



Neonatal Resuscitation

Practice Resource for
Health Care Providers

May 2024



**Perinatal
Services BC**

Provincial Health Services Authority

Territory acknowledgement

We respectfully acknowledge that this document was developed at Perinatal Services BC on the unceded, traditional and ancestral territories of the Coast Salish People, specifically the x^wməθk^wəyəm (Musqueam), Skwxwú7mesh Úxwumixw (Squamish Nation) and səłílwətał (Tsleil-Waututh Nation) who have cared for and nurtured the lands and waters around us for all time. We give thanks for the opportunity to live, work and support care here.

A note on gender inclusion and the language of this document

Providing gender-inclusive and gender-affirming perinatal health care is integral to providing patient-centered, trauma-informed, and culturally safe care for all who experience pregnancy and birth.

This document refers to women or birthers to respectfully demonstrate PSBC's commitment to gender-inclusive and gender-affirming care for Two-Spirit, transgender, and non-binary individuals. This approach to language and health care is intended to support excellence in perinatal care for women and all individuals who experience pregnancy and birth.

This practice resource is intended for the use of health care providers that

- Attend newborn births in acute care and homebirth settings.
- Provide clinical care to newborns until discharge from the hospital.

This Practice Resource was developed by the NRP Instructor Trainer Committee of British Columbia.

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1. Key Messages and Recommendations

The following are key recommendations to support neonatal resuscitation in British Columbia.

Clinical:

- Umbilical cord management is now included in the four pre-birth questions. Perinatal Services BC (PSBC) recommends that, whenever possible and unless contra-indicated, the umbilical cord not be clamped during the first 30 seconds of life while performing the initial steps in the NRP algorithm.
- Continuous positive airway pressure (CPAP) is helpful in the preterm population with increased work of breathing or at high risk for developing Respiratory Distress Syndrome (RDS); however, the use of CPAP in the term or late preterm newborn has been associated with increased likelihood of pneumothorax.
- For educational efficiency the recommended initial oxygen concentration during positive pressure ventilation (PPV) is 21% for all babies. For babies less than 35 weeks gestation, some facilities may choose to set the initial oxygen concentration between 21% and 30% as per the local guideline and team discussion.
- Corrective steps to establish effective ventilation are reinforced with the mnemonic MR SOPPA, modified by the BC NRP Instructor Trainers, to improve clarity.
- The electronic cardiac monitor provides the most accurate assessment of the baby's heart rate.
- Suggested epinephrine dosing:
 - Endotracheal dose: 0.1mg / kg with no maximum dose
 - UVC / IV / IO dose:
 - Initial IV / IO dose: 0.02 mg / kg followed by a 3 mL NS flush
 - Subsequent dose: 0.03 mg / kg followed by a 3 mL NS flush

Neonatal resuscitation at the facility level:

- Implement and maintain current neonatal resuscitation guidelines.
- Standardized neonatal resuscitation supplies and equipment should be present and functioning at all births.
- Facilities that offer planned perinatal services must ensure their personnel is capable of neonatal resuscitation, post-resuscitation assessment, and stabilization.
- Every attempt should be made during the antenatal period to identify at-risk pregnancies to plan for additional neonatal support or, if needed, transfer the pregnant person to a higher level of care prior to the birth.
- At least one qualified health care professional should be at every birth whose only responsibility is to manage the newly born baby. If needed, this person must be able to initiate resuscitation, including PPV and cardiac compressions.
- If advanced resuscitation measures are anticipated, a qualified health care professional that can intubate, insert an umbilical catheter or intraosseous needle, and prescribe medication must be available on site.
- Facilities must develop and practice a system for assembling the neonatal resuscitation team, including how the team will be alerted if risk factors are present, who will be called, and how to call for additional help if necessary.
- In some facilities, the response team may include health care personnel from outside the usual perinatal team (e.g., emergency room, anesthesia, operating room). The roles and responsibilities of each team member must be clearly identified. Teams should practice a variety of scenarios to ensure that sufficient personnel are immediately available to perform all the necessary tasks required during neonatal resuscitation.
- Health Authorities should establish a method of supporting midwives and physicians attending out-of-hospital births and non-designated perinatal sites with equipment and supplies required for neonatal resuscitation.
- Emergency departments should have the capability to care for any unplanned event, including birth and neonatal resuscitation.
- Teams should follow the principles of family-centered care while resuscitating a baby.

Neonatal resuscitation education:

- Neonatal Resuscitation Program (NRP) is an evidence-based education program that introduces neonatal resuscitation concepts and basic skills to the adult learner. All facilities where planned births occur must support NRP. This includes providing adequate learning space, access to the *Textbook of Neonatal Resuscitation, 8th Edition*, the NRP 8th Edition on-line exam and appropriate supplies and equipment.
- Two course options are available: NRP Essential and NRP Advanced. Each health authority and planned maternity care site will decide what option the providers working at each site should take.
- A team approach to education and training must be used to develop collaboration across professions and disciplines, including the definition of roles and responsibilities, scope of practice, improved teamwork, and enhanced communication.
- Successful completion of the NRP Provider course does not imply that an individual has the competence to perform neonatal resuscitation in the clinical setting. Professional regulatory bodies, Health Authorities, or individual hospitals are responsible for determining the level of competence and qualifications required for someone to assume clinical responsibility for neonatal resuscitation.

2. Introduction

Approximately 85% of newborns successfully transition from intrauterine to extrauterine life with no assistance. Ten percent will begin breathing in response to drying and stimulation, five percent of newborns will receive PPV, and two percent of term newborns will be intubated. Less than one percent will receive chest compressions and emergency medication.¹ Even though most newborns do not require intervention during transition, the large number of births each year means that timely intervention can save many newborn lives. The need for assistance cannot always be predicted; health care providers need to be prepared to respond quickly and efficiently when needed.

This document outlines the standards for neonatal resuscitation in British Columbia (B.C.) and is based on the *Textbook of Neonatal Resuscitation, 8th Edition*. The *Textbook of Neonatal Resuscitation, 8th Edition*, is informed by the evidence presented by the neonatology subgroup of the International Liaison Committee on Resuscitation (ILCOR), reflecting recommendations from research studies and expert opinion in neonatal resuscitation practices. Key clarifications to this textbook are provided in *Section 4: Clinical Significance* in this document.

NRP is an educational program that introduces neonatal resuscitation concepts and basic skills to the adult learner. In addition to clinical information and resuscitation skills, NRP emphasizes teamwork and communication. A Joint Commission investigation identified poor teamwork and communication as the most common root causes for potentially preventable infant deaths in the delivery room.¹ While NRP is primarily designed to teach the principles and skills of resuscitation of the newborn undergoing transition to extrauterine life in acute or home birth setting, these principles also apply to the resuscitation of newborns while in hospital until discharge.

3. Guiding Principles

3.1 Identification of Newborns at Risk

With careful consideration of antenatal risk factors, most babies who potentially require resuscitation can be identified before birth.¹ See [Appendix 1](#) for maternal and fetal risk factors that increase the likelihood of neonatal resuscitation. However, even after a healthy pregnancy, some babies may experience sudden, unexpected difficulties that require immediate intervention by skilled personnel.

3.2 Neonatal Resuscitation Team

Aside from the health care professional responsible for the birth (i.e., the physician or midwife), a second health care professional should be present whose primary responsibility is the newborn, and if needed, can initiate resuscitation, including effective ventilation and chest compressions. If this person cannot perform advanced resuscitation skills (endotracheal intubation, establishing vascular access, and prescribing medications), additional personnel who can perform these skills should be readily available. Until another team member takes over, care of the newborn remains the responsibility of the primary care provider who attends the birth. The primary care provider should have current Advanced Level NRP Provider registration with the CPS to exercise this responsibility effectively.

Facilities must develop and practice a system for assembling the neonatal resuscitation team, including how the team will be alerted if risk factors are present, who will be called, and how additional help will be called if necessary. In some facilities, the response team may include health care professionals from outside the usual perinatal team (e.g. emergency room, anesthesia, operating room). The roles and responsibilities of each team member must be clearly identified. Teams should practice a variety of scenarios to ensure that sufficient personnel is immediately available to perform all of the necessary tasks required during neonatal resuscitation.

Teamwork, clear communication, and a respectful working relationship between team members will improve the functioning of the neonatal resuscitation team and, ultimately, the outcome of the newborn.

Debriefing after resuscitation is a useful strategy to improve resuscitation performance and teamwork. Teams that practice post-resuscitation debriefings will find that creating a safe and effective way to debrief will improve team development and patient safety. Use a template or checklist to organize the debrief.

