American Heart Association.

HIGHLIGHTS

of the **2023 American Heart Association and American Academy of Pediatrics Focused Update on Neonatal Resuscitation**: An Update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

We thank the following people for their contributions to the development of this publication: Nicole K. Yamada, MD, MS; Henry C. Lee, MD; Edgardo Szyld, MD, MSc; the American Heart Association and American Academy of Pediatrics Neonatal Life Support Focused Update Writing Group; and the AHA Guidelines Focused Update Highlights Project Team.

Introduction

These Highlights summarize the key points of the "2023 American Heart Association and American Academy of Pediatrics Focused Update on Neonatal Resuscitation: An Update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care."[1] The guidelines contained in that document serve as an update on topics from the *2020 American Heart Association (AHA) Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care*[2] and the *2020 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations* from the International Liaison Committee on Resuscitation (ILCOR) Neonatal Life Support Task Force.[3] Because this publication is a summary, it does not reference the supporting published studies and does not list Classes of Recommendation or Levels of Evidence as detailed in the 2023 focused update to the neonatal resuscitation guidelines.

Process Overview for Developing Guidelines Focused Updates

Updated AHA/American Academy of Pediatrics guidelines for neonatal resuscitation are developed in concert with ILCOR's continuous evaluation of new resuscitation science. The methods used by ILCOR to perform evidence evaluations[4] and by the AHA to translate these evidence evaluations into resuscitation guidelines[5] have been published in detail.

In developing these guidelines, the writing group produced clinical questions in the population, intervention, comparison, outcome format; performed structured literature reviews; synthesized the evidence; and developed treatment recommendations by using standardized methodology. Each recommendation was assigned a Class of Recommendation and Level of Evidence using standard AHA definitions (Table). Conflicts of interest of the writing group members were disclosed and managed by using AHA processes.

Table. Applying Class of Recommendation and Level of Evidence to Clinical Strategies, Interventions, Treatments, or Diagnostic Testing in Patient Care (Updated May 2019)*

CLASS (STRENGTH) OF RECOMMENDATION	
CLASS 1 (STRONG)	**Benefit >>> Risk**
Suggested phrases for writing recommendations: • Is recommended • Is indicated/useful/effective/beneficial • Should be performed/administered/other • Comparative-Effectiveness Phrases†: – Treatment/strategy A is recommended/indicated in preference to treatment B – Treatment A should be chosen over treatment B	
CLASS 2a (MODERATE)	**Benefit >> Risk**
Suggested phrases for writing recommendations: • Is reasonable • Can be useful/effective/beneficial • Comparative-Effectiveness Phrases†: – Treatment/strategy A is probably recommended/indicated in preference to treatment B – It is reasonable to choose treatment A over treatment B	
CLASS 2b (WEAK)	**Benefit ≥ Risk**
Suggested phrases for writing recommendations: • May/might be reasonable • May/might be considered • Usefulness/effectiveness is unknown/unclear/uncertain or not well-established	
CLASS 3: No Benefit (MODERATE) **(Generally, LOE A or B use only)**	**Benefit = Risk**
Suggested phrases for writing recommendations: • Is not recommended • Is not indicated/useful/effective/beneficial • Should not be performed/administered/other	
CLASS 3: Harm (STRONG)	**Risk > Benefit**
Suggested phrases for writing recommendations: • Potentially harmful • Causes harm • Associated with excess morbidity/mortality • Should not be performed/administered/other	

LEVEL (QUALITY) OF EVIDENCE‡	
LEVEL A	
• High-quality evidence‡ from more than 1 RCT • Meta-analyses of high-quality RCTs • One or more RCTs corroborated by high-quality registry studies	
LEVEL B-R	**(Randomized)**
• Moderate-quality evidence‡ from 1 or more RCTs • Meta-analyses of moderate-quality RCTs	
LEVEL B-NR	**(Nonrandomized)**
• Moderate-quality evidence‡ from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies • Meta-analyses of such studies	
LEVEL C-LD	**(Limited Data)**
• Randomized or nonrandomized observational or registry studies with limitations of design or execution • Meta-analyses of such studies • Physiological or mechanistic studies in human subjects	
LEVEL C-EO	**(Expert Opinion)**
• Consensus of expert opinion based on clinical experience	

COR and LOE are determined independently (any COR may be paired with any LOE).

A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

* The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information).

† For comparative-effectiveness recommendations (COR 1 and 2a; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

‡ The method of assessing quality is evolving, including the application of standardized, widely-used, and preferably validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee.

COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence; NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.

Updated Recommendations

The 2023 focused update on neonatal resuscitation is based on 4 systematic reviews recently completed under the direction of the ILCOR Neonatal Life Support Task Force. Systematic reviewers and content experts from this task force performed comprehensive reviews of the scientific literature on umbilical cord management in preterm,[6] late preterm, and term newborn infants[7] as well as the optimal devices and interfaces used for administering positive-pressure ventilation (PPV) during resuscitation of newborn infants.[8,9] In addition to affirming or updating recommendations on the timing of umbilical cord clamping from the 2020 guidelines,[2] the 2023 focused update provides new guidance on the use of intact umbilical cord milking, device selection for administering PPV, and use of an additional primary interface for administering PPV.

Delayed cord clamping (DCC) refers to not clamping the umbilical cord immediately after delivery and allowing for a continued placental transfusion while the cord remains intact. This may take place over 30 to 60 seconds or more. *Umbilical cord milking* is gently squeezing the umbilical cord toward the newborn infant to facilitate transfusion after birth. PPV is a key component of neonatal resuscitation. Devices used to administer PPV include T-piece resuscitators, self-inflating bags, flow-inflating bags, and laryngeal masks.

