3rd SRFAC Townhall  
(Virtual)  
Neonatal Resuscitation Guidelines  
2021 Update  
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On behalf of Neonatology Subgroup - SRFAC
2021 Neonatal Resuscitation guidelines

- Update of 2016 Singapore Neonatal Resuscitation Guidelines
- 2020-2021 Updates from International bodies (ILCOR, AHA, ERC) used as a framework
- Adapted to local practice and health care delivery
- Drafted by neonatologists from 3 PHIs and Private guided by Neonatology subgroup members of SRFAC
2021 Neonatal Resuscitation guidelines

Applies to:
• Newborns Transitioning to extra-uterine life
• Newborns who have completed transition but remain in hospital after birth

Need for Resuscitation or stabilization after birth
• Most Preterms
• Up to 10% of Term newborns
2021 Neonatal Resuscitation guidelines

- Steps of resuscitation and Algorithm remain the same
  - Anticipation and Preparation
  - Umbilical cord management
  - Thermoregulation
  - Airway and Breathing
  - Circulation (CPR, Drugs)
  - Post resuscitation care

- Minor changes in some areas informed by evidence

There are NO Major Changes since 2016 guidelines
Algorithm remains same as 2016 guidelines
Anticipation and Preparation

- Anticipate and prepare in advance
- Environment: warm, well-lit and draught-free, designated resuscitation area, overhead warmer and equipment for monitoring
- Equipment: well maintained and ready for use.
- Providers: at least trained in Basic neonatal life support
- High risk deliveries: Advanced skilled providers
2021 Neonatal Resuscitation guidelines:
Umbilical cord management

• Facilitation of placental blood transfusion to newborn by delayed cord clamping
  • Term: reduced iron def – no benefit on survival or neurodevelopment
  • Preterm
    • Reduction of transfusion needs, NEC, all grade IVH
    • Unclear on CLD, PVL, ROP, neurodevelopment
    • **Survival advantage:** 2 large sys Rev (RR 0.68[0.52-0.9] and 0.73[0.54-0.98]); Equivocal in another for <34 wks (RR 1.02 [1.00-1.04])

• Cord Milking
  • No advantage over delayed cord clamping
  • Increased risk of severe IVH among <28 wks
2021 Neonatal Resuscitation guidelines: Delayed cord clamping (DCC)

• **Recommendations**
  - DCC for up to 60 seconds is recommended for newborns who do not require resuscitation at birth
  - DCC should not delay resuscitation in babies who require immediate resuscitation
  - Contraindicated in settings when placental circulation is compromised
  - Cord milking is not recommended in clinical care of preterms
2021 Neonatal Resuscitation guidelines: Thermoregulation

- Hypothermia at admission strongly predicts survival and morbidity—strengthened by 2018 Cochrane sys rev
- Preterms may require additional thermoregulatory devices
- **Recommendations**
  - Ambient temp of the delivery room at 23°C–25°C
  - Maintain temperature of non-asphyxiated newborns at 36.5°C - 37.5°C
  - ≥ 33 weeks and no resus: dried, skin-skin contact, cover with blanket
  - ≥ 33 weeks who need resus: dried under radiant warmer
  - < 33 weeks: wrapped in polyethylene without drying under warmer
  - Maintain warm chain during transfer

Must Measure and Record Temperature at Admission
2021 Neonatal Resuscitation guidelines:
Initial steps in golden minute

• Ensure warmth

• Gently stimulate to initiate breathing

• Maintain an open airway

• Avoid routine suctioning

• Start Assessment
  • Adequacy of breathing
  • HR by Auscultation (Consider ECG in advanced resus)
  • Pulseoxymetry

• Initiate positive pressure ventilation if required
2021 Neonatal Resuscitation guidelines:
Meconium stained amniotic fluid

• No advantage of immediate Laryngoscopy and Tracheal toileting on prevention of meconium aspiration syndrome, survival, pulmonary hypertension, hypoxic ischemic encephalopathy and need for respiratory support – *sys rev 2020&2021*

• *Recommendations*
  • Intrapartum suction of nose or mouth is contraindicated
  • *Routine oropharyngeal or nasopharyngeal suctioning is not required.* Do it only if airways are obstructed
  • *Follow usual resuscitation steps in a non-vigorous baby to establish regular respiration*
2021 Neonatal Resuscitation guidelines:
Positive pressure ventilation

