Neonatal resuscitation 2016: Newer Guidelines

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COI statement

Jonathan Wyllie:
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Aims

❖ Look a little at the history

❖ Look at the process

❖ Look at the main conclusions

❖ Look at the main changes to the ERC and UK guidelines
History

• 1966 – National Academy of Sciences National Research council ad hoc conference on CPR
• 1967 – International Symposium on Emergency Resuscitation – Oslo
• AHA standards and guidelines on resuscitation
  • 1974
  • 1980
  • 1986
  • 1992 ILCOR founded
ILCOR representation

• American Heart Association (AHA)
• European Resuscitation Council (ERC)
• Heart and Stroke Foundation of Canada (HSFC)
• Australian and New Zealand Committee on Resuscitation (ANZCOR)
• Resuscitation Councils of Southern Africa (RCSA)
• Inter American Heart Foundation (IAHF)
• Resuscitation Council of Asia (RCA)
International Guidelines 2000

- 1st attempt to achieve international, global, standardised resuscitation guidelines.
- Consensus not achieved
- AHA and ERC published separate guidelines as did other councils
2005 International Consensus Conference on CPR Science with Treatment Recommendations

- International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations
  - Consensus on Science with Treatment Recommendations (CoSTR)

- Joint publication “Resuscitation” and “Circulation”
ILCOR and Neonatal Resuscitation

• Pediatric working group 1995

• Resuscitation of the newly born infant: An advisory statement from the pediatric working group of the international liaison committee on resuscitation. 1999


• Consensus on science 2005, 2010 + 2015
Generation of Topics 2010-2015

After guidelines 2010

Number of unclear issues

Breadth of our ignorance was becoming apparent

Generation of Topics 2010-2015

The following RCTs were proposed:

- Prophylactic post-delivery endotracheal suctioning versus no suctioning in a depressed baby with meconium

- Comparison of different saturation percentiles to use for targeting supplementary oxygen delivery in uncompromised and compromised premature infants

- Comparison of prolonged versus conventional inspiratory times to determine if the former is more effective in establishing functional residual capacity (FRC) and increasing the heart rate

- Studies to determine the optimum technique for maintaining the temperature of very low birth weight (VLBW) infants from the time of delivery through admission to intensive care
Generation of Topics 2010-2015

◆ One small randomized study had addressed the question of prophylactic endotracheal suctioning in the depressed baby with meconium.

◆ One randomized trial of sustained inflation (SI) had recently been published.

◆ Additional studies addressing these critical questions are ongoing but were not available for the 2015 CoSTR review.
Generation of Topics 2010-2015

◆ 38 members from 13 countries met in Washington in Dec 2011 followed by a series of meetings
  ◆ A number of questions were refined into the 27 Questions for review of evidence using the GRADE approach
  ◆ GRADE stipulated by ILCOR and AHA

◆ Meetings:

◆ Consensus achieved
Topics

- Optimal assessment of heart rate (NRP 898)
- Delayed cord clamping in preterm infants requiring resuscitation (NRP 787)
- Umbilical cord milking (NRP 849)
- Temperature maintenance in the delivery room (NRP 589)
- Maintaining infant temperature during delivery room resuscitation (NRP 599)
- Warming of hypothermic newborns (NRP 858)
- Babies born to mothers who are hypothermic or hyperthermic in labor (NRP 804)
- Maintaining infant temperature during delivery room resuscitation—intervention (NRP 793)
- Continuous positive airway pressure (CPAP) and intermittent positive-pressure ventilation (IPPV) (NRP 590)
- Sustained inflations (NRP 809)
- Outcomes for positive end-expiratory pressure (PEEP) versus no PEEP in the delivery room (NRP 897)
- T-piece resuscitator and self-inflating bag (NRP 870)
- Intubation and tracheal suctioning in nonvigorous infants born through meconium-stained amniotic fluid (MSAF) versus no intubation for tracheal suctioning (NRP 865)
- Oxygen concentration for resuscitating premature newborns (NRP 864)
- 2-Thumb versus 2-finger techniques for chest compression (NRP 605)
- Chest compression ratio (NRP 895)
- Oxygen delivery during CPR—neonatal (NRP 738)
- Laryngeal mask airway (NRP 618)
- Newborn infants who receive PPV for resuscitation, and use of a device to assess respiratory function (NRP 806)
- Use of feedback CPR devices for neonatal cardiac arrest (NRP 862)
- Limited resource-induced hypothermia (NRP 734)
- Delivery room assessment for less than 25 weeks and prognostic score (NRP 805)
- Apgar score of 0 for 10 min or greater (NRP 896)
- Predicting death or disability of newborns of greater than 34 weeks based on Apgar and/or absence of breathing (NRP 860)
- Resuscitation training frequency (NRP 859)
- Neonatal resuscitation instructors (NRP 867)
GRADE/2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations

• GRADE is an emerging consensus process which rates quality of evidence and strength of recommendations along with values and preferences.

