SimBox+
Tele SimBox

Pediatric Seizure

EMS

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with links to pages

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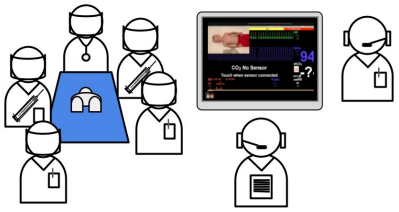
Thank you for your interest in SimBox low-technology learning tools!

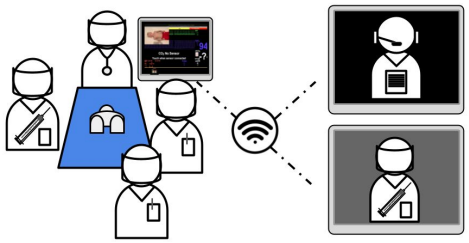
- ❏ Our low-technology simulation series allows your team to engage in the first 10 minutes of an emergency scenario.
- ❏ Use your own equipment and resources in your own clinical environment, or in the convenience of a virtual environment to practice non technical skills.

SimBox Original Version

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



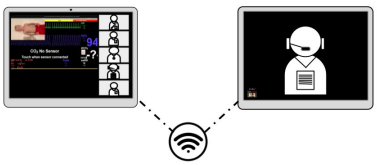
SimBox+ (SimBox Original + tele-facilitator)



- ❏ 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.

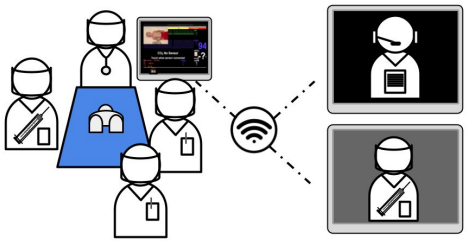
**For additional questions or concerns, arrange a one-on-one tutorial with the project team.

TeleSimBox is a tool meant for you to use as you see fit, based on your own comfort and experience facilitating sims.

The video has a structured, narrated prebrief and debrief and the booklet includes suggested scripts, learning objectives, a prebrief and debrief, case-specific checklists & resources. These can be optional for advanced learners, but are recommended for novice facilitators.

Feel free to run through the video and the facilitator guide prior to the session, and use as many of the resources as you want!

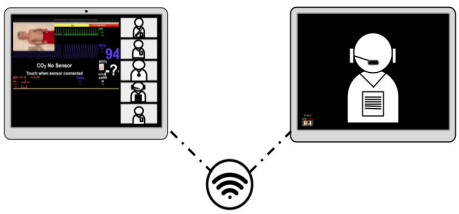
Trial sharing the video prior to the first session.



Use gallery view & ask the participants to name themselves with the assigned role.

Tele-tips

If you use the pre-narrated prebrief and debrief, make sure to make statements and comments to complement the video.



Ask observers to mute the audio and turn off the video for the simulation.

During the simulation, scroll through the monitor video based on the participants' actions.

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 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 seizing pediatric patient with emphasis on the following objectives:

1. Apply Crisis Resource Management and teamwork in the care of a patient with a seizure (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 patient with a seizure.
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
Parent Liaison	Medications	Recorder

10 mins

Stem: You are called to a assess a child who is actively seizing and desaturating.

Your team will focus on the resuscitation of a child in status epilepticus.

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 EMS Pediatric Seizure Video

Video states: "EMS please respond to the scene of an 8 year old boy who is having abnormal movements. His mom says that this has never happened before and that he has not had any recent illness or trauma. It will take approximately two minutes to arrive on scene."

2 minute warning

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

Facilitator states: "You arrive on scene. The scene is safe and you have put on the appropriate PPE. You find an 8 year old boy on this bed who is actively seizing."

Time 0
min 7

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

"Airway is patent. Breath sounds are equal bilaterally, but he is saturating 80% on room air. Pulses are 2+ and CRT is brisk. He is unresponsive with tonic- clonic movements of his arms and legs. Pupils are equal, small and minimally reactive. No obvious injuries or rashes."