The following is an example of a simple debriefing format to use after a resuscitation using the mnemonic "RECAP" to focus the debrief:

R	Review how the NRP algorithm was followed
E	Evaluate team function
C	Consider feelings
A	Areas for improvement?
P	PSLS* submission to document concerns related to supplies, equipment, and patient safety

* Patient Safety Learning System

3.3 Family-centered Care

During neonatal resuscitation, the baby is the focus of everyone's attention; however, the family's needs should not be overlooked. Resuscitation can be frightening for the parents and their support people; health care professionals must offer information and respect and incorporate parental choices. Parents and their support people should be offered the option of being present during resuscitation efforts, with a staff member assigned to support the family.^{2,3}

4. Neonatal Resuscitation Practices

The clinical guidelines for neonatal resuscitation are developed by the American Academy of Pediatrics (AAP), endorsed by the Canadian Paediatric Society (CPS), and described in the *Textbook of Neonatal Resuscitation, 8th Edition*. Key clarifications to the textbook are provided below, with corresponding page numbers from the textbook.

Corresponding pages in Textbook of Neonatal Resuscitation, 8 th Edition	Neonatal Resuscitation Practices
<p>Preparation for birth focuses on:</p> <ul style="list-style-type: none"> • obtaining a history • team briefing • role assignment • equipment check <p>Page 15</p>	<p>History should include answers to four questions:</p> <ol style="list-style-type: none"> 1. What is the expected gestational age? 2. Is the amniotic fluid clear? 3. Are there any additional risk factors? 4. What is our umbilical cord management plan? <p>During the team brief, risk factors are assessed based on the history. If resuscitation is anticipated, identify a team leader. Ideally, this will be the person with the most experience in neonatal resuscitation.</p> <p>Preparation also includes assigning a team member to initiate the initial steps in the NRP algorithm (Appendix 2) while waiting for the cord to be clamped.</p>
<p>Three questions for rapid evaluation of the newborn at birth.</p> <p>Page 39</p>	<ol style="list-style-type: none"> 1. Does the baby appear term? 2. Does the baby have good muscle tone? 3. Is the baby breathing or crying?

Corresponding pages in Textbook of Neonatal Resuscitation, 8 th Edition	Neonatal Resuscitation Practices
<p>When should the umbilical cord be clamped?</p> <p>Pages 35, 37, 38, 39, 41, 52, 215, 227</p>	<p>Current evidence suggests that cord clamping should be delayed for at least 30 to 60 seconds for most vigorous term and preterm newborns while the initial steps are completed skin-to-skin with the mother / birther (Appendix 3).</p> <ul style="list-style-type: none"> • Approximately 1/3 of the baby's blood volume resides in the placenta. Approximately 80% of that is transfused to the baby if cord clamping is delayed for one minute. • Unless contra-indicated and whenever possible and done in a safe manner, all newborns should receive the benefits of delayed cord clamping (DCC) for a minimum 30 seconds while the initial steps in the NRP algorithm are performed. • Benefits of DCC: <ul style="list-style-type: none"> ○ Fills the expanding space of the pulmonary vasculature as the vessels relax after birth ○ Increasing blood volume improves perfusion resulting in smoother cardiopulmonary transition ○ Reduces the need for vasopressors⁴ ○ Lowers the incidence of intraventricular hemorrhage (IVH) and necrotizing enterocolitis (NEC) in premature babies⁵ ○ Increases hemoglobin and improves iron stores for several months^{4,5} ○ Transfusion of stem cells⁵ • Delay in umbilical cord clamping may delay timely resuscitation efforts, if needed, especially in preterm infants. However, because the placenta continues to perform gas exchange after delivery, sick and preterm infants are likely to benefit most from additional blood volume derived from continued placental transfusion. • DCC is contraindicated if the placental circulation is not intact (such as placental abruption, bleeding placenta previa, bleeding vasa previa) or cord avulsion. • Regarding multiples: <ul style="list-style-type: none"> ○ As most studies on delayed cord clamping excluded multiple gestations, it is difficult to evaluate the safety of DCC.¹ ○ At this time that there is insufficient evidence to recommend for or against delayed umbilical cord clamping in multiple gestations.⁵

Corresponding pages in Textbook of Neonatal Resuscitation, 8 th Edition	Neonatal Resuscitation Practices
<p>Umbilical cord milking</p> <p>Page 227</p>	<ul style="list-style-type: none"> • For babies less than 28 weeks gestation, intact-cord milking is not recommended because it has been associated with an increased risk of intraventricular hemorrhage.^{6,7} • Intact-cord milking could be considered as a reasonable alternative to deferred cord clamping for babies born at 28+0 to 33+6 weeks.⁷ • There is insufficient evidence to recommend intact-cord milking for term and late preterm infants (34+0 and after).⁷
<p>Meconium</p> <p>Pages 16, 52, 119</p>	<ul style="list-style-type: none"> • Routine tracheal suction with or without intubation at birth for babies born in the presence of meconium is not recommended. • Meconium-stained amniotic fluid remains a risk factor for resuscitation. A licensed practitioner with intubation skills should be identified and immediately available as these babies may require intubation for tracheal suction or positive pressure ventilation.
<p>Thermal management</p> <p>Pages 37, 41, 219, 220, 239</p>	<ul style="list-style-type: none"> • The baby's temperature should be maintained between 36.5 and 37.5°C. • A baby who is vigorous at birth should receive skin-to-skin care with the mother / birther (Appendix 3). The initial steps can occur while skin-to-skin. • Use prewarmed hats for all babies. Ensure the head is dried before applying the hat. • Use servo-controlled temperature probes as soon as possible on all babies positioned under radiant warmers for more than a few minutes. • The room temperature should be increased to 23 to 25° C when the birth of a premature baby is expected. • For babies less than 32 weeks gestation: <ul style="list-style-type: none"> ◦ Put the baby in a food-grade transparent plastic bag or wrap. Dry the head and apply a hat, while delayed cord clamping is occurring. ◦ Do not use zip-lock bags. Due to the sharp edges, there is a risk of skin lacerations to the baby. ◦ During a cesarean section, use a sterile plastic bag or wrap. Dry the head and cover with a sterile cloth, while delayed cord clamping is occurring. ◦ If using a thermal mattress, ensure it is placed under a pre-warmed blanket, so the baby is not in direct contact with the thermal mattress. The thermal mattress should be activated approximately five minutes before birth. • Therapeutic hypothermia should be considered within the first 6 hours of life in the stabilized baby who is 35 weeks gestation or more, who suffered a perinatal asphyxial event, and develops moderate to severe hypoxic ischemic encephalopathy. It is not initiated during resuscitation or initial stabilization and only after consultation with a neonatologist.

Corresponding pages in Textbook of Neonatal Resuscitation, 8 th Edition	Neonatal Resuscitation Practices
<p>Suction only as needed</p> <p>Pages 43, 52</p>	<ul style="list-style-type: none"> • No routine suctioning of the oropharynx while at the perineum. • Routine suctioning of the mouth and nose is not recommended. • Babies are obligate nose breathers. Avoid suctioning the nares as there is a potential risk of injuring the nasal mucosa that can result in breathing issues later. The small amount of secretions in the nares is not significant compared to the potential blockage impeding effective ventilation that could be in the oropharynx. The quickest and least harmful way to suction that area is through the mouth. Only suction the nares if secretions are visible. • 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). • Suctioning beyond the oropharynx should be avoided as stimulation beyond this area could trigger a vagal response causing or worsening bradycardia.
<p>Positive pressure ventilation (PPV)</p> <p>Pages 44, 67, 75</p>	<ul style="list-style-type: none"> • Begin positive-pressure ventilation within 1 min of birth if the baby is apneic or gasping, or the heart rate is less than 100 bpm. • The T-piece resuscitator is recommended as the main device to provide controlled PPV in neonatal resuscitation. • Initial peak inspiratory pressure (PIP) of 20 cm H₂O is recommended for term and preterm babies. • Use PEEP (5 cm H₂O) for all babies needing positive pressure ventilation. • Ventilate at a rate of 40 to 60 breaths per minute.



