

Neonatal resuscitation



45 minutes

Towards CPD Hours

References:

The Queensland Clinical Guideline: Neonatal resuscitation is the primary reference for this package.

Recommended citation:

Queensland Clinical Guidelines. *Neonatal resuscitation*: Clinical guideline education presentation E16 9.5-1-V4-R21. Queensland Health. 2016.

Disclaimer:

This presentation is an implementation tool and should be used in conjunction with the published guideline. This information does not supersede or replace the guideline. Consult the guideline for further information and references.

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Funding:

Queensland Clinical Guidelines is supported by the Queensland Health, Healthcare Innovation and Research Branch.

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Abbreviations

| Abbreviations | |
|---------------|---------------------------------|
| < | Less than |
| > | Greater than |
| bpm | Beats per minute |
| CDH | Congenital diaphragmatic hernia |
| CHD | Congenital heart disease |
| ETT | Endotracheal tube |
| FGR | Fetal growth restriction |
| Hb | Haemoglobin |
| HR | Heart rate |
| IVH | Intraventricular haemorrhage |

Clinician skills

- All births
 - At least one clinician responsible for baby with basic neonatal resuscitation skills present
 - Clinician with advanced skills available
- High risk births
 - Clinician with advanced skills present
 - More than one clinician present
- Caesarean
 - Same as vaginal births

Risk factors–maternal

- Prolonged ROM(>18 hours)
- Bleeding in second or third trimester
- Hypertension in pregnancy; diabetes mellitus; chronic illness
- Substance use; prescribed medication; heavy sedation
- Pyrexia; infection; chorioamnionitis
- Previous fetal or neonatal death;
No/minimal antenatal care

Risk factors–fetal

- Multiple gestation
- Preterm; post term
- Fetal growth restriction; large for dates
- Polyhydramnios; oligohydramnios
- Haemolytic disease; hydrops fetalis
- Reduced fetal movements
- Congenital abnormalities
- Infection

Risk factors–intrapartum

- Abnormal CTG
- Abnormal fetal presentation; cord prolapse
- Prolonged labour; precipitate labour
- Antepartum haemorrhage
- Meconium in liquor
- Narcotic administration within 4 hours of birth
- Assisted vaginal birth; general anaesthesia

Preparation

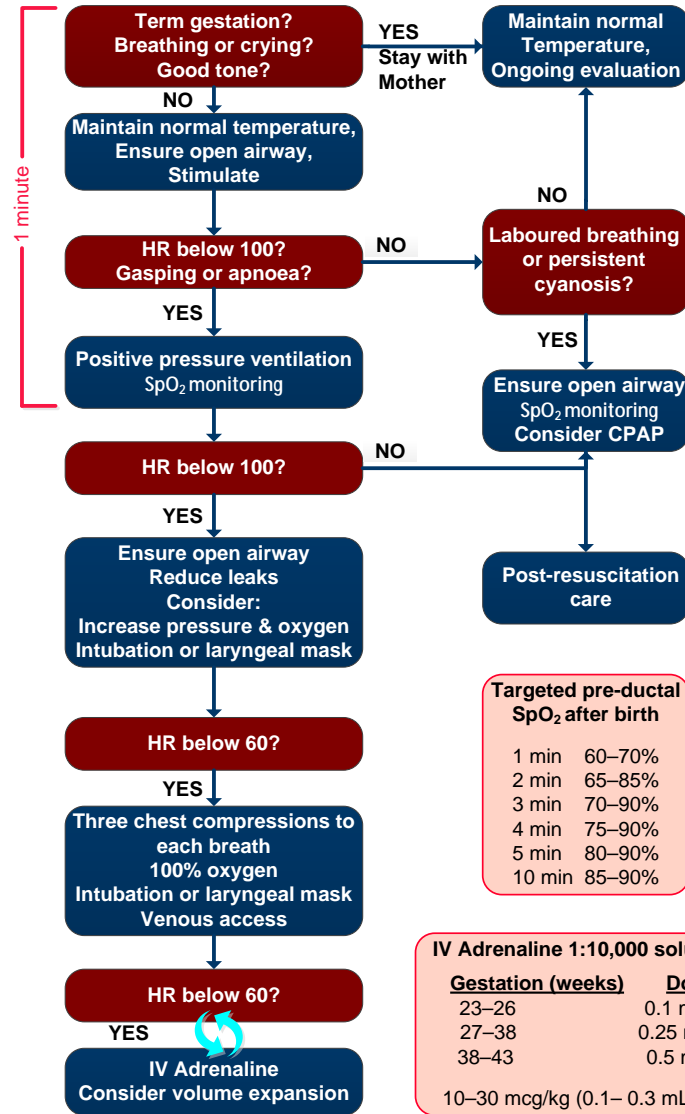
- Staff—one person responsible only for baby
- Equipment and medications—available for all births
- Environmental temperature
 - Warm, draft free, overhead radiant warmer
 - Polyethylene bag for babies less than 28 weeks or very low birth weight

