

neoResus

The Victorian Newborn Resuscitation Project

First Response

Learning Module 2

Based on ILCOR 2020 and ANZCOR 2021

© Victorian Newborn Resuscitation Project
Updated July 2021

1

neoResus

The Victorian Newborn Resuscitation Project

Learning objectives

Following completion of the theoretical & practical components of this module, the participant will be able to demonstrate their ability to:

- 1 Assess a newborn infant's transition to extra-uterine life and determine the need for resuscitation
- 2 Initiate **First Response** interventions including positive pressure ventilation via a face mask or supraglottic airway, and external chest compressions
- 3 Assess the newborn's response to these interventions and determine when **Advanced Resuscitation** interventions are required

Updated July 2021
© Victorian Newborn Resuscitation Project

2

neoResus

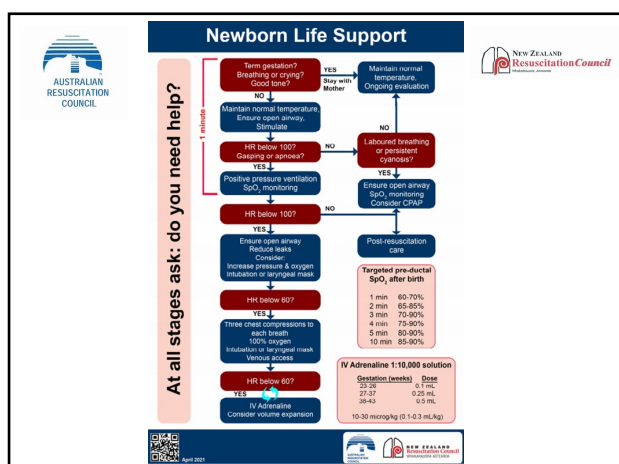
The Victorian Newborn Resuscitation Project

Behavioral factors

- Anticipation of need and escalation of care
 - Based on risk assessment
- Equipment
 - Checked and ready for use
- Environment
 - Warm and clean
 - Situational awareness
- Skilled personnel
 - Able to form a team, nominate leadership, allocate roles and develop a plan of action

Updated July 2021
© Victorian Newborn Resuscitation Project

3



4

Transition to extra-uterine life

- Very few newborns require “resuscitation”
- Most will respond to simple interventions
- First Response interventions are therefore most important & time critical

Intervention	Percentage
No intervention other than drying and stimulation	81%
Suction and/or oxygen therapy	6.1%
Positive pressure ventilation through mask	5.7%
Intubation & positive pressure ventilation	0.6%
Cardiac compressions & positive pressure ventilation	0.2%

* Australian Institute of Health and Welfare 2020†

5

Delayed cord clamping (DCC)

Vigorous newborn: ILCOR and ANZCOR suggest:

- DCC for all infants, regardless of gestational age
- Aim to delay cord clamping ≥ 60 seconds if:
 - Uncomplicated term or preterm birth ≥ 34 weeks, **and**
 - Newborn is breathing and has good muscle tone
- Aim to delay cord clamping ≥ 30 seconds if:
 - Newborn <34 weeks who does not require immediate resuscitation interventions
- Ideally wait until breathing is established before clamping the cord. Do not pull on the cord.
- Continue to reassess the newborn until the cord is clamped

Updated July 2021
© Victorian Newborn Resuscitation Project

6

Delayed cord clamping (DCC)

neoResus

Non-vigorous newborn: ILCOR and ANZCOR suggest:

- In newborns who do not breathe or have poor muscle tone at birth, or become apnoeic or hypotonic during transition on the cord:
 - Cut the cord and move the newborn to the resuscitaire
 - Insufficient evidence regarding initiating resuscitation interventions before cord clamping (studies underway)
- Avoid pulling on the cord
- Document the time of cord clamping
- Continue to assess the newborn

Updated July 2021
© Victorian Newborn Resuscitation Project

7

Cord milking ('stripping')

neoResus

ILCOR and ANZCOR suggest

Term and ≥ 34 weeks' gestation newborns:

- Insufficient evidence of benefit of milking the intact cord

<28⁺⁰ weeks' gestation newborns:

- ANZCOR suggest **against** intact cord milking

For all newborns, irrespective of gestational age:

- ANZCOR suggest **against** milking a cut cord

Updated July 2021
© Victorian Newborn Resuscitation Project

8

Monitoring

neoResus

- Pulse oximetry is recommended:

- When the need for resuscitation is anticipated
- When persistent cyanosis is suspected
- When CPAP or positive pressure is used
- When supplemental oxygen is used
- Place the oximeter sensor on the right wrist or hand (pre-ductal oxygen saturation)

