Neonatal Resuscitation

Clinical Guideline Presentation v6.0

45 minutes

Towards CPD Hours

Clinical Excellence Queensland

Queensland Government

References:

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

Recommended citation:

Queensland Clinical Guidelines. Neonatal resuscitation clinical guideline education presentation E22.5-1-V6-R27. Queensland Health. 2022.

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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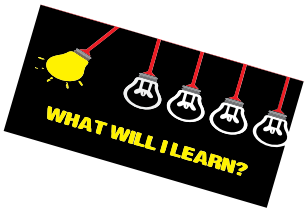
Abbreviations

<	Less than	**GA**	General anaesthesia
>	Greater than	**Hb**	Haemoglobin
AP	Anteroposterior	**HR**	Heart rate
BP	Blood pressure	**IV**	Intraventricular
bpm	Beats per minute	**IVH**	Intraventricular haemorrhage
CDH	Congenital diaphragmatic hernia	**LMA**	Laryngeal mask airway
CHD	Congenital heart disease	**PEEP**	Positive end expiratory pressure
CPAP	Continuous positive airway pressure	**PIP**	Positive inspiratory pressure
CTG	Cardiotocograph	**PPH**	Postpartum haemorrhage
ETT	Endotracheal tube	**PPV**	Positive pressure ventilation
FGR	Fetal growth restriction	**ROM**	Rupture of membranes

Objectives



- Outline preparation for neonatal resuscitation
- Identify maternal, fetal and intrapartum risk factors
- Outline best practice for management of airway, breathing and circulation
- Recognise ethical considerations for neonatal resuscitation
- Outline care after resuscitation

Clinician skills/responsibilities

- 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

Maternal risk factors

- 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

Fetal risk factors

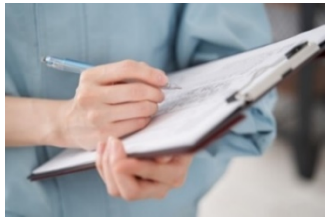
- Multiple gestation
- Preterm; post term
- FGR; large for dates
- Polyhydramnios; oligohydramnios
- Haemolytic disease; hydrops fetalis
- Reduced fetal movements
- Congenital abnormalities
- Infection

Intrapartum risk factors

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

Communication and information sharing

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



Cord clamping

Vigorous baby ≥ 34 weeks gestation

- Clamping for **≥ 60 seconds** associated with:
  - Increased placental transfusion
  - Increased cardiac output
  - Higher and more stable BP
  - Higher Hb and iron status in infancy
  - Increased incidence of jaundice

Cord clamping

Vigorous baby < 34 weeks gestation

- Clamping for **at least 30 seconds** associated with:
  - Improved neonatal survival risk
  - Increased blood volume
  - Reduced need for inotropes
  - Increased and stabilised BP during stabilisation and at 4 hours of age
  - Improved haematology–reduced need for transfusion

