

SimBox+ *Tele* SimBox

Neonatal Shock



Emergency Department/Hospitalist/Resident



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FEEDBACK

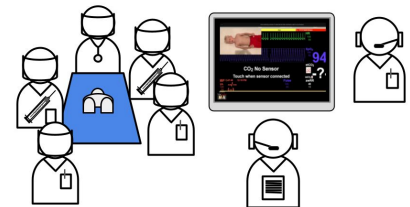
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Thank you for your interest in SimBox low-technology learning tools!

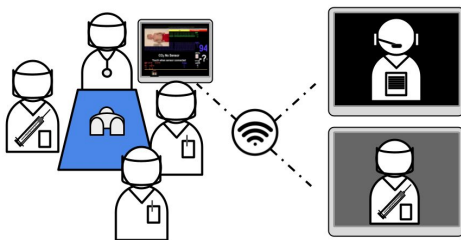
- ❑ Our low-technology simulation series allows your team to engage in the first 10 minutes of an emergency scenario.
- ❑ Use your own equipment and resources in your own clinical environment, or in the convenience of a virtual environment to practice non technical skills.

SimBox Original Version

- ❑ Low-technology manikin.
- ❑ + video.
- ❑ + tablet-based resources (*in situ* or sim lab).



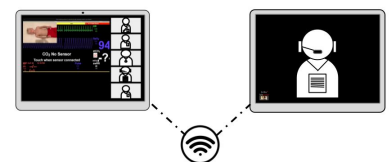
SimBox+ (SimBox Original + tele-facilitator)



- ❑ SimBox Original PLUS.
- ❑ Learners in remote or underserved areas +/- limited access to content or simulation experts.
- ❑ Remote facilitator.

Tele SimBox:

- ❑ Non-technical skills all remote version.
- ❑ Meets post-pandemic demands for virtual learning and continuous education for learners of all levels.



How to use these resources

SimBox or SimBox+

- Review this document + run a session in your ED with a doll/manikin/pillow.

Tele SimBox

- Reference: [Tips / Tricks](#).
- Watch a [sample recording](#) of the telesimulation to see how it is run.

*If using this resource for EM / PEM trainees see Resource page at end of booklet with suggested case augmentation to meet Milestones.

**For additional questions or concerns, arrange a one-on-one tutorial with the project team.

Guide

This guide is for facilitators of all backgrounds in how best to use these didactic resources.

Novice Facilitator

- Review this entire guide and watch video *prior to* first session.
- Utilize the Prebriefing / Debriefing Scripts, Prompts and Resources.
- Review the Checklist.
- Encourage all participants to complete Survey.

Intermediate to Advanced Facilitators

- Review the case summary and progression.
- Use the Prebrief / Debrief scripts or use your own.
- Review Educational Resources or use your own.
- Review this Checklist *or modify* to your specific learner group.

Tele Tips / Tricks

- Trial sharing the video *prior to* the session.
- Use *Gallery View*.
- Have participants *name themselves* with assigned *role*.
- Ask *observers to mute audio* and *turn off video* for simulation.
- Both participants and facilitators can use a “*Time Out*” whenever necessary to pause and regroup.
- An *embedded participant* can help move the scenario along.
- During the simulation, scroll through the monitor video based on the participants’ actions.**

For example, if the participants quickly stabilize the patient, you can “skip through” to the part of the video where the vital signs have normalized.

Conversely, if the necessary interventions, e.g. giving the patient oxygen, have not been performed, you can “scroll back” and spend more time in the part of the video where the vital signs are abnormal.



After this activity, the team will be able to manage a neonatal patient in shock with emphasis on the following objectives:

1. Apply Crisis Resource Management and teamwork (with attention to role designation, directed orders, sharing mental model and closed loop communication with team and family members).
2. Prioritize treatment of potential etiologies to the guide stabilization or escalation of care for a neonate in shock.
3. Determine the appropriate destination for transfer.

Overall Scenario Schema

Prebrief: Use narrated video + [sample script](#) or your own script

2 mins

Assign or Coach them to allocate roles.
Adapt roles based on the participating team:

Team Leader	Airway	Bedside Survey
Respiratory Tx	Bedside Nurse	Medication Nurse
Parent Liaison	Pharmacy	Recorder

10 mins

Stem: You are called to assess a sick neonate. The patient is lethargic, tachycardic and hypotensive.
Your team will focus on the resuscitation of a neonate in shock.

