



First Response

Learning Module 2

Based on ILCOR and ANZCOR 2016

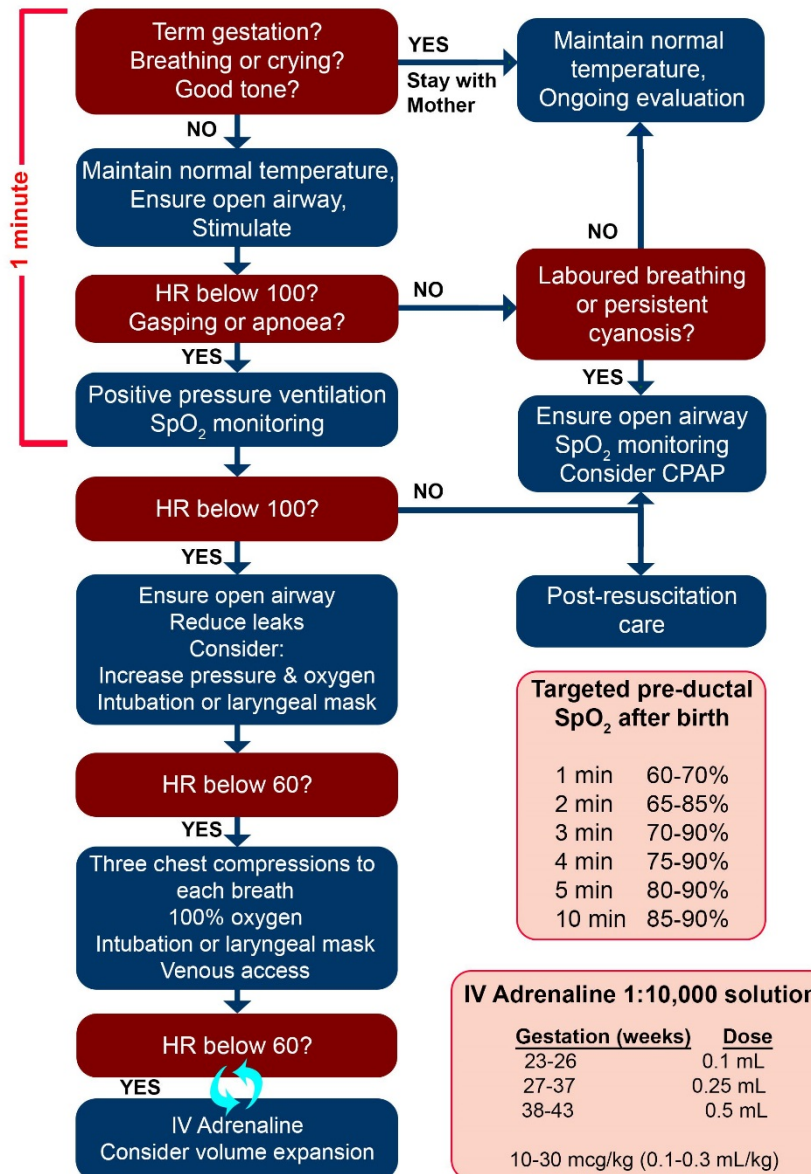
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Learning objectives

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.

At all stages ask: do you need help?



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

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.

