

**Royal Hospital for Women (RHW)
NEONATAL BUSINESS RULE
COVER SHEET**



Health
South Eastern Sydney
Local Health District

NAME OF DOCUMENT	Neonatal Resuscitation at Birth
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SUMMARY	To provide clinicians the process for initiating neonatal resuscitation at birth using the Australian and New Zealand Committee on Resuscitation (ANZCOR) Guidelines
KEY WORDS	Resuscitation, ANZCOR, Neonate, Breathing, Heart rate, Assessment

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This Clinical Business Rule (CBR) is developed to guide safe clinical practice at the Royal Hospital for Women (RHW). Individual patient circumstances may mean that practice diverges from this Clinical Business Rule. Using this document outside RHW or its reproduction in whole or part, is subject to acknowledgement that it is the property of RHW and is valid and applicable for use at the time of publication. RHW is not responsible for consequences that may develop from the use of this document outside RHW.

Within this document we will use the term woman, this is not to exclude those who give birth and do not identify as female. It is crucial to use the preferred language and terminology as described and guided by each individual person when providing care.

1 BACKGROUND

Less than 10% of neonates birthed each year will require some level of assistance to transition to extrauterine life¹. Successful outcomes are associated with the rapid response of staff who are educated on physiological neonatal transition and resuscitation.

Neonatal resuscitation is performed according to the recommendation of the Australian and New Zealand Committee on Resuscitation (ANZCOR) Guidelines¹.

2 RESPONSIBILITIES

2.1 Midwifery staff – ensure resuscitaire is appropriately stocked and ready for birth, support woman and family, identify the deteriorating neonate, call for assistance and commence resuscitation.

2.2 Medical staff – provide advanced airway skills for resuscitation and clinical support for neonatal resuscitation, provide debrief.

2.3 Nursing staff – assist in neonatal resuscitation as required

3 PROCEDURE

3.1 Equipment

3.1.1 General

- Neonatal resuscitaire with radiant heat source
- Light
- Clock with timer in seconds
- Warmed towels or blankets
- Polyethylene bag and bonnet for neonate < 32 weeks gestation
- Humidified resuscitation for neonate <32 weeks gestation
- Stethoscope
- Pulse oximeter with neonatal probe
- Blood gas syringes/ needles and analyser
- Neonatal resuscitation trolley

3.1.2 Airway

- Mechanical suction/tubing – negative pressure source not to be >100 mmHg
- Suction catheter – minimum of two of each size (8 Fr [French], 10 Fr or 12 Fr)

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- Oropharyngeal airways (size 0 and 00)
- Laryngoscopes with infant blades – at least one each of size 00, 0 and 1
- Spare laryngoscope batteries
- Endotracheal tubes (ETT) – minimum of two of each size (2.5, 3.0, 3.5 and 4.0 mm [uncuffed, no eye])
- Endotracheal stylet or introducer
- Supplies for fixing endotracheal tubes (e.g. scissors, adhesive tape)
- End-tidal carbon dioxide detector (Pedicap®)
- Meconium aspirator
- Magill forceps
- Laryngeal mask airway (LMA), size 1 (only suitable for neonate ≥ 34 weeks' gestation and ≥ 2 kg)

3.1.3 Breathing

- Positive-pressure ventilation device including:
 - T-piece resuscitator (Neopuff®)
 - Self-inflating bag (approximately 240 mL)
- Appropriate size mask. BE AWARE, small masks (e.g. 35 mm), for extreme preterm neonate, are not routinely available on resuscitaire and need to be brought from the Newborn Care Centre (NCC) if required.
- Blended gas supply
- Size 8 French feeding tubes and 10 mL syringe for gastric decompression