Telesim Co-facilitator prompts are indicated in these boxes

15 mins

Debrief: Use the narrated video + [sample script](#) or pause the video and use your own script

10 mins

Option: re-run scenario

Scenario script:

"Lets assign roles, including team lead, bedside survey and airway provider and parent liaison. You will hear a brief EMS patch and then see a two minute countdown clock as you prepare for the arrival of the patient. You will now hear the EMS dispatch."

[Link to ED Neonatal Shock Video](#)

Video states: "This is EMS, we are coming in with a 7 day old ex-full term baby boy who is lethargic and looks quite unwell. We will be there in 2 minutes."

2 minute warning

- Team assembles + confirms roles
- Asks for equipment: monitor, temperature, oxygen, breathing (BVM/CPAP), access (IV), Broselow tape/app
- Dons PPE (hard stop)
- Calls for help

Facilitator states: "The patient has arrived. You have put on the appropriate PPE. EMS tried a couple of times, but could not get an IV. The patient cried with the pokes but is otherwise very lethargic and grunting."

Time 0 min 7

- Team fully undresses the baby and places the cardiac monitors, pulse oximeter, BP cuff, temperature probe
- Performs ABCDEs
- Uses Broselow tape/ app for weight and/ or asks parents

"The baby is grunting and working hard to breathe. His oxygen saturation is 78%. Weight is 3 kg."

1 min 9

HR 199
BP 40/17
RR 40s
Sat 80%

- Team notes hypoxemia and increased work of breathing
- Repositions airway (chin lift/ jaw thrust/ neck roll) and looks for chest rise, respiratory effort and auscultates lungs
- Begins bag-valve-mask ventilation
- Requests rectal temperature
- Asks for IV/IO and POC glucose

"His saturations are improving with BVM. His heart rate is 199 and his blood pressure is 40/17. His CRT is prolonged and he is cold peripherally. A rectal temperature is 36.5. POC glucose is 90. Working on the IV."

2 min 11

HR 200
BP 40/21
RR 45
Sat 94% BVM

- Team verbalizes illness state: Neonate in shock
- Notes improvement in saturations with BMV
- Notes normal temperature and glucose level
- Puts warm blankets/ hat on the baby
- Asks for blood gas, blood cultures and CBC
- Asks for pre- and post-ductal saturations

SAMPLE history

Signs/Symptoms: Fussy and not tolerating feeds for the past 24 hours. No wet diapers in 12 hours.

Allergies/ Medications: None

Medical history: Full prenatal care without complications or infections, GBS negative. Term vaginal birth with appropriate post-birth routine care. Breastfed infant with no significant medical history.

Events: No trauma or infectious symptoms. Mother and Father are only caregivers.

"IV successful on 3rd attempt. Pre- and post- ductal saturations are 97%, his heart sounds are normal and there is no hepatomegaly on exam. According to his mother, all of his prenatal scans were normal."

3 min 13

HR 190
BP 44/23
RR 52
Sat 99%

- Team verbalizes lower suspicion for cardiogenic shock or congenital heart disease (similar pre and post ductal saturations, improvement in oxygenation with BMV, normal cardiac/ hepatic exam, normal upper and lower extremity BP and pulses differential)
- Orders NS bolus 10 mL/kg

"Normal saline bolus going in. The HR and his perfusion are improving and he is more alert. Also appears to be making good respiratory effort on his own. Blood gas results are 7.25/70/60/15 BE -15."

4 min 15

HR 170
BP 50/30
RR 50
Sat 99%

- Team notes improvement in perfusion with fluid resuscitation
- Trials off the BVM
- Discusses the need for full septic workup including a urine culture and a lumbar puncture
- Orders IV antibiotics per protocol (eg vancomycin, cefepime, acyclovir)

"His vital signs have further improved with the bolus and he is breathing comfortably and saturating well on his own."

Wrap min 16

HR 140
BP 60/40
RR 50
Sat 100%

- Team notes clinical improvement
- Orders second NS bolus of 10 ml/kg
- Updates parents of diagnosis, management plan and need for admission
- Hands off to the admitting team

"Second NS bolus administered with further improvement of his vital signs. He is now pink and crying vigorously."

