APPENDIX

DISCLOSURES

Part 13: Neonatal Resuscitation: 2015 Guidelines Update Writing Group Disclosures

Writing Group Member	Employment	Research Grant	Other Research Support	Speakers' Bureau/ Honoraria	Expert Witness	Ownership Interest	Consultant/ Advisory Board	Other
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Gary M. Weiner	University of Michigan	None	None	None	None	None	American Academy of Pediatrics†	None
Jeannette G. Zaichkin	Self-employed	None	None	None	None	None	American Academy of Pediatrics†	None

This table represents the relationships of writing group members that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all members of the writing group are required to complete and submit. A relationship is considered to be "significant" if (a) the person receives $10 000 or more during any 12-month period, or 5% or more of the person's gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns $10 000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.

* Modest.

† Significant.

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APPENDIX

2015 Guidelines Update: Part 13 Recommendations

Year Last Reviewed	Topic	Recommendation	Comments
2015	Umbilical Cord Management	In summary, from the evidence reviewed in the 2010 CoSTR and subsequent review of DCC and cord milking in preterm newborns in the 2015 ILCOR systematic review, DCC for longer than 30 seconds is reasonable for both term and preterm infants who do not require resuscitation at birth (Class IIa, LOE C-LD).	new for 2015
2015	Umbilical Cord Management	There is insufficient evidence to recommend an approach to cord clamping for infants who require resuscitation at birth and more randomized trials involving such infants are encouraged. In light of the limited information regarding the safety of rapid changes in blood volume for extremely preterm infants, we suggest against the routine use of cord milking for infants born at less than 29 weeks of gestation outside of a research setting. Further study is warranted because cord milking may improve initial mean blood pressure, hematologic indices, and reduce intracranial hemorrhage, but thus far there is no evidence for improvement in long-term outcomes (Class IIb, LOE C-LD).	new for 2015
2015	Importance of Maintaining Normal Temperature in the Delivery Room	Preterm infants are especially vulnerable. Hypothermia is also associated with serious morbidities, such as increased respiratory issues, hypoglycemia, and late-onset sepsis. Because of this, admission temperature should be recorded as a predictor of outcomes as well as a quality indicator (Class I, LOE B-NR).	new for 2015
2015	Importance of Maintaining Normal Temperature in the Delivery Room	It is recommended that the temperature of newly born nonasphyxiated infants be maintained between 36.5°C and 37.5°C after birth through admission and stabilization (Class I, LOE C-LD).	new for 2015
2015	Interventions to Maintain Newborn Temperature in the Delivery Room	The use of radiant warmers and plastic wrap with a cap has improved but not eliminated the risk of hypothermia in preterms in the delivery room. Other strategies have been introduced, which include increased room temperature, thermal mattresses, and the use of warmed humidified resuscitation gases. Various combinations of these strategies may be reasonable to prevent hypothermia in infants born at less than 32 weeks of gestation (Class IIb, LOE B-R, B-NR, C-LD).	updated for 2015
2015	Interventions to Maintain Newborn Temperature in the Delivery Room	Compared with plastic wrap and radiant warmer, the addition of a thermal mattress, warmed humidified gases and increased room temperature plus cap plus thermal mattress were all effective in reducing hypothermia. For all the studies, hyperthermia was a concern, but harm was not shown. Hyperthermia (greater than 38.0°C) should be avoided due to the potential associated risks (Class III: Harm, LOE C-EO).	updated for 2015
2015	Warming Hypothermic Newborns to Restore Normal Temperature	The traditional recommendation for the method of rewarming neonates who are hypothermic after resuscitation has been that slower is preferable to faster rewarming to avoid complications such as apnea and arrhythmias. However, there is insufficient current evidence to recommend a preference for either rapid (0.5°C/h or greater) or slow rewarming (less than 0.5°C/h) of unintentionally hypothermic newborns (temperature less than 36°C) at hospital admission. Either approach to rewarming may be reasonable (Class IIb, LOE C-LD).	new for 2015
2015	Maintaining Normothermia in Resource-Limited Settings	In resource-limited settings, to maintain body temperature or prevent hypothermia during transition (birth until 1 to 2 hours of life) in well newborn infants, it may be reasonable to put them in a clean food-grade plastic bag up to the level of the neck and swaddle them after drying (Class IIb, LOE C-LD).	new for 2015
2015	Maintaining Normothermia in Resource-Limited Settings	Another option that may be reasonable is to nurse such newborns with skin-to-skin contact or kangaroo mother care (Class IIb, LOE C-LD).	new for 2015

