HIGHLIGHTS

of the 2020 AMERICAN HEART ASSOCIATION

GUIDELINES FOR CPR AND ECC

Heart & Stroke Foundation of Canada Edition

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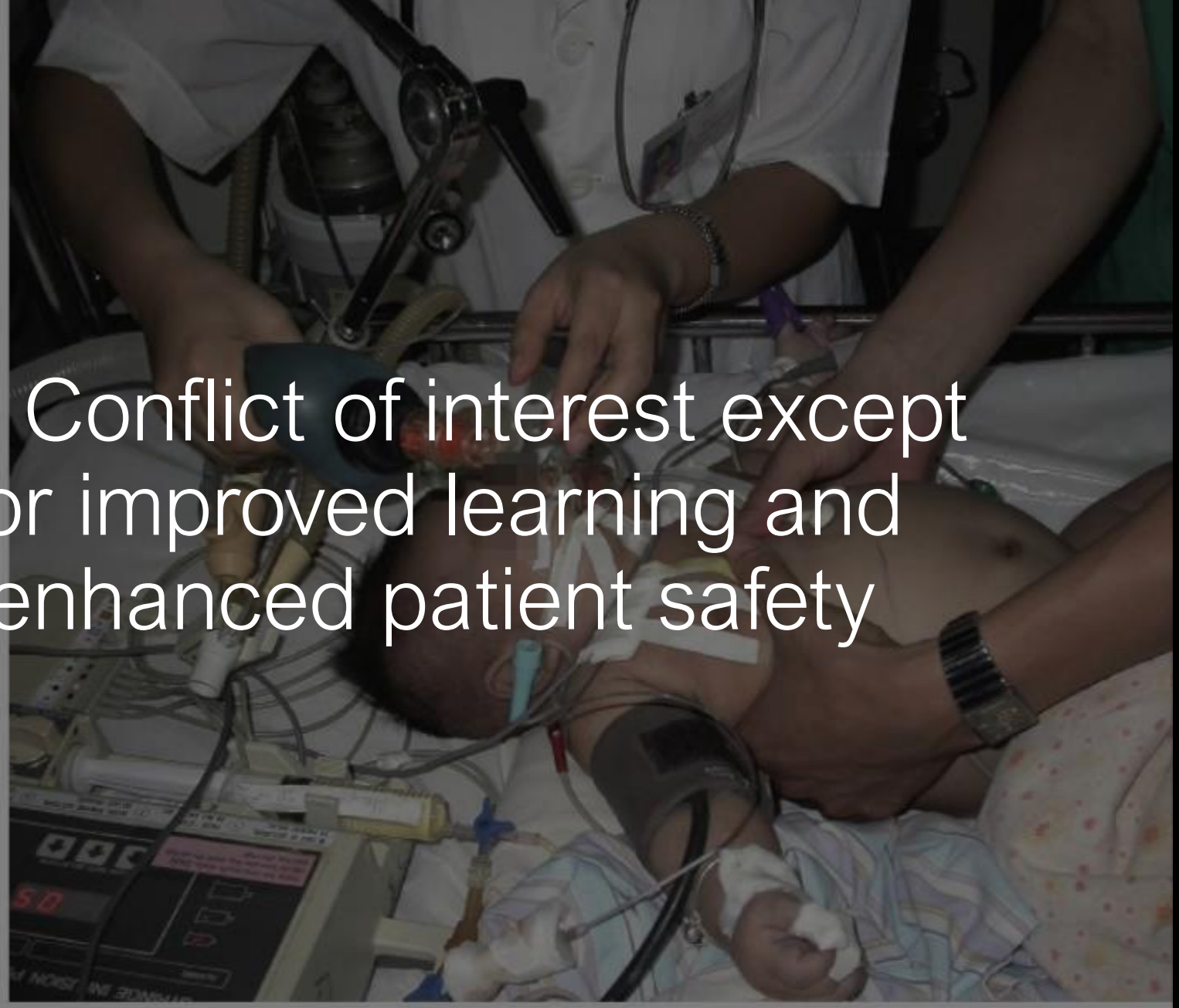

No Conflict of interest except for improved learning and enhanced patient safety

Figure 1.2 Advanced paediatric life support (APLS) in action

Objective

To describe and discuss the PALS 2020 updates

To discuss the rationale for changes

To describe the applicability of Education of science in clinical settings

Background

More than 20 000 infants and children have a cardiac arrest each year in the United States

IHCA vs OHCA

Single recommendation document for PBLS and CPR for PALS in 2020 Guidelines.

Major Updates

- Chain of Survival
- Airway
- Epinephrine
- Chest compression
- Shock management update
- Opioid
- Post arrest care
- Visual aids –algorithms

Major Updates

Chain of Survival
Airway
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Chest compression
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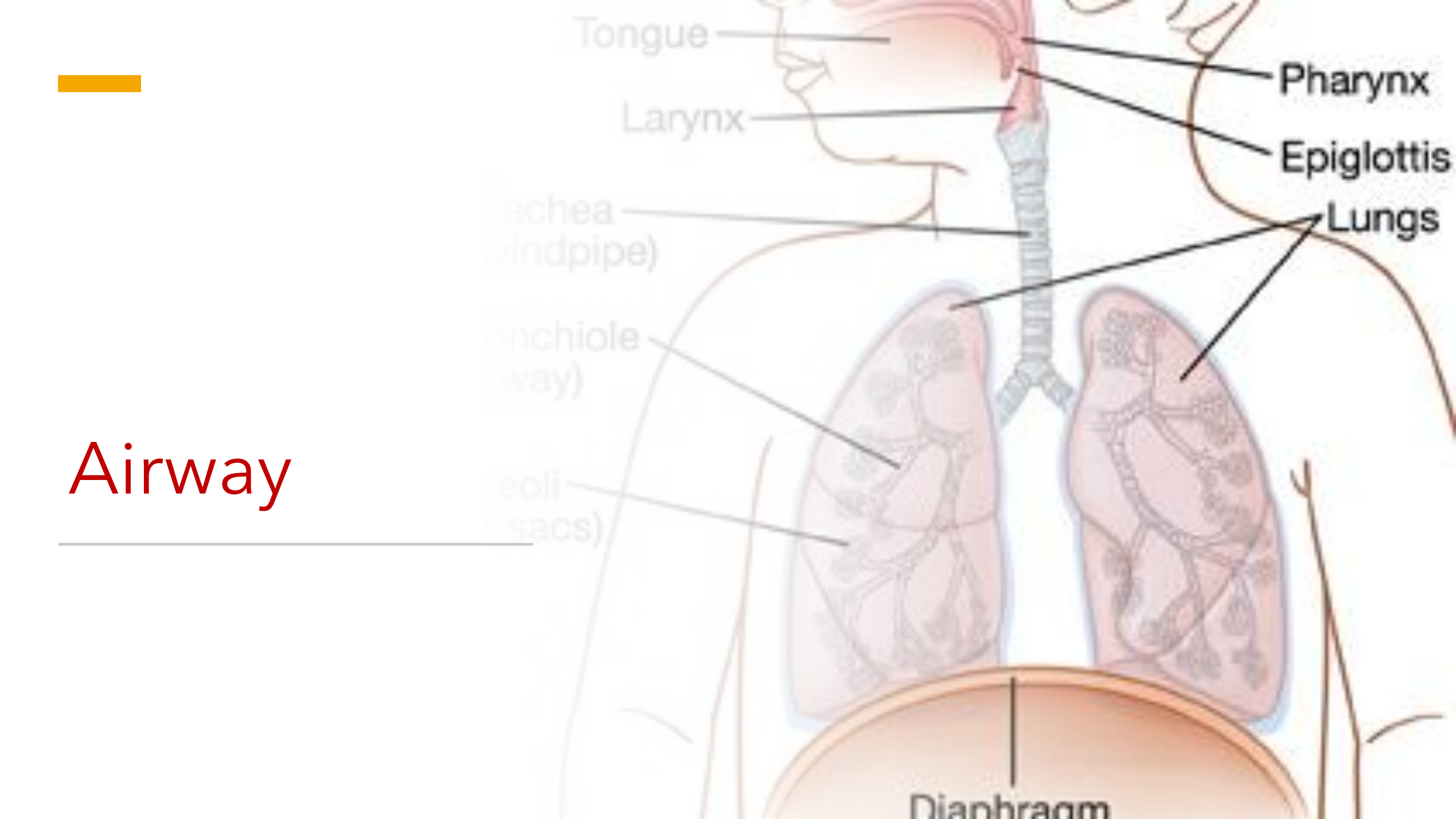
ure 10. AHA Chains of Survival for pediatric IHCA and OHCA.