Corresponding pages in Textbook of Neonatal Resuscitation, 8 th Edition	Neonatal Resuscitation Practices
<p>Continuous positive airway pressure (CPAP) is a post resuscitation (stabilization) treatment in the term and late preterm baby. In the preterm infant born before 34 weeks gestation CPAP during NRP is recommended⁴</p> <p>Pages 51, 89, 337</p>	<ul style="list-style-type: none"> • The T-piece resuscitator is recommended as the main device to provide controlled CPAP in neonatal resuscitation. • Consider CPAP with 5 cm H₂O pressure for babies with a heart rate greater than 100 bpm and showing signs of moderate respiratory distress. The ACoRN Respiratory Score (Appendix 4) can help guide the clinician. • Normally transitioning term or late preterm babies may have transient labored breathing, including grunting, and/or tachypnea, that does not require CPAP support. <ul style="list-style-type: none"> ◦ CPAP provides a continuous low pressure to keep the alveoli open, helping to establish functional residual capacity (FRC). CPAP also recruits collapsed alveoli, but this process occurs over a period of hours and days. Therefore, a trial of CPAP for a few minutes is not physiologically beneficial. ◦ Administering CPAP to term or late preterm babies who are transitioning with signs of mild respiratory distress puts them at increased risk for developing a pneumothorax.^{9,10} ◦ In contrast to premature babies whose main cause of respiratory distress is surfactant deficiency, term babies usually just have retained lung fluid. ◦ This retained lung fluid is not uniformly present throughout the lungs. Therefore, some alveoli are well inflated and compliant. In contrast, surfactant deficiency is a uniform disease throughout the lungs. ◦ Upon administration of CPAP to the transitioning term baby with only mild respiratory distress, the CPAP is most easily distributed to the open and compliant alveoli, increasing the risk of pneumothorax.
<p>Evaluation of heart rate Cardio-respiratory Monitoring</p> <p>Pages 45, 82, 161</p>	<ul style="list-style-type: none"> • Auscultation and use of a cardio-respiratory monitor are the two recommended methods to assess the heart rate. Other options include the pulse oximeter, handheld Doppler ultrasound and digital stethoscope. • A cardio-respiratory monitor facilitates rapid and accurate heart rate measurement in all babies requiring ventilation and is recommended once PPV is initiated. • A cardio-respiratory monitor is the preferred method for assessing heart rate during chest compressions. • Despite having cardiac leads in place, briefly auscultate the heart to rule out pulseless electrical activity (PEA). • For babies less than less than 32 weeks gestation: <ul style="list-style-type: none"> ◦ Before application of cardio-respiratory leads gently dry small areas where the leads will be applied. Apply leads and close the plastic bag or wrap to maintain normothermia.

Corresponding pages in Textbook of Neonatal Resuscitation, 8 th Edition	Neonatal Resuscitation Practices												
<p>Supplemental oxygen</p> <p>Pages 67, 293</p>	<ul style="list-style-type: none"> For educational efficiency, the recommended initial oxygen concentration during PPV is 21% for all babies. For babies less than 35 weeks gestation, some facilities may choose to set the initial oxygen concentration between 21 and 30% as per their local guideline and / or team discussion. The exact initial FiO₂ for preterm infants is unknown. A compressed air source, oxygen blender and a pulse oximeter must be available in the delivery room to enable titration of the oxygen dose. The pulse oximeter should be set to the manufacturer's specified mode for neonatal resuscitation. To avoid hyperoxemia, administration of supplemental oxygen should be titrated to achieve target oxygen saturation levels as per the table below for term and preterm babies. <table border="1" data-bbox="604 867 841 1234"> <caption>Target Oxygen Saturation Table</caption> <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> <ul style="list-style-type: none"> Hyperoxemia and hyperoxia can result in oxygen toxicity due to excess free oxygen radicals and decreased antioxidant fighting enzymes.^{11,12} This toxicity can cause damage to any cell in the body, which has been shown to have the following adverse effects in babies: <ul style="list-style-type: none"> Increased risk for retinopathy of prematurity (ROP)¹¹ Increased risk for bronchopulmonary dysplasia (BPD)^{11,12} Injury to the developing brain¹¹ Alteration of immune response, increasing the risk of sepsis¹³ DNA damage and cancer (leukemia)¹¹ Increased hospital stay¹³ 	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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<p>Corrective steps to establish effective ventilation</p> <p>Pages 67, 81, 82, 83, 84, 85, 152, 154, 221</p> <p>* MR SOPPA</p> <p>The most important indicator of successful PPV is a rising heart rate.</p> <p>(See Textbook of Neonatal Resuscitation, 8th Edition, p. 67).</p> <p>Consider attaching a CO₂ detector when initiating PPV as it may provide a visual cue that the lungs are inflated. Observe for colour cycling with each corrective step.</p>	<ul style="list-style-type: none"> • Inflation and ventilation of the lungs remain the most important interventions in NRP. • Corrective steps to establish effective ventilation are reinforced with the mnemonic MR SOPPA to improve clarity. <p>* MR SOPPA</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td rowspan="2" style="background-color: #1a3d54; color: white; text-align: center; vertical-align: middle;">1</td> <td style="background-color: #1a3d54; color: white; text-align: center;">M</td> <td><u>Mask adjustment (consider 2-hand technique)</u></td> </tr> <tr> <td style="background-color: #1a3d54; color: white; text-align: center;">R</td> <td><u>Reposition (head neutral or slightly extended)</u></td> </tr> <tr> <td colspan="3" style="padding: 5px;">Once seal is achieved, give 5 breaths, and evaluate chest movement, air entry, then heart rate. If no improvement in heart rate go to next step.</td> </tr> <tr> <td rowspan="2" style="background-color: #1a3d54; color: white; text-align: center; vertical-align: middle;">2</td> <td style="background-color: #1a3d54; color: white; text-align: center;">S</td> <td><u>Suction mouth (depth nose tip to earlobe)</u></td> </tr> <tr> <td style="background-color: #1a3d54; color: white; text-align: center;">O</td> <td><u>Open mouth</u></td> </tr> <tr> <td colspan="3" style="padding: 5px;">Once seal is achieved, give 5 breaths, and evaluate chest movement, air entry, then heart rate. 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If no improvement in heart rate go to next step.</td> </tr> <tr> <td rowspan="2" style="background-color: #1a3d54; color: white; text-align: center; vertical-align: middle;">5</td> <td style="background-color: #1a3d54; color: white; text-align: center;">A</td> <td><u>Airway alternative (ETT or LMA)</u></td> </tr> <tr> <td colspan="2" style="padding: 5px;">Evaluate chest movement, air entry, CO₂ detector, heart rate. Maximum recommended pressures: <ul style="list-style-type: none"> • 30 / 5 in the preterm baby • 40 / 5 in the full-term baby Assess the need for decreasing pressures when the heart rate is above 100 bpm. </td> </tr> </table> <p style="background-color: #1a3d54; color: white; padding: 5px; text-align: center;">Provide 30 seconds of effective ventilation before progressing through the NRP algorithm. Ensure there is chest rise before starting chest compressions; if not, consider increasing PIP if appropriate.</p> <ul style="list-style-type: none"> • Consider attaching a CO₂ detector to the face mask when initiating PPV as it may provide a visual cue that the lungs are inflated. • During the 15 seconds of initial PPV, assess for chest movement, bilateral air entry, and then rising heart rate. If an increase in heart rate does not occur, initiate ventilation corrective steps (MR SOPPA). • NOTE: Do not move to the next corrective step unless you have delivered the intended pressure and rate consistently. • 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. • By the time the step of increasing PIP to 30 cm H₂O is reached, most babies have or will improve by then. For those who do not, it is recommended to insert an alternate airway at this time to obtain a more definitive airway. 	1	M	<u>Mask adjustment (consider 2-hand technique)</u>	R	<u>Reposition (head neutral or slightly extended)</u>	Once seal is achieved, give 5 breaths, and evaluate chest movement, air entry, then heart rate. If no improvement in heart rate go to next step.			2	S	<u>Suction mouth (depth nose tip to earlobe)</u>	O	<u>Open mouth</u>	Once seal is achieved, give 5 breaths, and evaluate chest movement, air entry, then heart rate. If no improvement in heart rate go to next step.			3	P	<u>Pressure increase to 25 / 5 cm H₂O</u>	Once seal is achieved, give 5 breaths, and evaluate chest movement, air entry, then heart rate. If no improvement in heart rate go to next step.		4	P	<u>Pressure increase to 30 / 5 cm H₂O</u>	Once seal is achieved, give 5 breaths, and evaluate chest movement, air entry, then heart rate. 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	O	<u>Open mouth</u>																														
Once seal is achieved, give 5 breaths, and evaluate chest movement, air entry, then heart rate. If no improvement in heart rate go to next step.																																
3	P	<u>Pressure increase to 25 / 5 cm H₂O</u>																														
	Once seal is achieved, give 5 breaths, and evaluate chest movement, air entry, then heart rate. If no improvement in heart rate go to next step.																															
4	P	<u>Pressure increase to 30 / 5 cm H₂O</u>																														
	Once seal is achieved, give 5 breaths, and evaluate chest movement, air entry, then heart rate. If no improvement in heart rate go to next step.																															
5	A	<u>Airway alternative (ETT or LMA)</u>																														
	Evaluate chest movement, air entry, CO ₂ detector, heart rate. Maximum recommended pressures: <ul style="list-style-type: none"> • 30 / 5 in the preterm baby • 40 / 5 in the full-term baby Assess the need for decreasing pressures when the heart rate is above 100 bpm.																															

