

Site Applicability

BC Women's Hospital + Health Centre

Practice Level/Competencies

Advanced Skill – NRP Providers

Guideline

<p>Preparation for the Birth</p>	<p>History should include answers to 4 questions:</p> <ol style="list-style-type: none"> 1. What is the expected gestational age? 2. Is the amniotic fluid clear? 3. How many newborns are expected? 4. Are there any additional risk factors? <p>Team briefing with role assignment:</p> <ul style="list-style-type: none"> • Ensure that all required personnel are present • Includes discussion regarding delayed cord clamping • Includes assigning a team member to initiate the initial steps in the NRP algorithm while waiting for the cord to be clamped <p>Equipment check.</p>
<p>Three questions at birth</p>	<ol style="list-style-type: none"> 1. Does the newborn appear term? 2. Does the newborn have good muscle tone? 3. Is the newborn breathing or crying?
<p>Initial Steps Late Preterm 34⁺⁰ to 36⁺⁶ Weeks Gestation</p>	<p>A newborn that is between 34⁺⁰ to 36⁺⁶ weeks gestation, has good muscle tone and is breathing or crying may have the initial steps completed while skin to skin with their mother.</p>
<p>Meconium</p>	<p>No routine suctioning of the oropharynx while at the perineum.</p> <p>Oropharyngeal suctioning can be appropriate for a newborn born through meconium that is apneic or bradycardic to clear the mouth prior to PPV. Tracheal suctioning is not recommended.</p> <p>Meconium-stained amniotic fluid remains a risk factor for the need for resuscitation. A licensed practitioner with intubation skill (at BC Women's Hospital this is a Pediatrician) should be identified and immediately available as these babies may require intubation for tracheal suction or positive pressure ventilation later in the algorithm.</p>

<p>Thermal Management</p>	<p>The room temperature should be increased to 23 to 25°C when the birth of a premature newborn is expected.</p> <p>A newborn's temperature should be maintained between 36.5 and 37°C.</p> <p>A newborn who is vigorous at birth should receive skin-to-skin care with the mother. The initial steps can occur while skin-to-skin.</p> <p>Use pre-warmed hats for a newborn. Ensure the head is dried before applying the hat.</p> <p>Use servo controlled temperature probes as soon as possible on a newborn positioned under radiant warmers for more than a few minutes.</p> <p>For a newborn less than 32 week gestation, place a newborn in a sterile food-grade transparent plastic bag or wrap.</p>
<p>Suction only as needed</p>	<p>Routine suctioning of the mouth and nose is not recommended.</p> <p>Suction the oropharynx (insertion depth measured from the tip of the nose to the ear tragus) if there are obvious secretions, known and / or suspected airway obstruction secondary to secretions, meconium, and / or before initiating positive pressure ventilation (PPV).</p> <p>Suctioning beyond the oropharynx should be avoided as stimulation beyond this area could trigger a vagal response causing or worsening bradycardia.</p>
<p>Indications for Positive Pressure Ventilation (PPV)</p>	<p>After clearing the airway (if necessary), dry and remove wet linen, reposition to open the airway, stimulate, then evaluate respirations and heart rate (not colour).</p> <p>Begin positive-pressure ventilation if the newborn is apneic or gasping, or the heart rate is less than 100 beats per minute (bpm).</p> <p>Begin PPV with pressures 20/5 cmH₂O.</p> <p>Set the flow rate on the gas source to 10L (or 8L if no 10L dial position).</p>
<p>Continuous Positive Airway Pressure (CPAP)</p>	<p>Consider continuous positive airway pressure (CPAP) for a newborn showing signs of abnormal transition (labored breathing, tachypnea, or not meeting target oxygen saturations) who is in moderate respiratory distress.</p> <p>A normally transitioning term newborn may have transient labored breathing (including grunting) and/or tachypnea that does not require CPAP support.</p> <p>Administer CPAP support with 5 cmH₂O pressure in the delivery room. Do not exceed 8 cmH₂O pressure in the delivery room.</p> <p>If PPV is not required, it is recommended to routinely administer CPAP support with 5 cmH₂O to a newborn who is less than 29 weeks gestation in the delivery room to prevent atelectasis.</p>