Video guide

- 7 min: patient appears
- 9 min: Sats 80s, HR 200, BP low
- 11 min: Sats 90s, HR 200, BP low
- 13 min: Sats 100, HR 190, BP low
- 15 min: Sats 100, HR 170s, BP ok
- 16 min: Sats 100, HR 150s, BP ok

After team performs handoff, state "This concludes the simulation" and move to debrief.

[Link to resource page: educational content](#)

TASK		NOT DONE	NOT DONE CORRECTLY	DONE CORRECTLY
Team-centered care	Verbally assemble the necessary staff, equipment and resources to care for a newborn in shock in the ED.			
	Demonstrate effective teamwork and communication (i.e. designate leader/roles, directed orders, closed-loop communication, sharing mental model).			
	Demonstrate appropriate PPE.			
Family-centered care	Obtain an appropriate history from the family member (SAMPLE).			
	Address family concerns, update on care (translate medical aspects of care in plain language).			
Medical knowledge	Verbalize the initial management of an acutely ill neonate (airway, breathing, circulation).			
	Recognize presentation of shock in neonates.			
	Verbalize the first line therapeutic interventions for shock (IV fluids, antibiotics, temperature and glucose control).			
	Create a differential for a neonate in shock (trauma, heart/ lung disease, endocrine/ metabolic problems, inborn error of metabolism, seizures, feeding mishaps, intestinal catastrophe, toxins, sepsis).			
Communication	Demonstrate handoff of care at the end of the case.			

Best practices for establishing psychological safety in simulation

Basic Assumption: "we believe that everyone participating in our activities is intelligent, capable, cares about doing their best and wants to improve"

[Center for Medical Simulation, Boston MA](#)

Prebrief

Welcome your team, make introductions:

"This simulated resuscitation is to practice our team's response to an emergency. We will spend about 15 minutes in simulation, then we will debrief for 20 to discuss what went well and what could be improved with input from the team. Even though it is not real, and the manikin can't be harmed, everyone will get the most out of this scenario if we take it as seriously as possible."

Describe

Describe simulator capabilities, equipment and how to participate:

"Act as you would within your role. You will not get monitor feedback unless your equipment is attached to the patient. Airway equipment should be attached to oxygen, etc. Try to make tasks realistic and timely using your equipment. Please ask for clarifications."

Demo

DEMO: Closed loop communication:

Know your role and task designation. Use closed loop communication to verify and complete.

Leader: Tech, we need an EKG.

Tech: OK going to get the machine.

Tech: OK, I've got the EKG machine here.

Disclose

If a safety concern arises during the simulation, I will state:

"Let's take a safety pause."

If a real event happens that is not part of the simulation, I will state:

"This is not a simulation."

Disclose if video recording, privacy and permission.

Components of a Debrief (Based on 3Ds + PEARLS)

"The purpose of this debrief is to discuss areas of great performance and discover areas for improvement. It is not a blame session- everyone is here to do their best."

Defuse
1-2 min

Solicit emotions and reactions.
"Reactions?"; "Let's take a moment to gather our thoughts."

Discover
7-8 min

Clarify facts.
"Can a teammate share a short summary of the case?";
"Were there other thoughts?"



Explore Performance.
"What went well?"
"What could be improved?"

Use observations of learner experiences to highlight strengths of the team and individuals, while asking learners for their thoughts, observations and reflections.

Deepen
1-2 min

Identify patient care priorities. Then provide focused feedback and specific areas of opportunity for improvement. Elicit any other outstanding issues or concerns.

Summary
1-2 min

Identify take-home points to apply to future practice : Round the room reflections and thanks for participation.

This page provides possible questions to elicit teaching points during the debrief. We are tailoring content for each objective. These questions are not meant to replace your team's discussion, but can help to steer the debriefing session.

DEMONSTRATE A TEAM-BASED APPROACH TO CARE FOR AN ILL NEWBORN

How did your team prepare for the arrival of a sick neonate?
 Crisis & Crew Resource Management: Assign roles, designate team leader, share mental model and practice closed loop communication.

PERFORM A SYSTEMATIC ASSESSMENT OF A CRITICALLY ILL NEONATE



How does your team perform a systematic assessment of a critically ill infant?
 PAT Pediatric Assessment Triangle:

- Appearance: TICLS: tone, interactivity, consolability, look/gaze, speech/cry.
- Work of breathing: Important to undress neonate to visualize WOB.
- Circulation/capillary refill: Where and how is this assessed in a neonate?