3.1.4 Circulatory

- Peripheral intravenous cannulation (PIVC) equipment
- Umbilical catheter insertion pack
- Umbilical catheters: size 3.5Fr or 5.0Fr (or 5Fr feeding tube)
- 3-way tap
- Intraosseous needles – 50 mm length
- Tapes to secure Umbilical Vein Catheter (UVC)/PIVC
- Syringes and needles
- Skin preparation solution

3.1.5 Medication and fluids

- Adrenaline 1:10,000 concentration (0.1 mg/mL)
- Sodium Chloride 0.9%

3.2 Clinical Practice

- Recognise high risk birth where neonate may require resuscitation (Preterm birth, neonatal medical complexities).
- Ensure neonatal resuscitaire is appropriately stocked, on and in working order
 - Ensure clock/time is commenced from birth
- Assess the neonate and consider appropriateness of delayed cord clamping.
 - Respirations, heart rate (HR) auscultation with stethoscope and tone
 - ≥ 32 weeks' gestation, provide tactile stimulation, dry and keep warm (skin temp 36.5-37.5°C)
 - < 32 weeks' gestation, DO NOT DRY, place in a polyethylene bag up to neck after birth, place bonnet/beanie on head. Double clamp the cord for cord blood gas collection. Collect and perform analysis of paired sample when time permits (arterial & venous)
 - Provide routine care if respirations are regular and heart rate is > 100 beats per minute (bpm)

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- Escalate for appropriate level of assistance if required (Appendix A). If urgent, put out a neonatal code blue on 2222.
 - State Neonatal Code Blue, location including room or theatre number and your name.
 - Code blue team to ascertain role delineations where appropriate, including airway, circulation, scribe, timekeeper
- Scribe to report and record events accurately using the Newborn Resuscitation Record (kept on the neonatal resus trolley or in the drawer of the resuscitaire).
- Support the woman and support person/s, ensuring to acknowledge the situation and presence of staff in their birth space.

3.2.1 Irregular respirations but HR >100bpm

- Position neonate in a neutral position.
- Ensure open airway.
- Provide Positive Pressure Ventilation (PPV) with 21% oxygen (O₂) using appropriate size mask.
 - Peak Inspiratory Pressure (PIP) of 30cm Dihydrogen Oxide (H₂O) for a term neonate (20-25cm H₂O preterm neonate) and Positive End Expiratory Pressure (PEEP) of 5cm H₂O at 40-60 breaths per minute
- Consider increasing PIP if there is minimal chest movement during inflation.
- Use pulse oximetry when providing PPV (ask assistant to position saturation probe on the neonate's right wrist prior to connecting to monitor).
- Consider Continuous Positive Airway Pressure (CPAP) if respirations become regular but ongoing increased work of breathing is noted.
- Assess neonate's HR every 60 seconds.

3.2.2 Irregular respirations and/or HR <100bpm

- Ensure neonate is in neutral position to maintain open airway and adequate fit and seal of face mask is established.
- Continue PPV.
- Assess chest movement and adjust pressure to achieve adequate ventilation.
- Apply pulse oximetry (if not already in use).
- Provide blended O₂ and titrate to maintain neonatal preductal O₂ saturations as per Appendix 2.
- Consider intubation or LMA if adequate ventilation is not achieved with mask ventilation.

3.2.3 HR persistently <60bpm despite adequate assisted ventilation

- **Activate a CODE BLUE CALL (DIAL 2222)**
- Increase blended O₂ to 100%.
- Continue PPV.
- Commence cardiopulmonary resuscitation (CPR):
 - 90 chest compressions to 30 breaths per minute [3:1]⁶
 - Two thumb encircling hands method is preferred⁶
 - Compress 1/3 anterior-posterior chest⁶
- Consider intubation or LMA if adequate ventilation not achieved with mask ventilation. Only appropriately trained staff can insert an LMA.

3.2.4 HR remains <60bpm following 1 minute of CPR

- Continue CPR.
- Prioritise intubation if skilled staff available (consider LMA if skilled staff not available).
- Administer adrenaline via ETT⁷ as per Australasian Neonatal Medicines Formulary.