• Most important step
• Every 30 sec delay – increases morbidity or mortality by 16%
• Use of PEEP during PPV increases survival to discharge without CLD, severe IVH or PVL (OR 1.38, [1.06–1.80]) – 2018

• Recommendations
  • **PPV should be initiated within 60 seconds** after birth in newborns who remain apnoeic, gasping or bradycardic (HR < 100/min) despite the initial steps
  • Initiate PPV with pressure of 20-25 cm H2O
  • Use of PEEP (5 cm H2O) is beneficial during PPV- specially for <33 wks
  • Sustained lung inflation >5 sec is not recommended
2021 Neonatal Resuscitation guidelines: Oxygen use

- Metanalysis by ILCOR - NLS taskforce and CoSTR statement (2019)
  - Term babies: 40 fewer deaths for every 1000 deaths if 21% used instead of 100%
  - Preterms (<35 wk): No diff in survival or morbidity between ≤50% vs. >50% O2

- Recommendations
  - < 33 weeks: resuscitation should be initiated at 21%–30%; if blender unavailable use ambu bag without reservoir attached (provides 40%)
  - ≥ 33 weeks: resuscitation should be commenced at 21% oxygen
  - Titrate supplemental oxygen to preductal (right hand) minute specific oxygen saturation ranges
2021 Neonatal Resuscitation guidelines:

CPAP

- Death or BPD may be reduced in spontaneously breathing preterms by use of delivery room CPAP (instead of routine intubation)- NNT 25
- Higher (6–8 cm H$_2$O) vs. lower (3–5 cm H$_2$O) PEEP in first 120 hrs: OPTTIMMAL-Trial

**Recommendation**

- Support spontaneously breathing preterm newborns in respiratory distress at birth with **CPAP (PEEP of 5–6 cm H$_2$O)**
2021 Neonatal Resuscitation guidelines: Advanced airway

• Endotracheal intubation can be considered at several time points
  • Consider if mask ventilation is ineffective, chest compressions are initiated, there is a prolonged need for ventilation, there is requirement of tracheal toileting for presumed airway obstruction and in special circumstances (CDH)

• LMA may be used as an airway device when intubation is not successful or feasible in late preterm and term newborns (≥34 weeks, >2000g)
**2021 Neonatal Resuscitation guidelines: Oral intubation**

<table>
<thead>
<tr>
<th>Gestational age (wk)</th>
<th>Estimated weight (g)</th>
<th>ETT size: internal diameter (mm)</th>
<th>Depth of insertion at upper lip (cm)</th>
<th>Suction catheter size (Fr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 29†</td>
<td>&lt; 1,000†</td>
<td>2.5</td>
<td>5.5–6.5</td>
<td>6</td>
</tr>
<tr>
<td>29–34</td>
<td>1,000–2,000</td>
<td>3.0</td>
<td>7.0–8.0</td>
<td>6</td>
</tr>
<tr>
<td>35–38</td>
<td>2,000–3,000</td>
<td>3.5</td>
<td>8.0–9.0</td>
<td>8</td>
</tr>
<tr>
<td>&gt; 38</td>
<td>3,000–4,000</td>
<td>3.5</td>
<td>9.0–10.0</td>
<td>8</td>
</tr>
</tbody>
</table>

†Tochen’s formula: weight (kg) + 6 cm; may overestimate the depth of insertion in extremely preterm infants

Nasal-tragus length (NTL) measured as the distance from the nasal septum to the tragus: NTL (cm) + 0.5 cm (< 31 weeks of gestation) and NTL (cm) + 1 cm (≥ 31 weeks of gestation).
2021 Neonatal Resuscitation guidelines:
Circulation- Chest compression

• Comparison of different ventilation- compression ratios in asphyxial porcine models (2016, 2018): no advantage on ROSC

• **Recommendations**
  
  • Chest compressions should be commenced if the HR remains < 60/min after 30 seconds of effective PPV
  
  • Increase **inspired oxygen to 100%** and titrate to target
  
  • Coordinated compression- ventilation: **3:1 ratio**
  
  • **Two-thumb** with hands-encircling-chest technique
  
  • Depth of compression: **one-third AP diameter** of chest
  
  • Reassess after 1 minute of CPR
2021 Neonatal Resuscitation guidelines: Circulation - Drugs

