

M09: Neonatal Resuscitation

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Updated: January 31, 2024

Reviewed: December 14, 2023

Introduction

Neonatal resuscitation focuses on the respiratory system and transitioning from fetal circulation to neonatal circulation. These two factors are interrelated; a functioning respiratory system is necessary to deliver oxygen to produce pulmonary vasodilation, thus lowering the pulmonary vascular resistance. When combined with increasing systemic vascular resistance, this allows the closure of fetal shunts and lung perfusion to progress.

Paramedic and EMR/FR management in the resuscitation of a neonate focuses on stabilizing the respiratory system in a systemic manner from least invasive to most invasive.

Essentials

- The Neonatal Resuscitation Program (NRP) has a clearly defined algorithm for all neonatal resuscitation events. Each step in the algorithm requires 30 seconds of effective intervention prior to moving on to the next step.
 - During the first 30 seconds, begin by assessing the neonate's tone; are they at term, breathing or crying?
 - Tone: a neonate should be active with flexed extremities. If the neonate is flaccid with extended extremities, resuscitation will be required.
 - Term: if the neonate is < 37 weeks gestation, they require an initial assessment as they are more likely to require assistance either immediately or soon after delivery.
 - Breathing or crying: a strong cry is a sign of a strong respiratory system. If the neonate is not crying, then a respiratory assessment for work of breathing is required and possible movement down the resuscitation chart.
 - In the next 30 seconds, dry and stimulate the neonate, keep the neonate warm, reassess the respiratory system, and attain a heart rate.
 - Following the first minute, a decision is required: does the neonate require respiratory support or assistance (positive pressure ventilation - PPV)?
 - If the patient requires PPV, then 30 seconds of effective ventilation on room air is initiated. Effective ventilation is described as adequate chest expansion with all breaths. If all breaths are not effective, then the acronym MR SOPA should be reviewed:
 - M – Mask: Ensure adequate seal
 - R – Reposition: reposition the head, consider shoulder roll
 - S – Suction: use a 10 fr suction catheter and suction the oropharynx
 - O – Open: open the neonate's mouth
 - P – Pressure: If possible, increase the pressure being delivered; initial pressure is 20 mmHg to 25 mmHg to 30 mmHg; this can be accomplished with a flow inflating bag or Neopuff
 - A – Alternate Airway: Consider intubation or supraglottic airway if licensed to do so
 - Continue down the PPV path until effective ventilation is maintained.
 - If the HR remains in the 60-100 range with effective ventilation, then PPV must be maintained. If the HR increases to > 100 then PPV can be discontinued.
 - If the HR drops to < 60 with effective ventilation, then chest compression must be initiated at a rate of 3 compressions to 1 ventilation. Provide PPV with 100% oxygen (FiO₂ 100%).
 - If the HR remains < 60 EPINEPHrine should be administered. The dose is 20 mcg/kg.
 - If there is a clinical history of blood loss and signs of poor perfusion, a volume expander should be administered: either 10 ml/kg of normal saline or "O-negative" PRBC.

Additional Treatment Information

- Throughout a neonate resuscitation, it is important to keep the neonate warm. Once a neonate becomes hypothermic, they become more susceptible to increased pulmonary vascular resistance; this in turn adversely

affects the oxygenation and ventilation of the neonate and may reverse the transitioning back to fetal circulation, which is not compatible with life.

- EPINEPHrine can be administered via the endotracheal tube at a dose 10 times the IV dose - 200 mcg/kg.
- IV access can be via a peripheral IV or emergency UV.
- IO can be considered but is weight dependent.
- Uncuffed endotracheal tubes should be utilized to prevent the possibility of developing subglottic damage producing stenosis as the neonate grows.
- All pre-term neonates of ≤ 32 weeks gestation should be placed in a food grade polyethylene bag up to the neck to prevent insensible fluid loss and maintain thermoneutrality.
- A neonate delivered through thick meconium is at risk for developing increased work of breathing. If the child is vigorous, monitoring is suggested. If the neonate is not vigorous, then suctioning of the oropharynx is required, followed by movement down the treatment path. The past practice of suctioning below the vocal cords is no longer recommended.

Referral Information

All neonates requiring resuscitation should be conveyed to hospital for further work up.

General Information

- ECG monitoring should be performed during the resuscitation.
- SpO₂ monitoring must be via the pre-ductal right appendage for accurate measurements. A pre- and post-ductal (all other appendages) SpO₂ can be monitored to detect for the presence of shunts within the cardiovascular system.
- It is common for a neonate who experienced a precipitous delivery to develop increased work of breathing requiring respiratory support.

Interventions

First Responder

- Ongoing care as dictated by NRP; follow algorithm
 - [Neonatal Resuscitation Algorithm](#)
 - [→ A07: Oxygen Administration](#)
 - [→ B01: Airway Management](#)
 - Most pediatric airways can be effectively managed with proper positioning and an OPA/NPA (as per license level) and BVM without any requirements for further airway interventions. The gold standard for airway management is a self-maintained airway. Bag-valve mask is the preferred technique for airway management in pediatric resuscitation and is reasonable compared with advanced airway interventions (endotracheal intubation or supraglottic airway) in the management of pediatrics during a cardiac arrest in the out-of-hospital setting.
 - Resuscitation of neonates should take place with room air.

Emergency Medical Responder – All FR interventions, plus:

- Convey to the nearest hospital
- Consider intercept with additional resources

Primary Care Paramedic – All FR and EMR interventions, plus:

- iGEL insertion if unable to oxygenate or ventilate
 - [→ PR08: Supraglottic Airway](#)

Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- Advanced airway intervention if unable to oxygenate or ventilate

- Consider obtaining vascular access and providing fluid for hemodynamic compromise
 - → [D03: Vascular Access](#)
- Obtain IO access if patient meets weight-based guidelines
 - → [PR12: Intraosseous Cannulation](#)
- [EPINEPHrine](#)

Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- NIV/Invasive ventilation strategies
- Inotropic and vasopressor therapy for hemodynamic instability
- Central and arterial line monitoring
- [Blood product administration](#)
- UV access (needs to be added as a schedule 2)

Evidence Based Practice

Neonatal Resuscitation

Supportive

- [BVM](#)
- [Chest Compressions](#)
- [Intubation](#)
- [LMA \(without AW reflexes\)](#)
- [Nasal Ventilation](#)
- [Resuscitation Attempts in Stillbirth](#)
- [Suction](#)

Neutral

- [Therapeutic hypothermia](#)

Against

- [Epinephrine](#)