Umbilical Cord Management: Term and Late Preterm Infants

2023 (Updated): For term and late preterm newborn infants ≥34 weeks' gestation who do not require resuscitation, delayed cord clamping (≥30 seconds) can be beneficial when compared to early cord clamping (<30 seconds).

2023 (New): For nonvigorous term and late preterm infants (35–42 weeks' gestation), intact cord milking may be reasonable when compared to early cord clamping (<30 seconds).

2023 (Updated): For term and late preterm newborn infants ≥34 weeks' gestation who do not require resuscitation, intact cord milking is not known to be beneficial when compared to delayed cord clamping (≥30 seconds).

Why: Studies on cord management for term and late preterm infants have found that with delayed cord clamping for >30 seconds, there was potential benefit of increased hematologic indices and no evidence of harm. A study of nonvigorous late preterm and term infants found that cord milking was associated with potential benefit, such as increased hemoglobin levels and reduced need for cardiorespiratory support.

Umbilical Cord Management: Preterm Infants

2023 (Updated): For preterm newborn infants <34 weeks' gestation who do not require resuscitation, delaying cord clamping (≥30 seconds) can be beneficial when compared to early cord clamping (<30 seconds).

2023 (New): For preterm newborn infants between 28 and 34 weeks' gestation who do not require resuscitation and in whom DCC cannot be performed, intact cord milking may be reasonable.

2023 (Reaffirmed from 2020): For preterm newborn infants <28 weeks' gestation, intact cord milking is not recommended.

Why: Studies on cord management for preterm infants have found that delayed cord clamping ranging from 30 seconds to more than 2 minutes is beneficial, including possible improvement in survival and decreased need for inotropes and red blood cell transfusions. In several studies of intact cord milking for preterm infants, there were potential benefits, including decreased use of inotropes and higher hematologic indices. However, in a study of infants born before 28 weeks' gestation, cord milking was associated with higher incidence of severe intraventricular hemorrhage.

Devices and Interfaces to Administer PPV

2023 (New): It can be beneficial to use a T-piece resuscitator instead of a self-inflating bag, with or without a positive end-expiratory pressure valve, for administering positive-pressure ventilation to newborn infants, particularly for preterm infants.

2023 (New): It may be reasonable to use a supraglottic airway as the primary interface to administer PPV instead of a face mask for newborn infants delivered at ≥34 0/7 weeks' gestation.

Why: A meta-analysis of randomized controlled trials found that use of a T-piece resuscitator compared to a self-inflating bag reduced the duration of PPV and decreased the risk of bronchopulmonary dysplasia, possibly due to more consistent delivery of positive end-expiratory pressure. A meta-analysis of randomized controlled trials found that use of a supraglottic airway compared with face mask decreased the failure to improve with the assigned device as well as the rate of endotracheal intubation in the delivery room.

References

1. Yamada NK, Szyld E, Strand ML, et al; for the American Heart Association and American Academy of Pediatrics. 2023 American Heart Association and American Academy of Pediatrics focused update on neonatal resuscitation: an update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation.* Published online TBD. doi: 10.1161/CIR.0000000000001181

2. Aziz K, Lee HC, Escobedo MB, et al. Part 5: neonatal resuscitation: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation.* 2020;142(16)(suppl 2):S524-S550. doi: 10.1161/CIR.0000000000000902

3. Wyckoff MH, Wyllie J, Aziz K, et al; for the Neonatal Life Support Collaborators. Neonatal life support: 2020 international consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. *Circulation.* 2020;142(16) (suppl 1):S185-S221. doi: 10.1161/CIR.0000000000000895

4. Wyckoff MH, Greif R, Morley PT, et al. 2022 International consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations: summary from the Basic Life Support; Advanced Life Support; Pediatric Life Support; Neonatal Life Support; Education, Implementation, and Teams; and First Aid Task Forces. *Resuscitation.* 2022;181:208-288. doi: 10.1016/j.resuscitation.2022.10.005

5. Magid DJ, Aziz K, Cheng A, et al. Part 2: evidence evaluation and guidelines development: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation.* 2020;142(16)(suppl 2):S358-S365. doi: 10.1161/CIR.0000000000000898

6. Seidler AL, Gyte GML, Rabe H, et al; for the International Liaison Committee on Resuscitation Neonatal Life Support Task Force. Umbilical cord management for newborns <34 weeks' gestation: a meta-analysis. *Pediatrics.* 2021;147(3):e20200576. doi: 10.1542/peds.2020-0576

7. Gomersall J, Berber S, Middleton P, et al; for the International Liaison Committee on Resuscitation Neonatal Life Support Task Force. Umbilical cord management at term and late preterm birth: a meta-analysis. *Pediatrics.* 2021;147(3):e2020015404. doi: 10.1542/peds.2020-015404

8. Trevisanuto D, Roehr CC, Davis PG, et al; for the International Liaison Committee on Resuscitation Neonatal Life Support Task Force. Devices for administering ventilation at birth: a systematic review. *Pediatrics.* 2021;148(1):e2021050174. doi: 10.1542/peds.2021-050174

9. Yamada NK, McKinlay CJ, Quek BH, et al; for the International Liaison Committee on Resuscitation Neonatal Life Support Task Force. Supraglottic airways compared with face masks for neonatal resuscitation: a systematic review. *Pediatrics.* 2022;150(3):e2022056568. doi: 10.1542/peds.2022-056568