Communication and information sharing

- Maternal history—pre-existing or pregnancy related conditions, medication
- Fetal/neonatal—assessments of wellbeing, reason high risk
- Parents—discuss proposed plan, include in decision making, respond to questions
- Documentation—contemporaneous

Newborn Life Support

At all stages ask: do you need help?



January 2016



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Initial assessment & management at birth

- Tone
 - Good tone, moving limbs and flexed position—less likely to require resuscitation
 - Poor tone/floppy, not moving, extended position—more likely to need active resuscitation
- Breathing
- Heart rate

Oxygen saturation monitoring

- More accurate than visual assessment of colour by clinician
- HR and oximetry can be achieved within 90 seconds of birth
- Pre-ductal right hand or wrist:
 - Measures brain and coronary artery blood supply
 - Obtained more rapidly
 - Pre-ductal vessels better perfused, have higher blood pressure and higher oxygenation

Attaching the oximeter

- Use an oximeter designed to reduce movement artefact
- Use a neonatal sensor
 - Attach to baby as soon as possible after birth
- Attaching the cable:
 - Plug cable into machine without sensor lead attached and turn on
 - Attach sensor to cable

Target oxygen saturations

| Time from birth | Target oxygen saturation |
|-----------------|--------------------------|
| 1 minute | 60–70% |
| 2 minutes | 65–85% |
| 3 minutes | 70–90% |
| 4 minutes | 75–90% |
| 5 minutes | 80–90% |
| 10 minutes | 85–90% |

After 10 minutes of age

- Term baby: 92–98%
- Preterm baby: 90–95%

Care of baby

- Support head in neutral position
- Careful handling and skin protection
 - Preterm at greater risk of skin and internal organ damage
- Use alcohol containing solutions sparingly

Thermoregulation

- Target normal body temperature for all babies
 - 36.5 °C–37.5 °C
- Oxygen consumption increased when:
 - Cold stressed–temperature < 36.5 °C
 - Hypothermic–temperature < 36.0 °C

Cord clamping

- Delayed cord clamping in non-compromised term baby for 60 seconds may result in:
 - Increased placental transfusion
 - Higher Hb and iron later
 - Increased incidence of jaundice

Cord clamping

- Delayed cord clamping in non-compromised preterm baby may result in:
 - Stabilised BP at 4 hours of age
 - Reduced risk of intraventricular haemorrhage and periventricular leucomalacia
 - Increased blood volume

Airway management

- Effective ventilation is key to successful resuscitation
- Drying and stimulation are assessment and resuscitative measures
- Commence PPV if:
 - Effective spontaneous respirations not established
 - HR does not increase to above 100 bpm

Manual ventilation devices

- Facemask—appropriate size, seal around mouth and nose
- Laryngeal mask airway—size 1 for term or near term baby up to 5 kg
- T-piece device—requires pressurised gas source; have self-inflating bag available
- Self-inflating bag—cannot effectively deliver CPAP, PEEP or sustained inflation breath
- Flow inflating (anaesthetic bag)—requires pressurised gas source

Supplemental oxygen

- Commence PPV in air for term babies and use air to 30% oxygen for preterm babies
- Titrate oxygen requirements according to oxygen saturations
- Increase oxygen to 100% if chest compressions commenced
- Use a oxygen air blender if available

Positive pressure ventilation

- Rate:
 - 40–60 breaths per minute
- Pressures:
 - PEEP 5 cm H₂O
 - Peak inspiratory pressure (PIP)
 - Term: 30 cm H₂O
 - Preterm: 20–25 cm H₂O

PPV effectiveness

- Confirmed by observing:
 - HR >100 bpm
 - Slight rise in chest and upper abdomen with each inflation
 - Improvement on oxygen saturations