Airway Breathing Circulation Caveats: Consider pediatric anatomical differences: ABC vs CAB (in adults).

What do the patient's vital signs tell you about the clinical status?
 Heart rate: Heart rate < 60 should prompt CPR at rate of rate least 100 BPM.

What are some differences in shock assessment between infants, children and adults?
 Shock: Tachycardia, capillary refill > 2 seconds and altered mental status are early signs.

DESCRIBE AT LEAST THREE CAUSES OF SHOCK IN NEONATES

What could be causing this neonate to be in shock? Discuss differential diagnosis: THE MISFITS mnemonic.
 What are treatment priorities?
 ABCs + Dextrose.
 How do you select sites for venous access?
 IVs: dorsal veins of hands or feet, cubital, saphenous, or scalp veins using a 24g IV.
 How long should IV access be attempted before escalating to IO?
 PALS recommends 3 attempts in 90 secs.

DEMONSTRATE FAMILY CENTERED CARE INTERACTIONS

How does the team manage the reactions of family members while you are caring for a seriously ill child?

- A large body of literature supports family presence during resuscitation. This does not lead to increased malpractice.
- A social worker or other provider should be assigned to stay with the family through the difficult time.

Sick or not sick? NFLS:

Neuro: tone, suck, reflexes, cry.
 Fontanelle: sunken or bulging.
 LOOK: check diaper area for hernias, abnormal genitalia, umbilical stump.
 Skin: cyanosis, pallor, jaundice, rashes, petechiae or bruising.



A rectal temperature <36 C or >38 C should prompt a full sepsis workup.

- Consider infant warmer and bedside glucose if hypothermic.

Initial Management

A B C

- Per PALS: 90 sec or 3 IV attempts then place IO.
- Consider DEFIB pad placement.
- Defibrillator pads go front and back on children up to 15 kgs.
- Note: the sizing of "infant pads" is product specific, packaging can be misleading.

WATCH VITAL SIGNS

BEWARE OF LOW BLOOD PRESSURE:

Hypotension is a late finding in shocky neonates, and must be identified early.

Tachycardia is one of the first signs of shock!

Neonates have less myocardial contractility and a relatively fixed stroke volume. With increased metabolic demand, cardiac output is compensated by an increase in heart rate.

$$CO = HR \times SV$$

Don't forget: begin compressions if pulse <60.

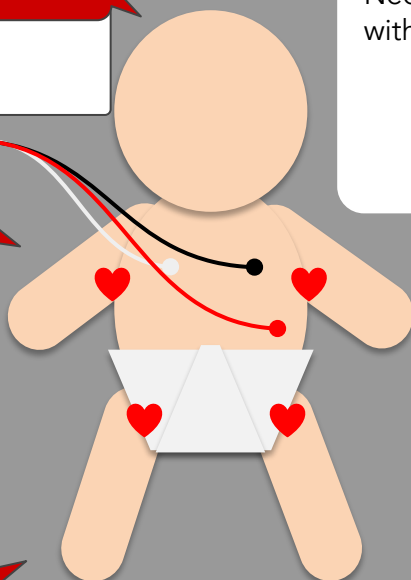
Alterations in respiratory rate:

Neonates in shock may initially present with tachypnea.

Bradypnea or apnea is an ominous sign requiring prompt immediate airway rescue.

Other features of shock:

- cap refill > 2 sec.
- decreased urine output.
- altered mental status.













Monitoring tips for cardiac suspects:

- Pre(R)+ Post(L) ductal pulse oximetry.
- Check Bilateral brachial + femoral pulses locations above.
- Check four extremity BPs.

CARDIAC CONCERNS

- Remember that some lesions may present in the first few weeks of life if not diagnosed prenatally.
- Poor feeding? Suspect coarctation or other congenital heart disease.
- Check for signs of heart failure: palpate below costal margin for "liver edge".
- Consider bedside ultrasound POCUS ECHO *if available*.
- Prostaglandin E1 (PGE1) is used to keep the ductus arteriosus patent. It can be life-saving in neonates with ductal-dependent cardiac lesions.

