

Neonatal Resuscitation Guidelines

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Objectives

- Understand the updated NRP guidelines
- Understand and verbalize the significance of ventilation in the newborn
- Application of these guidelines in the prehospital arena

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- In October of 2020, the AHA and the American Academy of Pediatrics released new Guidelines for the resuscitation of the neonate. The guidelines serve as the foundation for NRP.
- New guidelines are continually updated
- The guideline changes can be found fully online at eccguidelines.heart.org



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- The guidelines apply primarily to the newly born.
- The “newly born” period extends from birth to the end of resuscitation and stabilization.
- However, the guidelines may be applied to newborns in the neonatal phase.
- Healthcare providers who resuscitate neonates should follow these guidelines.

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- ## Key Concepts
- Newborn resuscitation is usually due to respiratory failure
 - Anticipation and teamwork are key
 - ABC's **not** CAB
 - Each algorithm step must be effectively performed before moving to the next step

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- ## Respiratory
- Ventilation of the newborn's lungs is the single most important and effective step in neonatal resuscitation

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Anticipation and Teamwork

- Gather information to anticipate situation (4 questions) prebirth questions
- GA, Risk Factors, Amniotic fluid color, & Cord plan
- Discuss equipment needed
- Discuss the algorithm steps
- Do you need additional resources

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ABC's not CAB

- Ventilation, ventilation, ventilation...
- All steps are to improve neonate's respiratory effort

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Algorithm Steps


- Each algorithm step must be effectively performed before moving to the next step
- Seconds to minutes can lapse before next action

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- Most newborns transition successfully
- They can be successfully identified with 3 questions...

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Rapid Evaluation Questions



- Term?
- Tone?
- Breathing or Crying?

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- If the answer to ALL 3 questions is "YES," the newborn may stay with mother for Initial Steps.
- Consider birth/cord plan
- If "NO" to any of the questions, Initial Steps completed away from mother
- Observation and assessment of breathing, activity, and HR must be ongoing.

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Initial Steps

- Warm, Dry, and Stimulate
- Open and position the airway
- Suction and clear secretions, if needed



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- 30-60 seconds for Initial Steps
- It is important to NOT unnecessarily delay the key step of ventilation
- The decision to progress beyond the Initial Steps is determined by the simultaneous assessment of HR and Respirations
- Once PPV or Supplemental O₂ is initiated add Pulse oximetry

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- The most sensitive indicator of a successful response to each step is an increase in Heart Rate!

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Warm, Dry, & Stimulate

- Warm neonate with available equipment
- Dry neonate with blankets/towels
- Stimulate simultaneously

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Open/Position Airway

- Neonate's head in sniffing position
- Open airway
- No pressure to bridge between eyes with mask

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Suction/Clear Airway

- No routine suctioning
- Clear secretions if needed
- Least invasive to more invasive

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- Vigorous newborns with good resp effort and tone may stay with mother during initial steps.
- Preterm and non-vigorous newborns have the initial steps completed in a warm environment away from mother.
- Importance is NOT delaying Ventilation within the first minute of life!

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- ## Temperature
- It has long been recognized temps of neonates can be a strong predictor of mortality. Preterm especially vulnerable. Hypothermia associated with an increase in respiratory issues, hypoglycemia, IVH and sepsis.
 - The guideline recommendation for a neonate's temp is between 36.5 and 37.5 C (97.7- 99.5 F).

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- ## Maintaining Temperature
- Increased Environment Temperatures (24-25 C)
 - Towels/blankets/hats
 - **Skin to Skin**
 - Thermal pads
 - Dry
 - Various combinations for preterm less than 32 weeks of gestation

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Cord Management

- Until recent years, a common practice has been to clamp the umbilical cord soon after birth
- Studies and evidence now indicate timed cord clamping is beneficial for newborns who don't need immediate resuscitation at birth.

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Cord Management

Why You Should Wait to Clamp the Umbilical Cord

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Benefits of TCC

- Optimal time is 60 seconds
- Maternal blood flow to an intact placenta provides warm additional oxygenated blood to the newborn
- Term neonates evidence higher Hgb concentration and increased iron stores.
- Preterm neonates evidence increased circulatory stability, reduced risk of IVH, and NEC

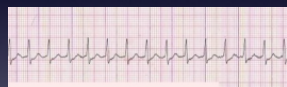
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- If placental circulation is not intact, such as placental abruption or cord avulsion, the cord should be clamped immediately.
- There is insufficient evidence to recommend timed cord clamping for infants who require resuscitation at birth.

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Assessment of HR

- During Resuscitation increase in the HR is the most sensitive indicator of a successful response to each intervention
- Clinical Assessment found to be unreliable and inaccurate with both auscultation and palpation. Studies found ECG most reliable and faster than pulse oximetry.