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- Insert UVC for medication and fluid volume administration.
 - Insert to approximately 4-5 cm from stump for term neonate
 - Ensure blood returns freely upon aspiration of UVC
 - Secure UVC to abdomen with adhesive tape
- Consider second dose of adrenaline via ETT if UVC insertion unsuccessful.
- Administer adrenaline via UVC⁷:
 - 1:10,000
 - 0.1- 0.3 mL/kg
- Ensure UVC is flushed with 0.9% sodium chloride following administration of medication.
- Continue chest compressions after adrenaline administration to ensure circulation of medication.
- Repeat dose intravenously every few minutes if HR remains <60bpm.
- Consider volume expansion (0.9% sodium chloride or whole blood transfusion if indicated [antepartum haemorrhage])
 - Use for any suspected blood loss or if neonate appears pale, poorly perfused, weak pulse and is not responding to other resuscitative measures
 - Give 0.9% normal saline 10 mL/kg by slow intravenous (IV) push over 5-10 minutes
 - Use O negative blood in the setting of massive blood loss. **O negative blood is kept in the Randwick Campus Operating Theatre and can be accessed by the nursing supervisor or senior medical officer**

3.2.5 Presence of meconium-stained liquor

- Provide routine care if neonate is vigorous with good respiratory effort, normal tone and HR >100bpm.
- Provide either of two pathways for neonate that is NOT vigorous at birth:
 - Clinicians without advanced airway skills should resuscitate the neonate as per routine resuscitative measures. This may include suctioning visualised meconium
 - Clinicians with advanced airway skills may consider intubation and brief suctioning using a meconium aspirator
- Provide PPV with 21% O₂ within the first 30 seconds after birth in the non-breathing, or ineffectively breathing neonate with poor muscle tone.

NOTE:

For all newborns exposed to meconium-stained amniotic fluid, ANZCOR suggests AGAINST routine direct laryngoscopy immediately after birth, with or without tracheal suctioning.

It is extremely important to avoid any delay in commencing resuscitation regardless of the pathway chosen.

AVOID prolonged or multiple intubation attempts, and/or waiting for clinicians with advanced airway skills to arrive.

3.2.6 Blended Oxygen Use

- Aim for O₂ saturation that resembles that of a healthy term neonate regardless of gestation (Appendix 2).
- Use blended O₂ cautiously and be guided by pulse oximetry.
- Use 21% O₂ at the commencement of resuscitation for **term neonate**.
- Use either 21% O₂ or a low concentration O₂ (up to 30%) for **preterm neonate or a known congenital lung pathology**.
- Consider higher concentration of O₂ if oxygenation (ideally guided by oximetry) remains unacceptable despite effective ventilation.

3.2.7 Tracheal Intubation

- Select ETT size by estimated weight

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- < 1kg = 2.5
- 1-2kg = 3
- 2-3kg = 3.5
- > 3kg = 3.5/4.0
- Use laryngoscope straight blade:
 - Size 1 (10cm) for term infants and larger preterm neonates
 - Size 0 (7.5cm) for premature neonates <32 weeks gestation
 - Size 00 (6cm) for extremely low birth weight neonates
- Estimate depth of insertion of ETT (weight in kg +6 cm or use Table 1 for greater precision in extremely low birth weight or preterm neonates)

Table 1: Recommended ETT length to the nearest 0.5cm by corrected gestation and weight at time of intubation⁵

Corrected gestation (weeks)	Actual weight (kg)	ETT mark at lip (cm)
23–24	0.5–0.6	5.5
25–26	0.7–0.8	6.0
27–29	0.9–1.0	6.5
30–32	1.1–1.4	7.0
33–34	1.5–1.8	7.5
35–37	1.9–2.4	8.0
38–40	2.5–3.1	8.5
41–43	3.2–4.2	9.0