Corresponding pages in Textbook of Neonatal Resuscitation, 8 th Edition	Neonatal Resuscitation Practices
<p>Cuffed versus uncuffed ETT for neonatal intubation</p> <p>Page 124</p>	<ul style="list-style-type: none"> • Due to insufficient evidence for alternate practice, uncuffed endotracheal tubes are preferred for endotracheal intubation during neonatal resuscitation. Due to ongoing concerns about potential airway damage, cuffed endotracheal tubes are not recommended as a primary choice endotracheal tube for neonatal resuscitation.
<p>Confirming the placement of an alternate airway</p> <p>Page 137</p>	<ul style="list-style-type: none"> • Initial signs of confirming the placement of an alternate airway consist of assessing bilateral air entry and CO₂ detector cycling. Chest rise is a function of pressure. PIP greater than 30 may be required to move the chest before providing 30 seconds of effective ventilation and before starting chest compressions.
<p>CO₂ detector</p> <p>Pages 86, 119, 135, 136, 172</p>	<ul style="list-style-type: none"> • The CO₂ detector should be used as the primary method for confirming ETT and LMA placement, along with bilateral air entry assessed under the axillae. • The CO₂ detector may also be used for face mask ventilation to provide a visual cue that effective ventilation has been achieved. • NOTE: The colorimetric CO₂ detector may take up to 6 - 10 breaths before the cycling colour change is visible. Cycling of colour change may not be seen if the baby is less than 1 kg or if the heart rate or cardiac output is very low. • CAUTION: The CO₂ detector stops cycling once the device is saturated with CO₂. Therefore, with alternate airway insertion, it is used for initial confirmation only. Subsequent checks should include assessment of air entry and chest rise, as well as heart rate and oxygen saturation. A new detector should be applied if during subsequent checks correct placement of the alternate airway is in question.



Corresponding pages in Textbook of Neonatal Resuscitation, 8 th Edition	Neonatal Resuscitation Practices																
<p>Chest compressions</p> <p>Pages 161, 162, 163, 164, 165, 166, 167, 168, 169</p>	<ul style="list-style-type: none"> Establishing effective ventilations is the highest priority in neonatal resuscitation. Do not start chest compressions without first establishing effective ventilation (defined here by good chest movement and bilateral air entry, because the baby may be too ill to have an increase in heart rate after performing all the steps of MR SOPPA). Insert an ETT or LMA before the initiation of chest compressions because they: <ul style="list-style-type: none"> are better tools to maintain a patent airway remove the risk of inconsistent pressures due to loss of face mask seal decrease amount of air tracking to the stomach. 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. The two-thumb technique is the preferred method to administer chest compressions. Move to the head of the bed to begin chest compressions. This allows space for umbilical venous line placement. The cardiorespiratory monitor is the preferred method for assessing the heart rate during chest compressions. When the heart rate is below 60 bpm, the pulse oximeter may not function. Interruption of chest compressions may result in a decrease of perfusion pressure in the coronary arteries. Therefore, continue chest compressions and coordinated ventilations for 60 seconds before stopping briefly to assess the heart rate, bilateral air entry, chest rise and oxygen saturation. Check the following using the mnemonic 'CARDIO' when the heart rate is not improving with chest compressions and ventilation: <table border="1" data-bbox="602 1262 1429 1738"> <tbody> <tr> <td>C</td> <td><u>C</u>hest movement</td> <td>Is the chest moving with each breath?</td> </tr> <tr> <td>A</td> <td><u>A</u>irway</td> <td>Is the airway secured with ETT or LMA?</td> </tr> <tr> <td>R</td> <td><u>R</u>ate</td> <td>Rate of 3 compressions to 1 ventilation every 2 seconds?</td> </tr> <tr> <td>D</td> <td><u>D</u>epth</td> <td>Depth of compressions is 1/3 AP diameter of chest?</td> </tr> <tr> <td>IO</td> <td><u>I</u>nspired <u>O</u>xygen</td> <td>100% oxygen?</td> </tr> </tbody> </table>		C	<u>C</u> hest movement	Is the chest moving with each breath?	A	<u>A</u> irway	Is the airway secured with ETT or LMA?	R	<u>R</u> ate	Rate of 3 compressions to 1 ventilation every 2 seconds?	D	<u>D</u> epth	Depth of compressions is 1/3 AP diameter of chest?	IO	<u>I</u> nspired <u>O</u> xygen	100% oxygen?
C	<u>C</u> hest movement	Is the chest moving with each breath?															
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D	<u>D</u> epth	Depth of compressions is 1/3 AP diameter of chest?															
IO	<u>I</u> nspired <u>O</u> xygen	100% oxygen?															

Corresponding pages in Textbook of Neonatal Resuscitation, 8 th Edition	Neonatal Resuscitation Practices
<p>Vascular access: Umbilical venous catheter (UVC) Intraosseous needle (IO)</p> <p>Page 185</p>	<ul style="list-style-type: none"> The UVC is the preferred route for vascular access in the delivery room, but the intraosseous needle (IO) is a reasonable alternative. All medications and fluids that can be infused into a UVC can be infused into an IO. The IO can be used in babies greater than 34 weeks gestation.
<p>Epinephrine 0.1 mg / mL</p> <p>Pages 181, 182, 185, 186, 202</p> <p>Appendix 5</p>	<ul style="list-style-type: none"> Epinephrine is indicated when the heart rate remains below 60 bpm after 30 seconds of effective ventilation that moves the chest, and another 60 seconds of coordinated chest compressions and effective ventilation with 100% oxygen. 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. That is why only one dose of ETT epinephrine may be administered while the UVC is being inserted. The recommended dose of epinephrine (0.1 mg / mL concentration) is: <ul style="list-style-type: none"> ETT route: Dose is 0.1 mg / kg (1 mL / kg). <ul style="list-style-type: none"> Draw it up in a 5 mL syringe and label "for ETT." Administer rapidly. Do not follow with a flush. UVC / IV / IO route (preferred routes): Dose is 0.02 mg / kg (0.2 mL / kg) <ul style="list-style-type: none"> Draw it up in a 1 mL syringe and label "for IV / UVC." Administer rapidly Follow with a 3 mL 0.9% NaCl flush. Consider 0.03 mg / kg for subsequent doses if the heart rate does not increase to above 60 bpm.
<p>Volume expanders: 0.9% NaCl unmatched type O Rh-negative packed red blood cells</p> <p>Pages 189, 190</p>	<ul style="list-style-type: none"> A volume expander is indicated when the baby does not respond to resuscitation interventions and has signs of shock or history of acute blood loss. The recommended dose is 10 mL / kg. Administered IV or IO over 5 – 10 minutes.

5. Neonatal Resuscitation Documentation

Use the British Columbia Newborn Resuscitation Record ([PSBC 1980](#)) ([Appendix 6](#)) for documentation in all cases requiring resuscitation. Refer to [British Columbia Newborn Resuscitation Record Guide for Completion](#) for information on documentation during the resuscitation of a newborn and how to use this form.

Additionally, the Newborn Record ([PSBC 1583A](#)) part 1 and Section 3 – Transition to One Hour of Age must be completed.

6. Availability and Maintenance of Equipment, Supplies and Medications

Standardized neonatal resuscitation supplies and equipment should be present and functioning at all births ([Appendix 7](#) and [Appendix 8](#)).

Equipment required in neonatal resuscitation should be checked regularly and prior to every birth. Clear policies need to be established and communicated for:

- Scheduling of equipment checks for operational fitness
- Upgrading or replacing equipment
- Preventative maintenance
- Rotation of supplies such as medications prior to expiration.

Supplies and equipment for births out-of-hospital and at sites with no planned maternity services

In an out-of-hospital birth environment where there may be only two licensed practitioners present, umbilical vein catheterization or insertion of an IO needle and administration of intravenous epinephrine may be delayed until a third practitioner or paramedic services arrives. Health Authorities must provide midwives and physicians attending out-of-hospital births and non-designated perinatal sites with equipment and supplies needed for neonatal resuscitation and provide information and support in maintaining this equipment.

Emergency departments should have the capability to care for any unplanned event, including birth. Neonatal resuscitation equipment and supplies ([Appendix 7](#) and [Appendix 8](#)) should be accessible in any emergency department. The training needs of health care professionals in facilities that do not provide planned perinatal services require discussion and planning.

Oxygen titration in settings with no oxygen blenders:

- While the search is ongoing for an accurate blending device in an out-of-hospital birth environment, adjusting the flow rate to titrate oxygen administration to meet target saturations for the baby is an option at this time.
- Removal of the reservoir from the self-inflating bag while providing positive pressure ventilation (PPV) will also decrease the oxygen concentration delivery to the baby if the flow rate is very low (approximately less than 4 L/min).
- Free-flow oxygen by cupping the oxygen tubing over the baby's mouth and nose delivers a low oxygen concentration to the baby (less than 40%), even with a higher flow rate.

7. Neonatal Resuscitation Program and ongoing neonatal resuscitation education

All facilities where planned births occur must support NRP. This includes providing adequate learning space, appropriate supplies and equipment. Each NRP provider should have access to the latest version of the NRP Textbook and the required on-line exam. Health Authorities should support the availability of a minimum of one set of functional equipment per hospital for neonatal resuscitation education and practice sessions. This equipment should be easily accessible to providers for practice use.

