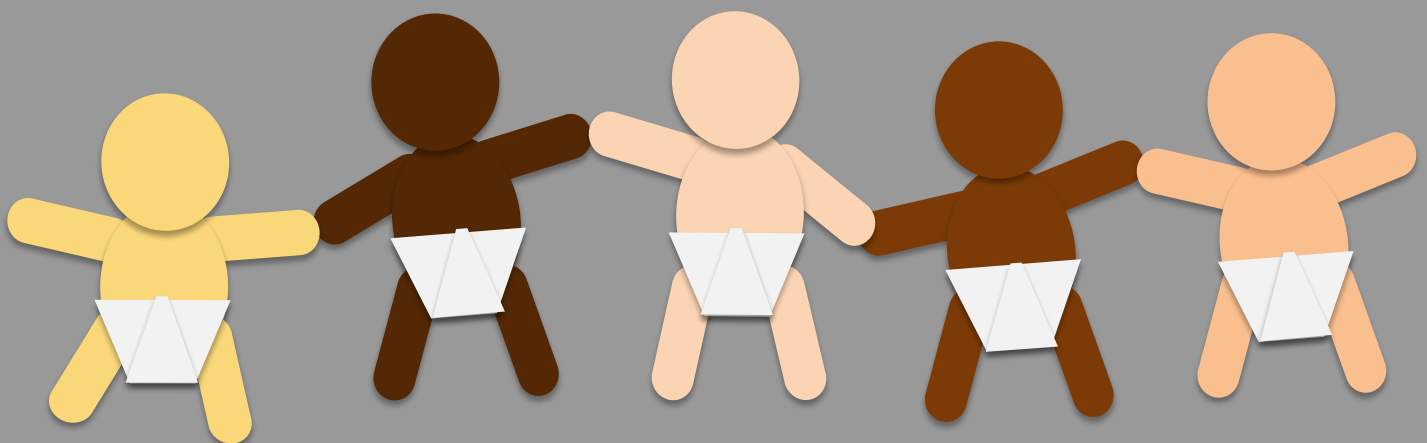


# Pediatric SimBox+ *Tele* SimBox

## Neonatal Shock

Emergency Department/Hospitalist



### Preparation

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### Purpose

#### **Thank you for your interest in SimBox low fidelity learning tools!**

This series of cases features low fidelity simulations that allow your teams to engage in the first 5-10 minutes of an emergency scenario.

You will 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, SimBox<sup>+</sup> vs TeleSimbox

There are three ways in which the simulation can be delivered:

#### **SimBox Original:**

Low-fidelity manikin + video and tablet-based resources for use *in situ*.

#### **SimBox<sup>+</sup>** (SimBox **PLUS** a telefacilitator).

SimBox was adapted for use in remote or underserved areas and/or limited access to content or simulation experts, with a remote facilitator.

#### **TeleSimBox:**

As a result of the COVID 19 Pandemic, SimBox was adapted to meet the demands for virtual learning platforms, and continuous education for learners of all levels. This version targets non-technical skills.

### Best way to use these resources

#### **SimBox or SimBox<sup>+</sup>**

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

#### **TeleSimBox**

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

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

[Sample telesimulation demo](#)

## Guide

This guide is meant to explain to facilitators with **varying levels of experience** 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.

## Advanced Facilitator

Use the learning tools included **or your own** for Prebrief / Debrief and Educational Resources.

Review this Checklist **or your own** adapted 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.

Move scenario along through the **embedded participant**.

**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 guide stabilization or escalation of care for a neonatal patient in shock.
3. Determine the appropriate destination for transfer.

### Overall Scenario Schema

[Link to Pre-briefing Script for SimBox/SimBox+](#)

2 mins

[Play video to team](#)

**Assign** or **Coach them to allocate** roles

**Team leader**

**Airway/survey/  
bedside**

**Family liaison**

6-10  
mins

Stem: A seven day old infant arrives in distress with a weak cry and a 5 second capillary refill. Heart rate is in the 190s, blood pressure is measured in the 40/20s, and the rectal temp is 36.2 C. You arrive on the scene and see a pale, unresponsive neonate. You identify features of a neonate in shock, discuss the differential of neonatal shock, perform a systematic assessment of a critically ill neonate, and identify appropriate interventions.