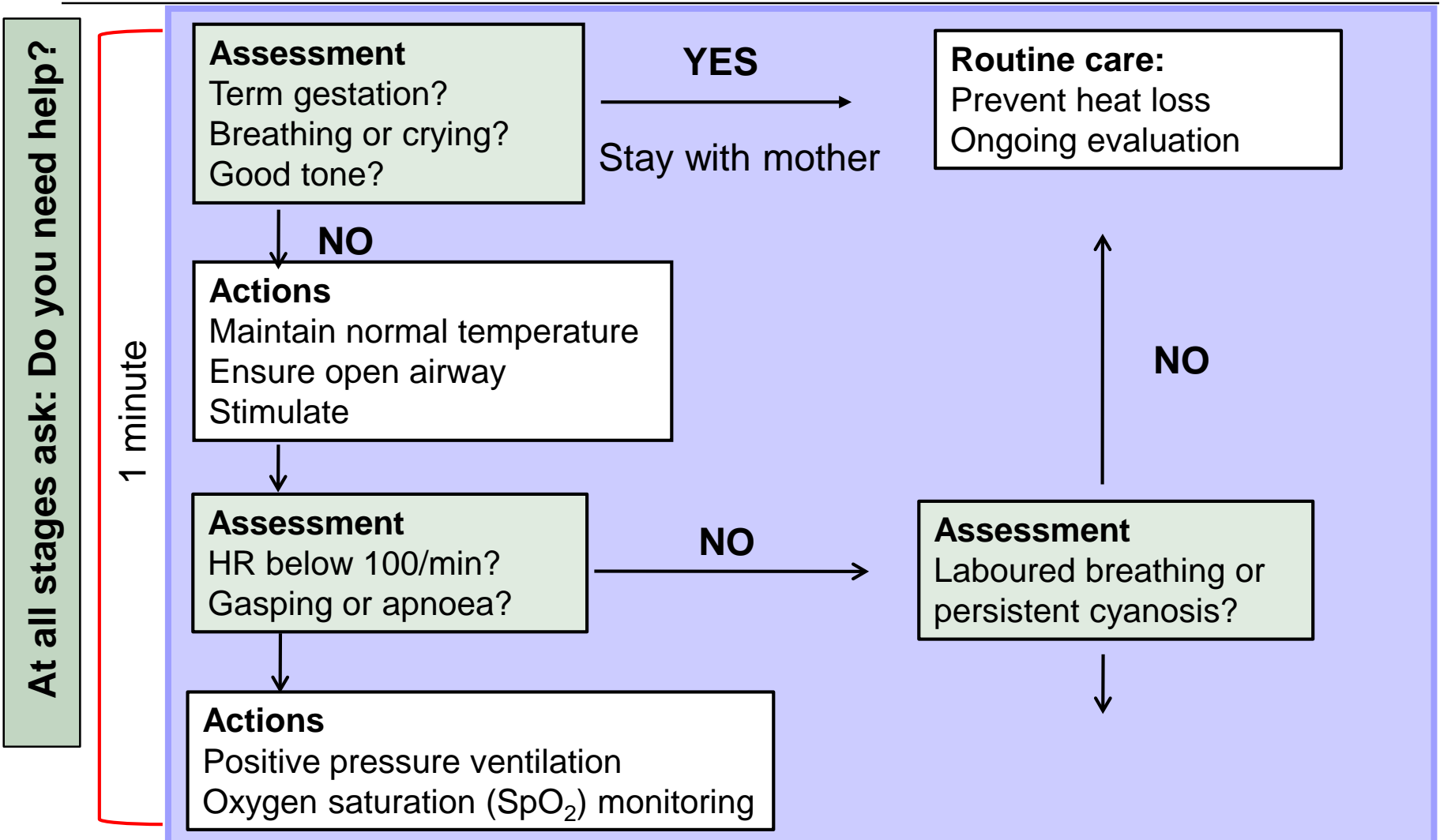
Monitoring

- 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)