- Check for signs of successful intubation:
 - Chest movement with each breath
 - Increase in HR
 - Oxygen saturations improve
 - Visualisation of tube passing through vocal cords
 - Colour change towards yellow on carbon dioxide (CO₂) detector
 - Auscultation of equal breath sounds

3.2.8 Post Resuscitation Care

- Obtain paired cord gases including pH, lactate and Base Excess for neonates needing active resuscitation.
- Report arterial pH if <7.10 to neonatal medical team.
- Inform the NCC Team Leader/ Nursing Unit Manager of admission requirements.
- Admit to NCC for ongoing assessment and formal observations for 4-6 hours if:
 - Intubated during resuscitation
 - Need for prolonged resuscitation (e.g. assisted ventilation and/or chest compressions at 10 minutes)
 - Apgar score at 10 minutes ≤ 5
 - Acidosis as determined by cord blood gas or sample taken from the neonate soon after birth (pH <7.0 or base excess worse than -12mmol/L)
 - If lactate >8mmol/L on cord blood gas or sample taken from the neonate soon after birth
 - If received naloxone at birth (see educational notes)
- Insert a size 8 Fg orogastric tube to aspirate and decompress the stomach of any neonate that required prolonged ventilation. (Consider size 6Fg feeding tube if extremely premature infant.)
- Invite the relevant support person to accompany the resuscitation team and neonate to NCC.

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- Consider discontinuation of resuscitative efforts if the neonate is in cardiorespiratory arrest and does not have a detectable heart rate after 10-20 minutes of intensive resuscitation. **Ceasing resuscitation must be discussed with on-call neonatologist and the family/support person.**

3.3 Documentation

- Electronic Medical Record (eMR)
- Newborn Resuscitation Record
- eRIC
- NICUS database

3.4 Educational Notes

- ANZCOR neonatal guidelines for resuscitation are drawn from consensus treatment and resuscitation recommendations from:
 - International Liaison Committee on Resuscitation (ILCOR) includes representation from the Australian Resuscitation Council (ARC) and the New Zealand Resuscitation Council (NZRC)²
 - American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care (Neonatal) 2015³
 - European Resuscitation Council Guidelines for Resuscitation 2015⁴
- World Health Organisation (WHO) definitions:
 - Very preterm (28+0 to 31+6 weeks)
 - Moderate to late preterm (32+0 to 36+6 weeks)
 - Term (37+0 weeks and over)
- The temperature of a neonate should be maintained between 36.5°C and 37.5°C after birth. The recorded admission temperature is a predictor of outcome as well as a quality indicator.
- At < 32 weeks gestation, placing the neonate in a polyethylene bag up to neck and placing a bonnet on the head has been shown to be effective in reducing hypothermia.
- In the setting of meconium-stained liquor, ANZCOR suggests against routine direct laryngoscopy immediately after birth, with or without tracheal suctioning.¹
- Ventilatory support of term neonates should start with air. For preterm neonates < 35 weeks gestation, either air or a low concentration of O₂ (up to 30%) is recommended. If, despite effective ventilation, oxygenation remains unacceptable, use of a higher concentration of O₂ should be considered.
- Initial respiratory support of spontaneously breathing preterm neonates with respiratory distress may be provided by CPAP.
- It is mandatory for all health care professionals involved in the direct care of neonates to attend an annual teaching and assessment of basic neonatal life support.
- The Newborn Life Support Flow diagram focus on the first minute after birth (Appendix B). The emphasis is on rapid assessment and prompt initiation of first response interventions.
- Cord clamping:¹
 - Should be delayed for at least one minute in neonates who do not require resuscitation.
 - Delayed cord clamping is recommended for preterm neonates not requiring immediate resuscitation at birth.
 - There is insufficient evidence to recommend an approach to cord clamping for compromised preterm neonates requiring immediate resuscitation after birth.
- Medications are rarely indicated in resuscitation of the neonate as bradycardia is usually the result of inadequate lung inflation or profound hypoxia. Adequate ventilation is the most important step in correcting bradycardia.