Airway



Case 1: 9 mo with Fever + URTI +Unwell

9 mo baby with pulse but absent or inadequate respiratory efforts. You decided to give rescue breaths

The rate of rescue breaths are :

- 1 breath every 3-5 sec @ of 12-20 breaths/ min
- 1 breath every 2-3 sec @ 20-30 breaths / min
- 1 breath every 5-7 sec @ 8-10 breaths / min
- 1 breath every 1-2 sec @ 30-35 breaths / min

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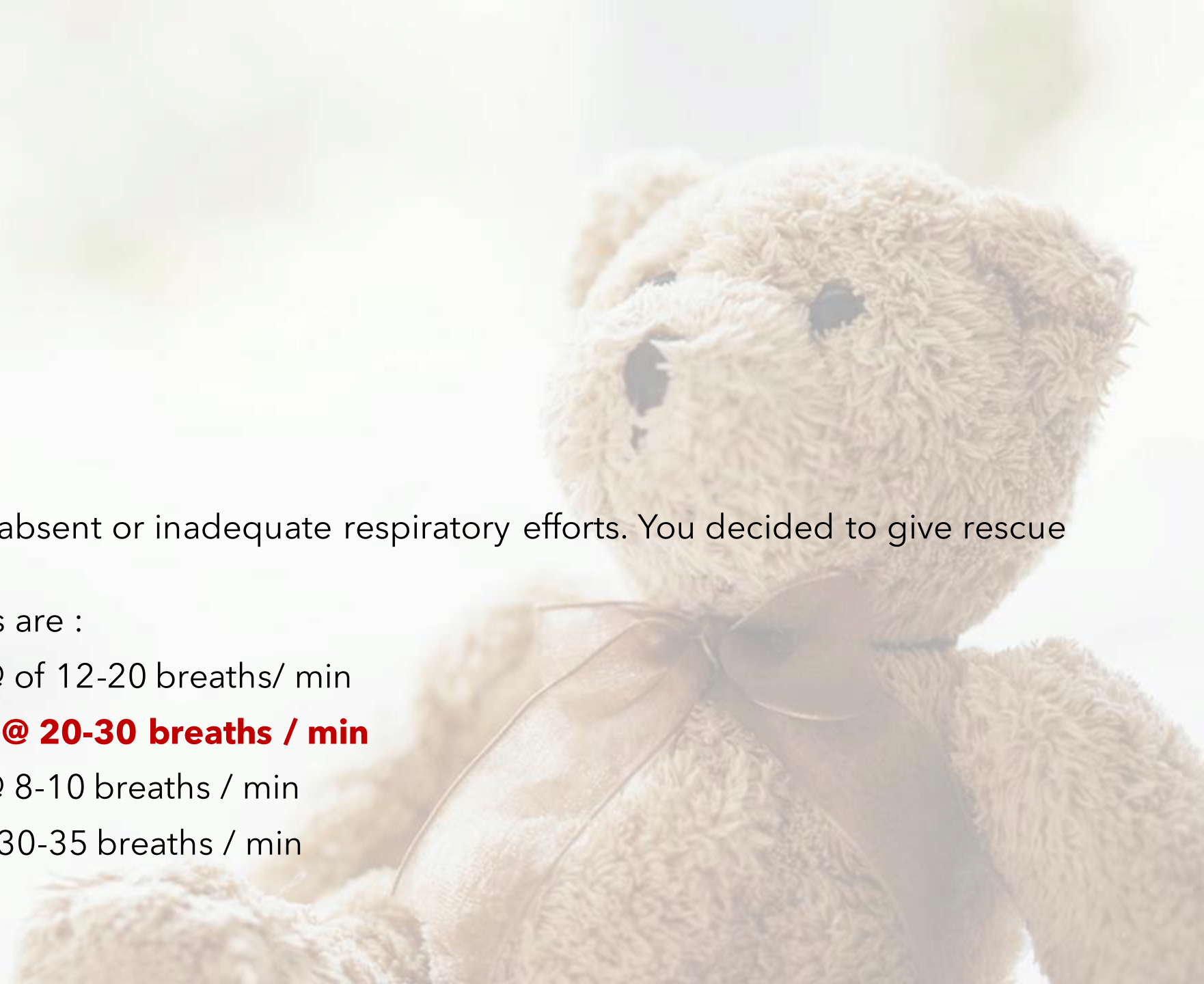
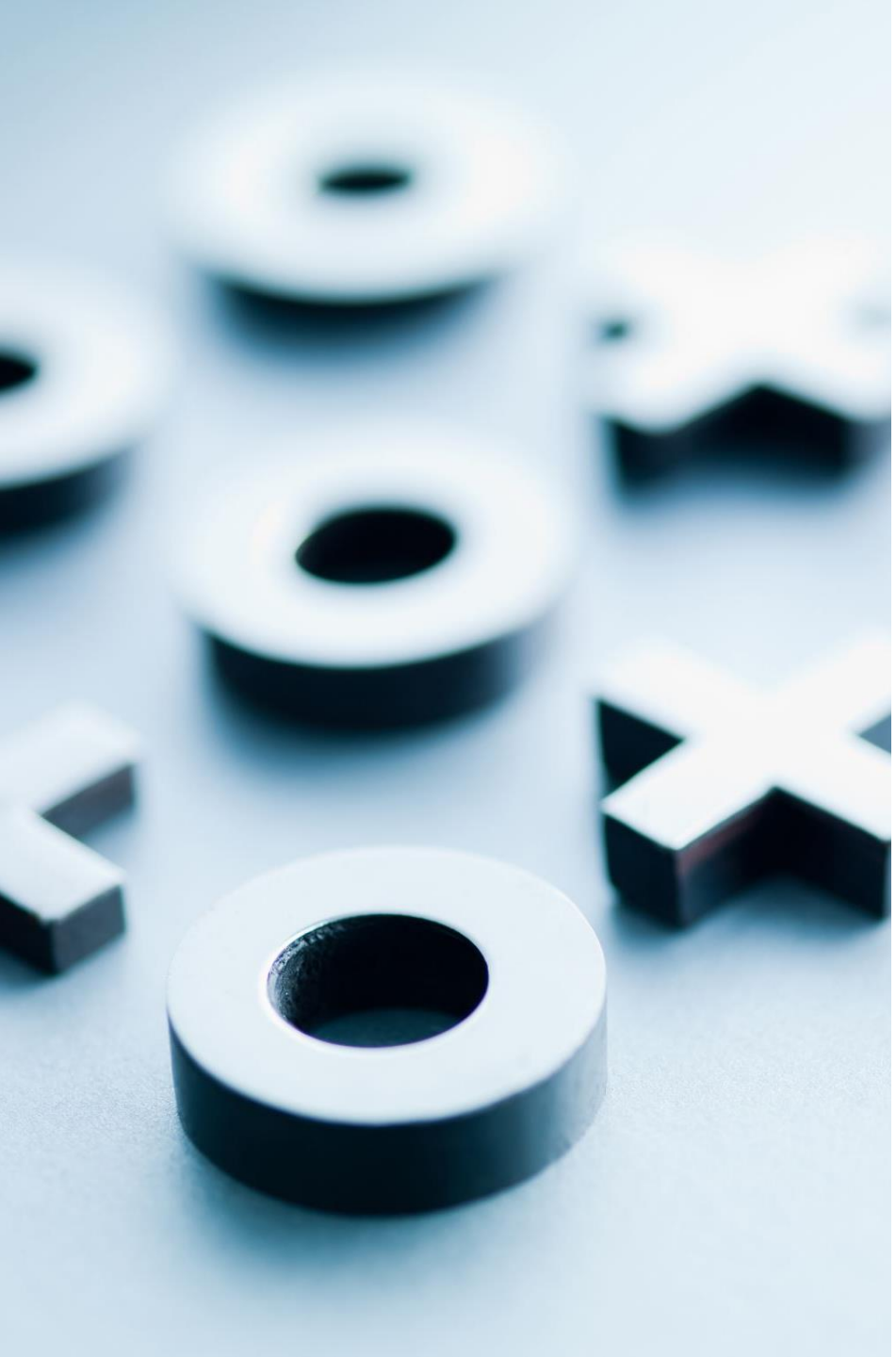