1
min 8

HR 140
BP 100/65
RR 20
Sat 80%

- Team notes hypoxia
- Performs airway repositioning maneuvers, suctions any oral secretions, and begins bag-valve-mask ventilation
- Checks temperature and POC glucose
- Tries for IV

"Saturations are improving with airway repositioning and BVM. POC glucose is 120. Working on the IV. Temperature is 36.5 C. Weight is 28 kg."

2
min 10

HR 140
BP 98/65
RR 20
Sat 94%

- Team notes improvement in oxygen saturation with BVM
- Notes normal glucose level and temperature
- Prepares 0.1 mg/kg of IV lorazepam if IV efforts successful
- Prepares PR diazepam or IN/ BC/ IM midazolam as alternative

Case progression: Seizure

SAMPLE history

Signs/Symptoms: Generalized seizure began at home a few minutes prior to EMS arrival, has never done this before. No recent fevers or infectious symptoms.
Allergies/meds: None.
Medical history: Uneventful perinatal and past medical history. Vaccines up to date. No known family history of seizures or neurologic, vascular, hematologic, or biliary diseases. Single child, lives with mom and dad.
Last meal: Usual cereal for breakfast ~2 hrs prior.
Events: No obvious triggering events. No trauma.

"IV successful on 3rd attempt. It has been 5 minutes since you arrived and he is still seizing."

3 min 12

HR 140
BP 100/60
RR 25
Sat 100%
CRT 1 sec

- Team administers 0.1 mg/kg of lorazepam IV
- Team discusses the differential for seizure: primary seizure disorder, vascular emergency (stroke), CNS infection, head injury, toxidrome, metabolic, neoplasm/ mass
- Checks ETCO2 (if not placed already)

"The tonic clonic movements stop and he appears to be more alert and responsive."

4 min 14

HR 140
BP 102/64
RR 20
Sat 100% NRB
CRT 1s

- Team notes that the seizure is slowing down
- Stops BVM and places on 10L 100% O2 via NRB
- Prepares a second dose of 0.1 mg/kg of lorazepam IV to be ready in case the seizure persists
- Discusses the possibility that an advanced airway/ intubation might be needed if the patient does not stop seizing and further doses of benzodiazepine are required

"The seizure has stopped. He is now awake and answering questions. He is maintaining his airway and breathing well on his own."

Advanced learner option: "It has been 5 minutes since the IV lorazepam and he is still seizing. Second dose of IV lorazepam is going in now. The seizure seems to be slowing down but the patient is desaturating, despite BVM." Team performs endotracheal intubation.

Wrap min 16

HR 100
BP 98/60
RR 20
Sat 99% NRB

- Team notes that the seizure has stopped
- Reassesses ABCDE and repeats POC glucose
- Verbalizes the need to transfer to the ED
- Updates the family and addresses any questions and concerns
- Discusses the need for pediatric neurology consult, head imaging, and cEEG
- Hands off to the receiving ED team and prepares to transfer

Video guide

0 min: Seizure starts
7 min: Patient appears
8 min: SpO2 80%, HR 140s
10 min: SpO2 high 90s, HR 140s
16 min: SpO2 100%, HR 100

After team performs handoff, state "This concludes the simulation" and move to debrief.
Link to 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 seizing pediatric patient in the prehospital setting.			
	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 pediatric patient (airway, breathing, circulation).			
	Verbalize the first line diagnostic tests of a seizing patient (monitors, dextrose, electrolytes).			
	Discuss the first line therapeutic interventions of a seizing patient (benzodiazepines).			
	Form a broad differential for status epilepticus in pediatric patients.			
Communication	Demonstrate handoff of care at the end of the case.			

Prebriefing Script

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.