During the NRP Provider course, the health care provider will learn how to quickly evaluate a newborn, make decisions about what actions to take, and practice the steps involved in resuscitation. A team approach to education and training must be used to develop collaboration across disciplines, including the definition of roles and responsibilities, scope of practice, improved teamwork, and enhanced communication.¹⁴⁻¹⁶

NRP Provider Courses must include the following components:

- Pre-reading of the:
 - *Textbook of Neonatal Resuscitation, 8th Edition*
 - *PSBC Neonatal Resuscitation Practice Resource*
- Successful completion of the online examination prior to attending the workshop.
- Neonatal resuscitation skills development or validation.
- Individual Integrated Skill Station Assessment. Each participant's knowledge and performance should be objectively evaluated using the Canadian individual Integrated Skills Station Assessment (ISSA) tool ([Appendix 9](#)).
- Simulation and debriefing exercises.

NRP Provider courses vary in length and specific content according to the participants' learning needs and level of responsibility. It is recommended that health care providers involved in the care of a newborn should take NRP Essentials (chapters 1 – 4). Health care providers that attend births and/or are responsible for the care of high-risk newborns should take NRP Advanced (chapters 1 – 11). Given the requisite components (skill stations, integrated skills stations, and simulation and debriefing), completing an Essential Level Course in less than six hours and Advanced Level Course in less than eight hours may be challenging.

Successful completion of the NRP Provider course does not imply that an individual has the competence to perform neonatal resuscitation in the clinical setting.^{1,14} Professional regulatory bodies, Health Authorities, or individual hospitals are responsible for determining the level of competence and qualifications required for someone to assume clinical responsibility for neonatal resuscitation.

Registration with the CPS at either the provider level every 2 years or instructor level every 3 years are essential for all health care professionals who care for neonates.¹⁷

8. Administration and Responsibilities

Health Authority and birthing facilities in B.C.:

Responsibilities of hospital-based and / or regional-based interprofessional neonatal resuscitation or perinatal committees include:

- Implement current neonatal resuscitation guidelines.
- Implement and support NRP as the ongoing interprofessional education program for health care professionals involved in neonatal resuscitation.
- Develop and implement Health Authority and site-specific algorithms or plans outlining the response necessary to provide neonatal resuscitation.
- Identify and resolve administrative, operational and clinical problems related to newborn resuscitation.
- Consult health authority-based NRP Instructor Trainers and NRP Site Leads regarding the purchase and maintenance of neonatal resuscitation equipment for clinical care and teaching.

NRP Instructor Trainer Committee of British Columbia

- Support the implementation of current neonatal resuscitation guidelines.
- Inform on all educational aspects of the Neonatal Resuscitation Program including the development of new educational resources.
- Work together for quality improvement and standardization of NRP in B.C. including NRP Provider courses, educational resources and neonatal resuscitation equipment
- Support NRP Instructors in B.C.

Provincial Neonatal Resuscitation Advisory Committee

- Promote and support the development, dissemination, and maintenance of a standardized NRP in B.C.
- Advise the PSBC Leadership Group on matters related to neonatal resuscitation.
- Respond to NRP concerns or recommendations expressed by providers, NRP Instructors, and NRP Instructor Trainers within B.C.
- Establish relationships of consultation and collaboration with perinatal care providers, professional organizations, and other stakeholders to share information and expertise related to neonatal resuscitation and NRP.

National NRP Steering Committee

- The National NRP Steering Committee is a multidisciplinary group providing expertise, recommendations and initiatives on all NRP issues in Canada.
- Manage, support and promote the AAP / AHA Neonatal Resuscitation Program (NRP) in the Canadian context.
- Establish guidelines for training and maintenance of NRP Provider, NRP Instructor and NRP Instructor Trainer status.
- Encourage research in neonatal resuscitation and NRP education.
- B.C. is represented at the National NRP Steering Committee by the co-chairs of the Provincial Neonatal Resuscitation Advisory Committee and the NRP Instructor Trainer Committee of British Columbia.

Canadian Paediatric Society (CPS)

- Coordinate and support the activities of the National NRP Steering Committee.
- Distribute all NRP education materials in Canada.
- Communicate NRP updates and changes.
- Develop and maintain a national database to track NRP Providers, NRP Instructors, and NRP Instructor Trainers.

9. Clinical Performance Indicators

The British Columbia Perinatal Data Registry (BCPDR) contains data abstracted from neonatal medical records on nearly 100% of births in the province of British Columbia from over 60 hospitals as well as births occurring at home attended by BC registered midwives. The PSBC Surveillance team provides ongoing systematic analysis and interpretation of the abstracted data describing and monitoring trends in neonatal resuscitation in B.C. (see Table 1 and Figure 1 for data collected between 2016/2017 and 2020/2021).

Oxygen administration increased from 6.3% in 2016/2017 to 8% in 2020/2021 however the reason for this increase is not clear. The preterm birth rate over the same period only increased from 10.9% in 2016/2017 to 11.2% in 2021/2021. The preterm birthrate accounts for all births delivered before 37 completed weeks' estimated gestation. Babies born at lower gestational age may require more oxygen, compared to babies born closer to 37 weeks gestation. Further analyses of preterm birth stratified by gestational age may provide more information.

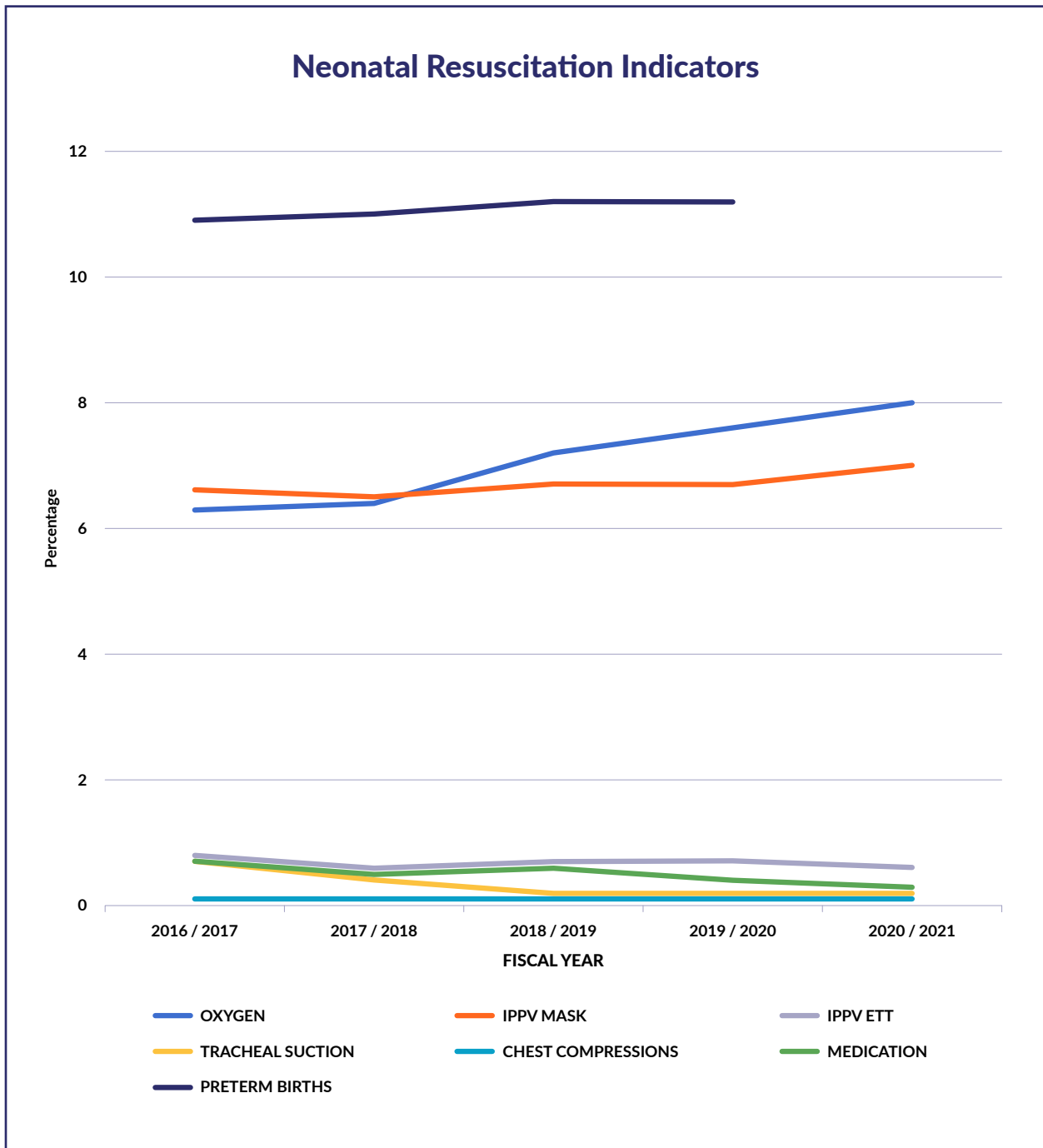
Tracheal suctioning decreased from 0.7 in 2016/2017 to 0.2 in 2020/2021. This decrease is reflective of the discontinuation of tracheal suction of babies born in the presence of meconium that is limp and apneic at birth.

