

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

Educational Focus

Scenario Outline

This case presents a pregnancy of 37 weeks' gestation complicated by gestational hypertension, intrauterine growth restriction (IUGR), and a Category III fetal heart rate tracing. After an emergency cesarean birth, the newborn requires endotracheal intubation and chest compressions.

The learners are expected to prepare for the birth by asking the 4 pre-birth questions, assembling a resuscitation team based on perinatal risk, and performing the equipment check. 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:

- Recognize the newborn that requires chest compressions
- Use a cardiac monitor for accurate assessment of heart rate if pulse oximetry is not functioning, if the baby's heart rate is low, if the baby has poor perfusion, and during chest compressions

- Demonstrate the correct technique for performing chest compressions
- Identify the sign that indicates chest compressions should be discontinued

Debriefing Points

Points for discussion during debriefing could include:

- Indications for chest compressions during resuscitation
- Strategies for optimizing teamwork during resuscitation, e.g.:
 - How the scribe can help ensure that resuscitation events are following the sequence of the NRP Algorithm
 - How the team can help the scribe document events accurately
- When to discontinue chest compressions
- Use of NRP Key Behavioral Skills

Reference Materials

Textbook of Neonatal Resuscitation, 8th edition, Lesson 6: Chest Compressions

Setup & Simulation

Equipment

For setup:

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

For use during simulation:

- All items included in the NRP Quick Equipment Checklist
- Umbilical cord clamps
- 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.
- 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, lightly 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:	37 weeks
Amniotic fluid:	Clear
Additional risk factors:	Gestational hypertension, intrauterine growth restriction, category III fetal heart rate tracing, emergency C-section with general anesthesia
Estimated fetal weight:	2000 g (4 lb 6 oz).
Umbilical cord management plan:	I will not delay cord clamping due to intrauterine growth restriction.

CRITICAL PERFORMANCE STEPS

Scenario Progression

- ❑ **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**

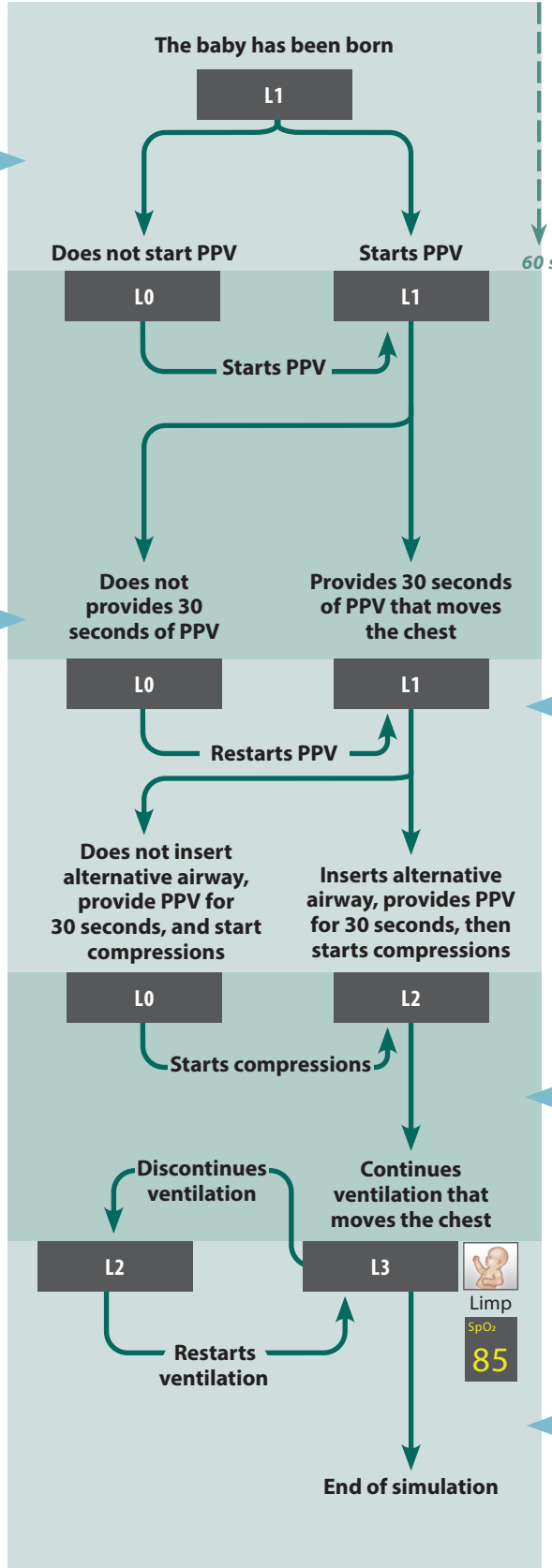
- ❑ **Attach pulse oximeter sensor to right hand or wrist** (pulse oximeter has no signal)
- ❑ **Request cardiac monitor**
- ❑ **Document resuscitation events.** The scribe may note 30-60 second time intervals for checking HR and oxygen saturation
- ❑ **Check HR after the first 15 seconds of PPV in 21% 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 obstructed airway no later than 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**

Before delivery

Emergency cesarean section • 37 weeks gestation • Clear amniotic fluid
 • Gestational hypertension, intrauterine growth restriction, category III fetal heart rate tracing, emergency cesarean section
 • Estimated birth weight 2000 g • I will not delay cord clamping.



CRITICAL PERFORMANCE STEPS

- ❑ **Reassess heart rate per auscultation or cardiac monitor**
- ❑ **Announce, "Chest is moving with PPV Heart rate 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 symmetrical 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 to avoid overheating newborn**
- ❑ **Re-assess HR after 30 seconds of PPV that moves the chest via alternative airway**
- ❑ **Announce, "Chest is moving. Cardiac monitor displays HR of 40 bpm and not increasing."**
- ❑ **Increase oxygen concentration to 100% for chest compressions**
- ❑ **Call for more help if needed**
- ❑ **Place leads and use cardiac monitor to assess heart rate** (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..."**
- ❑ **Prepare UVC and epinephrine for anticipated use** (if not already done)
- ❑ **After 60 seconds, pause compressions, continue ventilations, re-assess heart rate**
- ❑ **Discontinue compressions for heart rate more than 60 bpm. Confirm this heart rate with auscultation.**
- ❑ **Continue ventilation at rate of 40-60 breaths/min**
- ❑ **When pulse oximeter works, wean 100% oxygen to maintain newborn's oxygen saturation within target range for age in minutes**
- ❑ **Continue ongoing evaluation of newborn's breath sounds, chest movement, CO₂ detector color change, respirations, HR, oxygen saturation, tone and activity**
- ❑ **Plan appropriate post-resuscitation care**
- ❑ **Communicate effectively with the medical team**
- ❑ **Perform post-resuscitation debriefing**