Changes to the Assisted Ventilation Rate: Rescue Breathing

2020 (Updated): (PBLS) For infants and children with a pulse but absent or inadequate respiratory effort, it is reasonable to give 1 breath every 2 to 3 seconds (20-30 breaths/min).

2010 (Old): (PBLS) If there is a palpable pulse 60/min or greater but there is inadequate breathing, give rescue breaths at a rate of about 12 to 20/min (1 breath every 3-5 seconds) until spontaneous breathing resumes.

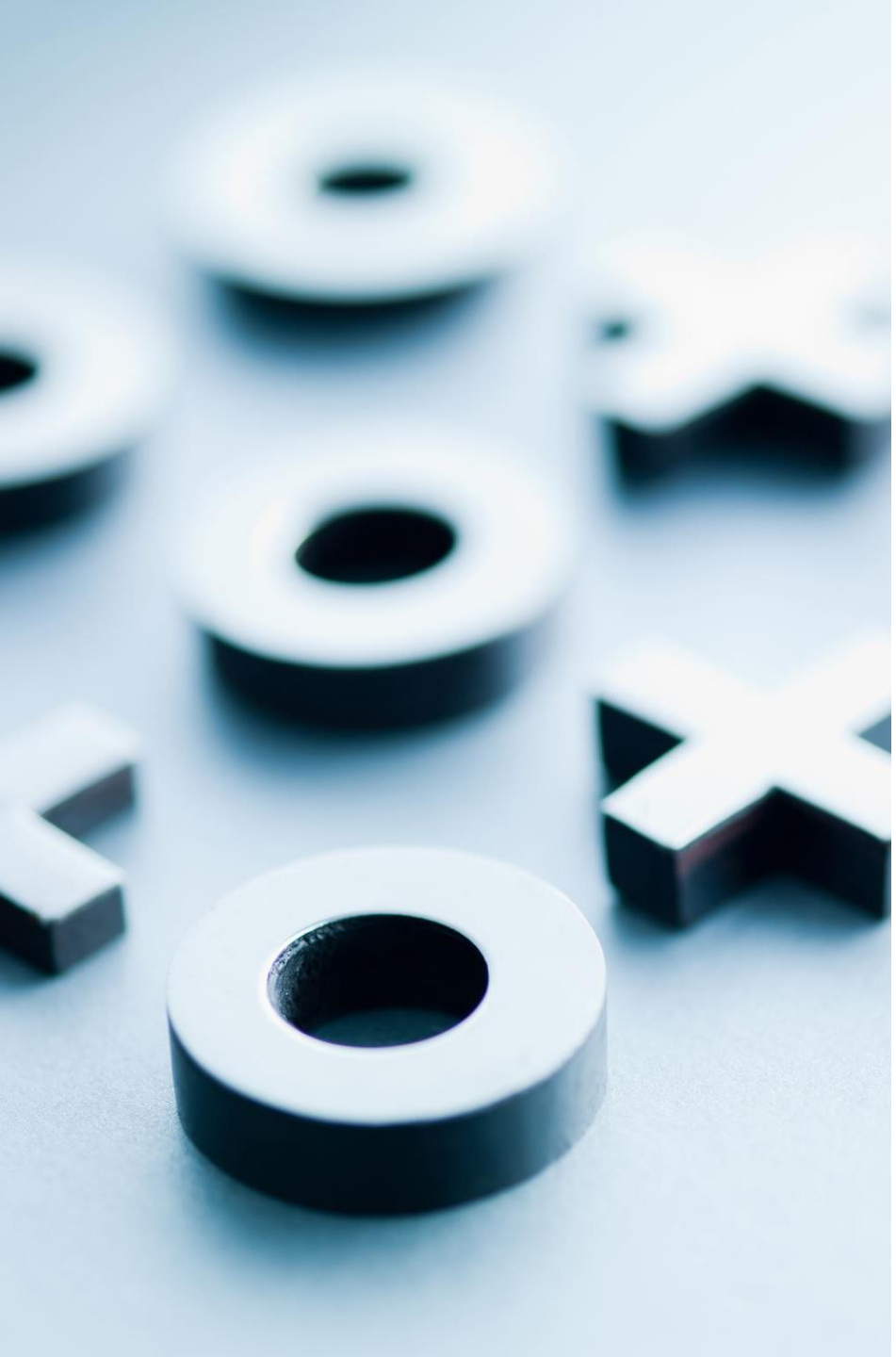
The causes of cardiac arrest in infants and children differ from cardiac arrest in adults, and a growing body of pediatric-specific evidence supports these recommendations.