The rate of chest compressions remained stable at 0.1% between 2016/2017 and 2020/2021. If after one minute of cardiac compressions at 100% oxygen the heart rate does not increase to ≥ 60 beats per minute the administration of epinephrine is indicated. It is therefore reasonable to expect that the rate of medication administration will be less than the rate of cardiac compressions. The rate of medication administration while decreasing every year still remained above the rate of cardiac compressions. Unfortunately the BCPDR does not account for type of medication given during neonatal resuscitation however it is reasonable to assume that naloxone is still used as a resuscitation medication during neonatal resuscitation. Naloxone is not recommended as part of the initial resuscitation for newborns with respiratory depression in the delivery room. The newborn with respiratory depression after maternal opiate exposure should be supported with effective ventilation and airway support.

Table 1: Neonatal Resuscitation Indicators (2016 – 2021)

Resuscitation Indicators	Fiscal Year									
	2016/2017		2017/2018		2018/2019		2019/2020		2020/2021	
	N	%	N	%	N	%	N	%	N	%
Oxygen Resuscitation	2,829	6.3	2,867	6.4	3,141	7.2	3,315	7.6	3,344	8.0
IPPV Mask Resuscitation	3,002	6.6	2,889	6.5	2,931	6.7	2,907	6.7	2,932	7.0
IPPV Endotracheal Tube Resuscitation	348	0.8	290	0.6	297	0.7	293	0.7	258	0.6
Oropharynx Suction	5,297	11.7	4,289	9.6	3,746	8.6	3,794	8.7	3,815	9.1
Trachea Suction	327	0.7	162	0.4	108	0.2	73	0.2	91	0.2
Chest Compression	50	0.1	43	0.1	44	0.1	39	0.1	40	0.1
Medication	337	0.7	233	0.5	269	0.6	168	0.4	123	0.3
Live Births	45,251	100.0	44,620	100.0	43,664	100.0	43,474	100.0	42,023	100.0

Figure 1: Neonatal Resuscitation Indicators (2016 - 2021)



10. References

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11. Appendices

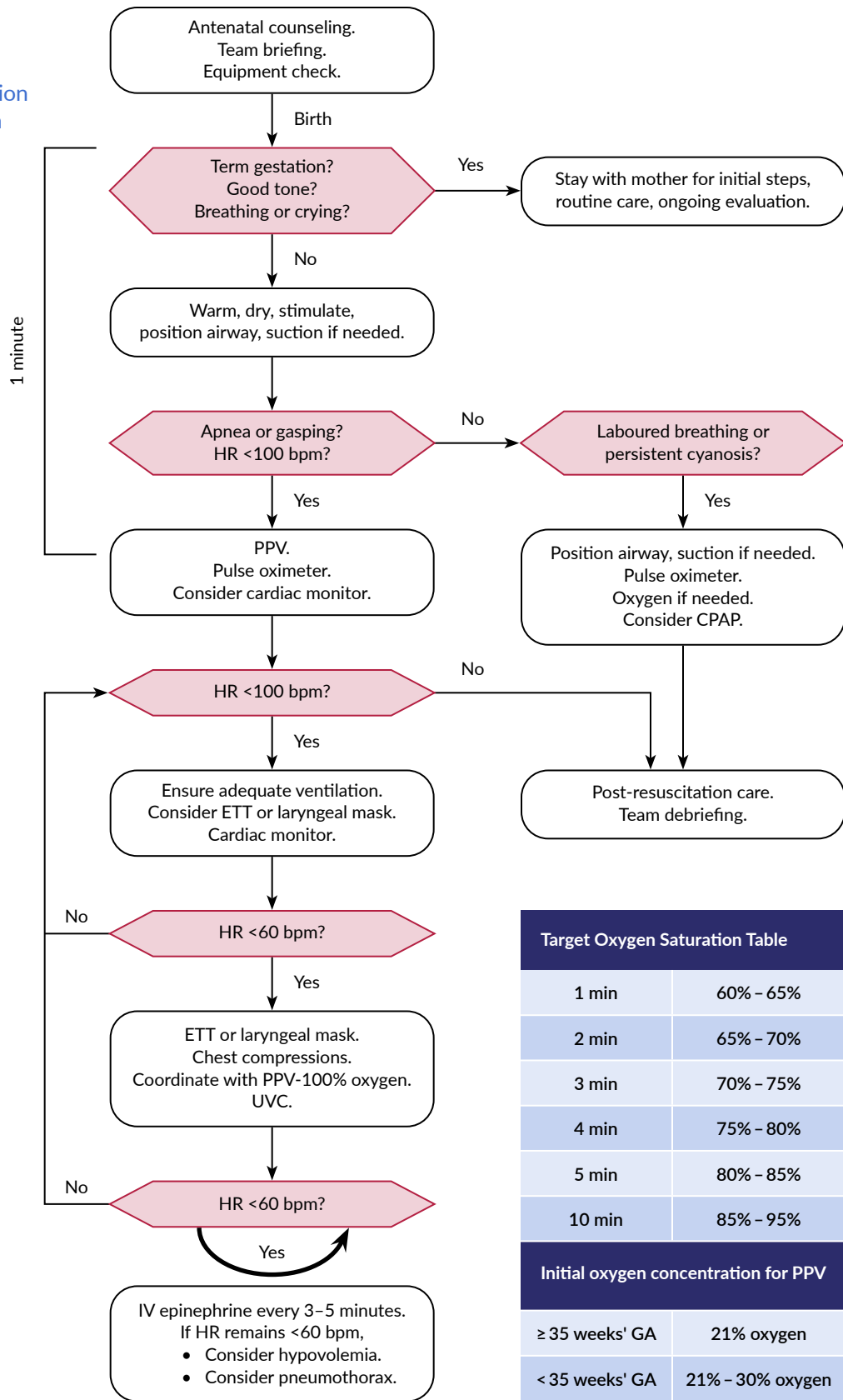
Appendix 1: Perinatal Risk Factors increasing the likelihood for Neonatal Resuscitation¹

Antepartum Risk Factors	Intrapartum Risk Factors
<ul style="list-style-type: none"> • Gestational age less than 36 0/7 weeks • Gestational age greater than or equal to 41 0/7 weeks • Preeclampsia or eclampsia • Maternal hypertension • Multiple gestation • Fetal anemia • Polyhydramnios • Oligohydramnios • Fetal hydrops • Fetal macrosomia • Intrauterine growth restriction • Significant fetal malformations or anomalies • No prenatal care 	<ul style="list-style-type: none"> • Intrapartum bleeding • Chorioamnionitis • Opioids administered to mother within 4 hours of delivery • Shoulder dystocia • Meconium-stained amniotic fluid • Prolapsed umbilical cord • Emergency cesarean delivery • Forceps or vacuum-assisted delivery • Breech or other abnormal presentation • Category II or III fetal heart rate pattern* • Maternal general anesthesia • Maternal magnesium therapy • Placental abruption

*Fetal heart rate Categories

Category I	Category II	Category III
<ul style="list-style-type: none"> • Normal tracing • Predictive of normal fetal acid-base status at the time of the observation. • Routine follow-up 	<ul style="list-style-type: none"> • Indeterminate tracing • Inadequate evidence to classify these tracings as either normal or abnormal. • Further evaluation, continued surveillance, and reevaluation are indicated. 	<ul style="list-style-type: none"> • Abnormal tracing • Predictive of abnormal fetal acid-base status at the time of the observation. • Requires prompt evaluation and intervention.

Appendix 2:
Neonatal Resuscitation
Program® 8th Edition
Algorithm



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

Initial oxygen concentration for PPV	
≥ 35 weeks' GA	21% oxygen
< 35 weeks' GA	21% - 30% oxygen

Appendix 3: Safe Skin-to-Skin Positioning

Immediately after birth, the naked baby is placed directly on the mother, dried, and moved up to the mother's chest. The initial steps of resuscitation, if needed, can be done while the infant is skin-to-skin with the mother/birther.

Sudden Unexpected Postnatal Collapse (SUPC) is a condition in which a previously vigorous, spontaneously breathing infant who had a five-minute Apgar of 8 or more unexpectedly became apneic, often necessitating full resuscitation. SUPC commonly occur within the first two hours after birth and are associated with skin-to-skin contact and/or breastfeeding.¹⁸ Therefore, the safe positioning of the baby and close observation using the RAPP¹ assessment tool is of paramount importance.

Safe Skin-to-Skin practice: ¹⁹

- Position of the baby:
 - Vaginal birth: Immediately after birth, the naked baby is placed directly on the mother / birther, dried, and moved up to the mother / birther's chest.
 - In the operating room: as low on the mother / birther's chest and as diagonally as possible without interfering with the surgical procedure.
 - In the recovery room (PAR): vertically between the mother / birther's breasts.

- Ensure that the newborn's
 - Face can be seen.
 - Head is in the 'sniffing' position.
 - Nose and mouth are visible and not covered.
 - Head is turned to one side.
 - Neck is straight, not bent.
 - Shoulders are flat against mother / birther.
 - Chest-to-chest with mother / birther.
 - Legs are flexed.