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Year Last Reviewed	Topic	Recommendation	Comments
2015	Clearing the Airway When Meconium Is Present	However, if the infant born through meconium-stained amniotic fluid presents with poor muscle tone and inadequate breathing efforts, the initial steps of resuscitation should be completed under the radiant warmer. PPV should be initiated if the infant is not breathing or the heart rate is less than 100/min after the initial steps are completed. Routine intubation for tracheal suction in this setting is not suggested, because there is insufficient evidence to continue recommending this practice (Class IIb, LOE C-LD).	updated for 2015
2015	Assessment of Heart Rate	During resuscitation of term and preterm newborns, the use of 3-lead ECG for the rapid and accurate measurement of the newborn's heart rate may be reasonable (Class IIb, LOE C-LD).	new for 2015
2015	Administration of Oxygen in Preterm Infants	In all studies, irrespective of whether air or high oxygen (including 100%) was used to initiate resuscitation, most infants were in approximately 30% oxygen by the time of stabilization. Resuscitation of preterm newborns of less than 35 weeks of gestation should be initiated with low oxygen (21% to 30%), and the oxygen concentration should be titrated to achieve preductal oxygen saturation approximating the interquartile range measured in healthy term infants after vaginal birth at sea level (Class I, LOE B-R).	new for 2015
2015	Administration of Oxygen	Initiating resuscitation of preterm newborns with high oxygen (65% or greater) is not recommended (Class III: No Benefit, LOE B-R).	new for 2015
2015	Positive Pressure Ventilation (PPV)	There is insufficient data regarding short and long-term safety and the most appropriate duration and pressure of inflation to support routine application of sustained inflation of greater than 5 seconds' duration to the transitioning newborn (Class IIb, LOE B-R).	new for 2015
2015	Positive Pressure Ventilation (PPV)	In 2015, the Neonatal Resuscitation ILCOR and Guidelines Task Forces repeated their 2010 recommendation that, when PPV is administered to preterm newborns, approximately 5 cm H_2O PEEP is suggested (Class IIb, LOE B-R).	updated for 2015
2015	Positive Pressure Ventilation (PPV)	PPV can be delivered effectively with a flow-inflating bag, self-inflating bag, or T-piece resuscitator (Class IIa, LOE B-R).	updated for 2015
2015	Positive Pressure Ventilation (PPV)	Use of respiratory mechanics monitors have been reported to prevent excessive pressures and tidal volumes and exhaled CO_2 monitors may help assess that actual gas exchange is occurring during face-mask PPV attempts. Although use of such devices is feasible, thus far their effectiveness, particularly in changing important outcomes, has not been established (Class IIb, LOE C-LD).	new for 2015
2015	Positive Pressure Ventilation (PPV)	Laryngeal masks, which fit over the laryngeal inlet, can achieve effective ventilation in term and preterm newborns at 34 weeks or more of gestation. Data are limited for their use in preterm infants delivered at less than 34 weeks of gestation or who weigh less than 2000 g. A laryngeal mask may be considered as an alternative to tracheal intubation if face-mask ventilation is unsuccessful in achieving effective ventilation (Class IIb, LOE B-R).	updated for 2015
2015	Positive Pressure Ventilation (PPV)	A laryngeal mask is recommended during resuscitation of term and preterm newborns at 34 weeks or more of gestation when tracheal intubation is unsuccessful or is not feasible (Class I, LOE C-EO).	updated for 2015
2015	CPAP	Based on this evidence, spontaneously breathing preterm infants with respiratory distress may be supported with CPAP initially rather than routine intubation for administering PPV (Class IIb, LOE B-R).	updated for 2015
2015	Chest Compressions	Compressions are delivered on the lower third of the sternum to a depth of approximately one third of the anterior-posterior diameter of the chest (Class IIb, LOE C-LD).	updated for 2015

