


neoResus
The Victorian Newborn Resuscitation Project

First Response
Learning Module 2
Based on ILCOR and ANZCOR 2016

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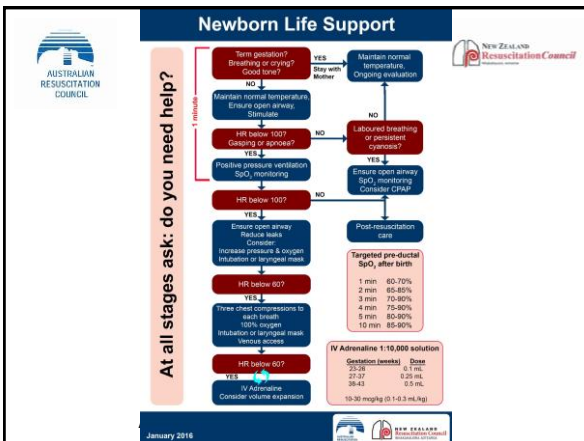


Learning objectives

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

- Assess a newborn infant's transition to extra-uterine life & determine the need for resuscitation.
- Initiate **First Response** interventions including face mask ventilation and external chest compressions.
- Assess the newborn's response to these interventions and determine when **Advanced Resuscitation** interventions are required.

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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

Resuscitation at birth in Australia: 2012	
Suctioning	5%
Oxygen therapy	5%
Positive pressure ventilation	5%
Intubation & positive pressure ventilation	1%
Cardiac compressions & positive pressure ventilation	0.3%

Preparation for resuscitation

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

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Cord clamping & cord milking

- ILCOR and the ANZCOR *suggest*:
- Delayed cord clamping for 30-60 seconds if:
 - Uncomplicated term or preterm birth, **and**
 - Not requiring immediate resuscitation
- For compromised newborns:
 - Insufficient evidence for optimal timing of cord clamping in term and preterm depressed newborns
- Insufficient evidence of benefit of cord milking, especially if <28 weeks. Not recommended.

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Monitoring

- Pulse oximetry is recommended:
 - When the need for resuscitation is anticipated
 - When CPAP or positive pressure is used
 - When persistent cyanosis is suspected
 - When supplemental oxygen is used
 - Place the oximeter sensor on the right wrist or hand (pre-ductal oxygen saturation)
- ECG monitoring:
 - May be used as an adjunct to auscultation and pulse oximetry (if readily available)

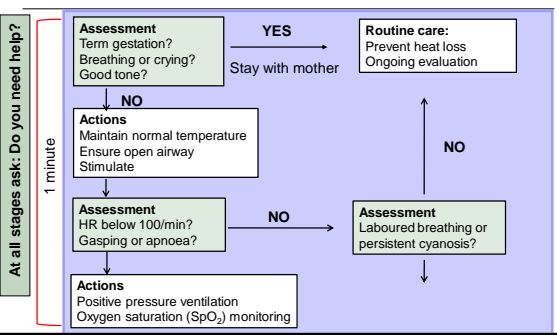
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Strategies to maintain normal core temperature: 36.5 - 37.5°C

- Very preterm newborns (<32 weeks):
 - Place (wet & warm) into a polyethylene bag or under a polyethylene sheet
 - Radiant warmer
- Additional measures (alone or in combination):
 - Covering the head (except the face) with a hat/bedding
 - Ambient room temperature 23 - 26°C
 - Exothermic warming mattress

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A: Assess and Airway

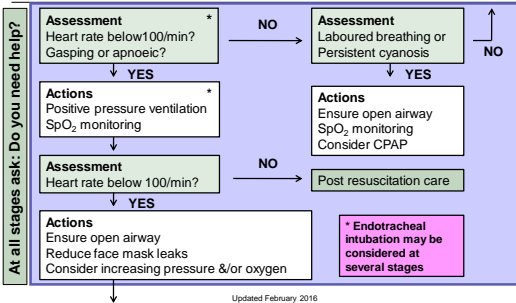


If meconium liquor is present

- Clear the oro-pharynx if obvious 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
 - Likely to cause further delays in resuscitation
 - Tracheal intubation for suctioning should only be performed for suspected tracheal obstruction.