  – Quality of evidence
    – High – Confident in the estimate of effect
    – Very low – the estimate may be substantially different

  – Strength of recommendation
    – We recommend – STRONG
    – We suggest – weak
    – For and against

  – Task Force Insights
    • What we talked about/argued/haemorrhaged over
Evidence: Consensus on Science

Part 7: Neonatal Resuscitation

2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations

Jeffrey M. Perlman, Co-Chair*; Jonathan Wyllie, Co-Chair*; John Kattwinkel; Myra H. Wyckoff; Khalid Aziz; Ruth Guinsburg; Han-Suk Kim; Helen G. Liley; Lindsay Mildenhall; Wendy M. Simon; Edgardo Szyld; Masanori Tamura; Sithembiso Velaphi; on behalf of the Neonatal Resuscitation Chapter Collaborators

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Part 7: Neonatal resuscitation
2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations**

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2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations

For each topic:

- PICO question
- Consensus on science
- Treatment recommendation
- Values, preferences, and task force insights
- Knowledge gaps
ILCOR to Guidelines to NLS (ERC)

2015 ILCOR
Evidence evaluation of PICOS

ILCOR 2005, 2010 evidence not reviewed this time

Guidelines

Pragmatism and more didactic

NLS manual and course

Previous ERC Guidelines

New evidence not reviewed

Previous NLS Manual and course

Annual Middlesbrough Neonatal Conference
Guidelines

2015 ILCOR
Evidence evaluation of PICOS

ERC Guidelines

National Guidelines
Guidelines

• ERC and UK Name change!
  – *Resuscitation at Birth* to *Resuscitation and support of transition at birth*
  
  • to reflect an emphasis on supporting transition to air breathing and only rarely the need for resuscitation
Main conclusions

◆ Optimal Assessment of Heart Rate:

It is suggested in babies requiring resuscitation that the ECG can be used to provide a rapid and accurate estimation of heart rate.

Very-low-quality evidence from 5 nonrandomized studies enrolling 213 patients showing a benefit of ECG compared with oximetry.

Very-low-quality evidence from 1 nonrandomized study enrolling 26 patients showing a benefit of ECG compared with auscultation.
Main conclusions

◆ Optimal Assessment of Heart Rate:

Knowledge gaps

- Studies delineating differences in interventions and/or patient outcomes based on ECG versus pulse oximetry measurements

- Studies of heart rate in VLBW infants requiring resuscitation and in relationship to timing of cord clamping

- Improved technology for rapid application of ECG
ERC and UK

• An accurate assessment of heart rate can be made using ECG or pulse oximetry.
Main conclusions

◆ Cord clamping:

We **suggest** delayed umbilical cord clamping of at least 1 minute for preterm infants not requiring immediate resuscitation after birth (weak recommendation, very-low-quality evidence).

Still insufficient evidence to recommend an approach to cord clamping for preterm infants who do receive resuscitation immediately after birth.
Main conclusions

◆ Cord clamping:

Knowledge gaps

◆ Results of ongoing large randomized controlled trials
◆ Comparison of delayed versus immediate cord clamping among preterm infants who receive resuscitation with PPV
◆ Comparison of delayed cord clamping with cord milking
◆ Outcome data of high importance, such as long-term neurodevelopment
◆ Need for resuscitative intervention at delivery
◆ Hyperbilirubinemia among those high-risk populations
Cord Milking

• We suggest against the routine use of cord milking for infants born at 28 weeks of gestation or less, because there is insufficient published human evidence of benefit.

• Cord milking may be considered on an individual basis or in a research setting, as it may improve initial mean blood pressure and haematologic indices and reduce intracranial hemorrhage.

• There is no evidence for improvement in long-term outcomes (weak recommendation, low-quality evidence).
Main conclusions

◆ Temperature:

We **recommend** that the temperature of newly born non-asphyxiated infants is maintained between 36.5°C and 37.5°C after birth. Record this as a predictor of outcomes as well as a quality indicator.

At <32 weeks gestation, a combination of interventions may be required to maintain temperature **between 36.5°C and 37.5°C**.
Temperature

- Hypothermia <36.5°C occurs in ALL settings and is associated with increased mortality and morbidity
  - Mortality 35 refs, single direction of effect, dose effect.
  - IVH, Late sepsis, Respiratory support, Hypoglycaemia

- For every degree below 36.5°C risk of mortality increases by at least 28%

- Keeping babies warm decreases morbidity
  - Reilly 2015, Russo 2014, De Mauro 2013

- International standard of care 36.5-37.5°C

- Methods of achieving this - multiple
For newborns needing resuscitation or stabilisation

- Radiant warmer and hats
- Possibly warm humidified gases
- For preterm newborns <32 weeks
  - Polyethylene occlusive wrapping
  - DR above 25°C if less than 29 weeks
  - Possibly heated mattresses
Main conclusions

◆ Meconium:

There is insufficient published human evidence to suggest routine tracheal intubation for suctioning of meconium in non-vigorous infants born through MSAF as opposed to no tracheal intubation for suctioning.