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Appendix Continued

Year Last Reviewed	Topic	Recommendation	Comments
2015	Chest Compressions	Because the 2-thumb technique generates higher blood pressures and coronary perfusion pressure with less rescuer fatigue, the 2 thumb–encircling hands technique is suggested as the preferred method (Class IIb, LOE C-LD).	updated for 2015
2015	Chest Compressions	It is still suggested that compressions and ventilations be coordinated to avoid simultaneous delivery. The chest should be allowed to re-expand fully during relaxation, but the rescuer's thumbs should not leave the chest. The Neonatal Resuscitation ILCOR and Guidelines Task Forces continue to support use of a 3:1 ratio of compressions to ventilation, with 90 compressions and 30 breaths to achieve approximately 120 events per minute to maximize ventilation at an achievable rate (Class IIa, LOE C-LD).	updated for 2015
2015	Chest Compressions	A 3:1 compression-to-ventilation ratio is used for neonatal resuscitation where compromise of gas exchange is nearly always the primary cause of cardiovascular collapse, but rescuers may consider using higher ratios (eg, 15:2) if the arrest is believed to be of cardiac origin (Class IIb, LOE C-EO).	updated for 2015
2015	Chest Compressions	The Neonatal Guidelines Writing Group endorses increasing the oxygen concentration to 100% whenever chest compressions are provided (Class IIa, LOE C-EO).	new for 2015
2015	Chest Compressions	To reduce the risks of complications associated with hyperoxia the supplementary oxygen concentration should be weaned as soon as the heart rate recovers (Class I, LOE C-LD).	new for 2015
2015	Chest Compressions	The current measure for determining successful progress in neonatal resuscitation is to assess the heart rate response. Other devices, such as end-tidal CO_2 monitoring and pulse oximetry, may be useful techniques to determine when return of spontaneous circulation occurs. However, in asystolic/bradycardic neonates, we suggest against the routine use of any single feedback device such as $ETCO_2$ monitors or pulse oximeters for detection of return of spontaneous circulation, as their usefulness for this purpose in neonates has not been well established (Class IIb, LOE C-LD).	new for 2015
2015	Induced Therapeutic Hypothermia Resource-Limited Areas	Evidence suggests that use of therapeutic hypothermia in resource-limited settings (ie, lack of qualified staff, inadequate equipment, etc) may be considered and offered under clearly defined protocols similar to those used in published clinical trials and in facilities with the capabilities for multidisciplinary care and longitudinal follow-up (Class IIb, LOE-B-R).	new for 2015
2015	Guidelines for Withholding and Discontinuing	However, in individual cases, when counseling a family and constructing a prognosis for survival at gestations below 25 weeks, it is reasonable to consider variables such as perceived accuracy of gestational age assignment, the presence or absence of chorioamnionitis, and the level of care available for location of delivery. It is also recognized that decisions about appropriateness of resuscitation below 25 weeks of gestation will be influenced by region-specific guidelines. In making this statement, a higher value was placed on the lack of evidence for a generalized prospective approach to changing important outcomes over improved retrospective accuracy and locally validated counseling policies. The most useful data for antenatal counseling provides outcome figures for infants alive at the onset of labor, not only for those born alive or admitted to a neonatal intensive care unit (Class IIb, LOE C-LD).	new for 2015
2015	Guidelines for Withholding and Discontinuing	We suggest that, in infants with an Apgar score of 0 after 10 minutes of resuscitation, if the heart rate remain undetectable, it may be reasonable to stop assisted ventilations; however, the decision to continue or discontinue resuscitative efforts must be individualized. Variables to be considered may include whether the resuscitation was considered optimal; availability of advanced neonatal care, such as therapeutic hypothermia; specific circumstances before delivery (eg, known timing of the insult); and wishes expressed by the family (Class IIb, LOE C-LD).	updated for 2015