Teaching Content: Seizure

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

PERFORM A SYSTEMATIC ASSESSMENT/ REASSESSMENT OF A SEIZING PATIENT

How does your team perform a systematic assessment of an ill pediatric patient?
PAT Pediatric Assessment Triangle:

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

Airway Breathing Circulation Caveats: Consider pediatric anatomical differences.
ABC vs CAB (in adult patient)
SAMPLE mnemonic: signs/symptoms, allergies, medications, last meal, events preceding

PRIORITIZE EARLY ADMINISTRATION OF APPROPRIATE MANEUVERS AND MEDICATIONS

How did you prioritize the interventions for this seizing patient?
ABCDs, Monitors, AEDs, Access Always reassess - monitor for apnea side effect (of both seizure and AEDs). Call for help.

What is your first priority in this patient? The Airway.
When the breathing was slow and irregular and the patient was hypoxic on 100% NRB, what maneuvers worked? Performing BVM (rate 30-50).

What are ways to give benzodiazepine medication without IV/IO access?
Intranasal, buccal, intramuscular, per rectum.

How did you get access? PALS recommends 3 PIV attempts in 90 secs prior to getting IO. Proximal tibia is preferred location for IO.

DESCRIBE COMMON SEIZURE ACTIVITY IN KIDS AND GENERATE A DIFFERENTIAL DIAGNOSIS FOR A SEIZURE

How do you recognize a seizure in a pediatric patient?

- There are various clinical manifestations including: unresponsiveness, apnea, tremulousness, tonic-clonic activity, fixed eye deviation, etc.

What mnemonic is useful in remembering seizure etiologies?

- VITAMINS: Vascular, Infection, Cerebral malaria, Trauma/Toxicology, Autoimmune, Metabolic, Idiopathic, Neoplasm, Syndromes

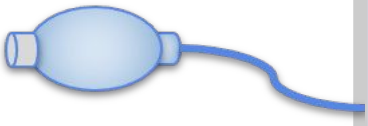
DEMONSTRATE FAMILY CENTERED CARE INTERACTIONS

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

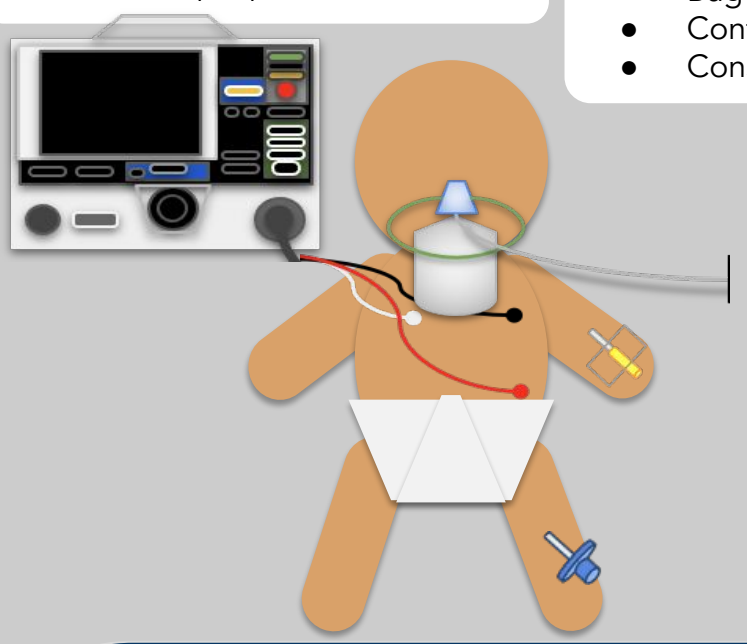
- A large body of literature supports family presence. This does not lead to increased malpractice.
- A social worker or other provider should be assigned to stay with the family through this difficult time.

ABCDE's
- Airway
- Breathing
- Circulation
- Disability/Dextrose
- (Anti)Epileptic drugs

Airway Management
- Jaw thrust, Chin lift, Shoulder roll
- Suction PRN
- Accessories: NP/OP airway



Assist breathing
- Bag mask ventilation (BVM)
- Continuous positive airway pressure(CPAP)
- Consider definitive airway