Case progression

You have intubated the baby. The rate of breathing would be:

- 1 breath every 3-5 sec @ of 12-20 breaths/ min
- 1 breath every 2-3 sec @ 20-30 breaths / min
- 1 breath every 5-6 sec @ 8-10 breaths / min
- 1 breath every 1-2 sec @ 30-35 breaths / min



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- 1 breath every 1-2 sec @ 30-35 breaths / min

Changes to the Assisted Ventilation Rate: Ventilation Rate During CPR With an Advanced Airway

2020 (Updated): (PALS) When performing CPR in infants and children with an advanced airway, it may be reasonable to target a respiratory rate range of 1 breath every 2 to 3 seconds (20-30/min), accounting for age and clinical condition. Rates exceeding these recommendations may compromise hemodynamics.

2010 (Old): (PALS) If the infant or child is intubated, ventilate at a rate of about 1 breath every 6 seconds (10/min) without interrupting chest compressions.

- New data suggested that higher ventilation rates that is
  - 30 breaths / min < 1 year
  - 25 breaths / min in older
- Associated with improved ROSC and survival in IHCA

The baby become apneic, and you decide to intubate

Which tube will you select?

- Cuffed ET tube
- Uncuffed ET tube

The baby become apneic, and you decide to intubate

Which tube will you select?

- **Cuffed ET tube**
- Uncuffed ET tube

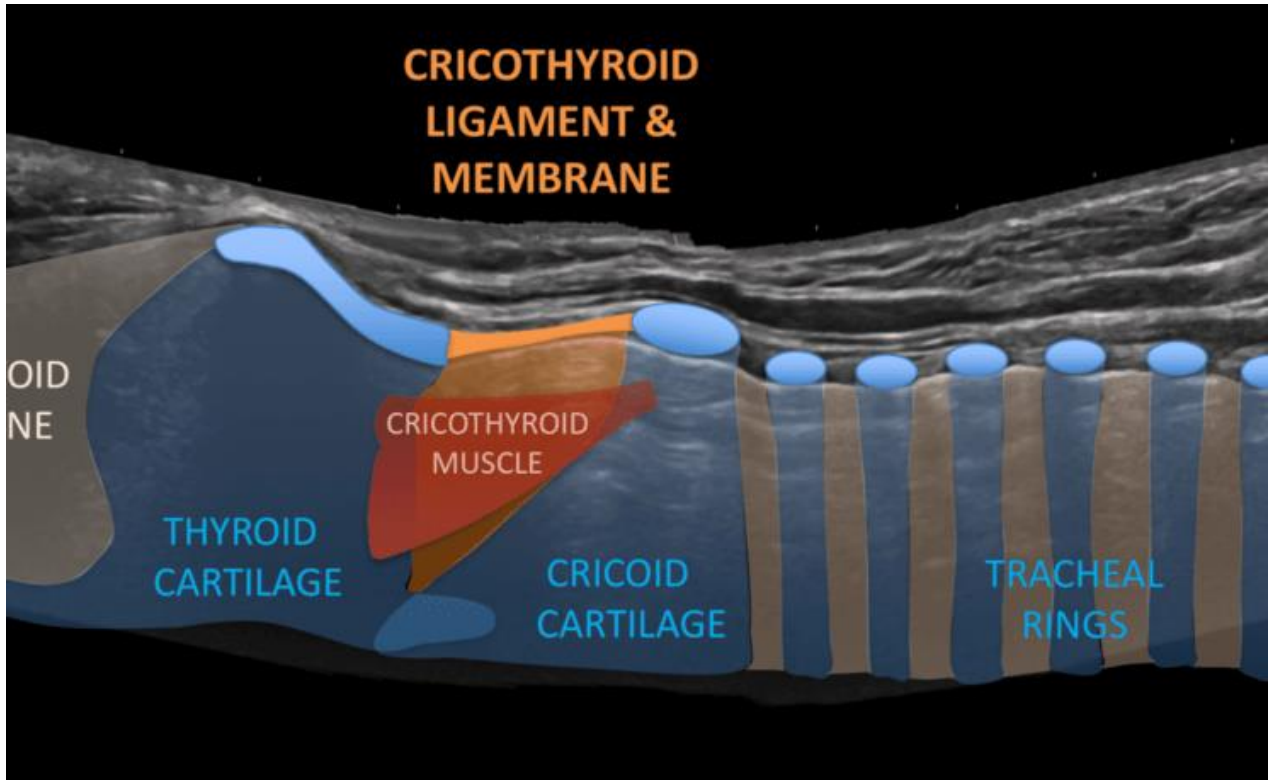
Cuffed ETTs

2020 (Updated): It is reasonable to choose cuffed ETTs over uncuffed ETTs for intubating infants and children. When a cuffed ETT is used, attention should be paid to ETT size, position, and cuff inflation pressure (usually <20-25 cm H_2O).

2010 (Old): Both cuffed and uncuffed ETTs are acceptable for intubating infants and children. In certain circumstances (eg, poor lung compliance, high airway resistance, or a large glottic air leak) a cuffed ETT may be preferable to an uncuffed tube, provided that attention is paid to [ensuring appropriate] ETT size, position, and cuff inflation pressure.