**Telesim Co-facilitator prompts are indicated in these boxes**

15 mins

[Link to Debriefing Script](#)

10 mins

**Option: re-run scenario**

## Scenario script:

“Please assign roles as you would in a typical scene response. You will hear a brief EMS dispatch and then see a two minute countdown clock as you prepare for the arrival of the patient.” [\\*CLICK TO PLAY VIDEO\\*](#)

Video states: “ED, ED, this is EMS Unit 1, we’re coming in lights and sirens, we have a 7 day old with a week cry, grey, cap refill is about 5 seconds. We can’t obtain a sat. We’ll be there in 2 minutes.”

2 minute  
warning

**VIDEO GIVES 120 SECOND COUNTDOWN, THEN PATIENT APPEARS**

- Team assembles + confirms roles
- Asks for equipment: cardiac leads, temperature, pulse oximeter, breathing (nasal cannula/BVM/CPAP), access (IV/IO), Broselow tape/app, BP cuff, warmer, blanket/lights
- Calls for help

**The recorded narrator on the video states:** “Hi team quick update from EMS. We couldn’t get an IV. We tried a couple times, he cried with the poke. His heart rate has been in the 190s, blood pressure 40/20s, still couldn’t get a sat.

Time 0

- Team confirms patient is on monitors, pulse oximetry, BP cuff, temperature
- Use of Broselow tape to assess weight
- Suction, reposition airway, and assist respirations with BVM

**Facilitator states: “Patient has arrived.”**

+ 3:43 min

HR 197  
BP --  
RR 60  
SPO2 78

- Team assesses ABCs
- Attempts IV/IO
- Requests BP, rectal temp
- Verbalize getting fluids/medications: dextrose, normal saline vs lactated ringers, antibiotics

**Facilitator states: “Monitors are attached, cycling blood pressure”**

## SAMPLE History

**Signs/Symptoms:** Not tolerating feeds and fussy for the past 24 hours. No wet diapers for 12 hours.

**Allergies/Medications:** None.

**Birth/ Medical history:** Ex-full term, normal vaginal delivery, no complications, received Vit K at birth, BW 7lbs, nursing only.

**Last meal:** 24 hours ago.

**Events:** No infectious symptoms. Only caregivers Mom and Dad. No history of trauma.

+ 4:12 min

HR 200  
BP 40/20  
RR 60  
Sat 79%

- Verbalize illness state - pediatric assessment triangle
- Verbalize concern for shock
- State that if cannot get IV on 3<sup>rd</sup> attempt will consider IO
- Estimate weight: 3 kg
- Continue BVM

**Facilitator states: "Cannot get IV on first attempt. Baby is pale, unresponsive."**

**"Subcostal, intercostal retractions. Weak central pulses. Cap refill 5 secs."**

**"Cool to touch when completely exposed. Diaper dry."**

+ 5:25 min

HR 187  
BP 44/23  
RR 63  
Sat 90%

- Request IO
- Order 10 mL/kg NS via push-pull
- Request baby warmer (chemical mattress vs bed)

**"Rectal temperature is 36.2 C."**

+ 7:19 min

HR 175  
BP 51/25  
RR 71  
Sat 95%  
T 36.2 C

- Order STAT POC labs, including POC glucose, iSTAT, cultures
- Order antibiotics
- Give 10 mL/kg NS via push-pull
- Discuss differential of neonatal shock and consider further evaluation (sepsis, trauma (NAT), congenital heart disease, endocrine emergencies, inborn errors of metabolism, seizures, feeding mishaps, intestinal disasters (volvulus, ect.), toxins)

**Facilitator states: " IO successfully flushes well. I will work on getting baby warmer."**

+ 8:51 min

HR 170  
BP 62/30  
RR 55  
Sat 93 %  
T 36.2 C

- Initiate transfer arrangements
- Complete patient hand-off
- Update family

**Facilitator: "10 ml/kg NS bolus via push-pull has been administered."**

**POC glucose is 170. Other labs pending. Calling pharmacy for antibiotics.**

Conclude simulation and move to debrief.  
[Link to resource page: educational content](#)