Sick Neonate? Think: "THE MISFITS"

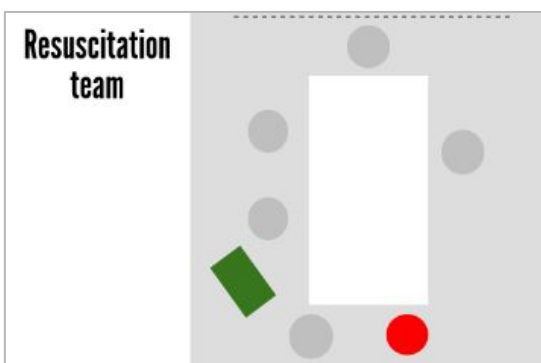
T H E	 Trauma: Non-accidental trauma
	 Heart & Lung: Congenital Heart Disease Apnea (of prematurity) Lung infection (meconium, pertussis, RSV)
	 Endocrine: Congenital Adrenal Hyperplasia Thyroid (Hyper- or Hypothyroidism)
M I S	 Metabolic: Electrolyte Abnormalities (Hypoglycemia, Na, Ca)
	 Inborn Errors of Metabolism Mitochondrial disease
	 Seizures: CNS and Infectious Causes (TORCHES, neonatal HSV)
F I T	 Formula and Feed Mishaps: Free H ₂ O or dilutional HypoNa Concentrated HyperNa
	 Intestinal Catastrophes Diaphragmatic Hernia Malrotation with volvulus Hirschsprung's Megacolon Necrotising Enterocolitis
	 Toxins: Maternal exposure to opiates or other drugs of abuse
S	 Sepsis: Group B Strep, E. coli, Listeria

COMPONENTS OF EFFECTIVE TEAMS: TEAMSTEPS IN A NUTSHELL

<https://www.ahrq.gov/professionals/education/curriculum-tools/cusptoolkit/modules/implement/teamworknotes.html>

COMMUNICATION	LEADERSHIP	SITUATION MONITORING	MUTUAL SUPPORT
SBAR Situation Background Assessment Recommendation	BRIEF Planning, setting the tone	STEP Status of pt Team Members Environment Progress toward goal	TASK ASSISTANCE Awareness of team work load
CALL OUT Sharing critical information with the team	HUDDLE Ad-hoc planning or updates	"I'M SAFE" <i>Tool for self evaluation</i> Illness Medication	FEEDBACK Providing information for purpose of team improvement
CHECK BACK Loop Closure**	DEBRIEF Exchange of information to inform team of performance and effectiveness	Stress Alcohol/Drugs Fatigue Eating + Elimination	ADVOCACY & ASSERTION Advocating for patient in case of a disagreement with decision maker
HANDOFF I PASS the BATON Introduction Patient Assessment Situation Safety Concern Background Actions Timing Ownership Next Cognitive Aid @DrM_Kou			2 CHALLENGE RULE Information conflict regarding patient safety
			DESC Script <i>Tool for personal conflict*</i> Describe situation Express your concern Suggest an alternative Consensus statement
			CUS STATEMENT I'm concerned I'm uncomfortable This is a safety issue
			COLLABORATION Working toward a common mission

CRISIS RESOURCE MANAGEMENT: CRM and the Shared Mental Model:



CRM (established by the airline industry) is based upon team leadership and defining clear roles for team members. Closed loop communication when used by all team members reduces errors and improves safety through:

- Addressing team members by name when assigning tasks.
- Giving confirmation when tasks are acknowledged or completed.

A shared mental model allows a team to anticipate the plan for patient care and what equipment or medications might be needed.