- Cuffed ET is :
  - Safe
  - Dec need of tube change
  - Dec rate of reintubation
  - Dec the risk of aspiration
- The rate of subglottic stenosis is rare with cuffed ETT with careful technique

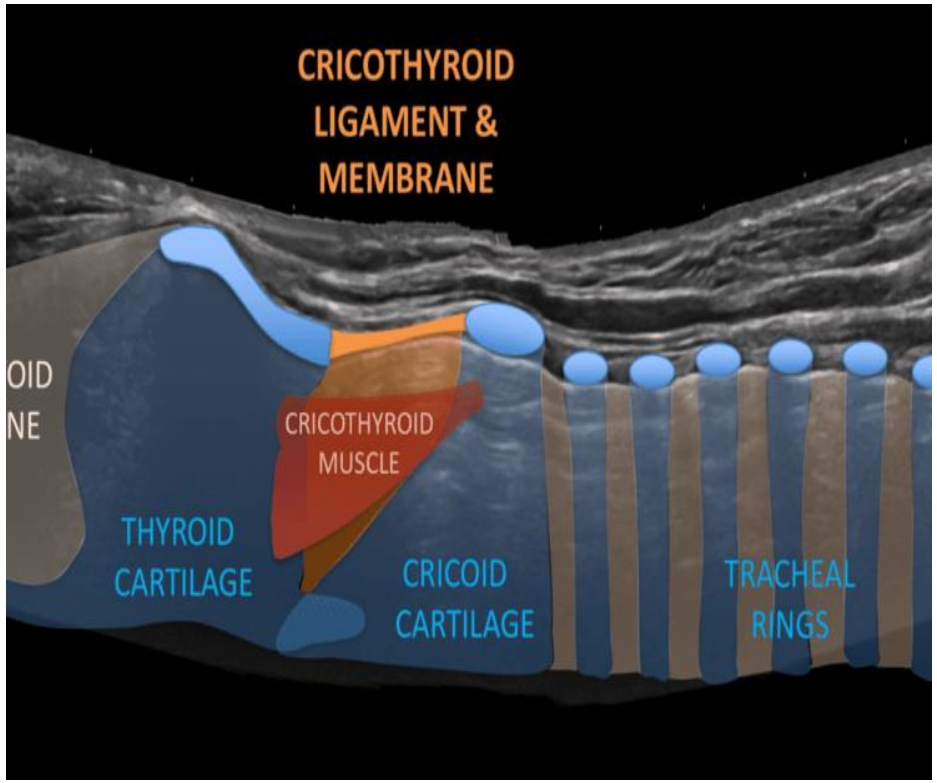
Your colleague advised for Cricoid pressure:



What would you do?

- Apply the cricoid pressure
- Not recommended as routine

Your colleague advised for Cricoid pressure:



What would you do?

- Apply the cricoid pressure
- **Not recommended as routine**

Cricoid Pressure During Intubation

2020 (Updated): Routine use of cricoid pressure is not recommended during endotracheal intubation of pediatric patients.

2010 (Old): There is insufficient evidence to recommend routine application of cricoid pressure to prevent aspiration during endotracheal intubation in children.

- Routine use of Cricoid pressure is associated with :
  - Dec intubation success rate
  - Does not reduce the rate of regurgitation

While ETT intubation was being done, the baby went to cardiac arrest, CPR was started: Epinephrine ordered?

What is the 2020 recommendations about the time at which it should be administered?

- 3-5 min
- Within 5 min
- After 5 min

While ETT intubation was being done, the baby went to PEA, CPR was started: Epinephrine ordered?

What is the 2020 recommendations about the time at which it should be administered?

- 3-5 min
- **Early within 5 min**
- After 5 min

Emphasis on Early Epinephrine Administration

2020 (Updated): For pediatric patients in any setting, it is reasonable to administer the initial dose of epinephrine within 5 minutes from the start of chest compressions.

2015 (Old): It is reasonable to administer epinephrine in pediatric cardiac arrest.

- For Every min of delay in administration of epi is associated with :
  - Dec in ROSC
  - Dec survival at 24 hrs
  - Dec survival to DC
  - Dec Survival with Favorable neurological outcome

Case progression

Baby has a ROSC

Admitted to PICU

Major Updates

- Chain of Survival
- Airway
- Epinephrine
- Chest compression
- Shock management update
- Opioid
- Post arrest care
- Visual aids –algorithms

5 Components of high-quality CPR

- Adequate chest compression depth,
- Optimal chest compression rate,
- Minimizing interruptions in CPR (ie, maximizing chest compression fraction or the proportion of time that chest compressions are provided for cardiac arrest),
- Allowing full chest recoil between compressions, and
- Avoiding excessive ventilation

Surface during CPR

Firm surface should be used

Meta-analysis of 6 studies showed a 3-mm (95% CI 1–4 mm) improvement in chest compression depth associated with backboard use when CPR was performed on a manikin placed on a mattress or bed.

Energy Dose

Initial dose of 2–4 J/kg of monophasic or biphasic energy for defibrillation, but, for ease of teaching, an initial dose of 2 J/kg may be considered

For refractory VF, increase the defibrillation dose to 4 J/kg

For subsequent energy levels, a dose of 4 J/kg may be reasonable, and higher energy levels may be considered, though not to exceed 10 J/kg or the adult maximum dose

Other recommendations

If arterial line in place than continuous measurement of arterial BP may improve CPR quality

After ROSC , seizure evaluation and Rx should be considered if indicated

Major Updates

- Chain of Survival
- Airway
- Epinephrine
- Chest compression
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Case 2

- 2 yo baby with fever, vomiting and looking lethargic. HR 180/ min, RR 28/ min, Temp 39C, BP 80/55, CRT 3-4 sec. You decided to give fluid bolus.
- 20 ml / kg
- 10 ml / kg
- 5 ml / kg

Case 2

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- 20 ml / kg
- **10 ml / kg**
- 5 ml / kg

Septic Shock

Fluid Boluses

2020 (Updated): In patients with septic shock, it is reasonable to administer fluid in 10 mL/kg or 20 mL/kg aliquots with frequent reassessment.

2015 (Old): Administration of an initial fluid bolus of 20 mL/kg to infants and children with shock is reasonable, including those with conditions such as severe sepsis, severe malaria, and dengue.

2 randomized trials of patients with septic shock, with those who received higher fluid volumes or faster fluid resuscitation were more likely to develop :

- clinically significant fluid overload characterized by increased rates of mechanical ventilation and worsening oxygenation

Baby remain tachycardic with poor perfusion. You decided to start Inotrope. What would you choose?

- Epinephrine
- Norepinephrine
- Dopamine
- Dobutamine

Baby remain tachycardic with poor perfusion. You decided to start Inotrope. What would you choose

- **Epinephrine**
- **Norepinephrine**
- Dopamine
- Dobutamine

Choice of Vasopressor

2020 (New): In infants and children with fluid-refractory septic shock, it is reasonable to use either epinephrine or norepinephrine as an initial vasoactive infusion.