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

A: Assess and Airway



If meconium liquor is present

- Clear the oro-pharynx if obvious meconium

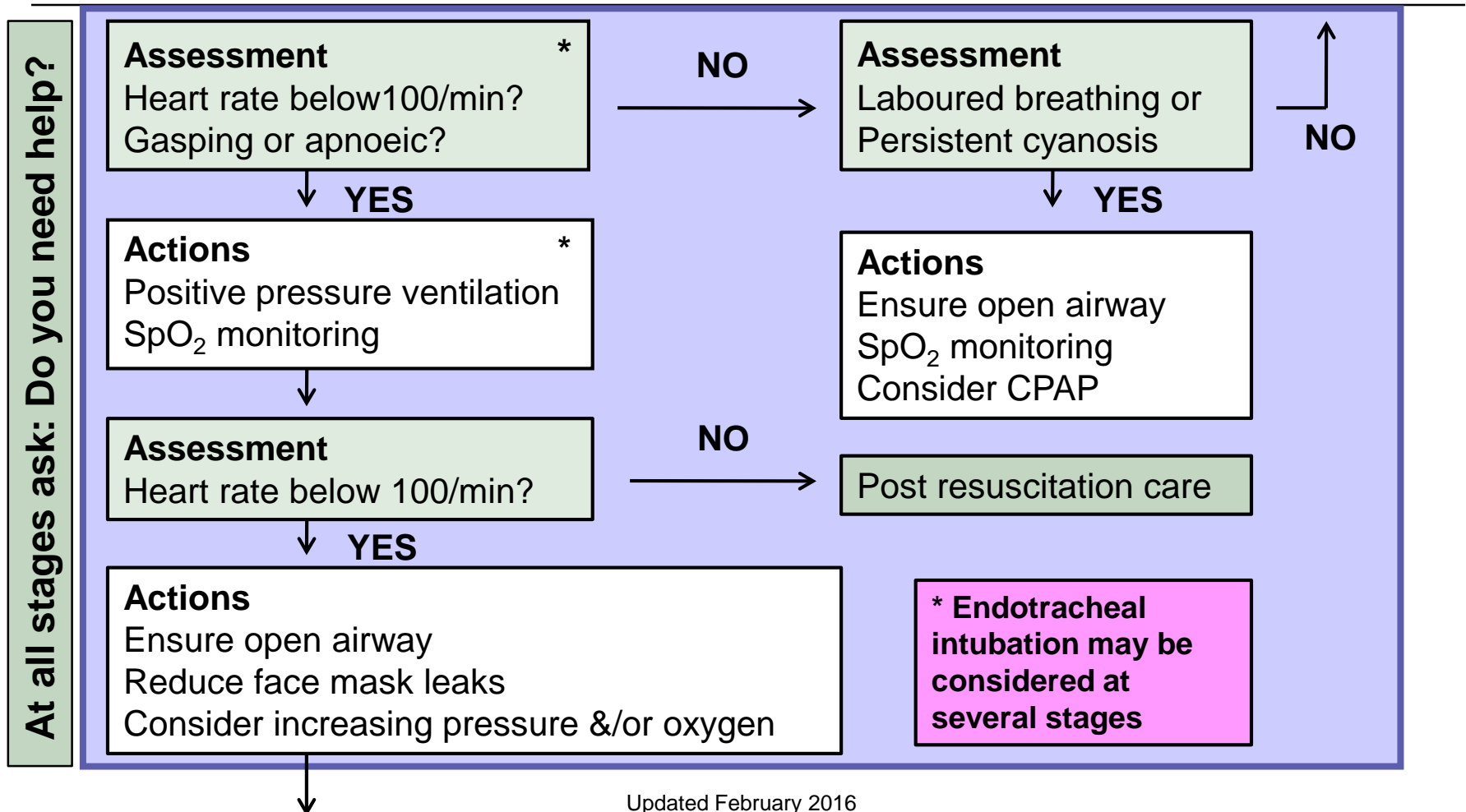
If the newborn is vigorous:

- 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.

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)



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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

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

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

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.

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

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.

