What’s new in newborn resuscitation?

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- Neonatal Member, Australian Resuscitation Council
- Australia/NZ Council on Resuscitation representative to International Liaison Committee on Resuscitation, Neonatal Working Group
Babies are anxiety-provoking
Adults have a full hand to play
Babies have few cards to play
Things can turn ugly very quickly......
## Deaths avoided by 2020

<table>
<thead>
<tr>
<th>Service</th>
<th>Maternal deaths</th>
<th>Stillbirths</th>
<th>Neonatal deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-eclampsia/eclampsia management</td>
<td>6900</td>
<td>26 000</td>
<td></td>
</tr>
<tr>
<td>Diabetes case management</td>
<td></td>
<td>8700</td>
<td></td>
</tr>
<tr>
<td>Antenatal Steroids</td>
<td></td>
<td></td>
<td>214 300</td>
</tr>
<tr>
<td>Antibiotics for preterm prelabor rupture of membranes</td>
<td>14 000</td>
<td>22 000</td>
<td></td>
</tr>
<tr>
<td>Detection and management of intrauterine growth restriction</td>
<td>32 500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Induction after 41 weeks of pregnancy</td>
<td></td>
<td>19 000</td>
<td></td>
</tr>
<tr>
<td>Labor and delivery management</td>
<td>82 700</td>
<td>464 200</td>
<td>389 200</td>
</tr>
<tr>
<td>Clean birth practices</td>
<td>9200</td>
<td></td>
<td>67 000</td>
</tr>
<tr>
<td><strong>Neonatal resuscitation</strong></td>
<td></td>
<td></td>
<td><strong>170 600</strong></td>
</tr>
<tr>
<td>Case management of prematurity and severe infection</td>
<td></td>
<td></td>
<td>461 800</td>
</tr>
</tbody>
</table>

Bhutta ZA, Das JK, Bahl R et al.  
“Every Newborn” Series  
Lancet 2014 384:347-370
Learning Objectives

• Understand contemporary principles of newborn resuscitation
Be prepared

Equipment
- Checklists, protocols, algorithms (www.resus.org.au)
- Consider standardized kits (e.g. for vascular access)

Training
- Good training resources, including simulation
- Reinforcement activities and drills

Teamwork
- Learn & practice together
- Role allocation
- Task and moral support
Transitional circulation
Timing of cord clamping

Uncomplicated term birth
• delay clamping for minimum of 1 min or until cessation of cord pulsation
  – improved iron status through infancy, increased likelihood of jaundice requiring phototherapy (McDonald, Cochrane Database 2008)

Uncomplicated preterm > 30 weeks
• delay clamping 30 sec - 3 min
  – increases BP during stabilisation, reduces risk of intraventricular haemorrhage & need for blood transfusion (Rabe et al, Neonatology 2008)
Deferred cord clamping

• Avoid
  – Traction on the cord
  – Palpating or handling the cord
• Uncertain role of gravity
  – Baby at or below level of placenta
• Consider avoiding if family history severe jaundice
• Assess the baby manage as per flow diagram
  • Assess the mother

Term gestation? Breathing or crying? Good tone?
Yes Stay with mother
Routine care: Prevent heat loss Ongoing evaluation
No Prevent heat loss Ensure open airway Stimulate
Timing of cord clamping in compromised infants?

Compromised infant
- optimal timing unknown & resuscitation measures may need to take priority

Preterm infant < 30 weeks?
- await.....
Initial steps

Assessment -- Does the baby need resuscitation?
Management -- airway and temperature management

Term gestation?  Breathing or crying?  Good tone?

Yes
Stay with mother

Routine care:
Prevent heat loss
Ongoing evaluation

No
Prevent heat loss
Ensure open airway
Stimulate
Temperature management

For well babies
- Dry
- Skin to skin with mother
- Avoid drafts

For <28 week babies
- Ambient temp of at least 26°C
- Warm towel or blanket if available
- Polyethylene bag or wrap, without drying or unwrapping
- Avoid drafts
- Radiant warmer or consider skin to skin with mother if not available
- Cap/hat if available

For all babies
- Prevention of hyperthermia
Assessment of Colour – eyeball vs oximetry

“The mean $\text{SpO}_2$ when infants were perceived to be pink by all 27 observers was 69%, ranging from 10% to 100% between observers. The median $\text{SpO}_2$ for individual babies varied from 42% to 93%”
Oximetry

• recommended when
  – the need for resuscitation is anticipated
  – positive pressure is administered for more than a few breaths
  – persistent cyanosis is suspected
  – supplemental oxygen is used

• can play an important role in avoiding hyperoxaemia
Effective ventilation is the key to successful neonatal resuscitation

AAP/AHA, ERC & ARC/NZRC 2010 Guidelines
Why emphasise airway and breathing in newborn life support?