2020 (New): In infants and children with fluid-refractory septic shock, if epinephrine or norepinephrine are unavailable, dopamine may be considered.

Two randomized controlled trials comparing escalating doses of dopamine or epinephrine demonstrated:

- improvement in timing of resolution of shock and
- 28-day mortality with the use of epinephrine over dopamine

In situation where epi and norepi is not available than dopamine is a reasonable alternative

The baby remains the same. The nurse asked about giving steroids. Do you order it?

Yes

No

The baby remains the same. The nurse asked about giving steroids. Do you order it ?

- **Yes**
- No

Corticosteroid Administration

2020 (New): For infants and children with septic shock unresponsive to fluids and requiring vasoactive support, it may be reasonable to consider stress-dose corticosteroids.

For Hypovolemic or shock giving steroid is reasonable as shown to

- Shorten the time to reversal of shock
- Esp in pts at risk of adrenal insufficiency like chronic steroid use , patients with purpura fulminans

Cardiogenic Shock

- Early expert consultation
- More appropriate to start epinephrine as initial Vasopressor
- Early consideration of ECLS for myocarditis
- If arrythmias like heart block , ST-segment changes than at higher risk of cardiac arrest

Traumatic Hemorrhagic Shock

- Among infants and children with hypotensive hemorrhagic shock following trauma, it is reasonable to administer blood products, when available, instead of crystalloid for ongoing volume resuscitation

Major Updates

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Opioid overdose arrest

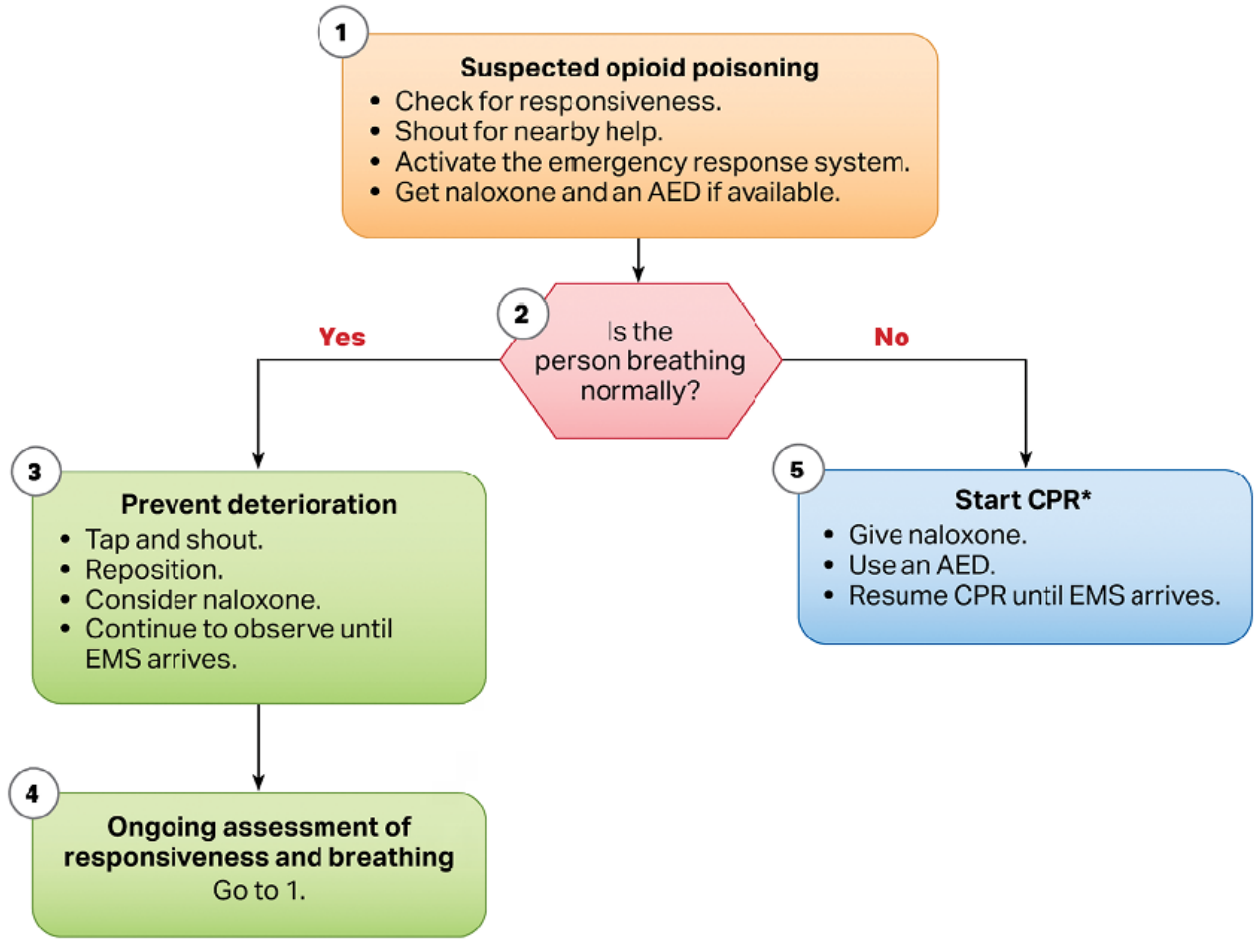
Continue providing airway support

CPR is priority

No improvement / benefit on administering naloxone in arrest for survival so focus should be airway and CPR

If resources allows that concomitant administration of Naloxone can be considered

Opioid-Associated Emergency for Lay Responders Algorithm



*For adult and adolescent victims, responders should perform compressions and rescue breaths for opioid-associated emergencies if they are trained and perform Hands-Only CPR if not trained to perform rescue breaths. For infants and children, CPR should include compressions with rescue breaths.

Figure 10. Opioid-Associated Emergency for Lay Responders Algorithm.
AED indicates automated external defibrillator; CPR, cardiopulmonary resuscitation; and EMS, emergency medical services.