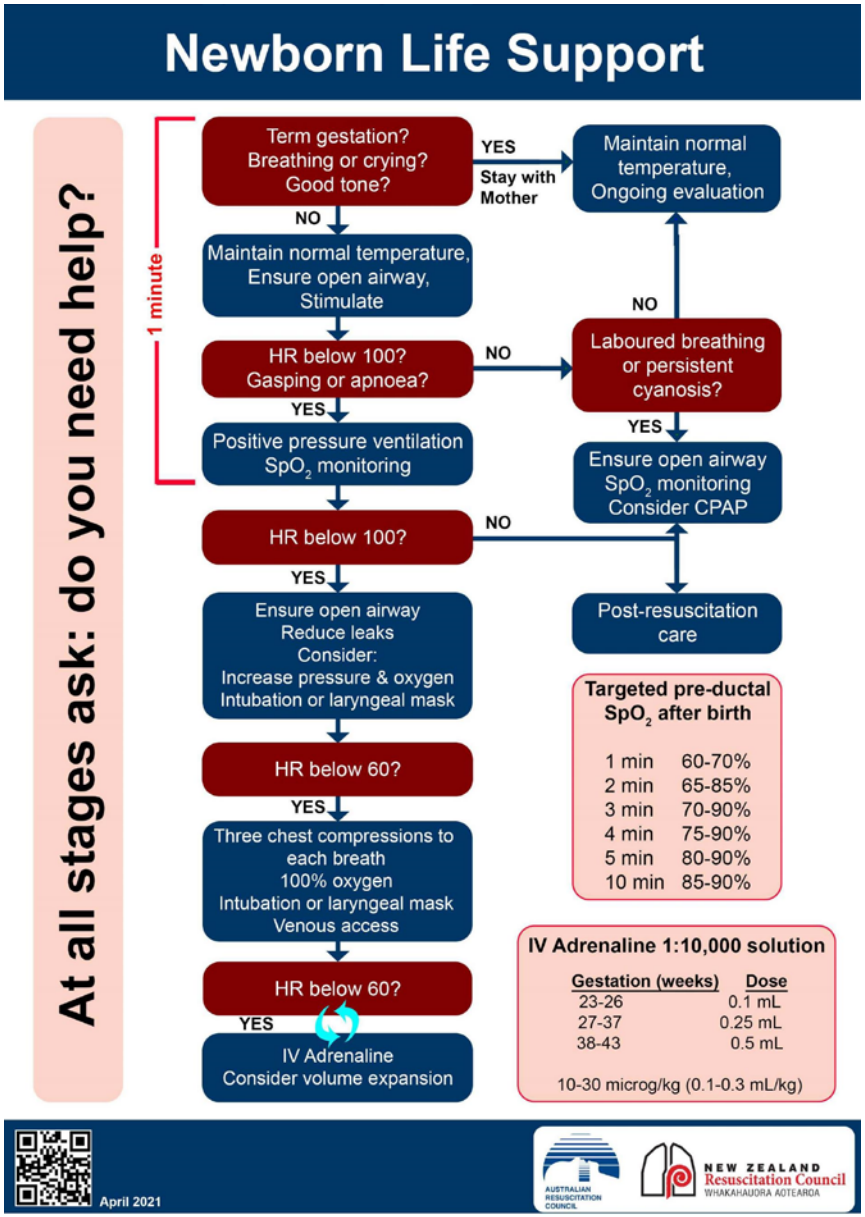
Cord clamping

Compromised baby any gestation

- Resuscitation takes precedence
- Consider maternal, fetal and placental conditions:
  - Relative contra-indications to delaying clamping–severe PPH, twin anaemia polycythaemia syndrome

Cord milking

- ≥ 34 weeks–insufficient evidence of benefit to recommend
- 28–33+6 weeks and if/when? immediate resuscitation not required–may be a reasonable alternative
- < 28 weeks gestation not recommended


Newborn Life Support
At all stages ask: do you need help?
1 minute
Term gestation?
Breathing or crying?
Good tone?
YES
Stay with Mother
Maintain normal temperature, Ongoing evaluation
NO
Maintain normal temperature, Ensure open airway, Stimulate
HR below 100?
Gasping or apnoea?
NO
Laboured breathing or persistent cyanosis?
YES
Positive pressure ventilation
SpO2 monitoring
YES
Ensure open airway
SpO2 monitoring
Consider CPAP
HR below 100?
NO
YES
Post-resuscitation care
Ensure open airway
Reduce leaks
Consider:
Increase pressure & oxygen
Intubation or laryngeal mask
Targeted pre-ductal SpO2 after birth
1 min 60-70%
2 min 65-85%
3 min 70-90%
4 min 75-90%
5 min 80-90%
10 min 85-90%
HR below 60?
YES
Three chest compressions to each breath
100% oxygen
Intubation or laryngeal mask
Venous access
IV Adrenaline 1:10,000 solution
Gestation (weeks) Dose
23-26 0.1 mL
27-37 0.25 mL
38-43 0.5 mL
10-30 microg/kg (0.1-0.3 mL/kg)
HR below 60?
YES
IV Adrenaline
Consider volume expansion
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WHAKAHAUORA AOTEAROA

Good practice point

If heart rate, oxygenation, breathing & tone do not improve ***or***

baby is deteriorating

Correct any problems with the airway and/or assisted ventilation ***then***

Progress to the next step of resuscitation

Initial assessment

- 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
- HR

Oxygen saturation monitoring

More accurate than visual assessment of colour

- 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 pulse 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 saturation levels

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: 94% Preterm baby: 90–95%

Care of baby

Drying and stimulation are assessment and resuscitative measures

- Support head in neutral position
- Careful handling and protection of skin
  - 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 ºC–37.5 ºC
- Oxygen consumption increased when:
  - Cold stressed–temperature < 36.5 ºC
  - Hypothermic–temperature < 36.0 ºC