• Most newborns with prolonged asystole require at least one IV adrenaline for ROSC

• ROSC faster with IV adrenaline compared to ET (Animal model 2017)

• No significant difference in efficacy between initial ET or initial IV dose – sys rev 2020

• A saline flush delivers IV adrenaline better (animal model 2021)

• Recent animal studies support use of crystalloids over colloids as initial choice for volume expansion (2017, 2018)
2021 Neonatal Resuscitation guidelines:
Circulation - Drugs

• Recommendations
  • If HR remains < 60/min after one minute of CPR, IV adrenaline (1 in 10,000; 0.1 mg/mL) is recommended at a dose of 0.1–0.3 mL/kg administered rapidly followed by a 3-mL saline flush
  • Continue CPR if HR< 60; Adrenaline every 3-5 minutes
  • ETT adrenaline if IV access not available – administer IV when secured
  • Early volume administration if non response to advanced resus
  • 10 ml/Kg of 0.9% saline over 5-10 min
  • Uncrossmatched O neg blood preferred if blood loss is obvious
2021 Neonatal Resuscitation guidelines: Post resuscitation care

- Prevent and Correct hypothermia (unless clinically indicated TH)
  - Evidence on rate of correction <0.5 °C/Hr vs. >0.5 °C/Hr equivocal
- Maintain SpO2, BP, pCO2 based on clinical targets
- Glucose control
  - Monitor blood glucose
  - Identify and treat hypoglycemia early
  - Avoid swings of hypo-hyperglycemia
2021 Neonatal Resuscitation guidelines: Therapeutic Hypothermia (TH)

• TH reduces the risk of death or major neurodisability at 18 months in term and near-term newborns with moderate to severe perinatal asphyxia (RR 0.75, 95% CI 0.68–0.83) (2013 sys rev)

• Recent evidence not convincing to extend TH as a clinical service to
  • Newborns <36 weeks
  • Newborns with mild HIE
  • Delayed initiation after 6 hours
  • Longer period of cooling or core temp <33 °C

• Recommendations
  • TH should be performed as per established protocols in centres with appropriate expertise
  • Core temperature should be maintained between 33°C and 34°C for 72 hours
• Best to approach with a Shared Decision Making (SDM) framework
  • < 23 Weeks: not recommended
  • 23<sup>+</sup>0 to 23<sup>+</sup>6 Weeks: decisions guided by parental views and goals as well as certainty of gestation age assignment and presence of additional risk factors
  • 24<sup>+</sup>0 to 24<sup>+</sup>6 Weeks: offer resuscitation unless a shared decision made against it; consider additional clinical information
  • Redirection to palliative pathway: Clinical conditions are associated with certain early death or unacceptable burden on the survivor

• Discontinuing resuscitation: Small but definite possibility of ROSC and acceptable outcome despite an Apgar score of 0 at 10 minutes (2019)
  • If 20 minutes of optimal resuscitation and correction of all reversible causes do not result in ROSC or cardiac activity, resuscitation may be discontinued
  • Individualise decisions; Discuss with parents
2021 Neonatal Resuscitation guidelines:
Briefing- Debriefing and Training

• Recommendations
  • Briefing before delivery should be conducted where possible.
  • In a multimember team, a team leader should assign roles and orchestrate.
  • Debriefing after neonatal resuscitation is encouraged.

• Individual providers attend regular focused retraining of skills and knowledge at two-yearly intervals or more frequently.
• Singapore Neonatal Resuscitation Course (SNRC) run at KKH, NUH and SGH.
2021 Neonatal Resuscitation guidelines:
5 Take home messages

• Newborns transition well and respond to resuscitation when Normothermic
• Aeration of the newborn lungs is the most important step and should be initiated within the golden minute. Prevent hypoxia as well as hyperoxia
• Use delivery room CPAP to support spontaneous breathing of preterm babies with respiratory distress
• Provide early and good quality co-ordinated chest compression and ventilation at a ratio of 3:1 to a newborn who needs it
• Ensure timely and efficacious administration of Adrenaline and or crystalloids when required
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