during the first minute's post birth in full term newborns.

Additional information *(cont.)*

Time After Birth (Minutes)	Lower SpO2 Target
1	60 – 70%
2	65 – 85%
3	70 – 90%
4	75 – 90%
5	80 – 90%
10	85 – 90%

- Effectiveness of ventilations is determined by observing appropriate rise of the chest/upper abdomen with each inflation coupled with improvements in oxygenation saturations and an increased heart rate.
- Healthy newborns may appear cyanosed until their SpO2 reaches extrauterine values. If central cyanosis persists for longer than 10 minutes post birth, commence O_2 @ 2 LPM until the newborn appears centrally pink.

Circulation

- The delivery of chest compressions must only be performed after IPPV has been attempted and should occur concomitantly. As correcting hypoxia is the primary objective of newborn resuscitation, ambulance clinicians should ensure the quality of ventilations are not compromised by performing compressions.
- Compressions must be performed at a 3:1 compression to ventilation ratio. During resuscitation, pulse checks should be regularly conducted to identify if the heart rate is > 100 BPM and if compressions can be discontinued.
- Instances of shockable cardiac rhythms are extremely uncommon in newborns. If identified, defibrillation should be performed using an appropriate joule setting (4 J/kg).
- The administration of adrenaline and sodium chloride 0.9% should be considered in instances where chest compressions are being performed.
- Early hospital notification is mandatory for all newborns that have received resuscitative measures.
- In instances where midwifes are present on scene (i.e. homebirths), ambulance clinicians are responsible for the management of the newborn and mother unless by mutual agreement, the midwife agrees to take primacy of care. If this occurs, ambulance clinicians should provide monitoring equipment and support the midwife as directed.

CPG: Clinician safety
CPG: Standard cares

Full term gestation and evidence of:
- Good tone
- Vigorous breathing or crying
- Heart rate ≥ 100/min

Y → **Manage as per:** CPG: Physiological cephalic birth

N

- Stimulate the newborn
- Ensure airway patency (neutral head position)
- Normothermia maintained

HR > 100/min? and adequate breathing?

Y → Continually reassess the newborn. If central cyanosis is present 10 minutes post birth consider O2 at 2 LPM until centrally pink

N

Commence IPPV @ 40–60/min (room air)
- Pulse oximetry placed on right hand
- Reassess after 30 seconds

HR > 100?

Y

N

Commence IPPV (high concentration O2)
Consider:
- Two-person BVM technique
- PEEP (5 cm H2O)

HR > 60?

N

Commence CPR (3:1 ratio)
Consider:
- Access (if IV not obtainable in < 1 minute consider IO)
- Adrenaline (epinephrine)
- Sodium chloride 0.9%

Transport to hospital with pre-notification as required

Aim to perform tasks within 1 minute

Reassess every 30 seconds

Note: *Clinicians must only perform procedures for which they have received specific training and authorisation by the QAS.*