CPAP

- Indicated for baby:
 - Breathing spontaneously with laboured breathing/respiratory distress
 - Breathing but not meeting oxygen saturation targets
- Use 5–8cm H₂O via facemask or nasal prongs

Endotracheal intubation

- Indications:
 - Unsuccessful face mask or LMA ventilation
 - HR remains low
 - Oxygen saturations falling or failing to rise
 - Prolonged mask ventilation
 - Special circumstances (e.g. diaphragmatic hernia)
 - Baby has no detectable heart rate at birth

ETT position verification

- Chest moves with each inflation
- HR increases to above 100 bpm
- Oxygen saturations improve
- Other:
 - Visualisation of ETT passing through cord
 - Condensation on inside of ETT on exhalation
 - Colour change with paediatric end tidal CO₂ detector
 - Symmetrical air entry over lung fields on auscultation

Chest compressions

- Not a substitute for effective ventilation
- Increase oxygen to 100%
- Insert UVC or IV
- Ratio—3:1
- Rate 90 compressions to 30 breaths in one minute

Medications & fluids

- Rarely indicated for neonatal resuscitation
- Continue ventilations and chest compressions
- UVC preferable route

Adrenaline (epinephrine)

- Indication:
 - HR < 60 bpm
- Route:
 - UVC preferred
- Dose:
 - 1:10,000
 - 0.03 mg/kg or 0.3 mL/kg (vascular)

Volume expanding fluids

- Use isotonic crystalloid (0.9% sodium chloride or Hartmann's solution)
- Indications:
 - Suspected blood loss
 - Shocked baby (pale, poor perfusion, weak pulses) **and** not responding to other resuscitative measures

Volume expanding fluids

- Blood products (Group O RhD negative)
blood
- Indications:
 - Critical blood loss
 - Baby not responding to resuscitation (may be occult blood loss)

Preterm baby

Temperature management

- If < 28 weeks
 - Do not dry
 - Place in polyethylene/plastic bag (up to neck)
 - Cover head with hat/bonnet

Preterm baby

Initiation of respiratory support

- Sustained inflation breath not recommended
- Commence CPAP in baby < 32 weeks
 - If breathing spontaneously and showing signs of respiratory distress
 - Use at least 5cm H₂O (no more than 8cm H₂O)
- Air or oxygen–air blend up to 30%
 - Titrate to oxygen saturations

Other special circumstances

- Consider other special requirements for:
 - Multiple pregnancy
 - Pneumothorax
 - Pleural effusion/ascites/fetal hydrops
 - Pneumonia/sepsis
 - Fetal haemorrhage
 - Congenital anomalies
 - Upper airway obstruction, CDH, CHD, abdominal wall defects

Cord blood gas sampling

- Cord blood gas sampling when:
 - Baby has required resuscitation
 - Apgar < 4 at one minute or < 7 at 5 minutes
 - Fetal blood sampling in labour
- Collect paired samples (umbilical vein and umbilical artery)
- Interpretation:
 - Relative risk of neonatal encephalopathy increased if cord arterial pH is low

Ethical considerations

- Initiating resuscitation:
 - Consistent approach by all clinicians
 - Discuss with parents and involve them in decision making
- Discontinuing resuscitation:
 - Absent or very low HR at 10 minutes—poor prognosis for morbidity and mortality
 - Apgar 1–3 at 20 minutes (babies < 34 weeks)—strong predictor of mortality or significant morbidity

Initiating resuscitation

- High rate of survival and acceptable morbidity—resuscitation usually indicated
- **Borderline survival and high rate of morbidity** with prognosis uncertain and burden to child high—support parents' views
- **Almost certain death and unacceptable high morbidity** as indicated by gestation, birth weight or congenital anomaly—resuscitation not indicated
- Unexpected anomalies—offer full resuscitation until full clinical picture available and discussions occur with parents
- Clinicians and parents together decide to withhold or withdraw treatment based on futility and best interests of baby

Discontinuing resuscitation

- May be influenced by:
 - Presumed diagnosis
 - Gestation of baby
 - Presence or absence of complications
 - Parent(s) views regarding acceptable risk of morbidity

Withdrawal or withholding of resuscitation

- Focus on baby's comfort if signs of life present
- Support parents