<p>Evaluation of Heart Rate</p>	<p>Auscultation or use of an electrocardiogram (ECG) monitor are the two recommended methods to assess the heart rate.</p> <p>Pulse oximeter can also be used to monitor the heart rate.</p> <p>The use of a cardiorespiratory monitor facilitates rapid and accurate heart rate measurement in all babies requiring ventilator support.</p> <p>Using an ECG monitor when initiating chest compressions is recommended.</p> <p>ECG monitor does not replace the use of a pulse oximeter.</p>														
<p>Initial Oxygen Concentration</p>	<p>Initial oxygen concentration should be 21% for a newborn at ≥29 weeks gestation.</p> <p>For a newborn less than 29 weeks gestation, the initial oxygen concentration of 30% is recommended by BCW Neonatologists at PHSA. There is evidence to show that a preterm newborn generally will require 30% oxygen at the end of resuscitation.</p> <p>Oxygen concentration for the newborn should be titrated (up or down) based on pulse oximetry and target SpO₂.</p> <table border="1" data-bbox="841 800 1110 1052"> <thead> <tr> <th colspan="2">Targeted Preductal SpO₂ After Birth</th> </tr> </thead> <tbody> <tr> <td>1 min</td> <td>60% - 65%</td> </tr> <tr> <td>2 min</td> <td>65% - 70%</td> </tr> <tr> <td>3 min</td> <td>70% - 75%</td> </tr> <tr> <td>4 min</td> <td>75% - 80%</td> </tr> <tr> <td>5 min</td> <td>80% - 85%</td> </tr> <tr> <td>10 min</td> <td>85% - 95%</td> </tr> </tbody> </table>	Targeted Preductal SpO ₂ After Birth		1 min	60% - 65%	2 min	65% - 70%	3 min	70% - 75%	4 min	75% - 80%	5 min	80% - 85%	10 min	85% - 95%
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Corrective Steps to Establish Effective Ventilation

The most important interventions in NRP, inflation and ventilation of the lungs, have not changed, and are reinforced with the mnemonic MR SOPPA.

During the **15 seconds of initial PPV**, assess for chest movement, bilateral air entry then rising heart rate. If an increase in heart rate does not occur, initiate ventilation corrective steps (MR SOPPA).

Effective ventilation has been established if the heart rate has increased despite perceived inadequate breath sounds or chest movement.

NOTE: It is possible to provide adequate ventilation without apparent chest movement, especially in preterm babies.

MR SOPPA	
M	Mask adjustment (consider 2-hand technique)
R	Reposition (head neutral or slightly extended)
S	Suction mouth (depth = nose tip to ear tragus)
O	Open mouth Once seal achieved, evaluated chest movement, air entry, then heart rate
P	Pressure increase to 25/5 cmH ₂ O Once seal achieved, evaluated chest movement, air entry, then heart rate
P	Pressure increase to 30/5 cmH ₂ O Once seal achieved, evaluated chest movement, air entry, then heart rate
A	Airway alternative (ETT or LMA) Evaluated chest movement, air entry, CO ₂ detector, and then heart rate <ul style="list-style-type: none"> Continue pressure 30/5 cmH₂O and assess the need for decreasing pressure when the heart rate is above 100bpm Consider the need to increase pressure incrementally to a maximum 40/5 cmH₂O

Provide 30 seconds of effective ventilation before progressing through NRP.

Endotracheal Intubation

The vocal cord guide on the ETT is an approximation for correct insertion depth. The use of 6 plus a newborn's weight formula is a helpful formula for immediate assessment of insertion depth. This formula provides a good approximation for a newborn who's weigh is between 1,500 and 2,500 grams – it significantly overestimates the insertion depth for a newborn below and above this range. The depth of the oral ETT is determined by using the NRP "Initial endotracheal tube insertion depth" table below or by measuring the nasal septum to ear tragus length (NTL) plus 1 centimeter. This modified NRP table is meant as a guide.

Gestation (weeks)	Weight (grams)	Endotracheal Tube size	Endotracheal Tube insertion depth at lips (cm)
23-24	500-600	2.5	5.5
25-26	700-800	2.5	6.0
27-29	900-1000	2.5	6.5
30-32	1,100-1,400	3.0	7.0
33-34	1,500-1,800	3.0	7.5
35-37	1,900-2,400	3.0-3.5	8.0
38-40	2,500-3,100	3.5	8.5
41-43	3,200-4,200	3.5	9.0

Sudden Deterioration After Intubation

The mnemonic DOPE is useful in the event of a sudden deterioration following intubation.

The DOPE Mnemonic	
D	Displaced Endotracheal Tube
O	Obstructed Endotracheal Tube
P	Pneumothorax
E	Equipment Failure

<p>Chest Compressions</p>	<p>Establishing effective ventilations is the highest priority in neonatal resuscitation. Do not start chest compressions without first establishing effective ventilation (defined here by chest movement and audible bilateral air entry because a newborn may be too ill to have an increase in heart rate after performing all the steps of MRSOPPA).</p> <p>An LMA should be used with chest compressions if intubation is not feasible or is unsuccessful.</p> <p>The insertion of an ETT or LMA before the initiation of chest compressions is recommended because they are better tools to maintain a patent airway, remove the risk of inconsistent pressures due to loss of face mask seal, and decrease amount of air tracking to the stomach.</p> <p>If the heart rate is still below 60 bpm despite 30 seconds of effective PPV, increase the oxygen concentration to 100% and begin chest compressions.</p> <p>When the heart rate is below 60 bpm, the pulse oximeter may not function.</p> <p>The two thumb technique is the preferred method to administer chest compressions. The compressor should move to the head of the bed once the airway is in place.</p> <p>Interruption of chest compressions to check the heart rate may result in a decrease of perfusion pressure in the coronary arteries.</p> <p>Therefore, continue chest compressions and coordinated ventilations for 60 seconds before stopping briefly to assess the heart rate, breath sounds and oxygen saturation.</p> <p>The compression-to-ventilation ratio remains 3:1 as compromised gas exchange is nearly always the primary cause of cardiovascular collapse in the newborn. This requires aeration and effective ventilation of the lungs in order for the newborn to begin recovery. However, once effective ventilation has been established, the team may consider using a ratio of 15 compressions to 2 ventilations if the arrest is believed to be of cardiac origin.</p> <p>Saturation and ECG monitoring are the preferred methods for assessing the heart rate during chest compressions.</p>
<p>Umbilical Venous Catheter (UVC) and Intraosseous Needle (IO)</p>	<p>The umbilical venous catheter (UVC) remains the preferred route for vascular access in the delivery room but the intraosseous needle (IO) is a reasonable alternative.</p> <p>All medications and fluids that can be infused into a UVC can be infused into an IO.</p>