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- The following medications may be used in special circumstances but are not available on the resuscitation trolleys⁷:
 - **Naloxone** for reversal of respiratory depression in a neonate whose mother received narcotics within 4 hours of birth.
 - Ensure adequate ventilation and circulation before administration.
 - Dose: 0.1 mg/kg of a 0.4 mg/mL solution given intramuscularly or intravenous
 - **DO NOT** administer naloxone to neonate born to woman suspected of narcotic dependence (may cause abrupt withdrawal and seizure)
 - Sodium **Bicarbonate** in the case of prolonged resuscitation and/or unresponsive to other therapy.
 - Should be given only after all attempts to establish ventilation and circulation.
 - Dose: 1-2 mEq/kg of a 0.5 mEq/mL solution
 - Dilute in equal volume with water for injection and give by slow intravenous push over at least 2 minutes.
 - **DO NOT** give via ETT.
- The umbilical vein is the most accessible IV route for volume expansion and administration of medication. Consider UVC insertion when chest compressions are required.
- Intraosseous lines should be considered if umbilical or direct venous access is unattainable.¹
- Endotracheal route may be used for administration of adrenaline only.
- In a late preterm and term neonate, ANZCOR suggests that it is reasonable to stop resuscitation if the heart rate is undetectable and remains so for 10 minutes, because both survival and quality of survival deteriorate precipitously by this time. However, the decision to continue resuscitation efforts beyond 20 minutes when there is no heart rate, or a very low heart rate is often complex and may be influenced by issues such as whether the resuscitation was considered to be optimal, availability of advanced neonatal intensive care (including therapeutic hypothermia), presumed aetiology and timing of the arrest, the gestation of the neonate, specific circumstances prior to delivery (e.g. known timing of the insult) and wishes expressed by the family.¹
- The absence of spontaneous breathing or an Apgar score of 1-3 at 20 minutes of age in babies >34 weeks but with a detectable heart rate are strong predictors of mortality or significant morbidity.¹
- If it is decided to withdraw or withhold resuscitation, care should be provided in a way that is focused on the neonate's comfort (if signs of life are still present) and dignity, and on support of the parents

3.5 CBR Implementation Plan

The revised CBR will be distributed to all medical, nursing and midwifery staff via @health email. The CBR will be discussed at ward meetings, education and patient quality and safety meetings. Education will occur through in-services, open forum and local ward implementation strategies to address changes to practice. The staff are asked to respond to an email or sign an audit sheet in their clinical area to acknowledge they have read and understood the revised CBR. The CBR will be uploaded to the CBR tab on the intranet and staff are informed how to access

3.6 Related Policies/procedures

- NSW Health Guideline GL2018_016- Maternity – Resuscitation of the Newborn Infant
- NSW Health Policy PD2012_069- Health Care Records - Documentation and Management
- RHW LOP- Neonatal Observations Guideline

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- RHW PNW CBR- Admission of a neonate to Postnatal Ward
- RHW NCC Nursing CBR- Admission of a neonate to Newborn Care Centre
- RHW NCC Medical CBR- Umbilical Catheterisation
- RHW NCC Nursing CBR- Humidified and heated gas for preterm infants at birth
- ANMF guidelines

3.5 Abbreviation

ANZCOR	Australian and New Zealand Committee on Resuscitation	ETT	Endotracheal tubes
LMA	Laryngeal mask airway	PIVC	Peripheral intravenous cannula
UVC	Umbilical Veinous Catheter	HR	Heart rate
bpm	beats per minute	PPV	Positive Pressure Ventilation
PIP	Peak Inspiratory Pressure	PEEP	Positive End Expiratory Pressure
CPAP	Continuous Positive Airway Pressure	CPR	Cardiopulmonary resuscitation
ILCOR	International Liaison Committee on Resuscitation	ARC	Australian Resuscitation Council
NZRC	New Zealand Resuscitation Council		