		Done correctly	Not done correctly	Not done
<b>TASK</b>				
<b>Team-centered care</b>	<b>Verbally assemble the necessary staff, equipment and resources to care for an ill patient</b>			
	<b>Demonstrate effective teamwork and communication (i.e. designate leader/roles, directed orders, closed-loop communication, sharing mental model)</b>			
	<b>Demonstrate appropriate PPE</b>			
<b>Family-centered care</b>	<b>Obtain an appropriate history from the family member (SAMPLE)</b>			
	<b>Address family concerns, update on care (translate medical aspects of care in plain language)</b>			
<b>Medical knowledge</b>	<b>Verbalize the initial management of an acutely ill pediatric patient (airway, breathing, circulation)</b>			
	<b>Recognize a neonate in shock (a neonate with abnormal vital signs and concerning clinical exam)</b>			
	<b>Verbalize the first line therapeutic interventions for shock (fluids, antibiotics, temperature and glucose control)</b>			
	<b>Demonstrate handoff of care at end of case</b>			



## Tips to establish 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” - [CMS, Boston MA](#)

### Introduce team and 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

**Closed loop communication demo:**

Know your role and task designation with 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

In case of a safety concern during the simulation, state “Let’s take a safety pause.” If a real event happens that is **not** part of the simulation, state “This is not a simulation.” Disclose if video recording.

## 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 minutes

### **Solicit emotions and reactions**

“Reactions?”; “Let’s take a moment to gather our thoughts.”

**Summary**  
1-2 minutes

### **Clarify facts**

“Can a teammate share a short summary of the case?”; “Were there other thoughts?”

**Discover**  
7-8 minutes

### **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. Then provide specific areas of opportunity for improvement.

**Deepen**  
1-2 minutes

### **Provide focused feedback and identify patient care priorities**

Elicit any other outstanding issues or concerns

**Take-Home points**  
1-2 minutes

### **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 for each objective. These questions are not meant to replace your team discussion, but can help to steer the debriefing session.

Demonstrate a team-based approach to care for a critically ill neonate

**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)

**SAMPLE mnemonic:** Signs/Symptoms, Allergies, Medications, Last Meal, Events preceding

**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 the neonate in shock

**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

## TeamSTEPPS Approach

**Components of effective teams (as developed in TeamSTEPPS) Table @DrM\_Kou**

Communication	Leadership	Situation Monitoring	Mutual Support
<b>SBAR:</b> Situation Background Assessment Recommendation	<b>Brief:</b> Planning, setting tone	<b>STEP:</b> Status of pt Team Members Environment Progress toward goal	<b>Task assistance:</b> awareness of team work load
<b>Call out:</b> sharing critical information with the team	<b>Huddle:</b> Ad-hoc planning	<b>I'M SAFE:</b> <ul style="list-style-type: none"> <li>• Illness</li> <li>• Medication</li> <li>• Stress</li> <li>• Alcohol/Drugs</li> <li>• Fatigue</li> <li>• Eating and Elimination</li> </ul>	<b>Feedback:</b> providing information for purpose of team improvement
<b>Check back:</b> Loop Closure	<b>Debrief:</b> Exchange of information to inform team of performance and effectiveness		<b>Advocacy and assertion:</b> advocating for patient in case of a disagreement with decision maker
<b>Handoff:</b>  <b>I PASS the BATON</b>  Introduction Patient Assessment Situation Safety Concern  Background Actions Timing Ownership Next	@DrM_Kou 		<b>Two challenge rule:</b> information conflict regarding patient safety  <b>DESC Script:</b> Tool for personal conflict* Describe situation Express your concern Suggest an alternative Consensus should be stated  <b>CUS: I'm concerned</b> I'm <b>uncomfortable</b> This is a <b>safety</b> issue  <b>Collaboration:</b> working toward a common mission

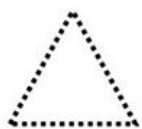
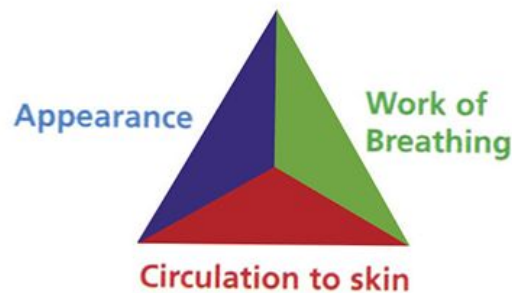
<https://www.ahrq.gov/professionals/education/curriculum-tools/cusptoolkit/modules/implement/teamworknotes.html>