- ECG monitoring:

- Can be used to more rapidly and accurately display heart rate in the first 3 minutes of life

Updated July 2021
© Victorian Newborn Resuscitation Project

9

If meconium liquor is present:

Regardless of consistency of meconium:

If the newborn is vigorous:

- Endotracheal suctioning is discouraged because it does not alter outcome and may cause harm

If the newborn is not vigorous:

- No evidence of the value of routine or repeated endotracheal suctioning to prevent meconium aspiration
- Priority is to initiate resuscitation interventions for newborns who are not breathing or ineffective breathing

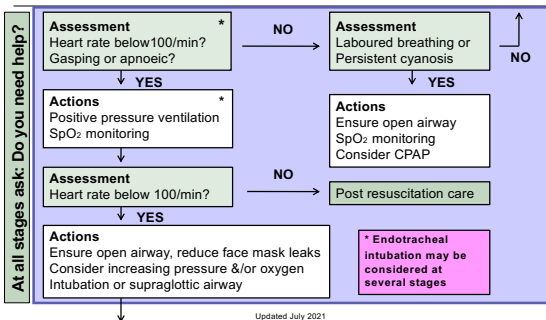
All newborns exposed to meconium:

- ANZCOR suggests against routine direct laryngoscopy, with or without tracheal suctioning

Updated July 2021
© Victorian Newborn Resuscitation Project

13

B: Breathing



14

CPAP during resuscitation

- Spontaneously breathing term newborns with respiratory distress
 - A trial of CPAP may be considered
- Spontaneously breathing newborns <32 weeks' gestation with respiratory distress who require respiratory support
 - ANZCOR suggest commencing CPAP in the first minutes after birth rather than intubation and ventilation
 - Use a CPAP pressure at least 5 cm H₂O

Updated July 2021
© Victorian Newborn Resuscitation Project

15

Manual ventilation devices

"A T-piece device, a self inflating bag (~240mL) and a flow inflating bag are all acceptable devices to ventilate newborn infants either via a face mask, supraglottic airway or endotracheal tube." (ANZCOR, 2021)



Updated July 2021
© Victorian Newborn Resuscitation Project

16

Initial settings: T-piece device

- Gas flow
 - Set at 8-10 L/min (8 L/min if using cylinders)
- Maximum pressure relief valve
 - Set at 50 cm H₂O
- Peak inspiratory pressure (PIP)
 - Set at 30 cm H₂O (term newborn)
 - Set at 20 - 25 cm H₂O (preterm <32 weeks)
- Positive end expiratory pressure (PEEP)
 - Set at 5 - 8 cm H₂O

Updated July 2021
© Victorian Newborn Resuscitation Project

17

Initial T-piece settings by gestation

Initial settings	Term	<35 weeks	<32 weeks
PIP cmH ₂ O	30	30	20-25
PEEP cmH ₂ O	5-8	5-8	5-8
Air/oxygen	21%	21-30%†	21-30%†
Avoid high O ₂ initially (65%-100%)			

† Use room air if air/oxygen blend not available

Updated July 2021
© Victorian Newborn Resuscitation Project

18

PEEP during resuscitation

- Without PEEP:
 - Lung aeration is not achieved as quickly
 - Functional residual capacity (FRC) is not established
- With PEEP:
 - FRC is established and maintained
 - Oxygenation is improved
- ANZCOR (2021) recommend:
 - PEEP of 5 - 8 cm H₂O during resuscitation of preterm newborns recommended

Updated July 2021
© Victorian Newborn Resuscitation Project

19

Oxygen use in resuscitation

- **All newborns**
 - Oxygen should be used judiciously, guided by SpO₂
 - Introduce supplemental oxygen if lower end of target saturations are not met, despite respiratory support
 - Avoid hyperoxaemia
 - Avoid hypoxaemia
- **If external chest compressions are required:**
 - Increase oxygen concentration to 100%
 - Oxygen concentration should be weaned as soon as the heart rate is >100 bpm and target saturations >90%

Updated July 2021
© Victorian Newborn Resuscitation Project

20

Target saturations for newborn infants during resuscitation

Time after birth in minutes	Targeted pre-ductal oxygen saturations for newborn infants during resuscitation
1 minute	60 – 70%
2 minutes	65 – 85%
3 minutes	70 – 90%
4 minutes	75 – 90%
5 minutes	80 – 90%
10 minutes	85 – 90%

