

Neonatal Resuscitation Guidelines 2020: Implications for Practice

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ABSTRACT

Perinatal asphyxia continues to remain the major cause of neonatal mortality and morbidity worldwide. The Neonatal Resuscitation Program (NRP) is one of the structured training programs to ensure uniformity in resuscitation practices worldwide and is aimed at standardizing perinatal care. With rapid scientific advancements in the clinical practices of newborn care, the NRP is regularly updated based on emerging scientific evidence and expert opinions. The NRP 8th edition based on the latest 2020 revision has been implemented in practice since June 2021. We have summarized the significant recommendations with their impact on practice and possible research opportunities.

Keywords: Birth, Care, Delivery, Newborn, Ventilation

The complex process of transition from intrauterine to extrauterine physiology by the onset of breathing during delivery is crucial to deliver oxygenated blood to vital organs. Failure to initiate breathing by a compromised fetus is a medical emergency, which may be managed by a simple airway maintenance and stimulation, or may even warrant advanced resuscitation including chest compression and need for medications. The International Liaison Committee on Resuscitation (ILCOR) presents consensus-based recommendations after a systematic evaluation of evidences every 5 years to enable neonatologists, pediatricians and obstetricians to provide the best care practices around birth.¹ Since their introduction in 1987, the NRP Guidelines have been updated seven times, the latest update being the NRP 2020 Guidelines.² This narrative review discusses the relevant recommendations in the recent guidelines and its implications for clinical practice.

Pre-resuscitation preparation: Anticipation and preparedness is the key to every resuscitation as the need for assistance may arise in any delivery. The 2020 guidelines have emphasized the usage of a standardized risk assessment tool to assemble the number of qualified persons needed. A standardized equipment checklist is a must to ensure the availability and functioning of equipment during resuscitation. When anticipating a high-risk birth, a pre-resuscitation team briefing ensures role assignment and anticipating potential interventions needed as any delay in

intervention increases the risk of morbidity and mortality. Four pre-birth questions were revised in contrast to the previous guideline.³ (a) What is the expected gestational age? (b) Is the amniotic fluid clear? (c) Are there any additional risk factors? (d) What is our umbilical cord management plan?

Implications for Practice: Use risk factors and equipment checklist prior to every delivery. Carry out predelivery team briefing for high-risk delivery.

Umbilical cord management plan: Pre-planning the umbilical cord clamp has been emphasized for both term and preterm with a plan to delay cord clamping for at least 30 seconds if the baby does not need any resuscitation. Preterms have the advantage of survivability, lesser blood transfusion requirement, and stable circulation with delayed cord clamping. With additional placental trans-fusion, iron stores get better in term babies. Umbilical cord milking as an alternative to delayed cord clamping is contraindicated in neonates with gestation less than 28 weeks amid concerns of intraventricular hemorrhages.

Implications for Practice: Delayed cord clamping for at least 30-60 seconds should be universally practiced unless the baby needs active resuscitation or placental circulation is not intact.

Thermoregulation in the delivery room: Skin-to-skin care is

recommended soon after delivery for all babies except preterm neonates and those requiring active resuscitation, for whom additional means of providing warmth like radiant warmers, plastic wraps or bags, or hats, warmed humidified inspired gases are needed. For resource-limited set-ups, food-grade plastic bags are a cost-effective alternative.

Implications for Practice: Temperature maintenance with skin-to-skin care, plastic wraps, warmers, and exothermic mattresses is recommended.

Initial Steps: A set of interventions collectively designated as initial steps is mandatory to ensure that baby is warmed, dried, airway is open, and baby is stimulated before proceeding to ventilation in depressed neonates. The sequence of initial steps is revised to “warm, dry, stimulate, position and clear airway (if required) (WDSPS)” from “warm, position, clear airway (if required), dry and stimulate (WSPDS)” in the last guidelines. This reordered sequence is supposed to better reflect common practice.

Implications for Practice: Sequence of initial steps should be warm, dry, stimulate, position and clear airway (if required) (WDSPS).

Airway maintenance: For babies with poor breathing effort, clearing of the *visibly obstructed* airway is only recommended instead of the practice of routine suctioning irrespective of the meconium staining status of liquor. Emphasis is given on initial steps and positive pressure ventilation in place of routine endotracheal suction as the clinical outcomes of survival, need for respiratory support, or neurodevelopment were unaffected whether they are suctioned before or after the initiation of positive pressure ventilation (PPV).

Implications for Practice: Irrespective of meconium staining of liquor, routine suctioning of the trachea or oropharyngeal airway is not recommended unless there is visible obstruction enough to impair breathing effort or to make positive pressure ventilation ineffective.

Ventilation support at birth: Every effort should be made to avoid any delay in the initiation of PPV beyond 60 seconds from birth despite adequate initial steps and tactile stimulation. Every 30 seconds delay has been shown to increase mortality by 16%. The addition of positive end-expiratory pressure (PEEP) while delivering positive breaths helps in improving lung volume and lung compliance in preterms. Due to insufficient evidence, prior guidelines did not recommend sustained inflation, a strategy to establish functional residual capacity in a depressed newborn. Evidence from a systematic review showed that the use of sustained inflation had a definite risk of death in the first 48 hours of life which led to recommendations against the routine use of initial sustained inflation(s) greater than 5

seconds.⁴ Inspiratory time of 1 second or less should be used while giving positive pressure ventilation irrespective of gestation.

Implications for Practice: Sustained inflation is to be avoided during initial PPV. Positive pressure ventilation with PEEP should be initiated within the first minute of birth if needed.

