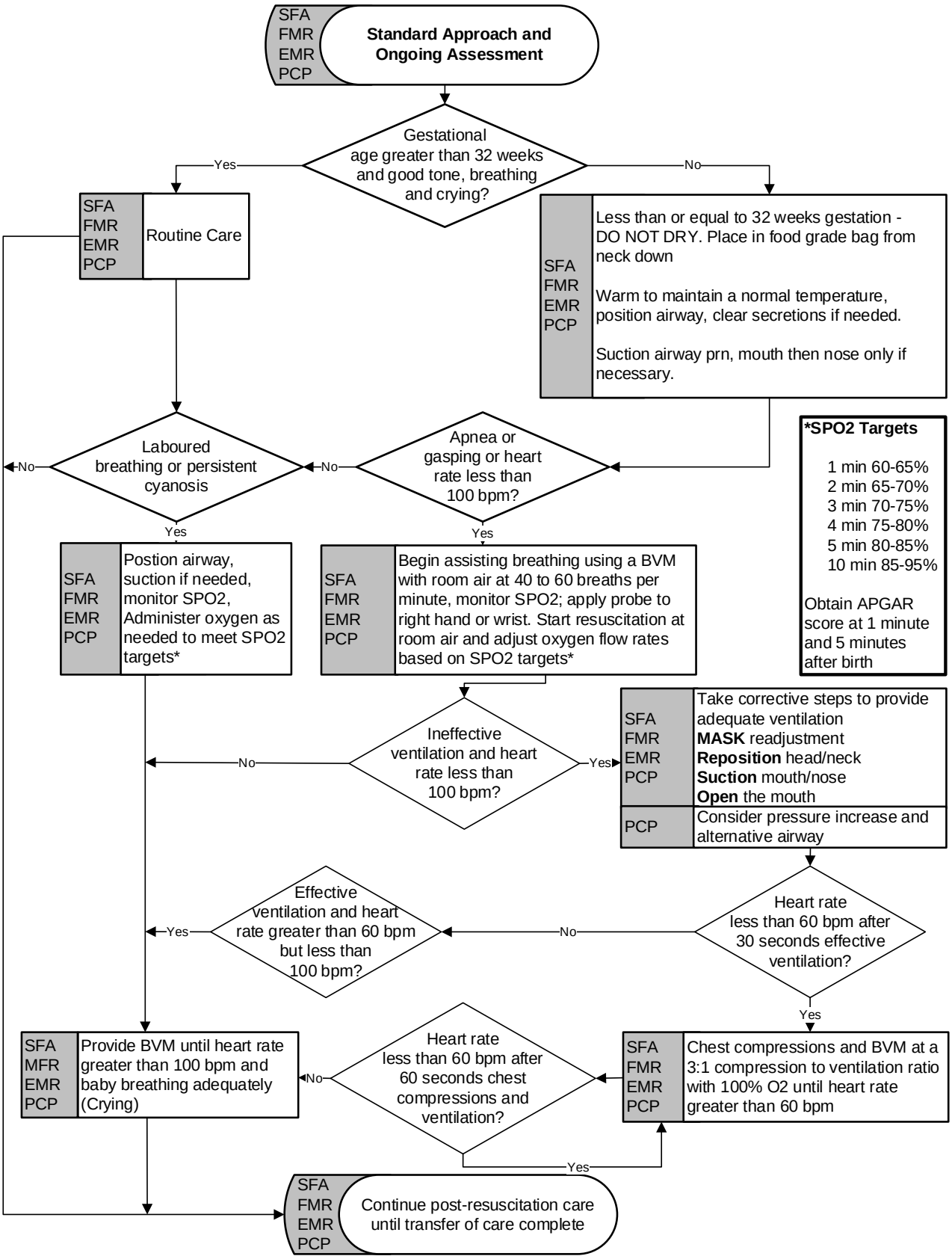
Neonatal Resuscitation



Neonatal Care and Resuscitation Notes

Etiology

Most babies do not require any intervention after delivery, but approximately 10% will need assistance to begin breathing and 1% will require extensive resuscitation. Though rare, these responses are stressful and can be traumatic. Practicing and reading through this MCP and its associated notes are one of the best ways to be ready for a difficult neonatal emergency.