3.6 References

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4 ABORIGINAL HEALTH IMPACT STATEMENT DOCUMENTATION

- Considerations for culturally safe and appropriate care provision have been made in the development of this Business Rule and will be accounted for in its implementation.
- When clinical risks are identified for an Aboriginal and/or Torres Strait Islander woman or family, they may require additional supports. This may include Aboriginal health professionals such as Aboriginal liaison officers, health workers or other culturally specific services

5 CULTURAL SUPPORT

- For a Culturally and Linguistically Diverse CALD woman, notify the nominated cross-cultural health worker during Monday to Friday business hours
- If the woman is from a non-English speaking background, call the interpreter service: [NSW Ministry of Health Policy Directive PD2017_044-Interpreters Standard Procedures for Working with Health Care Interpreters.](#)

6 NATIONAL STANDARDS

- Standard 1 Clinical Governance
- Standard 2 Partnering with Consumers
- Standard 3 Preventing and Controlling Infections
- Standard 4 Medication Safety
- Standard 5 Comprehensive Care
- Standard 6 Communicating for Safety
- Standard 7 Blood Management
- Standard 8 Recognising and Responding to Acute Deterioration

REVISION AND APPROVAL HISTORY

Date	Revision No.	Author and Approval
16/5/05	1	Quality Council
19/6/06	2	Quality Council
4/9/08	3	Neonatal Clinical Committee
12/2011	4	Neonatal Services Division
16/2/12	5	Quality & Patient Safety Committee
2/7/2019	6	RHW NCC LOPs Committee
8/2020	7	Maternity LOPs Committee

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24/5/24	8	S Arbidans (CMC), T Schindler (Neonatologist), M Currie (NP), R Jackson (NE)
20.6.24	8	Endorsed by NCC CBR Committee
5.8.24	8	Reviewed and accepted by Lily Byun (RHW Pharmacist)
9.9.24	8	Endorsed RHW BRGC