PEDIATRIC STATUS EPILEPTICUS

5 min	1st medication: Benzodiazepine
IV/IO	Lorazepam 0.1 mg/kg (max 4 mg)
IM IN/ BUC PR	Midazolam 0.2 mg/kg IM (max 10 mg) Midazolam 0.3 mg/kg IN/ BUC (max 10 mg) Diazepam 0.5 mg/kg PR (max 20 mg)
10 min	2nd medication: Benzodiazepine (as above)
>15 min	3rd medication
IV/IO	Levetiracetam 60 mg/kg or Fosphenytoin 20 PE mg/kg or Valproate 40 mg/kg

SimBox 3.0

VITAMINS

Seizure Etiology

V VASCULAR
Stroke, post stroke, AV malformations

I INFECTION
Meningoencephalitis, Lyme disease, TB meningitis, brain abscess, HIV related, cerebral malaria

T TRAUMA / TOXICOLOGY
Non-accidental trauma, brain injury (hemorrhage), toxicologic (prescription and non-prescription, recreational drugs, opioid withdrawal)

A AUTOIMMUNE
SLE, CNS vasculitis

M METABOLIC
Hepatic encephalopathy, uremia, hypoglycemia, low Na, Ca, Mg, porphyria

I IDIOPATHIC
Epilepsy

N NEOPLASM
Primary or secondary brain tumor

S SYNDROMES
Tuberous sclerosis, Down syndrome, Sturge Weber syndrome, Von Hipple Lindau syndrome, other neurodevelopmental syndromes

ELIZABETH SANSEAU MD, MAYBELLE KOU MD, ILENE CLAUDIUS MD

COMMONS.WIKIMEDIA.ORG/WIKI/FILE:VITAMIN_B12_CAPSULE.JPG

Consider Nonconvulsive status epilepticus NCSE if prolonged "seizure" or postictal period

PEDIATRIC SEIZURES

MANAGING CONVULSIVE STATUS EPILEPTICUS

Defined as:

1) Seizure >5 min and/or ongoing seizure upon arrival to ED
2) 2+ seizures without full recovery of consciousness between them

ETIOLOGY

Vascular: stroke, AV malformation
Infection: meningitis, Lyme, TB, brain abscess, HIV-related
Trauma: hemorrhage, toxicologic
Autoimmune: SLE, CNS vasculitis
Metabolic: hypoglycemia, low Na|Ca|Mg encephalopathy
Idiopathic
Neoplasm
Syndromes: Tuberous sclerosis, Rhetts, Sturge Weber, VHL

SYMPTOMS

Convulsions

Incontinence (urine or stool)

Clenched Teeth

Irregular breathing or apnea

Trouble Speaking

Staring or eye rolling

OPTIMIZING THE PEDIATRIC AIRWAY

Airway Differences: Short, anterior airway, large tongue and epiglottis, prominent occiput.
Neonatal seizures are non focal: watch for lipsmacking or blinking

Position Head

Jaw Thrust

Use index/middle fingers to push back of jaw up, thumbs on chin

Shoulder Roll

Use rolled towel under shoulders to achieve neutral neck

Chin LIft

Use two fingers under chin to lift

Suction

Suction secretions from nose and oral cavity

Assist Breathing

1) Airway adjuncts: NP/OP
2) Bag Mask Assist if RR <20
4) Consider supraglottic device or tracheal intubation if apneic and unconscious

EMERGENCY MANAGEMENT

5 min

IV Access

- Lorazepam (0.1 mg/kg) over 2 min **OR**
- Midazolam (0.1 mg/kg)
- Diazepam (0.2 mg/kg)

No IV Access

- Midazolam **IM** (0.15 mg/kg) **OR**
- Intranasal / Buccal Midazolam (0.2 mg/kg) (0.5 mg/kg)
- Rectal Diazepam (0.5 mg/kg)

10 min

Repeat Benzodiazepine

- Obtain intraossesous (IO) access if failed IV attempts x2
- Prepare second line agent

15 min

Administer 2nd line agent

- **Fosphenytoin 20 mg/kg IV/IO over 10 min OR**
- **Levetiracetam 20-60 mg/kg IV/IO over 15 min OR**
- Phenytoin 20 mg/kg IV/IO over 20 min OR
- Phenobarbital 20 mg/kg IV/IO over 20 min

30 min

Administer alternative 2nd line agent

e.g. if fosphenytoin used, give levetiracetam or phenobarbital.