Assessing the need for resuscitation

Neonates that don't require any intervention can generally be identified by assessing to confirm that they have good muscle tone with good breathing or crying. If the answer is "yes," the baby does not need resuscitation and should not be separated from the mother. If the answer to the question is "no," then the baby should receive resuscitation as per the algorithm. Assess breathing, activity and colour continuously to determine if any resuscitation is required.

Estimating gestational age, post-delivery

Estimating gestational age and fetal viability is difficult in the field. The age of viability is generally considered to be as early as 20 weeks but is more commonly considered to be 22 weeks. A Stanford University study analyzed statistics of preterm deliveries occurring between 2013 and 2018 and found that 28% of neonates born at 22 weeks of gestation survived, and 55% of infants born at 23 weeks gestation survived. However, it is important to note that positive outcomes are associated with in-hospital delivery with neonatal intensive care units.

Preterm neonates less than 20 -22 weeks old will deliver with a heartbeat approximately 30% of the time, but show no other signs of life, such as breathing or crying. Often, preterm infants die in utero and are delivered after. It is not uncommon for stillborn neonates to be demonstrating signs of decomposition.
Incorporating the mother and loved ones into the discussion may be appropriate, depending on the circumstances and timing.

When in doubt, assume the fetus is potentially viable and refer to the Neonatal Resuscitation MCP. Consider accessing On-Line Medical Consultation for assistance, particularly if there is doubt as to fetal viability related to gestational age. In short, there are no easy answers and fetal development can vary considerably, particularly if there are multiples, poor nutrition or inadequate prenatal care involved.

Levels of Care

1. Routine Care
    a. All newborns require their own patient care report with full assessment and vital signs including 1 and 5-minute APGAR scores. If APGAR is less than 10, note deficiencies. (See chart below.)
    b. 90% of newborns are vigorous, full-term babies with no need to be separated from their mothers.
    c. Clear the upper airway by wiping the baby's face (mouth and nose) clean of blood and mucous.
    d. If greater than 32 weeks gestation, thoroughly and vigorously dry the baby; this will aid in

stimulating the respiratory drive and prevent hypothermia.

e. Cover the baby with warm dry linen and place directly on the mother's chest while preparing for transport. Encourage parents to see, touch and where appropriate hold their baby. Support skin-to-skin contact for bonding, normothermia and breastfeeding.
f. Continually assess breathing, activity, and colour to determine the need for intervention.
g. Assess BGL and if hypoglycemic consult OLMC for further direction. Term infants will often have blood glucose that is less than 2.6 in the first two hours.
h. Delay cord clamping to 30-60 seconds if resuscitation is not required.

Stabilizing the Baby

1. Provide warmth
   a. Place the infant on a warm, clean surface.

2. Delay cord clamping
   a. 30-60 seconds is reasonable for both term and pre-term infants who do not require resuscitation at birth. If ventilation with BVM is required, clamp and cut the cord.

3. Dry infant
   a. Dry the baby thoroughly, remove the wet towels, and cover the baby with dry linen. Note if the infant is less than 32 weeks gestation do **NOT** dry - place infant directly into a polyethylene bag (re-sealable food grade bag). If using a re-sealable bag, cut the bottom open, slide the infant into the bag through the cut side up to the neck, and close the bag below the baby's feet.

4. Stimulation
   a. Tactile stimulation is performed during drying of the baby. Vigorous drying provides more stimulation which increases the baby's respiratory effort.
   b. Rubbing the baby's back and tapping his/her feet also provide stimulus.
   c. Tactile stimulation can be provided through the bag for neonates less than 32 weeks gestation.

5. Clear the airway
   a. Wipe the face after delivery, but do not automatically suction.

6. Position Airway
   a. Position infant on their back with head and neck neutral or slightly extended and eyes directed straight upward toward the ceiling (sniffing).
   b. Avoid hyperextension or flexion of neck.
   c. May place a small, rolled towel under shoulders to maintain position.

7. Suction if needed
   a. If not breathing, or if gasping, exhibiting poor tone, if secretions obstruct airway or infant is having difficulty clearing, use bulb syringe suction to first suction mouth then nose. If there are copious secretions, turn infants head to the side.
   b. Routine suctioning is no longer recommended for non-vigorous infants born through meconium-stained fluid.