- Cover the baby's back with a warm towel or blanket and put a warm hat on the baby's head.

¹ RAPP Assessment tool: **R**espiratory, **A**ctivity, **P**erfusion, **P**osition

Appendix 4: The ACoRN Respiratory Score²⁰

Score	0	1	2
Respiratory rate	40 – 60 breaths / min	60 – 80 breaths / min	> 80 breaths / min
Retractions	None	Intercostal or subcostal retractions (or both)	Intercostal, subcostal and sternal retractions
Grunting	None	With stimulation	Continuous at rest
Oxygen requirement	None	≤ 30%	> 30%
Breath sounds on auscultation	Easily heard throughout	Decreased	Barely heard
Prematurity	> 34 weeks	30 – 34 weeks	< 30 weeks
		Respiratory score	_____ / 12

Classification Criteria of the ACoRN Respiratory Score:

- Mild respiratory distress: < 5
- Moderate respiratory distress: 5 – 8
- Severe respiratory distress: > 8

Adapted from Downes JJ, Vidyasagar D, Boggs TR Jr, Morrow GM 3rd, Respiratory Distress Syndrome of newborn infants. I. New clinical scoring system (RDS Score) with acid-base and blood-gas correlations. Clin Pediatr 1970; 9(6):325-31

Appendix 5: Neonatal Code Medications

Neonatal Resuscitation Program[®], 8th Edition - Neonatal Code Medications Card
The most important and effective step in neonatal resuscitation is ventilation of the baby's lungs.



Neonatal Code Medications

Drug	Dose*	0.5 kg	1 kg	2 kg	3 kg	4 kg	Administration
Epinephrine IV/IO Concentration: 0.1 mg/mL 1 mg/10 mL	0.02 mg/kg Equal to 0.2 mL/kg	IV Dose: 0.01 mg Volume: 0.1 mL	IV Dose: 0.02 mg Volume: 0.2 mL	IV Dose: 0.04 mg Volume: 0.4 mL	IV Dose: 0.06 mg Volume: 0.6 mL	IV Dose: 0.08 mg Volume: 0.8 mL	IV/IO rapid push. Flush with 3 mL NS. Repeat every 3-5 minutes if heart rate less than 60 bpm.
Epinephrine ETT Concentration: 0.1 mg/mL 1 mg/10 mL	0.1 mg/kg Equal to 1 mL/kg	ET Dose: 0.05 mg Volume: 0.5 mL	ET Dose: 0.1 mg Volume: 1 mL	ET Dose: 0.2 mg Volume: 2 mL	ET Dose: 0.3 mg Volume: 3 mL	ET Dose: 0.4 mg Volume: 4 mL	May administer while vascular access is being established. ETT rapid push. No need for flush. Provide PPV breaths to distribute into lungs.
Normal Saline IV 0.9% NaCl	10 mL/kg	5 mL IV	10 mL IV	20 mL IV	30 mL IV	40 mL IV	Give over 5-10 min.

*The recommended dose range for intravenous or intraosseous administration is 0.01 to 0.03 mg/kg (equal to 0.1 to 0.3 mL/kg).
 The recommended dose range for endotracheal administration is 0.05 to 0.1 mg/kg (equal to 0.5 to 1 mL/kg).

These suggested epinephrine doses are based on a desire to simplify dosing for educational efficiency and do not endorse any particular dose within the recommended dosing range. Additional research is needed to ascertain the ideal epinephrine dose.

Appendix 6: British Columbia Newborn Resuscitation Record

British Columbia Newborn Resuscitation Record

Addressograph / Label

Target Pre-ductal SpO₂ 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%		A Resus. Date (dd/mm/yyyy) _____ Resus. Time (hh:mm) _____ Resus. Location: <input type="checkbox"/> Birthing Room <input type="checkbox"/> NICU <input type="checkbox"/> Other _____ Time of Birth (hh:mm) _____ Cord Clamped: <input type="checkbox"/> <15 sec <input type="checkbox"/> 15–30 sec <input type="checkbox"/> 31–60 sec <input type="checkbox"/> >60 sec Gestational Age (wks / days) _____ Weight (kg) _____ <input type="checkbox"/> Estimated <input type="checkbox"/> Actual																																							
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Appendix 7: Neonatal Resuscitation Supplies and Equipment Quick Check for Radiant Warmer

This checklist includes only the supplies and equipment needed on the radiant warmer for most neonatal resuscitations and is checked *prior* to every birth. The list can be adjusted to meet the site-specific needs.

	Item	Number	
Warmth	Preheated warmer	1	
	Warm towels or blankets	2 – 4	
	Temperature probe and sensor cover	1 each	
	Hat (term, preterm sizes)	1 each	
	Plastic bag or wrap (less than 32 weeks gestation)	1	
	Thermal mattress (less than 32 weeks gestation) – site specific need	1	
Clear airway	Mechanical suction (able to be set to 80 to 100 mmHg)	1	
	Suction tubing	1	
	Suction catheters: 6F, 8F, 10F	2 each	
	Tracheal aspirator	1 each	
Auscultate	Neonatal stethoscope	1	
Heart rate	Electronic cardiac monitor (quick access)	1	
	Electronic cardiac monitor leads	2 sets	
Ventilate	Flowmeter set to 10 lpm	1	
	Oxygen blender set to 21%	1	
	Positive pressure ventilation devices:	T-piece and system / tubing	1
		Self-inflating device	1
	Term and preterm sized face masks	1 of each size	
	8F feeding tube and 20-mL syringe, Tegaderm (small size)	1 of each	
Oxygenate	Pulse oximeter	1	
	Pulse oximeter sensor	2	
	Pulse oximeter sensor cover (posey)	2	
	Target oxygen saturation table	1	
Intubate	Slim laryngoscope handle	1	
	Laryngoscope straight blades: No. 00 (very preterm – optional), No. 0 (preterm) and No. 1 (term)	1 of each	
	Spare batteries	2	
	Uncuffed endotracheal tubes: 2.5-, 3.0-, 3.5-mm internal diameter	2 of each size	
	Stylet	2	
	CO ₂ detector	2	
	Measuring tape and / or endotracheal tube insertion depth table	1	
	Fabric tape (1/2 inch)	1	
	Securing device for endotracheal tube (Neobar)	1 of each size	
	Scissors	1	
	Laryngeal mask airway: size 1	2	
	Syringe: 5 mL (to inflate LMA cuff if using inflatable cuff style)	2	

Appendix 8: Detailed Neonatal Resuscitation Supplies and Equipment

1. Thermoregulation

- Food-grade transparent bags or transparent wrap (for use at birth if less than 32 weeks gestation)
- Sterile transparent plastic bag or wrap for use post cesarean section (less than 32 weeks gestation)
- Radiant warmer with firm, padded resuscitation surface and servo temperature probe
- Thermal reflectors (gel backing) for servo temperature probe
- Hats (various sizes)
- Towels / warmed linen
- Thermal mattress (optional in delivery rooms or for transport to nursery).
Alternative heat source for births outside of delivery rooms
- Transport incubator to maintain baby's temperature during move to the nursery

2. Suction

- Mechanical suction (able to be set to 80 to 100 mmHg)
- Suction connector tubing
- Suction catheters: 6F, 8F, 10F or 12F
- Feeding tubes 5F, 8F
- 20-mL syringe
- Tracheal aspirator

3. Assessment and monitoring:

- Stethoscope with neonatal or infant head
- Cardiac monitor and electrodes
- Pulse oximeter (see Oxygen section)

4. Establishment of airway

- Slim handle laryngoscope
- Laryngoscope straight blades: No. 00 (very preterm – optional), No. 0 (preterm) and No.1 (term)
- Extra bulbs and batteries for laryngoscope
- Uncuffed endotracheal tubes: 2.5-, 3.0-, 3.5-mm internal diameter (ID)
- Stylet 6F
- CO₂ detector
- Scissors
- Tape
- Securing device for endotracheal tube (Neobar – one of each size)
- Laryngeal mask airway: size 1
- Syringe: 5 mL (to inflate LMA cuff if using inflatable LMA)

5. Positive pressure administration

- Device for delivering positive-pressure ventilation (in preferred order):
- T-piece resuscitator, appropriate system tubing
- 240 mL self-inflating bag with reservoir, PEEP valve and pressure gauge (must be available as backup whenever gas dependent devices are used)
- Flow inflating bag with pressure gauge
- Face masks: size 0 and 1 (newborn and premature). Anatomical face mask with cushioned-rim preferable.