- Consider 3rd line agent

TESTING

- Perform STAT blood glucose and electrolytes. Consider sepsis workup if febrile.
- Treat hypoglycemia/hyponatremia/hypocalcemia
- Consider neuroimaging if first time seizure with prolonged post-ictal period, R/O NAT

ANTIEPILEPTIC MEDICATIONS

FIRST LINE

Benzodiazepines

Bind inhibitory GABA(A) receptor to facilitate GABA attachment

SECOND LINE

Levetiracetam

may bind synaptic vesicle protein SV2A that alters vesicle fusion; indirectly modulates GABA

Phenytoin
Fosphenytoin

blocks voltage-dependent neuronal sodium channels; watch PR interval

Phenobarbital

bind GABA(A) receptor, extending duration of GABA-mediated chloride channel opening

Please refer to your insititutional seizure algorithm for further direction*

SOURCES: https://trekk.ca/system/assets/assets/attachments/453/original/2020-03-09_SE_algorithm_v_3.0.PDF?1583872609
UpToDate: https://tinyurl.com/yb8uqj8q

SimBox Educational Media 2020 Infographic: Elizabeth Sanseau MD, Keyuree Satam MS4 @DrM_Kou

COMPONENTS OF EFFECTIVE TEAMS: TEAMSTEPPS IN A NUTSHELL

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

COMMUNICATION

SBAR
Situation
Background
Assessment
Recommendation

CALL OUT
Sharing critical information with the team

CHECK BACK
Loop Closure**

HANDOFF
I PASS the BATON

Introduction

Patient
Assessment
Situation
Safety Concern

Background
Actions
Timing
Ownership
Next

Cognitive Aid @DrM_Kou

LEADERSHIP

BRIEF
Planning, setting the tone

HUDDLE
Ad-hoc planning or updates

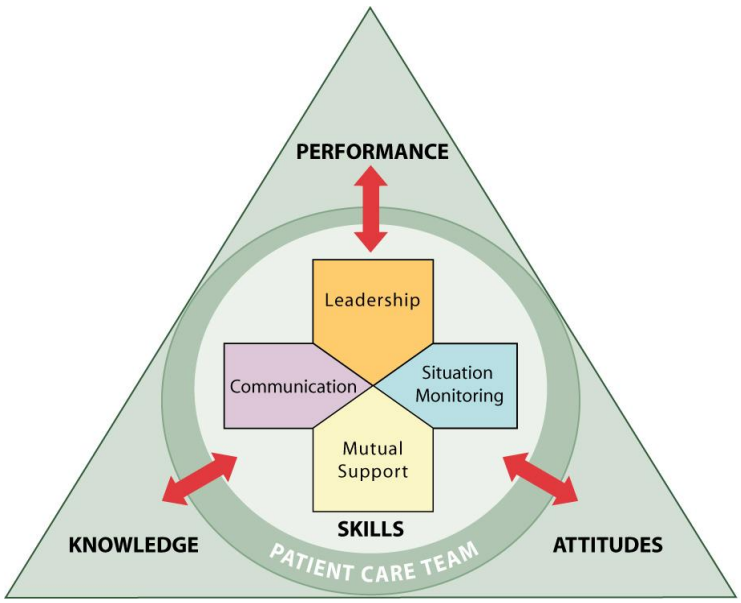
DEBRIEF
Exchange of information to inform team of performance and effectiveness

SITUATION MONITORING

STEP
Status of pt
Team Members
Environment
Progress toward goal

"I'M SAFE"
Tool for self evaluation
Illness
Medication

Stress
Alcohol/Drugs
Fatigue
Eating + Elimination



MUTUAL SUPPORT

TASK ASSISTANCE
Awareness of team work load

FEEDBACK
Providing information for purpose of team improvement

ADVOCACY & ASSERTION
Advocating for patient in case of a disagreement with decision maker