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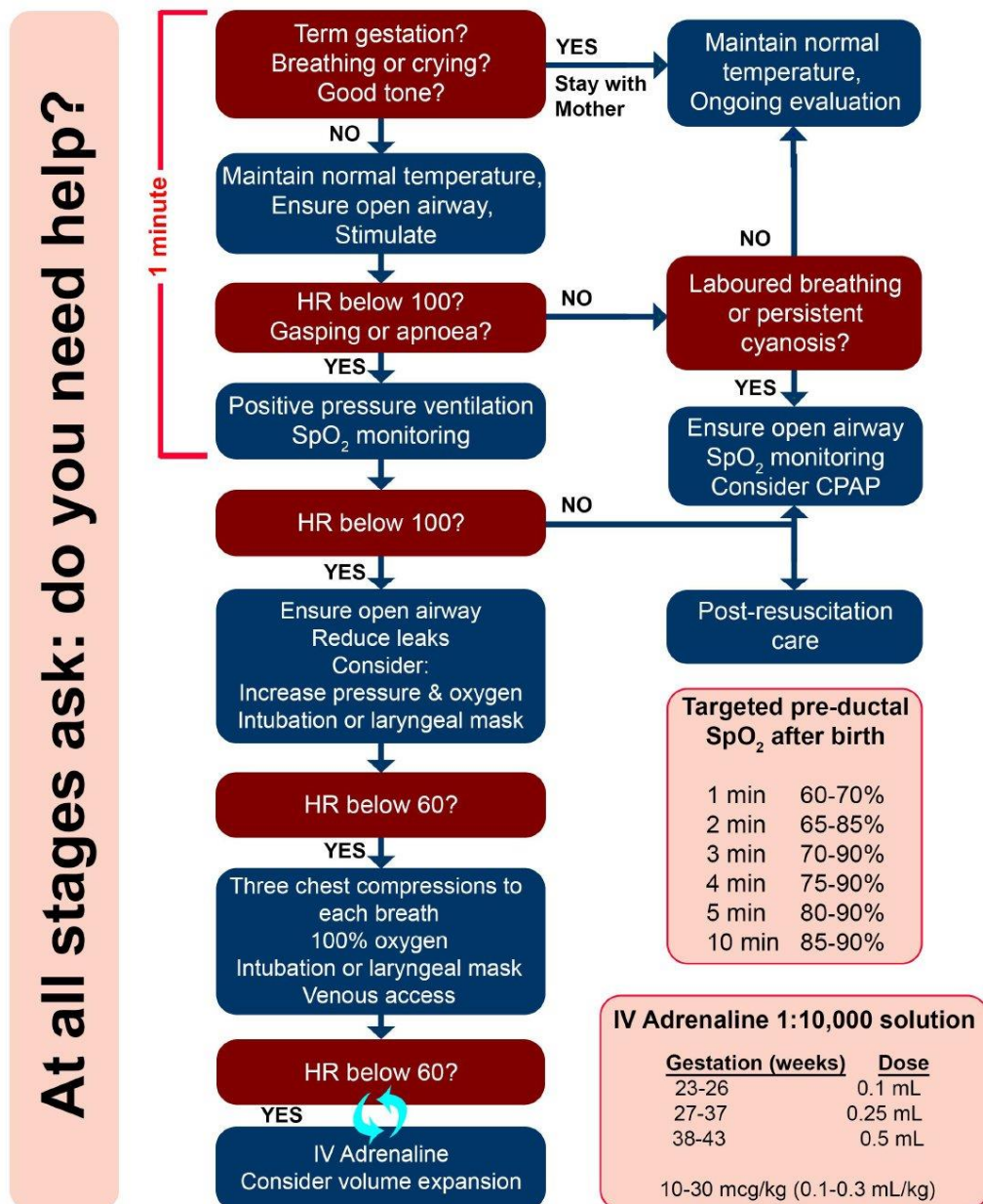
Appendix A Deliveries requiring paediatric attendance at birth

Risk Factor	Minimum Level of Assistance Required
CTG abnormality in “red zone”	Paediatric RMO/ Paediatric Registrar/ Neonatal Nurse Practitioner (NNP)
Emergency caesarean according to risk factor	Depends on indication for caesarean- at least paediatric RMO
Significant foetal abnormality	Paediatric RMO/Registrar/NNP
Foetal scalp blood sampling; pH <7.20 or lactate ≥4.8	Paediatric registrar/ NNP
General anaesthetic	Paediatric RMO/Registrar/NNP
Hydrops fetalis	Paediatric registrar/ NNP/ Fellow/ Consultant
Instrumental delivery	Paediatric RMO
Intrauterine growth restriction	Paediatric RMO
Breech presentation	Paediatric RMO
Meconium	Paediatric RMO
Multiple gestation	Paediatric RMO and Paediatric registrar +/- Neonatal intensive care nurse if other risk factors
Placental and cord accidents (e.g. cord prolapse or placental abruption)	Paediatric registrar/ NNP
Prematurity <32 weeks	Paediatric registrar/ NNP/ fellow/ consultant and Neonatal intensive care nurse
Prematurity >32 weeks <37 weeks	Paediatric registrar/ NNP
Shoulder dystocia	Paediatric registrar/ NNP
Foetal concerns	Paediatric RMO/ Paediatric registrar/ NNP

Appendix B
Australian and New Zealand Committee of Resuscitation (ANZCOR)
Algorithm

Australian and New Zealand Committee of Resuscitation (ANZCOR) Algorithm

Newborn Life Support



Reviewed August 2023



NEW ZEALAND
Resuscitation Council
WHAKAHAUORA AOTEAROA