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- During resuscitation of term and preterm newborns, the use of a 3-lead ECG for rapid and accurate measurement of the newborn's HR is the guideline.
- Pulse oximetry is utilized with ECG

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Oxygen Need and Admin

- If resuscitation is needed anticipate PPV
- Newborns 35 weeks gestation or greater start PPV with 21% oxygen. Less than 35 weeks gestation begin with 21-30% oxygen. Target preductal sats during the transition time
- What to do when unable to blend oxygen

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- If the newborn is breathing, HR is greater than 100 and sats are not in the target range, provide supplemental oxygen.
- Administer free flow at 10L/min
- Use oxygen tubing held to newborn mouth and nose

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Target Pre-ductal Sats

- 1 min 60-65%
- 2 min 65-70%
- 3 min 70-75%
- 4min 75-80%
- 5 min 80-85%
- 10 min 85-95%

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PPV



- If after the initial steps the HR is less than 100 and/or the newborn is apneic or gasping, PPV is indicated.
- PPV may be delivered with a BVM or a T-piece resuscitator

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PPV settings

- For PPV set flow at 10L/min
- Peak inspiratory pressure (PIP) is 20-25 cm H₂O, PEEP is set at 5 cm H₂O
- If PPV is needed for resuscitation, especially of the preterm newborn, a device that can monitor PIP and provide PEEP should be used
- If providing PPV an ECG is the recommendation for HR monitoring

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PPV rate

- Ventilation of 40-60 bpm for the newborn
- Cadence: "Breathe, two, three; breathe, two, three"
- Continually

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- Upon starting PPV assess chest rise and fall/HR after 10-15 secs.
- If the chest is rising and falling and the HR is increasing within 10-15 secs, cont. PPV for 30 secs total.
- If the HR is NOT increasing after 15 secs but the chest is rising and falling, cont. for another 15 secs and reassess
- If the HR is NOT increasing after 15 secs, no chest rise and fall, initiate MR.SOPA

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MR.SOPA

- M&R: mask adjustment and reposition head
- S&O: suction mouth and nose, open the mouth
- Pressure: increase PIP, max 30-preterm and 30-40 term
- Alternative airway: LMA or ETT
- Ventilate with each corrective step for 5 breaths

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MR.SOPA success

- After performing a corrective step for 5 breaths, if the newborn has chest rise and fall, provide effective ventilation for 30 secs and reassess HR
- HR above 60 continue PPV, HR above 100 consider stopping if target sats are achieved

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Alternative Airways

- Intubation with an endotracheal tube is recommended if unable to ventilate with PPV, HR < 100 with PPV, and prior to chest compressions
- LMA's are recommended as an AA for term and preterm newborns, new guidelines
- Remember, "Breathe, two, three; breathe, two, three"

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AA sizes

Gest age	ETT	approx. wt.
• < 28 weeks	2.5	< 1 kg
• 28-34 weeks	3.0	1-2 kg
• > 34 weeks	3.5	2-3 kg

LMA size wt. based

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- Guideline to measure for depth and placement of the ETT is the nasal tragus length (NTL) plus 1cm.
- Secure here and document

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Chest Compressions

- ENSURE that EFFECTIVE VENTILATIONS are being delivered before starting compressions
- Chest compressions are indicated when the HR <60 bpm after 30 secs of effective PPV

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- ECG is the preferred method for assessment of the HR during chest compressions
- Chest compressions are done for 60 secs prior to reassessing the HR
- The preferred technique is the 2-thumb technique at the head of the patient

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- 3:1 ratio is the recommendation for neonatal resuscitation due to the ventilation need
- Cadence: "One and two and three and breathe and..."
- Due to the gas exchange compromise 100% oxygen is recommended during compressions
- HR > 100, rescuers should wean the oxygen to target pre-ductal saturations

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Medication/Epi

- Epi is indicated if the newborn's HR remains less than 60 bpm after 30 secs of effective PPV and 60 secs of chest compressions with PPV using 100% oxygen.
- Epi is NOT indicated before the lungs are effectively ventilated.
- The first dose of Epi should be given via the ETT while establishing the UVC.

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- Epi dose via ETT route: 0.05 mg/kg - 0.1 mg/kg (0.5 ml/kg to 1ml/kg)
- Recommended dose: 0.1 mg/kg (1 ml/kg)
- Epi dose via UVC/IV/IO route: 0.01 mg/kg - 0.03 mg/kg (0.1 ml/kg to 0.3 ml/kg)
- Recommended dose: 0.02 mg/kg (0.2 ml/kg)
- The *only* Epi concentration used in NRP is 0.1mg per 1ml

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Volume

- NS flushes should be 3 ml for all newborn ages
- Promotes availability
- If after chest compressions and Epi, the HR is still less than 60 and signs of shock, volume is recommended. Only NS
- Recommended dose is 10ml/kg over 5-10 min

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- There is currently insufficient evidence to support the routine use of Narcan in the newborn.
- Effective airway management and ventilation support are the key interventions



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Top 10 Takeaways from NRP

- 1) Newborn resuscitation requires anticipation and preparation by providers who train individually and as teams.
- 2) Most newly born infants do not require immediate cord clamping or resuscitation and can be evaluated and monitored during skin-to-skin contact with their mothers after birth.
- 3) Inflation and ventilation of the lungs are the **priority** in newly born infants who need support after birth.
- 4) A rise in heart rate is the most important indicator of effective ventilation and response to resuscitative interventions.
- 5) Pulse oximetry is used to guide oxygen therapy and meet oxygen saturation goals

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Top 10 Take aways

- 1) Chest compressions are provided if there is a poor heart rate response to appropriate ventilations after ventilation corrective steps, which preferably include endotracheal intubation.
- 2) The heart rate response to chest compressions and medications should be monitored electrocardiographically.
- 3) If the response to chest compressions is poor, it is reasonable to provide epinephrine, preferably via the intravenous route.
- 4) Failure to respond to epinephrine in a newborn with history or examination consistent with blood loss may require volume expansion.
- 5) If all these steps of resuscitation are effectively completed and there is no heart rate response by 20 minutes, redirection of care should be discussed with the team and family

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