ANZCOR, 2021, Guideline 13.4

Updated July 2021
© Victorian Newborn Resuscitation Project

21

Positive pressure ventilation

Optimal positive pressure ventilation requires:

1. An appropriately sized face mask
2. A good seal between the mask and the face to minimise leak

❖ Consider two people holding the mask: one supporting the jaw and holding the mask in place with two hands; the second person providing positive pressure inflations



The 'two-point top hold' is one method shown to reduce mask leak when using the Laerdal™ round mask⁴

Updated July 2021
© Victorian Newborn Resuscitation Project

22

Ventilation rate and pressure

- Rate: 40 - 60 inflations per minute
- Peak inflating pressure (PIP):
 - Variable and should be individualised
 - Effective ventilation may be achieved with progressively lower pressures and rates
- Avoid hyperventilation (excessive PIP &/or rate)
 - Can lead to dangerously low CO₂ levels (<30 mmHg)
 - Can depress respiratory drive
 - Can reduce cerebral blood flow

Updated July 2021
© Victorian Newborn Resuscitation Project

23

Assessing the effectiveness of positive pressure ventilation

- Re-assess the heart rate every 30 seconds
- The effectiveness of ventilation is confirmed by:
 1. An increase in the heart rate above 100/min.
 2. A slight rise and fall of the chest and upper abdomen with each inflation.
 3. An improvement in oxygenation (assessed by pulse oximetry).

Updated July 2021
© Victorian Newborn Resuscitation Project

24

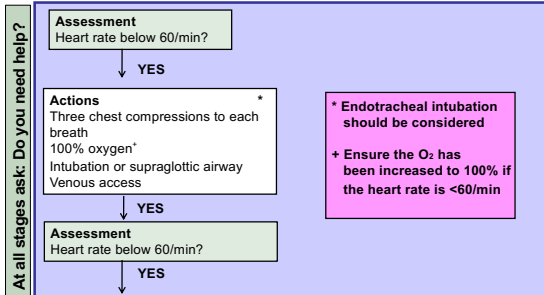
If the heart rate is not improving with positive pressure ventilation

- Check the ventilation technique
 - Is there a face mask leak?
 - Is the airway patent?
- Increase the peak inflating pressure
 - Increase the PIP in 5 cmH₂O increments: 30→35→40→45→50* cm H₂O if necessary
- Increase oxygen according to SpO₂ targets
 - Increase to 100% if the heart rate is <60/min

Updated July 2021
© Victorian Newborn Resuscitation Project

25

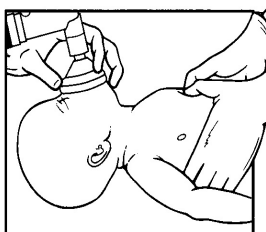
C: Circulation



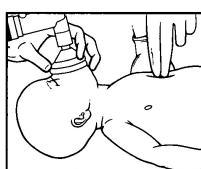
Updated July 2021
© Victorian Newborn Resuscitation Project

26

Techniques for ECC in newborns



Hand encircling, two thumb
(recommended technique)



Two finger technique
(only if single operator)

Updated July 2021
© Victorian Newborn Resuscitation Project

27

Advanced resuscitation

- Advanced resuscitation interventions are indicated if first response interventions do not result in an improvement in:
 - Heart rate
 - Breathing
 - Pre-ductal oxygen saturation (SpO₂)
 - Muscle tone

Updated July 2021
© Victorian Newborn Resuscitation Project

28

Interventions include

- Intubation
- Insertion of a supraglottic airway device
- Establishing umbilical venous or intraosseous access
- Administration of adrenaline
- Administration of volume expanders
 - 0.9% sodium chloride
 - O-negative red blood cells if blood loss or shock

Updated July 2021
© Victorian Newborn Resuscitation Project

29

Preparing for endotracheal intubation

Estimated endotracheal size internal diameter can also be calculated as gestation age in weeks divided by 10

Estimated depth of insertion
"Rule of 6"
Birth weight in kg + 6cm



Endotracheal size & depth of insertion (oral tube)

Corrected gestation (Weeks)	ETT size (Guide: GA ÷ 10)	Actual weight (kg)	ETT mark at the lip (cm)
23 – 24	2.5 mm	0.5 – 0.6	5.5
25 – 26		0.7 – 0.8	6.0
27 – 29		0.9 – 1.0	6.5
30 – 32	3.0 mm	1.1 – 1.4	7.0
33 – 34		1.5 – 1.8	7.5
35 – 37	3.5 mm	1.9 – 2.4	8.0
38 – 40		2.5 – 3.1	8.5
41 – 43		3.2 – 4.2	9.0

30

Supraglottic Airway (SGA)

Consider if:

- Face mask ventilation is unsuccessful
- Tracheal intubation is unsuccessful or not feasible
- Term or near-term infant, ≥ 34 weeks' gestation, ~ 2000 g birth weight
- Size 1 SGA



Updated July 2021
© Victorian Newborn Resuscitation Project

31

D:Drugs

At all stages ask: Do you need help?