Supplemental Oxygen

Start resuscitation at room air and adjust oxygen flow rates based on SpO_2 targets. Avoid applying blow-by oxygen directly to the face to prevent cold-stressing the baby.

1. SpO_2 Targets for Newborn / Neonatal Care

Age	SpO_2
1 min	60-65%
2 min	65-70%
3 min	70-75%
4 min	75-80%
5 min	80-85%
10 min	85-95%

Ventilation and Oxygenation

1. Monitor SpO_2, apply probe to right hand or wrist.

2. Acrocyanosis (blue colour of hands and feet) is a normal finding at birth and is not a reliable indicator of hypoxemia. Central cyanosis (blueness of the face, trunk and mucous membranes) is more accurate.

3. Assist the infant's respirations via BVM if the use of supplemental oxygen does not relieve central cyanosis, increase the heart rate to greater than 100 bpm, or if the baby continues to be apneic or gasping.
   a. Begin assisting ventilations with room air by utilizing the BVM without turning on the oxygen.
   b. If assisted ventilations continue, consider using oxygen at appropriate flow rates based on neonate SpO_2 targets (see above).
   c. Ventilate using a neonatal BVM at a rate of 40 to 60 breaths per minute. Tidal volumes are based on chest rise - be cautious of the child's abdomen as air flow can be directed to the stomach.
   d. If inadequate chest rise and heart rate after 30 seconds with BVM use the acronym **MRSOPA** as follows:
      i. **Mask** adjustment
      ii. **Reposition** head and neck
      iii. **Suction** with bulb suction to the mouth then the nose
      iv. **Open** the mouth
      v. **Alternative** airway (PCP consider supraglottic airway).
   e. Placing supraglottic airway (PCP only) may be indicated if:
      i. Bag mask ventilation is ineffective
      ii. Chest compressions are performed
   f. Consider advanced airway if resuscitation is prolonged beyond 3 – 5 minutes to improve efficacy and ease of assisted ventilations.

4. Ventilations are the most effective action in neonatal resuscitation.

Chest Compressions

1. Recommended depth for compressions is a third of the diameter of the neonate's chest.
2. Chest compressions are indicated for a neonatal heart rate that is less than 60 bpm, despite adequate ventilation with supplemental oxygen for 30 seconds.
3. Perform chest compressions and ventilations with BVM at a 3:1 ratio and 100% oxygen to achieve a combined total of 120 ventilations and compressions per minute (90 compressions and 30 ventilations).
4. Reassess respirations, heart rate, and colour every 60 seconds. Chest compressions with ventilations must continue until the spontaneous heart rate is greater than 60 bpm.
5. If heart rate is not increasing with continuous chest compressions and positive pressure ventilation, use the mnemonic **CARDIO** to assess the quality and effectiveness of your interventions as follows:
    a. **Chest** movement with each breath
    b. **Airway** secured supraglottic airway (PCP only)
    c. **Rate** 3:1 delivery every 2 seconds
    d. **Depth** of chest compressions 1/3 of chest diameter
    e. **Inspired Oxygen** 100% through BVM.

Fluid Resuscitation (PCP only)

Oxygenation and ventilation are the primary focus of neonatal resuscitation. However, if efforts continue to fail, consider IV access to administer normal saline. Prepare two 20 ml syringes containing a combined total of 40 ml of normal saline for a dose of 10 ml/kg, up to a max of 40 ml. This should be administered by slow IV push over 5-10 minutes.

Post-Resuscitation Care

1. Resuscitated neonates are at high risk for recurrent deterioration and for developing subsequent complications.
2. Continually assess breathing, activity, heart rate, thermoregulation and colour to determine the need for intervention.
3. Continuous pulse oximetry and cardiac monitoring (if available) should be in place.
4. Assessing heartrate may be easiest by stethoscope.

Assessing the APGAR score

1. The APGAR score is a simple method to quickly assess the health of a baby immediately after birth.
2. Perform and record the score at 1 and 5 minutes after birth.
3. Do not delay resuscitation efforts to record the score.
4. Scores of 0 – 3 are critically low, 4 – 6 is fairly low and 7 – 10 is generally normal.