6. Oxygen

- Oxygen blender to mix oxygen and compressed air with flow meter (flow rate up to 10 L/min)
- Oxygen tubing
- Pulse oximeter
- Pulse oximeter sensor
- Pulse oximeter sensor cover

7. Umbilical vessel catheterization supplies (reorganized supplies in order of use)

- Sterile gloves (preferably latex-free)
- 2% chlorhexidine swab sticks
- Sterile drape
- Umbilical tie tape
- Scalpel
- 2 x 2 gauzes
- Umbilical catheters, single lumen: 3.5F, 5F
- Three-way stopcocks or mini-extension set with med port
- 0.9% NaCl 10 mL prefilled syringes
- Mosquito forceps or curved forceps
- 3-0 silk suture
- Needle driver
- Scissors
- Syringes: 1, 5, 10, 30, and 60 mL
- Umbilical vessel securing device or tape
- Umbilical clamp

8. Intraosseous

- 2% chlorhexidine swab sticks
- IO drill or another driver
- IO needle: 15 mm
- Securement device
- Extension set
- Three-way stopcocks or mini-extension set with med port
- 0.9% NaCl 10 mL prefilled syringes

9. Medications

- Epinephrine (0.1 mg/mL = 1 mg/10 mL)
- Rapid fill connector
- Syringes: 1 and 5 mL
- 0.9% NaCl for flushes
- 0.9% NaCl for volume expansion: 10 mL pre-filled syringes or 100 mL or 250 mL bag

10. Needle aspiration for pneumothorax

- 2% chlorhexidine swab sticks
- 18- or 20-gauge percutaneous catheter-over-needle device
- 8 inch (20 cm) extension tubing
- 3-way stopcock
- 10-mL syringe (luer lock tip)
- Sterile gauze 2 x 2
- Transparent dressing (Tegaderm)


11. Miscellaneous

- Timer

12. Infection control

- Gloves, goggles, mask, long sleeved gowns for personal protection
- COVID-19 precautions, consult [BCCDC Guidelines](#) for most updated information. Update infection control supplies in newborn resuscitation cart accordingly.

Appendix 9: Individual Integrated Skill Station Assessment Form (Canadian Adaptation)

Individual Integrated Skills Station Assessment Form - Canadian Adaptation				 Essential ISSA		
Learner:		Date:		Evaluator:		Brief:
SCORING: 0= Not done 1= Done incorrectly, incompletely or out of order 2= Done correctly in order ✓ Learners must perform each of the 4 (if Essentials) or 6/8 (if Advanced) bolded and shaded items correctly. ✓ Bolded (but not shaded) item is often missed clinically and instructors should emphasize its importance. ✓ Learners will be evaluated according to their role and scope of practice. For example, if the skill is not within the learner's scope, he/she will be evaluated in the 'assist' role. ✓ If the skill is not scored (i.e., consider intubation), the instructor may provide additional feedback and instruction on these skills.						
Lesson	Possible Points	Item	0	1	2	Comments
2	2	Asks 4 pre-birth questions (<i>Expected GA, Fluid clear, UC management plan, Risk factors</i>)				
2	2	Discusses plan and assigns roles to team members				
2	2	Checks equipment to provide warmth, suction, ventilation and targeted oxygenation				
	2	Asks 3 assessment questions (<i>Term, Tone, Breathing or Crying</i>)				
3	2	Warm dry ¹ stimulate and removes wet towels				
	2	Position the airway and suction if necessary				
	2	Assesses respirations +/- heart rate ²				
4	2	Indicates need for and initiates positive-pressure ventilation³ (<i>Apnea or gasping, heart rate < 100 bpm</i>)				
	2	Checks for rising heart rate after 15 seconds of PPV <i>*(Instructor note: Heart rate does not improve and chest is not moving)</i>				
	2	Takes corrective action when heart rate not rising & chest not moving (<i>Mask readjustment Reposition; Suction mouth & nose Open mouth; Pressure increase; Alternate airway</i>)				
	No Score	If unable to ventilate through ET tube ('A' of MR.SOPA) indicates option to suction through ET tube or use ET to suction below the cords				No Score
	No Score	Confirms presence of chest movement, breath sounds and exhaled CO ₂ ; if intubated or LMA in situ				No Score
	2	Initiates monitoring ⁴ (<i>pulse oximeter probe to right wrist or hand +/- ECG</i>)				
	2	Calls for help, if not already done				
	2	Provides effective positive pressure ventilation (40-60 bpm) for 30 seconds				
	2	Re-evaluates heart rate <i>*(Instructor note: for Essential ISSA, heart rate is at or above 60bpm, for Advanced ISSA heart rate must remain below 60bpm)</i>				
	2	Administers blended oxygen to meet targeted saturations using pulse oximeter during resuscitation sequence				Do not score if completing Advanced ISSA
Closure	2	Continues/discontinues positive-pressure ventilation appropriately or weans oxygen correctly				Do not score if completing Advanced ISSA
Learner's score subtotals						
Learner's total score (add subtotals)						
Total possible score Essential ISSA (32)						
If learner is completing the ADVANCED ISSA maximum score is 28 as last 2 items of Essential ISSA are not scored above						
Performed all 4 bolded & shaded items correctly? Yes <input type="checkbox"/> No <input type="checkbox"/> Re-evaluate <input type="checkbox"/>						
Learner attained minimum passing score? MINIMUM PASSING SCORE is 26/32			Y Pass			
			N Re-evaluate			
Learner Self Reflection What went well in this resuscitation?		Learner Self Reflection What would you do differently?		Instructor Feedback		
Instructor Signature:		Pass <input type="checkbox"/> Re-evaluate (x1 and pass) <input type="checkbox"/> Unsuccessful – advised to retry after review If re-evaluation by a different instructor, please indicate name, date and outcome: _____				

Individual Integrated Skills Station Assessment Form - Canadian Adaptation



ADVANCED ISSA

Lesson	Possible Points	Item	0	1	2	Comments
Essential ISSA total (from page 1)						
5	No Score	Consider intubation and apply ECG if not already done	No Score			
	2	Demonstrates correct technique for intubation or assisting with intubation				
	No Score	Confirms presence of chest movement, breath sounds/air entry and exhaled CO ₂	No Score			
6	2	Identifies need to start chest compressions <i>(Heart rate <60 bpm despite 30 seconds of effective positive pressure ventilation)</i>				
	2	Increases oxygen to 100%				
	2	Demonstrates correct compression technique for 60 seconds <i>(2-thumb method, compression depth 1/3 anterior-posterior diameter, complete recoil of chest)</i>				
	2	Demonstrates correct rate and coordination with ventilation <i>(Can ask student and assistant to switch positions)</i>				
	2	Takes corrective action when heart rate not rising using the "CARDIO" mnemonic <i>(Is the Chest moving with each breath; Is the Airway secured; Is the Rate of compressions to ventilations 3:1; Is the Depth of compressions 1/3 of the AP diameter; Is the Inspired Oxygen being delivered at 100%)</i>				
7	2	Identifies need for epinephrine <i>(Heart rate <60 bpm despite effective PPV and coordinated compressions for 60 seconds)</i>				
	2	Identifies correct dose and route for epinephrine [0.02mg/kg IV (0.2mL/kg) and 0.1mg/kg (1mL/kg) ET]				
	No score	Administers ET dose while umbilical catheter being prepared	No score			
		Prepares or assists with preparation of umbilical catheter for insertion				
		Inserts or assists with insertion of umbilical venous catheter				
		Administers epinephrine via umbilical venous catheter with 3 ml flush				
2 (optional)	Indicates option to insert intraosseous needle if unable to place an umbilical venous catheter					
8-14 (optional)	2	Identifies additional interventions indicated based on history and clinical response to resuscitation <i>(For example, care of an extremely preterm infant, infant with a pneumothorax, diaphragmatic hernia, etc.)</i>				
	2	Administers blended oxygen to meet targeted saturations using pulse oximeter during resuscitation sequence				
Closure	2	Continues/discontinues positive-pressure ventilation appropriately or weans oxygen correctly				
Learner's score subtotals (page 2)						
Learner's total score (add subtotals)						
Total possible score (48 without optional skills; 50 with 1 optional skill or 52 with 2 optional skills)						
Performed all 6 bolded & shaded items correctly? Yes <input type="checkbox"/> No <input type="checkbox"/> Re-evaluate <input type="checkbox"/>						
Learner attained minimum passing score?			Y Pass			
MINIMUM PASSING SCORE IS 40/48; 42/50 or 44/52			N Re-evaluate			
Learner Self Reflection <i>What went well in this resuscitation?</i>		Learner Self Reflection <i>What would you do differently?</i>		Instructor Feedback		
Instructor Signature:		Pass <input type="checkbox"/> Re-evaluate (x1 and pass) <input type="checkbox"/> Unsuccessful – advised to retry after review If re-evaluation by a different instructor, please indicate name, date and outcome: _____				

1) Drying the skin does not apply to babies <32 weeks; they should be placed wet into a food-grade polyethylene bag below the neck.
 2) Heart rate may be assessed by auscultation or ECG; respirations may be assessed by chest movement or by auscultation.
 3) For term infants, begin PPV with 21% oxygen; for infants <35 weeks GA, follow local protocols.
 4) PPV and assessment of HR are the priority and should not be unduly delayed by the application of a pulse oximeter probe.



**Perinatal
Services BC**

Provincial Health Services Authority

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