Big change for some but small change for others
Main conclusions

◆ Meconium:

◆ 1 randomized study involving 122 infants (low-quality evidence, downgraded for risk of bias and imprecision) comparing tracheal intubation for suctioning versus no tracheal intubation for suctioning in nonvigorous infants showing no benefit to suctioning in either reduced mortality and/or MAS.
  ◆ Chettri 2015 (Intubation group slower to HR >100)
  ◆ Nangia S, Sunder S, Biswas R, Sali A. Resuscitation 2016 http://dx.doi.org/10.1016/j.resuscitation.2016.05.015

◆ Very-low-quality evidence from 3 studies including 12,389 MSAF infants showing higher incidence of MAS in depressed infants (268/1022, 26%) who had tracheal intubation for suctioning compared with vigorous infants (34/11,367, 0.3%) who were not intubated (downgraded for indirectness)

◆ 7 very-low-quality observational studies demonstrating improved survival and lower incidence of MAS when infants (including depressed and/or vigorous infants) born through MSAF were intubated for tracheal suctioning (downgraded for indirectness and inconsistency)

◆ 9 very-low-quality observational studies demonstrating no improvement in survival and/or incidence of MAS (including depressed and/or vigorous infants) when infants born through MSAF were intubated for tracheal suctioning (downgraded for indirectness)
Meconium

Values, Preferences and task force insights

◆ In making this suggestion, we place value on both harm avoidance (delays in providing bag-mask ventilation, potential harm of the procedure) and the unknown benefit of the intervention of routine tracheal intubation and suctioning.

◆ The emphasis is on initiating ventilation within the first minute of life in non-breathing or ineffectively breathing infants and this should not be delayed.
Main conclusions

◆ Air/Oxygen:

◆ We **recommend against** initiating resuscitation of preterm newborns (less than 35 weeks of gestation) with high supplementary oxygen concentrations (65–100%).

◆ We **recommend** initiating resuscitation with a low-oxygen concentration (21–30%) (strong recommendation, moderate-quality evidence).
Oxygen/Air

◆ Term
  ◆ No major change
  ◆ Start in air. Increase oxygen if starting compressions. Be guided by oximetry and wean as soon as possible.
  ◆ High initial oxygen concentrations associated with increased mortality
    ◆ Davis 2004

◆ Preterm
  ◆ <35 weeks gestation use initially 21-30%
  ◆ In meta-analysis of 7 RCTs of high (>65%) vs low (21-30%) there was no advantage in mortality of morbidity.

◆ Increase in oxidative stress

◆ Caveat studies not included:
  ◆ TORPIDO. Oei JL et al. EPAS 2015; 3130.2
Main conclusions and changes

◆ ILCOR LMA:

We suggest the laryngeal mask may be used as an alternative to tracheal intubation during resuscitation of the > 34 weeks if face mask is unsuccessful.

If nothing else works: the laryngeal mask is recommended for resuscitation of the late-preterm and term newborn (more than 34 weeks) (strong recommendation, good clinical practice).
Main conclusions and changes

• ERC LMA:
  – The laryngeal mask airway can be used in resuscitation of the newborn
    • if facemask ventilation is unsuccessful
    • if tracheal intubation is unsuccessful or not feasible.
  – The LMA may be considered as an alternative to a facemask for positive pressure ventilation among newborns weighing more than 2000 g or delivered ≥34 weeks gestation
Main conclusions

◆ CPAP in preterm infants:

For spontaneously breathing preterm infants with respiratory distress requiring respiratory support in the delivery room, we suggest initial use of CPAP rather than intubation and IPPV (weak recommendation, moderate-quality evidence).
Main conclusions and changes

- **CPAP/Preterm**
  - Initial respiratory support of all spontaneously breathing preterm infants with respiratory distress may be provided by CPAP, rather than intubation.

  - Three RCTs enrolling 2358 infants born at <30 weeks gestation demonstrated that CPAP is beneficial when compared to initial tracheal ventilation and PPV
    - Less intubation, less ventilation no short term disadvantages

- This did not include INSURE technique

- There are few data to guide the appropriate use of CPAP in term infants at birth and further clinical studies are required.
  - Hishikawa 2015, Poets 2015
ERC and UK

• Consider 2 person mask inflation and other airway techniques

• Chest compressions when heart rate < 60/min after five effective inflation breaths and 30 s of effective ventilation.
  – Coordinate compressions and ventilations at a ratio of 3:1.

• Counsel, brief and debrief
Conclusions are interpreted in Guidelines
Thank you