APGAR scale

Acronym		0	1	2
Appearance	Skin Colour	Blue or pale all over	Blue extremities / pink body (acrocyanosis)	Pink body and pink extremities, no cyanosis
Pulse	Heart Rate	Absent	Less than 100	Greater than or equal to100
Grimace	Reflex Irritability	No response to stimulation	Grimace / feeble cry when stimulated	Cry or pull away when stimulated
Activity	Muscle Tone	None	Some flexion	Flexed arms and legs that resist extension
Respiration	Breathing	Absent	Weak, irregular, gasping	Strong cry

Special Circumstances

Premature Babies

1. At higher risk for complications because they have:
   a. Underdeveloped lungs - have less surfactant.
   b. Immature immune system - prone to infection.
   c. Weak muscles and immature nervous system.
   d. Small blood volume – susceptible to hypovolemia.
   e. Fragile brain capillaries may rupture.
   f. Tissues can be damaged by excessive oxygen.
   g. Thin skin, less fat, and large surface area related to body mass - susceptible to hypothermia.

2. Handle the baby gently and avoid placing in a head-down position.

3. Perform ventilations via BVM with the minimal amount of pressure needed to inflate the lungs, avoiding excessive chest rise as lungs are easily damaged.

4. If fluid resuscitation is required, do not give rapidly.

Infection Prevention and Control (IP&C) Considerations

All EMS staff or other first responders in the immediate vicinity (within 1 meter) of a mother delivering a newborn should wear a simple face mask along with safety glasses or face shield and a gown. This practice is to protect the mother, and newborn from potentially harmful pathogens that health care workers may be carrying. This will also protect the practitioners from splashes or sprays of blood or body fluids.

Infection Prevention and Control (IP&C) Considerations

- Consider removing turnout gear or not donning turnout gear for childbirth and obstetrical emergencies. Turnout gear may have surface contamination, and additionally may be difficult to clean after a delivery. Street clothes and a gown is preferable to turnout gear if medical jumpsuits are not available to the medical first responder.
- Wear a procedural/surgical mask and safety glasses or face shield.
- Wear sterile gloves.
- Wear a gown.
- Remove sterile items from packaging just prior to use.
- Use aseptic technique during invasive procedures such as suctioning, cutting the umbilical cord, obtaining IV access.)

What to expect when EMS arrives

The neonate's condition will dictate how EMS responds and what measures are taken on scene. Try to update your dispatch centre on the condition of the neonate when possible, especially when resuscitation begins or condition improves. If using AFRRCS, consider utilizing the appropriate tactical channel for shared communications with AHS EMS dispatch, STARS and incoming EMS crew(s). If there are adequate resources on scene, consider assigning a responder to greet EMS to brief them as they prepare to enter the scene.

What to expect during and after a neonatal resuscitation emergency

Neonatal resuscitations can be very difficult responses because there are always at least two patients. If there are adequate resources, ensure one responder is attentive to the post-partum mother, who will be in great emotional distress but who could also be experiencing physical complications, such as post-partum hemorrhage.

It is best to allow the mother and loved ones to observe the resuscitation efforts, and the responder attending to the mother should gently try to explain what is taking place. For instance, if the neonate requires ventilation assistance, the mother and bystanders may not understand what is taking place and may assume the neonate is in cardiac arrest. Likewise, if chest compressions must be performed because the heartrate is less than 60, consider saying something like, "Your baby's heart is beating and they are breathing, but their heart is beating a little too slowly right now, so we are helping their heart to beat faster, and helping them to breathe more effectively."

If resuscitation turns into a code, or if the neonate was delivered without a heartbeat, this should be explained to the family as well. Plain, clear language in a kind, but clear tone will help deliver this difficult information. For example: "Your baby did not have a heartbeat when he/she was delivered and he/she is not breathing at this time. We are doing everything we can, including chest compressions and ventilations with oxygen. I will stay with you and explain everything I can."

These conversations are very hard, for everyone involved and there is no easy way to tackle them. Likewise, these type of low-occurrence, high-acuity emergencies can be difficult to prepare for. Watching videos of labour and deliveries, reviewing the MCP algorithms and notes and organizing

practice nights around this topic may be helpful. These responses can also be difficult for the responder to cope with. If struggling with this type of call, please reach out to department resources, or to Alberta 2-1-1 for immediate help by calling 2-1-1, or by visiting www.ab.211.ca.