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

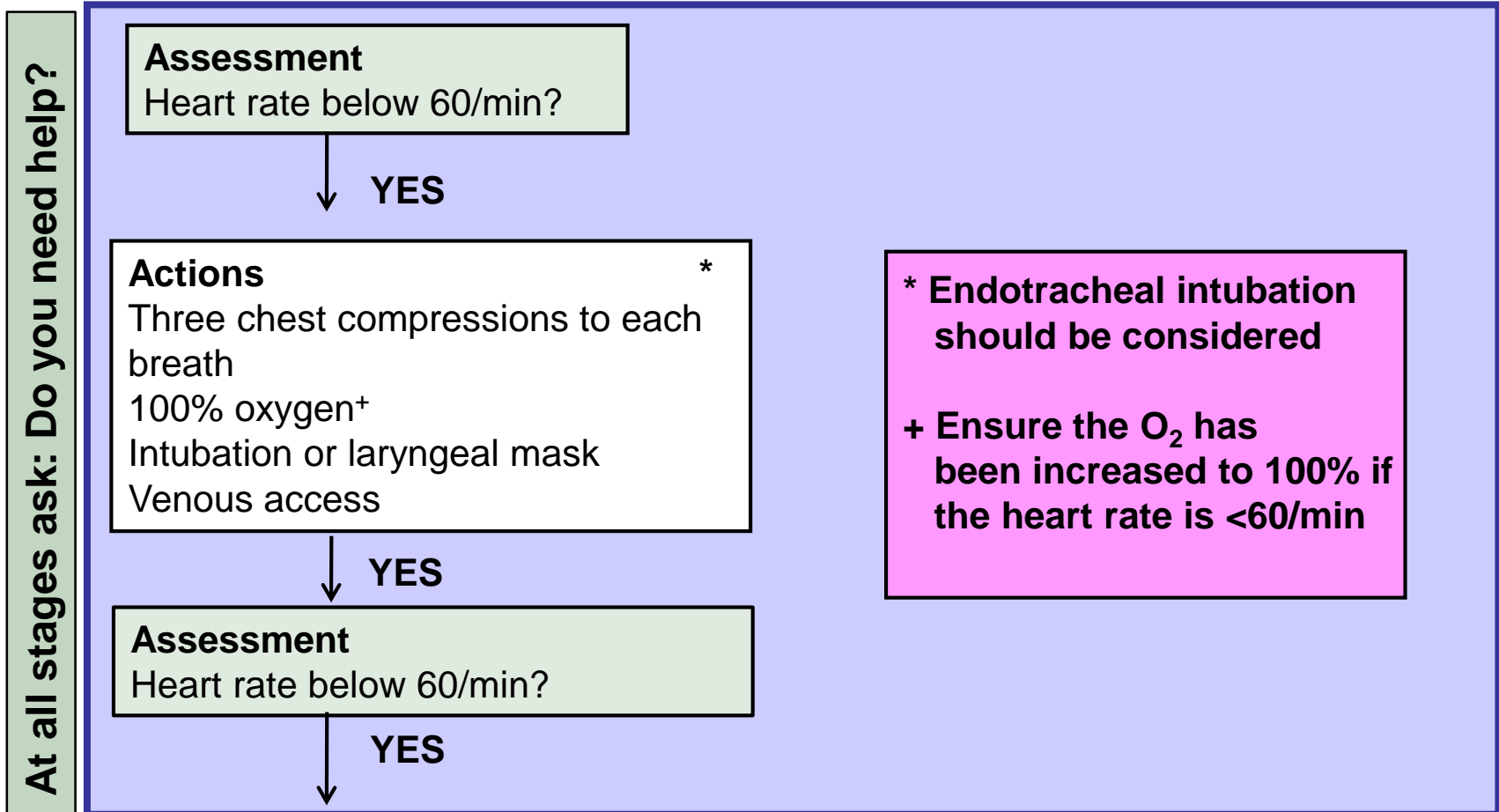
Assessing the effectiveness of positive pressure ventilation

- 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).

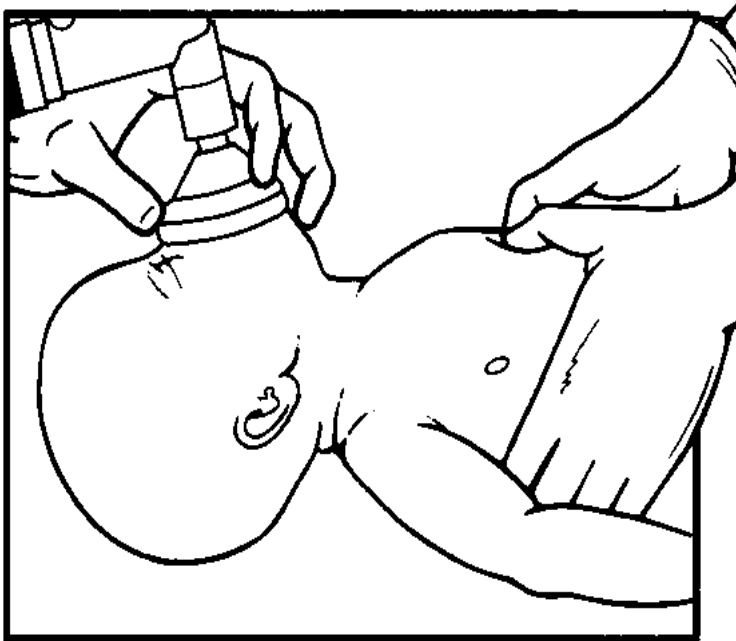
If the heart rate is not improving with positive pressure ventilation