<p>Epinephrine</p>	<p>Epinephrine is indicated when the heart rate remains below 60 bpm after 30 seconds of effective ventilation and another 60 seconds of coordinated chest compressions and effective ventilation with 100% oxygen.</p> <p>The preferred route for epinephrine is via a UVC or IO. The endotracheal route is associated with unreliable absorption and is unlikely to be effective.</p> <p>The Institute for Safe Medication Practices states to identify the concentration as “0.1 mg/mL”.</p> <p>Prepare the ETT dose in a 3 mL syringe and the UVC or IO dose in a 1 mL syringe to reduce the chances of a medication administration error.</p> <p>See Neonatal Resuscitation Medications and Supplies Form for medication dosing.</p>																	
<p>Volume Expansion</p>	<p>A volume expander of 0.9% NaCl or unmatched type O Rh-negative packed red blood cells is indicated when a newborn does not respond to resuscitation interventions and has signs of shock or history of acute blood loss.</p> <p>Volume expander can be administered IV or IO. The recommended dose is 10 mL/kg.</p>																	
<p>Unresponsive Newborn Interventions</p>	<p>In the event a newborn is unresponsive to the interventions detailed in NRP the following should be verbalized by the Resus Recorder.</p> <table border="1" data-bbox="782 919 1187 1486"> <thead> <tr> <th style="background-color: black; color: white;">Unresponsive Newborn Interventions</th> </tr> </thead> <tbody> <tr> <td>Neonatologist Involved in Management</td> </tr> <tr> <td>Access → UVC or IO</td> </tr> <tr> <td>Volume Expansion → 0.9% NS or Uncross matched PRBCs</td> </tr> <tr> <td>Gastric Decompression → NGT/OGT</td> </tr> <tr> <td>Needle Decompression</td> </tr> <tr> <td>Pulses → Brachial and Femoral</td> </tr> <tr> <td>Pre/Postductal Saturations</td> </tr> <tr> <td>Normothermia</td> </tr> <tr> <td>Medication</td> </tr> <tr> <td>• Inotropes • PGE₁ • iNO</td> </tr> <tr> <td>Defibrillation/Cardioversion</td> </tr> <tr> <td>Pericardiocentesis</td> </tr> <tr> <td>Consult</td> </tr> <tr> <td>• Cardiology</td> </tr> <tr> <td>• ENT/Anaesthesia</td> </tr> <tr> <td>• ECLS Activation</td> </tr> </tbody> </table>	Unresponsive Newborn Interventions	Neonatologist Involved in Management	Access → UVC or IO	Volume Expansion → 0.9% NS or Uncross matched PRBCs	Gastric Decompression → NGT/OGT	Needle Decompression	Pulses → Brachial and Femoral	Pre/Postductal Saturations	Normothermia	Medication	• Inotropes • PGE ₁ • iNO	Defibrillation/Cardioversion	Pericardiocentesis	Consult	• Cardiology	• ENT/Anaesthesia	• ECLS Activation
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Documentation

- Perinatal Services British Columbia (PSBC) Newborn Resuscitation Record
- PSBC Newborn Record Part 1
- Patient Safety Learning System (PSLS) for Neonatal Resus

Patient & Family Engagement/Education

Education and family centred care to be provided throughout resuscitation.

Cross Reference Documents

- [Delayed Cord Clamping Procedure](#)
- [Neonatal Resuscitation Algorithm](#)
- [Neonatal Resuscitation Medications and Supplies](#)

- [Neonatal Resuscitation Team: Onboarding Process Guideline](#)
- [Neonatal Resuscitation Team: Roles and Responsibilities Guideline](#)

References

American Academy of Pediatrics and the American Heart Association. (2016). *Textbook of Neonatal Resuscitation 7th Edition*. Elk Grove Village, Illinois: Published by the American Academy of Pediatrics.

Developed By

BCW Neonatal Program – Senior Practice Leader & Neonatologist

Version History

DATE	DOCUMENT NUMBER and TITLE	ACTION TAKEN
14-Nov-2019	C-06-07-604367 Neonatal Resuscitation Program (Nrp) 7th Edition Updates	Approved at: Neonatal Leadership Committee

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