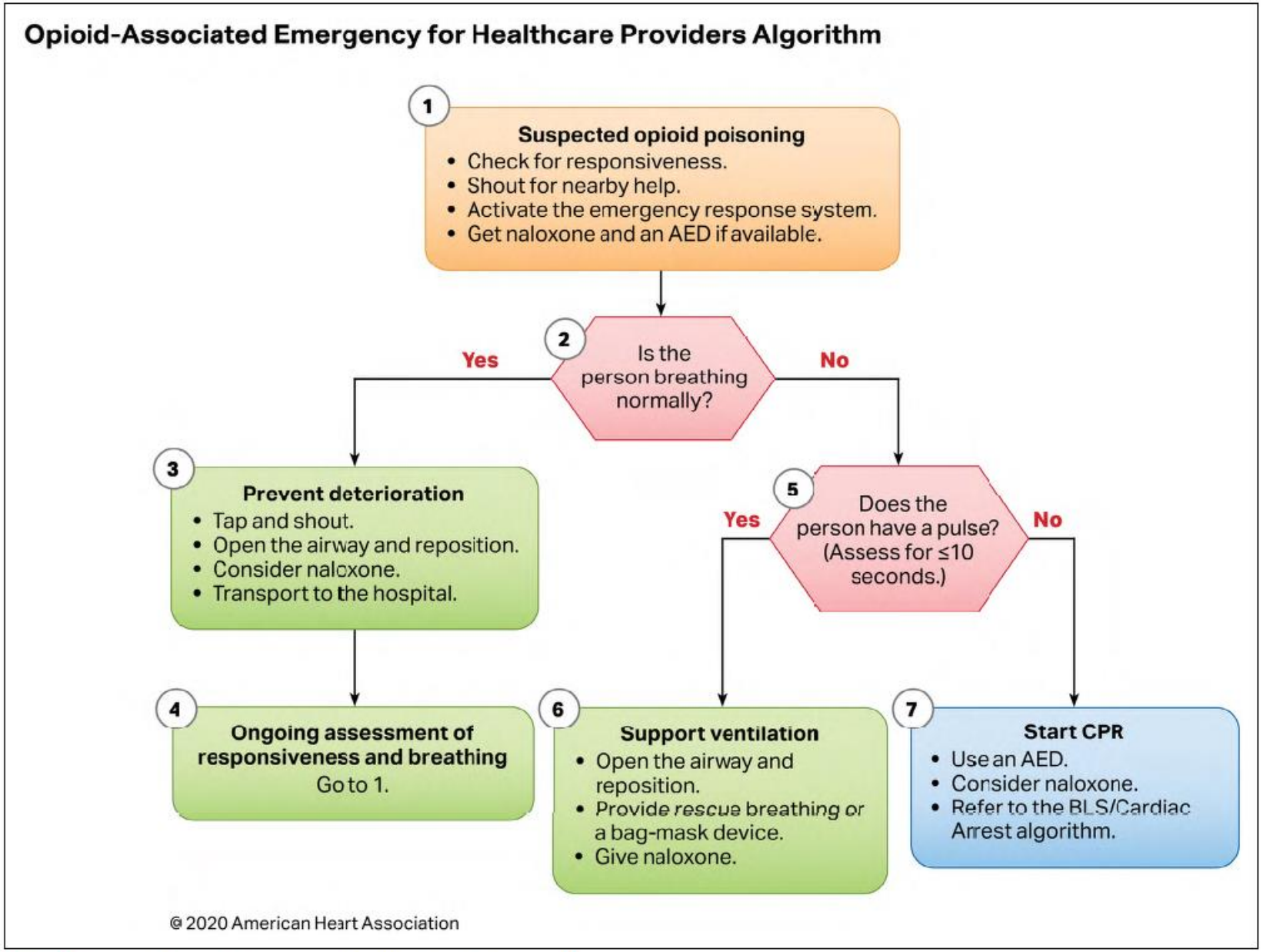


Figure 11. Opioid-Associated Emergency for Healthcare Providers Algorithm.
AED indicates automated external defibrillator; BLS, basic life support; and CPR, cardiopulmonary resuscitation.

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Pediatric Post Cardiac arrest Checklist

Figure 14. Pediatric Post–Cardiac Arrest Care Checklist.

Components of Post–Cardiac Arrest Care	Check
Oxygenation and ventilation	
Measure oxygenation and target normoxemia 94%-99% (or child's normal/appropriate oxygen saturation).	☐
Measure and target $Paco_2$ appropriate to the patient's underlying condition and limit exposure to severe hypercapnia or hypocapnia.	☐
Hemodynamic monitoring	
Set specific hemodynamic goals during post–cardiac arrest care and review daily.	☐
Monitor with cardiac telemetry.	☐
Monitor arterial blood pressure.	☐
Monitor serum lactate, urine output, and central venous oxygen saturation to help guide therapies.	☐
Use parenteral fluid bolus with or without inotropes or vasopressors to maintain a systolic blood pressure greater than the fifth percentile for age and sex.	☐
Targeted temperature management (TTM)	
Measure and continuously monitor core temperature.	☐
Prevent and treat fever immediately after arrest and during rewarming.	☐
If patient is comatose apply TTM (32°C-34°C) followed by (36°C-37.5°C) or only TTM (36°C-37.5°C).	☐
Prevent shivering.	☐
Monitor blood pressure and treat hypotension during rewarming.	☐
Neuromonitoring	
If patient has encephalopathy and resources are available, monitor with continuous electroencephalogram.	☐
Treat seizures.	☐
Consider early brain imaging to diagnose treatable causes of cardiac arrest.	☐
Electrolytes and glucose	
Measure blood glucose and avoid hypoglycemia.	☐
Maintain electrolytes within normal ranges to avoid possible life-threatening arrhythmias.	☐
Sedation	
Treat with sedatives and anxiolytics.	☐
Prognosis	
Always consider multiple modalities (clinical and other) over any single predictive factor.	☐
Remember that assessments may be modified by TTM or induced hypothermia.	☐
Consider electroencephalogram in conjunction with other factors within the first 7 days after cardiac arrest.	☐
Consider neuroimaging such as magnetic resonance imaging during the first 7 days.	☐