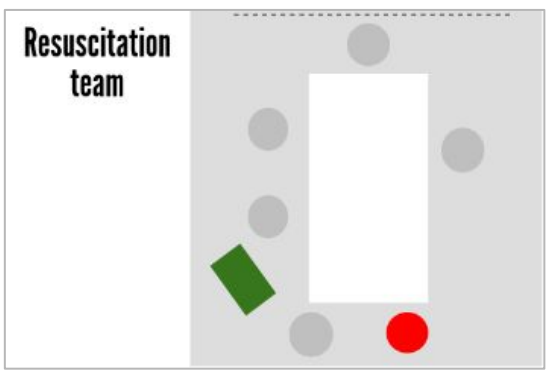
2 CHALLENGE RULE
Information conflict regarding patient safety

DESC Script
*Tool for personal conflict**
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.

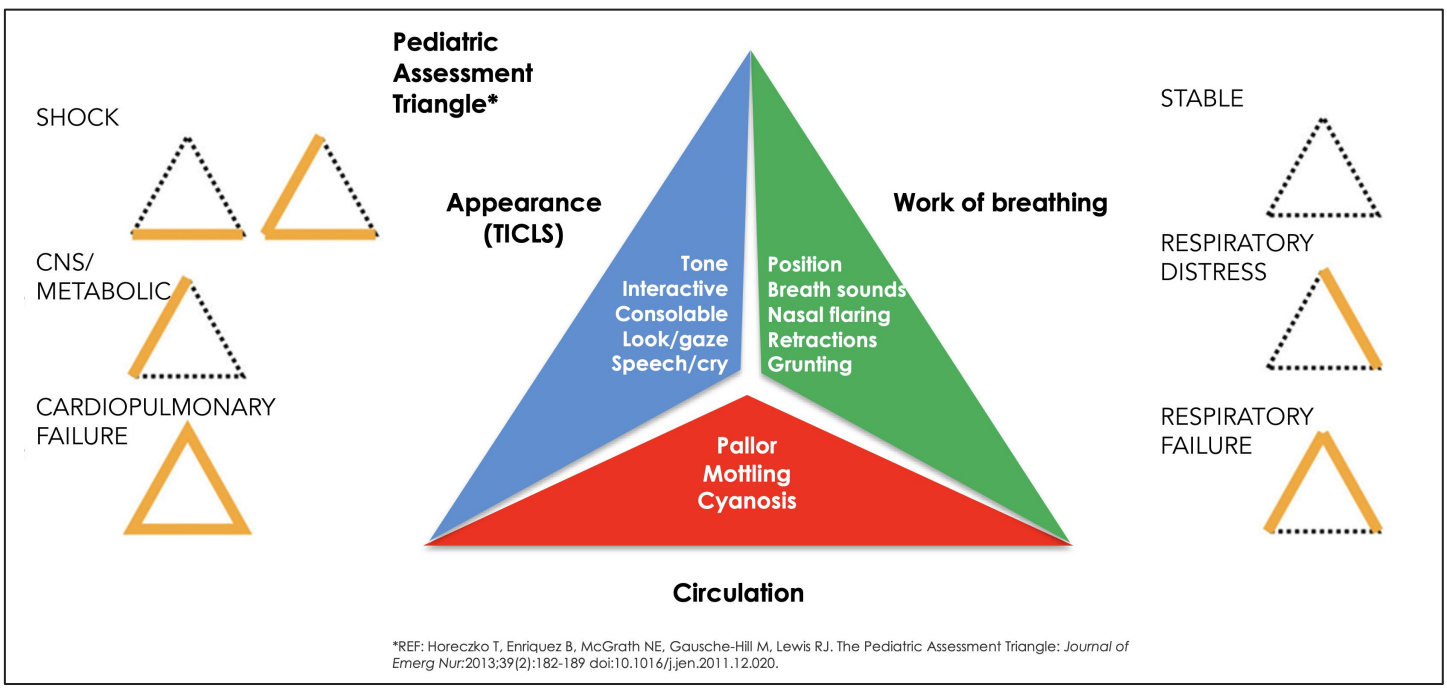
A shared mental model allows a team to anticipate the plan for patient care and what equipment or medications might be needed.

