

Resuscitation with Positive-pressure Ventilation, Alternative Airway, Chest Compressions, Epinephrine and Volume

Educational Focus

Scenario Outline

This case presents the birth of a term infant. The mother is admitted to the hospital after a car crash. She has heavy vaginal bleeding, and the fetus has persistent bradycardia. An emergency cesarean section is performed with general anesthesia. Resuscitation will require positive-pressure ventilation, chest compressions, and medications via an emergency umbilical venous catheter. Learners are expected to prepare for the birth by asking the 4 pre-birth questions and assembling a resuscitation team based on perinatal risk. Learners are also expected to be familiar with the setup and proper use of the self-inflating bag and, if used locally, the T-piece resuscitator and/or the flow-inflating bag.

Learning Objectives

Upon completion of the simulation, the learners will be able to:

- Use a cardiac monitor for accurate assessment of heart rate if the newborn's heart rate is low, if pulse oximetry is not working, if the baby has poor perfusion, and during chest compressions
- Identify the indications for epinephrine administration during resuscitation
- Demonstrate the correct procedure for administering epinephrine

- Demonstrate the correct procedure for obtaining emergency umbilical venous access
- Identify the indications for volume expansion during resuscitation
- Demonstrate the correct procedure for administration of volume expander

Debriefing Points

Points for discussion during debriefing could include:

- Methods to assess the newborn's heart rate.
How to access a cardiac monitor in the local setting
- When to begin chest compressions
- Indications for epinephrine, epinephrine concentration, dose, and routes of administration
- Clinical conditions to consider if the heart rate does not respond to intravenous epinephrine.
- Signs of shock in a newborn that indicate the need for volume expander
- Use of NRP Key Behavioral Skills

Reference Materials

Textbook of Neonatal Resuscitation, 8th edition, Lesson 7: Medication Lesson 4: Positive-Pressure Ventilation

Setup & Simulation

Equipment

For setup:

- Damp, heavily blood-stained blanket or towel
- Segment of simulated umbilical cord
- Simulated amniotic fluid or water
- Simulated blood

For use during simulation:

- Umbilical cord clamps
- All items included in the NRP Quick Equipment Checklist
- Additional items for complex resuscitation
 - Sterile gloves
 - Antiseptic prep solution
 - Umbilical tape
 - Small clamp (hemostat)
 - Forceps (optional)
 - Scalpel
 - Umbilical catheters (single lumen), 3.5F or 5F
 - Three-way stopcocks or fluid transfer device
 - Normal saline for flushes
 - Syringes (1-mL, 3-mL, 5-mL, 10-mL, 20- to 60-mL)
 - Clear adhesive dressing to temporarily secure UVC to abdomen (optional)

Setup & Preparation

- Setting: Operating room.
- The radiant warmer should be stocked with equipment and supplies as listed in the NRP Quick Equipment Checklist.
- Items for complex resuscitation should be placed in a code cart or emergency box.

- Moisten the simulator's skin with simulated amniotic fluid and blood and insert the umbilical cord segment into the abdomen.
- Wrap the simulator in a damp, heavily blood-stained blanket or towel, without a diaper, and place it under a blanket or towel on the mother's abdomen.

Learner Brief

Provide this information to the participants as they enter the simulation:

You have been asked to attend an emergency cesarean birth of a term newborn. The obstetric provider is present and the baby is about to be delivered. Please prepare for the birth.

Additional Information

Provide this information to the participants, if asked during simulation:

Gestational age:	38 weeks' gestation
Amniotic fluid:	Amniotic fluid is bloody
Additional risk factors:	The mother has been in a car crash, has heavy vaginal bleeding and has been cleared for emergency caesarean birth with general anesthesia. The fetus is bradycardic with a Category III fetal heart rate tracing.
Estimated fetal weight:	3000 g (6 lbs 9 oz).

Umbilical cord management plan: We will not delay cord clamping.

Scenario Progression

Before delivery

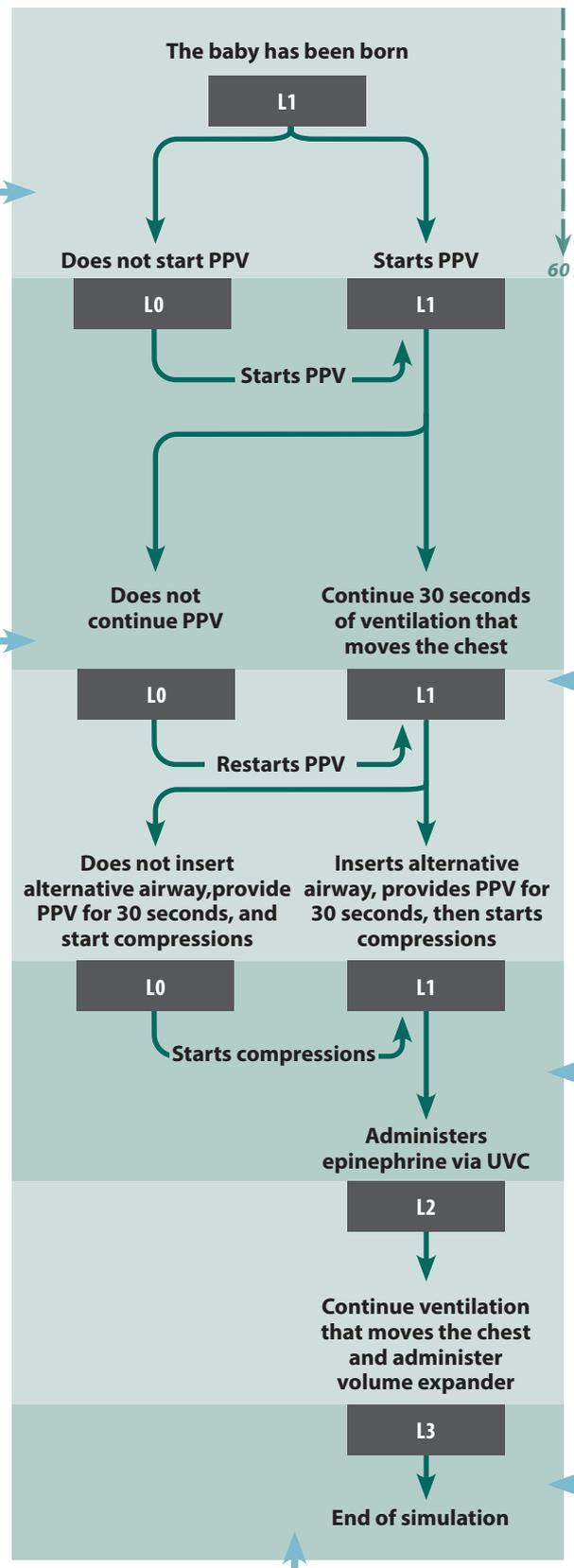
Emergency cesarean section with general anesthesia.
 38 weeks' gestation • Bloody amniotic fluid • The mother has heavy vaginal bleeding after a car crash and the fetus is bradycardic with a Category III fetal heart rate tracing. Estimated fetal weight is 3000 g.
 • We will not delay cord clamping.