Oxygen Administration: Overexposure to oxygen while resuscitating a newborn making a transition from a low oxygen intrauterine environment carries the risk of oxidative stress and toxicity, especially in preterms. As the evidence showed no difference in outcome with resuscitation with low oxygen concentration, the 2020 guideline reiterated the previous recommendation for initiation of PPV with 21-30% oxygen in gestation less than 35 weeks and 21% oxygen 35 weeks onwards with higher strength of recommendation.^{5,6}

Implications for Practice: PPV should be initiated with 21-30% oxygen for preterms less than 35 weeks and with room air for all other gestation.

Circulation: Vascular access by umbilical vein catheter was added as a new recommendation based on expert opinion, with intraosseous access being the next best option as per the availability. The medication route and dosage remained unchanged but simplified for educational efficiency. The suggested initial IV or intraosseous (IO) dose of epinephrine (0.02 mg/kg; 0.2 mL/kg; 1:10000 strength) and endotracheal (while establishing vascular access) dose (0.1 mg/kg; 1 mL/kg of 1:10000 strength). Use a flush volume of 3 mL normal saline for all IV/IO epinephrine dose for all weights and gestational ages.

Implications for Practice: Prefer umbilical vein catheterization as the primary choice of vascular access.

Withholding resuscitation: Prolonged resuscitation beyond 20 minutes without any detectable heart rate decreases the possibility of intact survival, so the timeframe to decide a change in care was revised to 20 minutes from 10 minutes in the earlier guideline. This duration should be individualized taking into consideration the gestational age, the parent's decision, and antenatal factors.⁷

Implications for Practice: In newly born babies receiving resuscitation, if there is no heart rate and all the steps of resuscitation have been performed, continuation or discontinuation of resuscitation efforts should be discussed with the team and the family around 20 min after birth considering individual patient and contextual factors.

Post-resuscitation Care: Babies who received advanced resuscitation receive post-resuscitation care in NICU with emphasis on maintenance of euthermia, circulation, and euglycemia. Therapeutic hypothermia should be offered for

TABLE 1. Summary of 2020 NRP guideline, present and future research implication

<i>Resuscitation topic</i>	<i>2020 Guideline recommendation</i>	<i>Implication for practice</i>	<i>Implication for research</i>
Pre-resuscitation preparation	<ul style="list-style-type: none"> • Pre-resuscitation team briefing should be carried out when anticipating high-risk delivery • Pre-birth questions include- what is the umbilical cord management plan 	<ul style="list-style-type: none"> • Use risk factors and equipment checklist prior to every delivery. • Carry out predelivery team briefing for high-risk delivery. 	Optimizing resources in resource-limited set-up
Umbilical cord management	Delaying clamping of cord for at least 30-60 seconds is reasonable for preterm and term infants who do not require resuscitation at birth	<ul style="list-style-type: none"> • Delay cord clamping for at least 30 seconds • Avoid umbilical cord milking in gestation less than 28 weeks 	<ul style="list-style-type: none"> • Umbilical cord milking in term babies • Intact cord resuscitation
Initial steps	Sequence of initial steps: Warm, dry, stimulate, position airway, suction as needed. No routine tracheal or airway suction irrespective of meconium staining status of liquor	Suction, only if airway obstruction impedes ventilation	Long term outcomes should be studied to assess the impact of change in practice. Studies to evaluate risks or benefits of intubation with tracheal suctioning in subgroup like specific gestation, thickness of meconium, operator experience, are needed.
Positive pressure ventilation	No sustained inflation of more than 5s. Initiate PPV with Ti of 1s or less	<ul style="list-style-type: none"> • Avoid sustained inflation • Prefer CPAP to intubation • Use PEEP wherever feasible while delivering PEEP 	Evaluation of sustained inflation of less than 5s
Oxygenation	Positive pressure ventilation should be initiated with 21-30% oxygen for preterms less than 35 weeks and with room air for all other gestation.	<ul style="list-style-type: none"> • Use blender while delivering oxygen for positive pressure ventilation 	Room air resuscitation of preterms
Post-resuscitation care and therapeutic hypothermia	Infants born at >36 weeks of gestation with evolving moderate-to-severe hypoxic-ischemic encephalopathy should be offered therapeutic hypothermia under clearly defined Protocols	Use therapeutic hypothermia with strict protocol adherence	Therapeutic hypothermia in low resource set up
Circulation	For babies requiring vascular access at the time of delivery, umbilical vein is the recommended route	Prefer umbilical vein catheterization in the delivery room Intraosseous route is the next option	Human neonatal studies to explore complications and resource consumption
Withholding and discontinuing Resuscitation	A reasonable time frame for change in goals of care is around 20 minutes after birth to discontinue resuscitative effort when there is absence of heart rate after all appropriate steps have been performed.	Take an individualized decision to discontinue resuscitation efforts around 20 minutes after birth.	Study of neurodevelopmental outcome of babies who were revived after 10 minutes to judge the load of neuro-morbidity added

babies with moderate to severe encephalopathy with strict adherence to protocol.

Implications for Practice: Post-resuscitation care including

therapeutic hypothermia, maintaining perfusion, glucose monitoring, and ventilation should be offered as necessary to all babies requiring advanced resuscitation efforts.

Conclusion: NRP guidelines have been evolving for the last three decades based on research work to recommend interventions that provide more benefit and avoid harm. Although the 2020 guidelines have emphasized its recommendation regarding umbilical cord management, oxygen use, therapeutic hypothermia, and oximetry use, still research work is underway to answer the unexplored questions as outlined in **Table 1**. We have summarized the significant practice points for the caregiver concerned with neonatal care and added insights for the research needed to address knowledge gaps. Resuscitation in the context of resource-limited set-ups should be focused on in the subsequent revisions of NRP guidelines.

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