Pediatric Vital Signs/Weight by Age

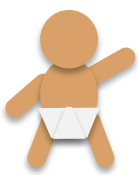
Age	Weight (kg)	Pulse	Resp	Systolic BP*
Newborn	3	100-180	30-60	60-70
6 mos	7	100-160	30-60	70-80
1 yr	10	100-140	24-40	72-107
2	12	80-130	24-40	74-110
3	15	80-130	24-40	76-113
4	16	80-120	22-34	78-115
5	18	80-120	22-34	80-116
6	20	70-110	18-30	82-117
8	25	70-110	18-30	86-120
10	35	60-100	16-24	90-123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



*REF: Horeczko T, Enriquez B, McGrath NE, Gausche-Hill M, Lewis RJ. The Pediatric Assessment Triangle: *Journal of Emerg Nur*:2013;39(2):182-189 doi:10.1016/j.jen.2011.12.020.



Pediatric Mental Status Assessment: response to stimuli

A	V	P	U
Alert	Verbal	Pain	Unresponsive

OVERVIEW

Ben Lawton. The First Afebrile Seizure, Don't Forget the Bubbles, 2014. Available at: The First Afebrile Seizure - Don't Forget the Bubbles

Thanos Konstantinidis. Febrile seizures, Don't Forget the Bubbles, 2014. Available at: Febrile seizures - Don't Forget the Bubbles

Dalziel, Stuart R., et al. "Levetiracetam versus phenytoin for second-line treatment of convulsive status epilepticus in children (ConSEPT): an open-label, multicentre, randomised controlled trial." *The Lancet* 393.10186 (2019): 2135-2145.

VIDEOS & PODCASTS

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ALGORITHMS

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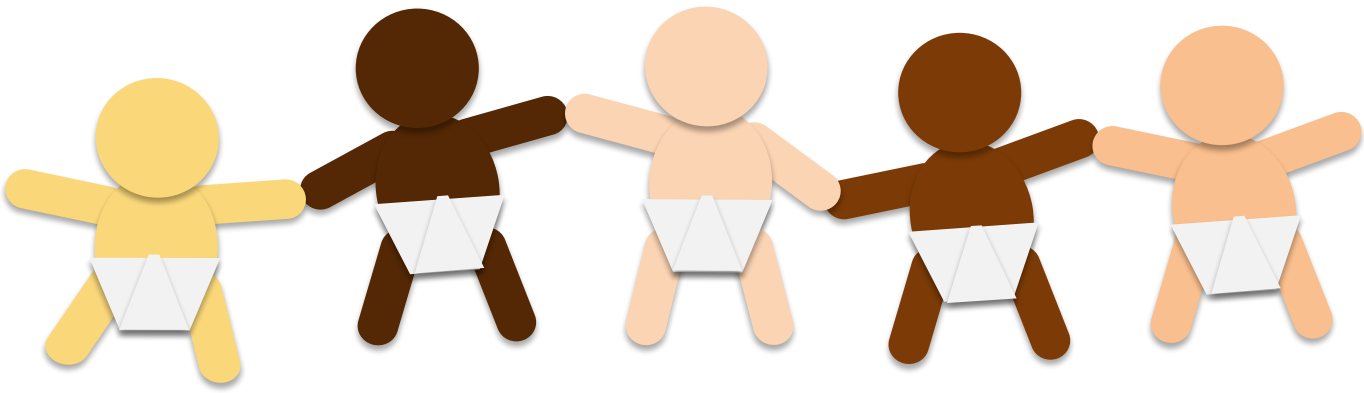
Thank you for participating! We would love to hear your feedback:

Participant Survey:

Or simply click this link for the participant's survey



Thank you for participating! We would love to hear your feedback!

We recommend printing the Participant Survey and completing the Facilitator Survey at the end of each session.

Facilitator Survey:

Or simply click this link for the facilitator's survey

Posted: May 2020
Revised: Feb 2022
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