Assessment
Heart rate below 60/min? +

YES

Actions
IV Adrenaline: 1:10,000
Dose: 0.1-0.3 mL/kg
Consider volume expansion

* Endotracheal intubation should be performed
* Ensure the O_2 has been increased to 100% if the heart rate is <60 /min

Remember to document all interventions & the newborn's response

Updated July 2021
© Victorian Newborn Resuscitation Project

32

Adrenaline

Adrenaline 1:10,000 solution	
Route	Dose
Umbilical vein	0.1 - 0.3 mL/kg
Peripheral IV	(10 - 30 mcg/kg)
Intraosseous	
Endotracheal tube (ETT)	0.5 - 1.0 mL/kg (50 - 100 mcg/kg)

- Use 1:10,000
- Intravenous route recommended - will require venous access (insertion of an umbilical venous catheter, peripheral intravenous cannula or intraosseous needle)

Updated July 2021
© Victorian Newborn Resuscitation Project

33

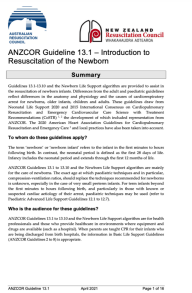
For more information on:

- Intubation
 - Use of an exhaled CO₂ detector
 - Use of a supraglottic airway (LMA™/i-Gel™ or similar)
 - Intravenous, umbilical and intraosseous access
 - Medications
 - Discontinuation &/or withdrawal of resuscitation
 - Resuscitation in special circumstances
 - Post resuscitation care and stabilisation
- See the “Learning Resources” section of the NeoResus web site at <http://www.neoresus.org.au>

Updated July 2021
© Victorian Newborn Resuscitation Project

34

Australian & New Zealand Committee on Resuscitation (ANZCOR)



Section 13.1 – 13.10 Neonatal Guidelines Published April 2021

Available for download at
www.resus.org.au

Updated July 2021
© Victorian Newborn Resuscitation Project

35

Key references

- Australian Institute of Health and Welfare 2020. *Australia's mothers and babies 2018- in brief*. Perinatal statistics series no.36. Cat no. PER 108. Canberra: AIHW.
- Australian & New Zealand Resuscitation Councils. (2021). Section 13: Neonatal Guidelines. Accessed 4 June 2021 from: <http://www.resus.org.au>
- Wyckoff, M.H., & Weiner, G.M. on behalf of the Neonatal Life Support Collaborators. (2020). Neonatal Life Support: 2020 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. *Circulation*; 142 (Supp 1); S185-S221.
- Wood, FE, Morley, CJ, Dawson JA *et al.* (2008). Improved techniques reduce face mask leak during simulated neonatal resuscitation: Study 2. *Arch Disease Child, Fetal Neonatal Ed*; 93:F230-234.

Updated July 2021
© Victorian Newborn Resuscitation Project

36

Additional Resources

Victoria

Neonatal e-handbook
<https://www.bettersafercare.vic.gov.au/clinical-guidance/neonatal>

New South Wales

Maternity: Resuscitation of the newborn
https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/GI_2018_01_6.pdf

Queensland

Maternity and Neonatal Clinical Guidelines
<https://www.health.qld.gov.au/gco/publications>

Updated July 2021
 © Victorian Newborn Resuscitation Project

37

Disclaimer

This teaching program has been developed by the Paediatric Infant Perinatal Emergency Retrieval Service (PIPER) Victoria as an educational program around neonatal care.

Whilst appreciable care has been taken in the preparation of this material, PIPER shall not be held responsible for any act or omission which may result in injury or death to any baby as a result of reliance on this material.

Updated July 2021
 © Victorian Newborn Resuscitation Project

38

Copyright

- This presentation was developed by Dr Rosemarie Boland and Dr Marta Thio on behalf of the Victorian Newborn Resuscitation Project (2021).
- The material is copyright NeoResus.
- This presentation may be downloaded for personal use but remains the intellectual property of NeoResus and as such, may not be reproduced or used for another training program without the written permission of the Victorian Newborn Resuscitation Project Executive.
- Please contact us at admin@neoresus.org.au

Updated July 2021
 © Victorian Newborn Resuscitation Project

39