Newborns have fluid-filled, low volume lungs, so no gas exchange is possible until

- Fluid is cleared (across lung epithelium, into capillaries and lung interstitium)
- Lungs are filled with air (adequate functional residual capacity established)
- Lung blood flow improves (in response to effective ventilation)

The oxygen content of blood at birth is low

The newborn heart is

- Usually healthy
- Tolerant of hypoxia – rare to see arrhythmias except sinus bradycardia, which improves in response to ventilation
Resuscitation by size of hospital birth service – Queensland 2009

Source: Perinatal Data Collection, Queensland Health (Extracted March 30, 2011) Prepared by: Statistical Output, Health Statistics Centre, Queensland Health
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Source: Perinatal Data Collection, Queensland Health (Extracted March 30, 2011)
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Airway Management

• Normal newborn infants do not require suctioning of the nose, mouth or pharynx after birth

• Suctioning can delay the normal rise in oxygenation

• Suction recommended only
  – when babies show obvious signs of obstruction
  – to visualise the vocal cords during intubation

**Positioning is critical**
Airway Management – Thick Meconium

ILCOR 2010

• No evidence for oropharyngeal suction after delivery of head
• Airway suctioning of vigorous babies discouraged - likely to cause harm
• *Insufficient evidence to recommend a change in current practice of performing endotracheal suctioning of non-vigorous infants*

**ARC:** *If tracheal suction is performed, it must be accomplished before spontaneous or assisted respirations have commenced, very promptly, and once only*

No evidence to support repeated intubation for endotracheal suction

• **New evidence from RCTs in India:**

  **NO BENEFIT OF INTUBATION TO SUCTION TRACHEA FOR MECONIUM**
Ventilation

Initiating ventilation;

• aim is initially to establish functional residual capacity (FRC)
• optimal strategy - not established
• studies suggest sustained initial breaths and PEEP helpful
Duration of intubation

(Data from Nadler & Liley, collected MMH 2009)
LARYNGEAL MASK

Size 0 mask - can be used down to about 1.5 kg
Ventilation

- TLC
- Volume
- Pressure
- high FRC (overexpansion)
- normal FRC
- low FRC (atelectasis)

Points A, B, C represent different states of ventilation.
Ventilation

• Pressures adjusted according to response

*For most infants, ventilation can be accomplished with progressively lower pressures and rates as resuscitation proceeds*
Oxygen

The use of oxygen in newborn resuscitation will be remembered as one of the most dangerous therapies inflicted on newborns

Ola Saugstad

In-hospital: Air, oxygen, blender, oximeter need to be considered as standard neonatal resuscitation equipment

Pre-hospital – as far as possible – judicious use of oxygen
Recommendations for oxygen

Term babies: commence resuscitation in room air.

Preterm: commence in room air or blended air & O2 (30-50%).

In all cases, the first priority is to ensure adequate inflation of the lungs, followed by increasing the concentration of inspired oxygen only if needed.

Adjust oxygen using pulse oximetry to meet targeted saturations.

<table>
<thead>
<tr>
<th>Time from birth</th>
<th>Target saturations for newborn infants during resuscitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 min</td>
<td>60-70</td>
</tr>
<tr>
<td>2 min</td>
<td>65-85</td>
</tr>
<tr>
<td>3 min</td>
<td>70-90</td>
</tr>
<tr>
<td>4 min</td>
<td>75-90</td>
</tr>
<tr>
<td>5 min</td>
<td>80-90</td>
</tr>
<tr>
<td>10 min</td>
<td>85-90</td>
</tr>
</tbody>
</table>
Oxygen Saturations – normal & targets

Source: Dawson et al., Paediatrics 2010

**FIGURE 2**
Third, 10th, 25th, 50th, 75th, 90th, and 97th Spo2 percentiles for term infants at ≥37 weeks of gestation with no medical intervention after birth.

**Source:** Dawson et al., Paediatrics 2010
Newborn Life Support

- Term gestation? Breathing or crying? Good tone?
  - Yes
  - Routine care: Prevent heat loss Ongoing evaluation
  - No
  - Stay with mother

- Prevent heat loss Ensure open airway Stimulate

- HR below 100? Gasing or apnoea?
  - Yes
  - Positive pressure ventilation SpO₂ monitoring
  - No
  - Laboured breathing or persistent cyanosis?
    - Yes
    - Ensure open airway SpO₂ monitoring Consider CPAP
    - No
    - HR below 100?
      - Yes
      - Ensure open airway Reduce leaks Consider increasing pressure & oxygen
      - No
      - Post-resuscitation care

- HR below 60?
  - Yes
  - Chest compressions 90/min 3 compressions to each breath 100% oxygen Consider intubation or LMA
  - No
  - HR below 60?
    - Yes
    - Venous access, adrenaline Consider volume expansion
    - No
    - 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%

Adrenaline IV 10-30 mcg/kg

www.resus.org.au

Guidelines revision after ILCOR 2015