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B: Breathing



Manual ventilation devices

“A T-piece device, a self inflating bag and a flow inflating bag are all acceptable devices to ventilate newborn infants either via a face mask, laryngeal mask or endotracheal tube”. (ANZCOR, 2016)



Initial settings: T-piece device

- Gas flow
 - Set at 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

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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 (2016) recommend:
 - PEEP of 5 - 8 cm H₂O during resuscitation of newborn infants if appropriate equipment available

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Oxygen use in resuscitation

- **Term and near term newborns**
 - Use room air (21%) initially.
 - Introduce supplemental oxygen if lower end of target saturations are not met, despite respiratory support
- **Preterm newborns <35 weeks' gestation**
 - Use room air (21%) **or**
 - Blended air and oxygen (up to 30%) to start
 - Avoid initiating resuscitation with high supplementary oxygen concentrations (65-100%)
 - If a blend of air and oxygen is not available, use air

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Oxygen use in resuscitation

- **All newborns**
 - Oxygen should be used judiciously, guided by pulse oximetry
 - 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 has recovered and target saturations are being met.

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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%

ANZCOR², 2016, Guideline 13.4

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Positive pressure ventilation

Optimal positive pressure ventilation requires:

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

Re-assess the heart rate every 30 seconds.

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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

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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).

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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 cm 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

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C: Circulation

At all stages ask: Do you need help?

Assessment
Heart rate below 60/min?

↓ YES

Actions

Three chest compressions to each breath*

100% oxygen*

Intubation or laryngeal mask

Venous access

↓ YES

Assessment
Heart rate below 60/min?

↓ YES

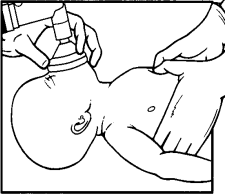
* Endotracheal intubation should be considered

+ Ensure the O₂ has been increased to 100% if the heart rate is <60/min

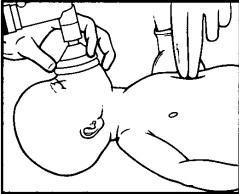
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Techniques for ECC in newborns



Hand encircling, two thumb technique (preferred technique)



Two finger technique

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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

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Interventions include:

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

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Preparing for intubation

Endotracheal size and depth of insertion

Select an appropriate size endotracheal tube according to estimated birth weight

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



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	3.5 mm	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

Preparing adrenaline

Adrenaline 1:10,000 solution	
Route	Dose
Umbilical vein Peripheral IV Intraosseous	0.1- 0.3 mL/kg (10 - 30 mcg/kg)
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)

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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

Remember to document all interventions & the newborn's response

* Endotracheal intubation should be performed

* Ensure the O₂ has been increased to 100% if the heart rate is <60/min

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For more information on:


- Intubation
- Use of an exhaled CO₂ detector
- Use of a laryngeal mask airway (LMA)
- 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>

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Australian & New Zealand Committee on Resuscitation (ANZCOR)



ANZCOR Guideline 13.1 – Introduction to Resuscitation of the Newborn Infant

Summary

Guidelines 13.1.1-13.1.3 and the Neonatal Life Support Algorithm are presented in order to facilitate implementation across neonates from 30 weeks gestation to term. The algorithm is presented in the context of a resuscitation team, and includes the role of the resuscitator, the role of the neonatal nurse, the role of the neonatal physician, the role of the neonatal pharmacist, the role of the neonatal respiratory therapist, the role of the neonatal physiotherapist, the role of the neonatal psychologist, the role of the neonatal social worker, the role of the neonatal dietitian, the role of the neonatal occupational therapist, the role of the neonatal speech therapist, the role of the neonatal audiologist, the role of the neonatal optometrist, the role of the neonatal podiatrist, the role of the neonatal pharmacist, the role of the neonatal physiotherapist, the role of the neonatal psychologist, the role of the neonatal social worker, the role of the neonatal dietitian, the role of the neonatal occupational therapist, the role of the neonatal speech therapist, the role of the neonatal audiologist, the role of the neonatal optometrist, the role of the neonatal podiatrist.

Section 13.1 – 13.10
Neonatal Guidelines
Published January 2016

Available for download at
www.resus.org.au

ANZCOR Guideline 13.1 – Introduction to Resuscitation of the Newborn Infant

Key references

1. Pearlman JM, Kattwinkel J, Wyckoff *et al.* Part 7: Neonatal Resuscitation 2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. *Circulation*, 2015; 132 (Supp 1): S204-S241.
2. Australian & New Zealand Resuscitation Councils. (2016). Section 13: Neonatal Guidelines. Accessed 24 February 2016 from: <http://www.resus.org.au>
3. The Victorian Newborn Resuscitation Project: NeoResus. (2016). Accessed 24 February 2016 from <http://www.neoresus.org.au/>.

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