### Pediatric Vital Signs/Weight by Age

Age	Weight (kg)	Pulse	Resp	Systolic BP*
<b>Newborn</b>	<b>3</b>	100-180	30-60	60-70
<b>6 mos</b>	<b>7</b>	100-160	30-60	70-80
<b>1 yr</b>	<b>10</b>	100-140	24-40	72-107
<b>2</b>	<b>12</b>	80-130	24-40	74-110
<b>3</b>	<b>15</b>	80-130	24-40	76-113
<b>4</b>	<b>16</b>	80-120	22-34	78-115
<b>5</b>	<b>18</b>	80-120	22-34	80-116
<b>6</b>	<b>20</b>	70-110	18-30	82-117
<b>8</b>	<b>25</b>	70-110	18-30	86-120
<b>10</b>	<b>35</b>	60-100	16-24	90-123
<b>12</b>	<b>40</b>	60-100	16-24	90-127
<b>14</b>	<b>50</b>	60-100	16-24	90-132
<b>15+</b>	<b>55+</b>	60-100	14-20	90-135

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

### Pediatric Assessment Triangle



= STABLE



= SHOCK



= RESPIRATORY  
DISTRESS



= CNS /  
METABOLIC



= RESPIRATORY  
FAILURE



= CARDIO-  
PULMONAR  
Y FAILURE

### Pediatric Mental Status

**A**- Alert

**V**- Responsive to verbal

**P**- Responsive to painful

**U**- Unresponsive

### 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



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*

Use **THE MISFITS mnemonic** for differential diagnosis:  
The differential of shock in a neonate is broad. In a crisis it can be difficult to remember the various H's and T's:

<b>T</b>	Trauma: must consider non-accidental causes
<b>H</b>	Heart and lung: congenital heart disease, apnea, lung infection (meconium, pertussis, respiratory syncytial virus)
<b>E</b>	Endocrine emergencies e.g. congenital adrenal hyperplasia, thyroid (hyper or hypothyroidism)
<b>M</b>	Metabolic disturbance: electrolyte abnormalities due to underlying disorders (hypoglycemia, Na, Ca)
<b>I</b>	Inborn errors of metabolism
<b>S</b>	Sepsis (Group B strep, E Coli more commonly, Listeria)
<b>F</b>	Feeding mishaps: dilutional hyponatremia versus concentrated formula and hypernatremia, free water
<b>I</b>	Intestinal disasters: diaphragmatic hernia, malrotation with volvulus, Hirschsprung's megacolon, necrotizing enterocolitis
<b>T</b>	Toxins: maternal exposure to opiates or other drugs of abuse
<b>S</b>	Seizures: CNS and infectious causes (TORCHES, neonatal HSV)



### OVERVIEW

Frank Lodeserto. Approach to the Critically Ill Child: Shock, Rebel EM, 2018. Available at:

<https://rebelem.com/approach-to-the-critically-ill-child-shock/>

Collection of resources and clinical guidelines for pediatric and neonatal septic shock, Translating Emergency Knowledge for Kids, 2020. Available at:

[https://trekk.ca/search?q=shock&events=events&teams=teams&external\\_resources=external\\_resources](https://trekk.ca/search?q=shock&events=events&teams=teams&external_resources=external_resources)

### VIDEOS & PODCASTS

Tim Horeczko. The Undifferentiated Sick Infant, Pediatric Emergency Playbook, 2015. Available from:

<https://pemplaybook.org/podcast/the-undifferentiated-sick-infant/>

Dustin Jacobson. Approach to Shock, Peds Cases, 2016. Available at:

<https://www.pedscases.com/approach-shock>

Colin Siu. Pediatric Advanced Life Support, Peds Cases, 2016. Available at:

<https://www.pedscases.com/pediatric-advanced-life-support>

Sara Gray. Ep 122 Sepsis and Septic Shock – What Matters from EM Cases Course. Emergency Medicine Cases, 2019. Available at:

<https://emergencymedicinescases.com/sepsis-septic-shock/>

### ALGORITHMS

PALS algorithm. Accessible at:

<https://www.acls-pals-bls.com/algorithms/pals/>

We want to hear how this went for you and thank you for your feedback. Please go online and click on either PARTICIPANT or FACILITATOR survey:

<https://www.acepsim.com/> OR

Use **QR code**: Take out your mobile device, open camera, get QR code in front of camera, a link should pop up, click on that link.



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