Airway management

Effective ventilation is key to successful resuscitation

- Commence PPV by one minute of age 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 ≥ 34 weeks gestation (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:
  - Term: in air (21% O_2)
  - Preterm: in air–30% oxygen
- Titrate oxygen based on SpO_2
- If chest compressions commenced, increase oxygen to 100%

⚒ *Practice tip*

Use a oxygen/air blender if available

Positive pressure ventilation

- Rate:
  - 40–60 breaths per minute
- Pressures:
  - PEEP 5 cmH_2O
  - PIP
    - Term: 30 cmH_2O
    - Preterm: 20–25 cmH_2O

Effectiveness of PPV

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

CPAP

- Indicated for baby
  - Breathing spontaneously with laboured breathing/respiratory distress
  - Breathing but not meeting oxygen saturation targets
- Use 5–8 cmH_2O
  - Use facemask or nasal prongs

Endotracheal intubation

- Indications:
  - Unsuccessful face mask or supraglottic airway (e.g. 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 correct

- 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 CO_2 detector
  - Symmetrical air entry over lung fields on auscultation

Chest compressions

- Not substitute for effective ventilation
- Increase oxygen to 100%
- Insert UVC or IV

❖ Two thumb technique preferred (two clinicians) or two fingers over lower third of sternum (single clinician)

❖ Depth one third of AP diameter of chest

❖ Rate 90 per minute

❖ Ratio 3:1 (90 compressions:30 breaths per minute)

Medications and fluids

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

Adrenaline (epinephrine)

- Indication:
  - HR < 60 bpm
- Route:
  - UVC (preferred route)

Dose (vascular):

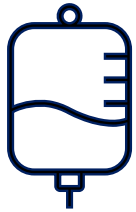
  - 1:10,000
  - 0.01–0.03 mg/kg (equates to 0.1–0.3 mL/kg)

- Repeat:
  - Every 3–5 minutes as indicated

Practice tip

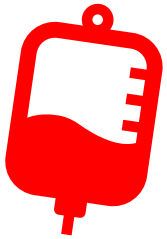
ETT route has different dose and administration recommendations from vascular route

Volume expanding fluids



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

Blood products



- Rarely required
- 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
- If breathing spontaneously and showing signs of respiratory distress
  - Commence CPAP in baby < 32 weeks
  - Use at least 5 cmH_2O (no more than 8 cmH_2O)
- Air or oxygen–air blend up to 30%
  - Titrate to SpO_2

Special circumstances

- Consider other special requirements for:
  - Multiple pregnancy
  - Pneumothorax
  - Pleural effusion/ascites/fetal hydrops
  - Pneumonia/sepsis
  - Fetal haemorrhage
  - Congenital anomalies–(e.g. 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:
  - If cord arterial pH is low, relative risk of neonatal encephalopathy increased

Ethical considerations

- Initiating resuscitation:
  - Consistent approach by all clinicians
  - Discuss with parents and involve them in decision making
- If in doubt or unexpected anomalies– initiate resuscitation until full clinical picture available and discussions occur with parents

Initiating resuscitation

Clinicians and parents together decide to withhold or withdraw treatment based on futility and best interests of baby

If **high** rate of survival and **acceptable** morbidity	Resuscitation usually indicated
If **borderline** survival and **high** rate of morbidity with prognosis uncertain and burden to child high	Support parent's views
If almost **certain** death and **unacceptable** high morbidity as indicated by gestation, birth weight or congenital anomaly	Resuscitation not indicated

Discontinuing resuscitation

"If, despite provision of all the recommended steps of resuscitation and excluding reversible causes, a newborn baby requires ongoing cardiopulmonary resuscitation (CPR) after birth, [ANZCOR] suggests discussion of discontinuing resuscitative efforts with the clinical team and family…. a reasonable timeframe to suggest this change in goals of care is around 20 minutes after birth"

Australian Resuscitation Council. ANZCOR Guideline 13.10 – Ethical issues in resuscitation of the newborn. [Internet]. 2021 [cited 2021 June 1]. Available from: https://resus.org.au

Discontinuing resuscitation

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

Withholding/withdrawing resuscitation

- Care in the best interests of baby
- Focus on baby's dignity, and comfort if signs of life present
- Support parents

Support for family

- Keep parents informed during and after resuscitation
- Facilitate early and regular contact with baby
- Facilitate referrals to support services/groups as indicted

- Provide relevant written parent information (e.g. QCG *Newborn resuscitation*)