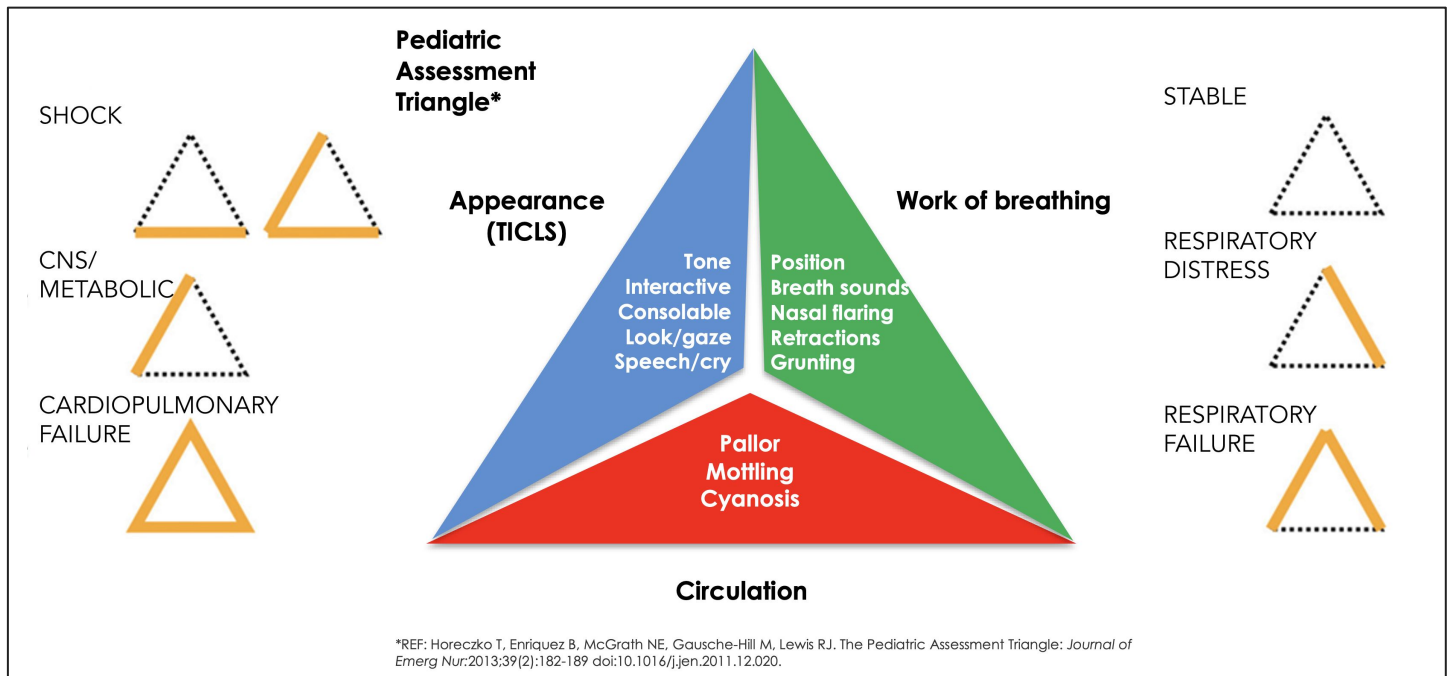
Pediatric Vital Signs/Weight by Age

Age	Weight (kg)	Pulse	Resp	Systolic BP*
Newborn	3	100-180	30-60	60-70
6 mos	7	100-160	30-60	70-80
1 yr	10	100-140	24-40	72-107
2	12	80-130	24-40	74-110
3	15	80-130	24-40	76-113
4	16	80-120	22-34	78-115
5	18	80-120	22-34	80-116
6	20	70-110	18-30	82-117
8	25	70-110	18-30	86-120
10	35	60-100	16-24	90-123
12-15+	40-55	60-100	16-24	90-135

*BP in children is a late and unreliable indicator of shock



Using the Pediatric Assessment Triangle (PAT)



Pediatric Mental Status Assessment: response to stimuli



Family-centered care:

- Obtain appropriate history from family member (SAMPLE).
- Address family concerns and update on care.
- Manage the expectations of those who receive care in the ED and use communication methods that minimize the potential for stress, conflict, and misunderstanding [Assess via their communication to prep family for intubation and then for transfer, Patient Centered Communication (EM Milestone ICS1) Level 3:].

Medical knowledge:

- Verbalize the initial management of an acutely ill pediatric patient (ABC's).
- Verbalize first line diagnostic tests of a newborn in shock.
- Verbalize the first line therapeutic interventions of a newborn in shock.
- Demonstrate handoff of care at the end of the case .
- Integrate hospital support services into a management strategy for a problematic stabilization situation [Trainee should request transfer early, Emergency Stabilization (EM milestone PC1) Level 4], Performs rapid sequence intubation in patients using airway adjuncts Employs appropriate methods of mechanical ventilation based on specific patient physiology [Airway Management (EM milestone PC10) Level 3/Pediatric ACGME intubation procedure requirement].

Thank you for participating in the simulation.
Please complete the facilitator and participant surveys by clicking on the links
or scanning the QR codes below:

Facilitator Survey



Participant Survey



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