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Year Last Reviewed	Topic	Recommendation	Comments
2015	Structure of Educational Programs to Teach Neonatal Resuscitation: Instructors	Until more research is available to clarify the optimal instructor training methodology, it is suggested that neonatal resuscitation instructors be trained using timely, objective, structured, and individually targeted verbal and/or written feedback (Class IIb, LOE C-EO).	new for 2015
2015	Structure of Educational Programs to Teach Neonatal Resuscitation: Providers	Studies that explored how frequently healthcare providers or healthcare students should train showed no differences in patient outcomes (LOE C-EO) but were able to show some advantages in psychomotor performance (LOE B-R) and knowledge and confidence (LOE C-LD) when focused training occurred every 6 months or more frequently. It is therefore suggested that neonatal resuscitation task training occur more frequently than the current 2-year interval (Class IIb, LOE B-R, LOE C-EO, LOE C-LD).	new for 2015
The following recommendations were not reviewed in 2015. For more information, see the *2010 AHA Guidelines for CPR and ECC*, "Part 15: Neonatal Resuscitation."			
2010	Temperature Control	All resuscitation procedures, including endotracheal intubation, chest compression, and insertion of intravenous lines, can be performed with these temperature-controlling interventions in place (Class IIb, LOE C).	not reviewed in 2015
2010	Clearing the Airway When Amniotic Fluid Is Clear	Suctioning immediately after birth, whether with a bulb syringe or suction catheter, may be considered only if the airway appears obstructed or if PPV is required (Class IIb, LOE C).	not reviewed in 2015
2010	Assessment of Oxygen Need and Administration of Oxygen	It is recommended that oximetry be used when resuscitation can be anticipated, when PPV is administered, when central cyanosis persists beyond the first 5 to 10 minutes of life, or when supplementary oxygen is administered (Class I, LOE B).	not reviewed in 2015
2010	Administration of Oxygen in Term Infants	It is reasonable to initiate resuscitation with air (21% oxygen at sea level; Class IIb, LOE C).	not reviewed in 2015
2010	Administration of Oxygen in Term Infants	Supplementary oxygen may be administered and titrated to achieve a preductal oxygen saturation approximating the interquartile range measured in healthy term infants after vaginal birth at sea level (Class IIb, LOE B).	not reviewed in 2015
2010	Initial Breaths and Assisted Ventilation	Inflation pressure should be monitored; an initial inflation pressure of 20 cm H_2O may be effective, but ≥30 to 40 cm H_2O may be required in some term babies without spontaneous ventilation (Class IIb, LOE C).	not reviewed in 2015
2010	Initial Breaths and Assisted Ventilation	In summary, assisted ventilation should be delivered at a rate of 40 to 60 breaths per minute to promptly achieve or maintain a heart rate of 100 per minute (Class IIb, LOE C).	not reviewed in 2015
2010	Assisted-Ventilation Devices	Target inflation pressures and long inspiratory times are more consistently achieved in mechanical models when T-piece devices are used rather than bags, although the clinical implications of these findings are not clear (Class IIb, LOE C).	not reviewed in 2015
2010	Assisted-Ventilation Devices	Resuscitators are insensitive to changes in lung compliance, regardless of the device being used (Class IIb, LOE C).	not reviewed in 2015
2010	Endotracheal Tube Placement	Although last reviewed in 2010, exhaled CO_2 detection remains the most reliable method of confirmation of endotracheal tube placement (Class IIa, LOE B).	not reviewed in 2015
2010	Chest Compressions	Respirations, heart rate, and oxygenation should be reassessed periodically, and coordinated chest compressions and ventilations should continue until the spontaneous heart rate is <60 per minute (Class IIb, LOE C).	not reviewed in 2015
2010	Epinephrine	Dosing recommendations remain unchanged from 2010. Intravenous administration of epinephrine may be considered at a dose of 0.01 to 0.03 mg/kg of 1:10 000 epinephrine. If an endotracheal administration route is attempted while intravenous access is being established, higher dosing will be needed at 0.05 to 0.1 mg/kg (Class IIb, LOE C).	not reviewed in 2015
2010	Epinephrine	Given the lack of supportive data for endotracheal epinephrine, it is reasonable to provide drugs by the intravenous route as soon as venous access is established (Class IIb, LOE C).	not reviewed in 2015
2010	Volume Expansion	Volume expansion may be considered when blood loss is known or suspected (pale skin, poor perfusion, weak pulse) and the infant's heart rate has not responded adequately to other resuscitative measures (Class IIb, LOE C).	not reviewed in 2015

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Year Last Reviewed	Topic	Recommendation	Comments
2010	Volume Expansion	An isotonic crystalloid solution or blood may be useful for volume expansion in the delivery room (Class IIb, LOE C).	not reviewed in 2015
2010	Volume Expansion	The recommended dose is 10 mL/kg, which may need to be repeated. When resuscitating premature infants, care should be taken to avoid giving volume expanders rapidly, because rapid infusions of large volumes have been associated with IVH (Class IIb, LOE C).	not reviewed in 2015
2010	Induced Therapeutic Hypothermia Resource-Abundant Areas	Induced therapeutic hypothermia was last reviewed in 2010; at that time it was recommended that infants born at more than 36 weeks of gestation with evolving moderate-to-severe hypoxic-ischemic encephalopathy should be offered therapeutic hypothermia under clearly defined protocols similar to those used in published clinical trials and in facilities with the capabilities for multidisciplinary care and longitudinal follow-up (Class IIa, LOE A).	not reviewed in 2015
2010	Guidelines for Withholding and Discontinuing	The 2010 Guidelines provide suggestions for when resuscitation is not indicated, when it is nearly always indicated, and that under circumstances when outcome remains unclear, that the desires of the parents should be supported (Class IIb, LOE C).	not reviewed in 2015
2010	Briefing/Debriefing	It is still suggested that briefing and debriefing techniques be used whenever possible for neonatal resuscitation (Class IIb, LOE C).	not reviewed in 2015

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Part 13: Neonatal Resuscitation: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care (Reprint)

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Textbook of Neonatal Resuscitation

7th Edition

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- Concentration of oxygen during resuscitation
- Use of continuous positive airway pressure (CPAP) during and after resuscitation
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