- 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

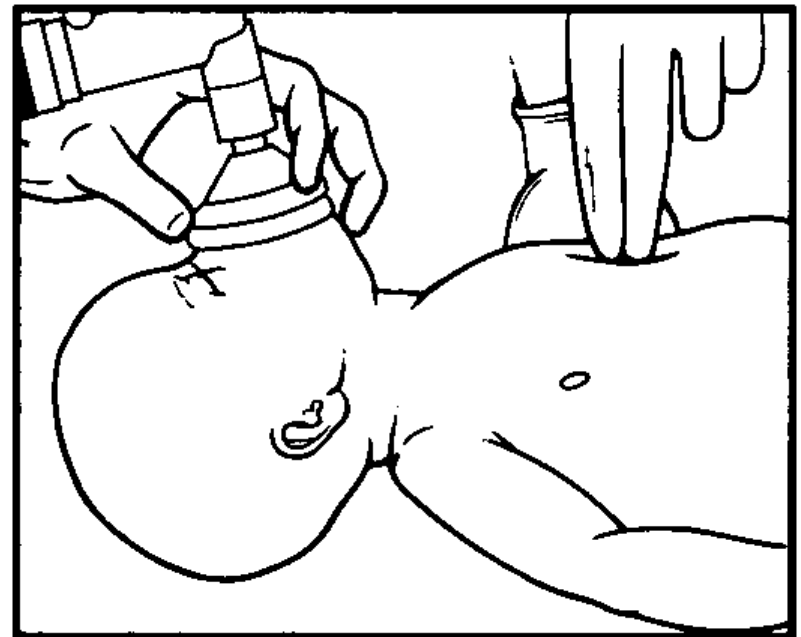
C: Circulation



Techniques for ECC in newborns



Hand encircling, two thumb technique (preferred technique)



Two finger technique

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

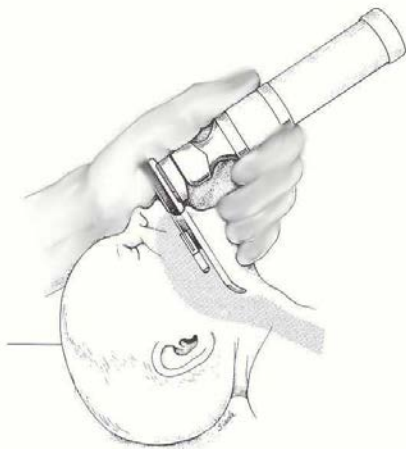
Interventions include:

- 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

Preparing for intubation

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



Endotracheal size and depth of insertion

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

Preparing adrenaline

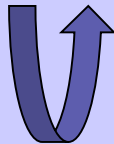
Adrenaline 1:10,000 solution	
Route	Dose
Umbilical vein Peripheral IV Intraosseous	0.1- 0.3 mL/kg (10 - 30 mcg/kg)
Endotracheal tube (ETT)	0.5 - 1.0 mL/kg (50 - 100 mcg/kg)

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

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

Remember to document all interventions & the newborn's response

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>

Australian & New Zealand Committee on Resuscitation (ANZCOR)



ANZCOR Guideline 13.1 – Introduction to Resuscitation of the Newborn Infant

Summary

Guidelines 13.1-13.10 and the Newborn Life Support algorithm are provided to assist in the resuscitation of newborn infants. Differences from the adult and paediatric guidelines reflect differences in the causes of cardiorespiratory arrest in, and anatomy and physiology of newborns, older infants, children and adults. These guidelines draw from the consensus on resuscitation and treatment recommendations issued by the International Liaison Committee on Resuscitation (ILCOR), which included representation from ARC and NZRC. The 2015 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care (Neonatal), the European Resuscitation Council Guidelines for Resuscitation 2015¹ and local practices have also been taken into account.

To whom do these guidelines apply?

The term “newborn” refers to the infant in the first minutes to hours following birth. In contrast, the neonatal period is defined as the first 28 days of life. Infancy includes the neonatal period and extends through the first 12 months of life.

Guidelines 13.1-13.10 and the Newborn Life Support algorithm are specifically for the care of infants during the neonatal period, and particularly for newborn infants. The exact age at which paediatric techniques and in particular, compression-ventilation ratios, should replace neonatal methods is unknown, especially for very small premature infants. For term neonates beyond the newborn period, and particularly in those with known or suspected cardiac aetiology of their arrest, paediatric techniques may be used (see Paediatric Advanced Life Support Guidelines 12.1-12.7).

Who is this audience for these guidelines?

Guidelines 13.1-13.10 and the Newborn Life Support algorithm are for health professionals and those who provide healthcare in environments where equipment and drugs are available (such as a hospital). When parents are taught CPR for their infants who are being discharged from birth hospitals, the information in Basic Life Support Guidelines (Guidelines 1-8) is appropriate.

Section 13.1 – 13.10

Neonatal Guidelines

Published January 2016

Available for download at

www.resus.org.au

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/>.

Disclaimer

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