- Ask the 4 pre-birth questions to assess perinatal risk:**
 - What is the expected gestational age?
 - Is the amniotic fluid clear?
 - Are there additional risk factors?
 - What is our umbilical cord management plan?
- Conduct pre-birth team briefing:**
 - Assemble team based on perinatal risk
 - Identify leader
 - Assign tasks
- Perform equipment check.**
 May prepare items for intubation and emergency UVC placement.

- Ask the 3 rapid evaluation questions:**
 - Term?
 - Good muscle tone?
 - Breathing or crying?
- Move infant to radiant warmer for initial steps of newborn care:**
 - Provide warmth, dry (and remove wet linen), put hat on baby's head, and stimulate
 - Position head and neck in sniffing position
 - Clear secretions from mouth and nose with bulb syringe, anticipating PPV
- Evaluate breathing**
- Initiate positive-pressure ventilation with 21% oxygen within 60 seconds of birth**

- Attach pulse oximeter sensor to right hand or wrist** (pulse oximeter has no signal)
 - Request cardiac monitor** (optional)
 - Document resuscitation events.**
 The scribe may note 30-60 second time intervals for checking HR and oxygen saturation
 - Check HR after the first 15 seconds of PPV in 21% oxygen.**
 - Announce, "HR is less than 60 bpm and not increasing," and announce whether or not chest is moving**
 - If no chest movement, start ventilation corrective steps (MR. SOPA). Complete as many steps as necessary to achieve chest movement**
- Note! Turn off airway obstruction during Pressure increase to allow face-mask PPV to continue.*

- When chest movement is achieved, announce, "Chest is moving NOW. Continue PPV for 30 seconds."**
- Provide 30 seconds of PPV that move the chest with face-mask ventilation**



- Reassess HR by auscultation or cardiac monitor**
- Announce, "Chest is moving with PPV. HR is less than 60 bpm and not increasing."**
- Apply cardiac monitor leads and use monitor for heart rate assessment** (if not already done)
- Insert alternative airway (laryngeal mask or 3.5 ET tube)**
 - Confirm placement by observing for chest movement, bilateral breath sounds, (no color change on CO₂ detector, no increase in HR)
 - Ensure proper depth by using NTL measurement or initial ET tube insertion depth table
- Continue PPV while quickly securing alternative airway per protocol**
- Secure temperature sensor to newborn and adjust radiant warmer to servo mode**
- Re-assess HR after 30 seconds of PPV that moves the chest via alternative airway**
- Announce, "Chest is moving with PPV. Cardiac monitor displays HR of 40 bpm and not increasing."**
- Increase oxygen concentration to 100% for chest compressions**
- Place leads and use cardiac monitor to assess heart rate** (if not already done)
- Call for more help if needed**
- Prepare UVC and epinephrine for anticipated use** (if not already done)
- Start chest compressions standing at the head of the bed, using two-thumb method, and calling out "1 and 2 and 3 and breathe and..."**

- Pause compressions after 60 seconds of coordinated compressions and ventilation and check HR while continuing ventilation**
 - Announce, "Chest is moving with PPV. Cardiac monitor displays HR of 40 bpm and not increasing."
- Resume chest compressions and coordinated PPV**
- Insert umbilical venous catheter**
- Using closed-loop communication, give order for correct dose of IV epinephrine**
- Prepare correct dose of IV epinephrine**
- If UVC is not ready, may use closed-loop communication and order epinephrine via the endotracheal tube (0.3 mg [3 mL])**
- After UVC is in place, immediately administer epinephrine via the UVC (0.06 mg [0.6 mL]). Flush with 3 mL normal saline**
- Continue PPV and chest compressions for 1 minute, then assess HR**

- Stop compressions when HR is more than 60 bpm. Confirm this HR with auscultation**
- Administer volume expander over 5-10 minutes (30 mL normal saline per UVC)**
- Instead of normal saline, consider ordering emergency, non-cross-matched, O-negative packed red blood cells (30 mL over 5-10 minutes)**
- Continue PPV via alternative airway**

- When pulse oximeter works, wean 100% oxygen to maintain newborn's oxygen saturation within target range**
- Communicate effectively with the medical team**
- Plan appropriate post-resuscitation care**
- Perform post-resuscitation debriefing**