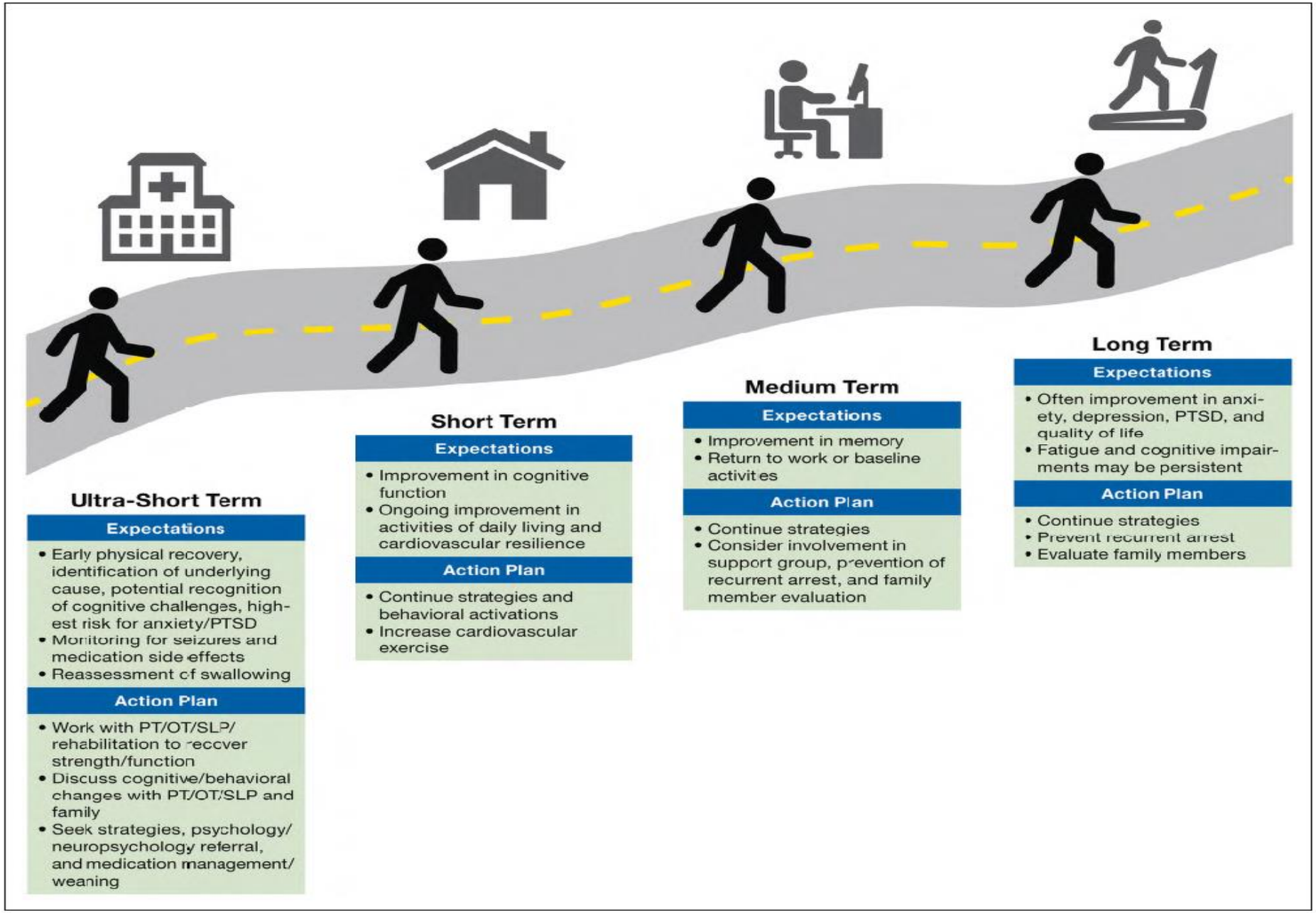

Figure 9. Road map to recovery.[3]

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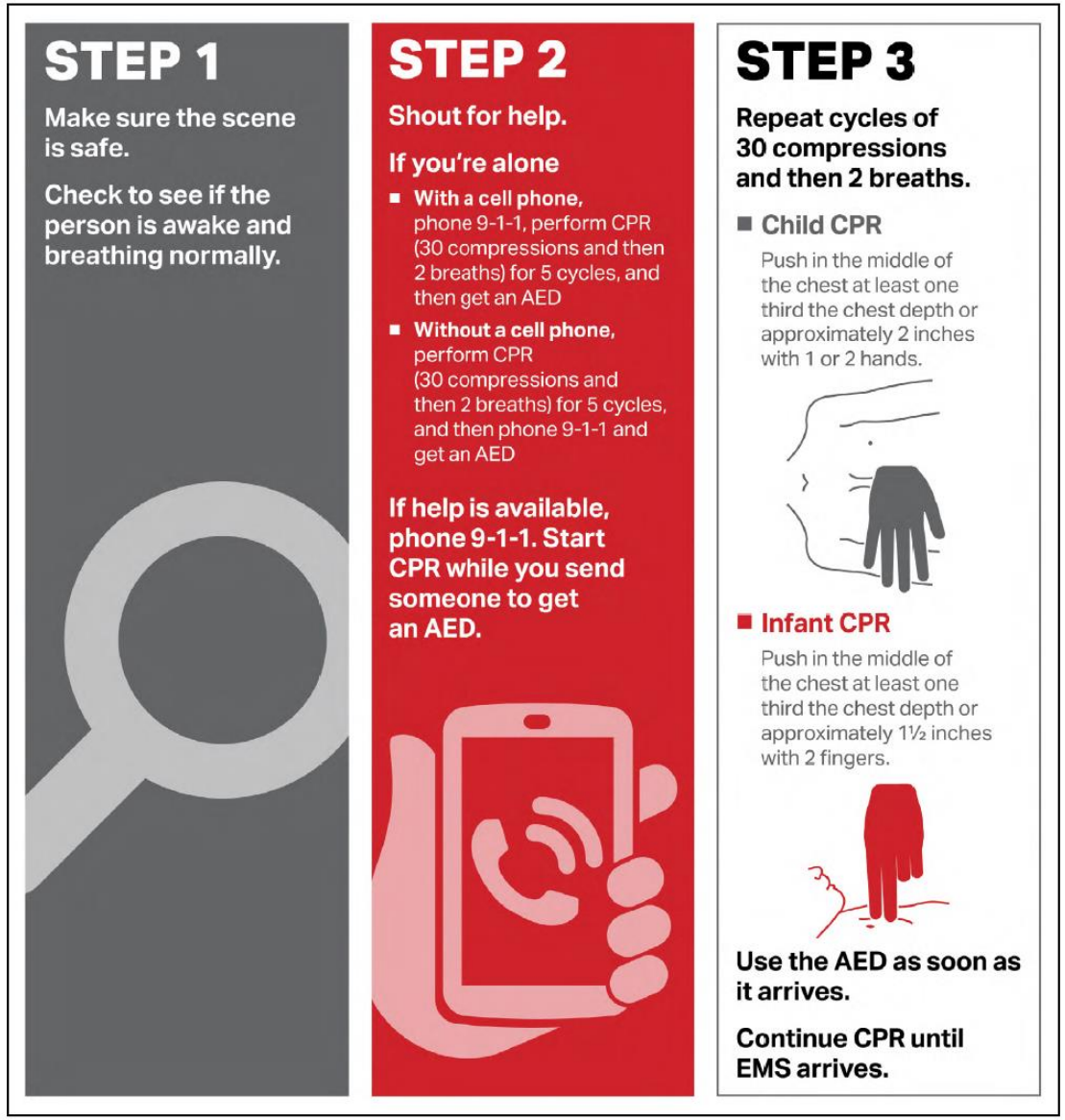


Figure 4. Pediatric BLS for lay rescuers.
AED indicates automated external defibrillator; BLS, basic life support; CPR, cardiopulmonary resuscitation; and EMS, emergency medical services.

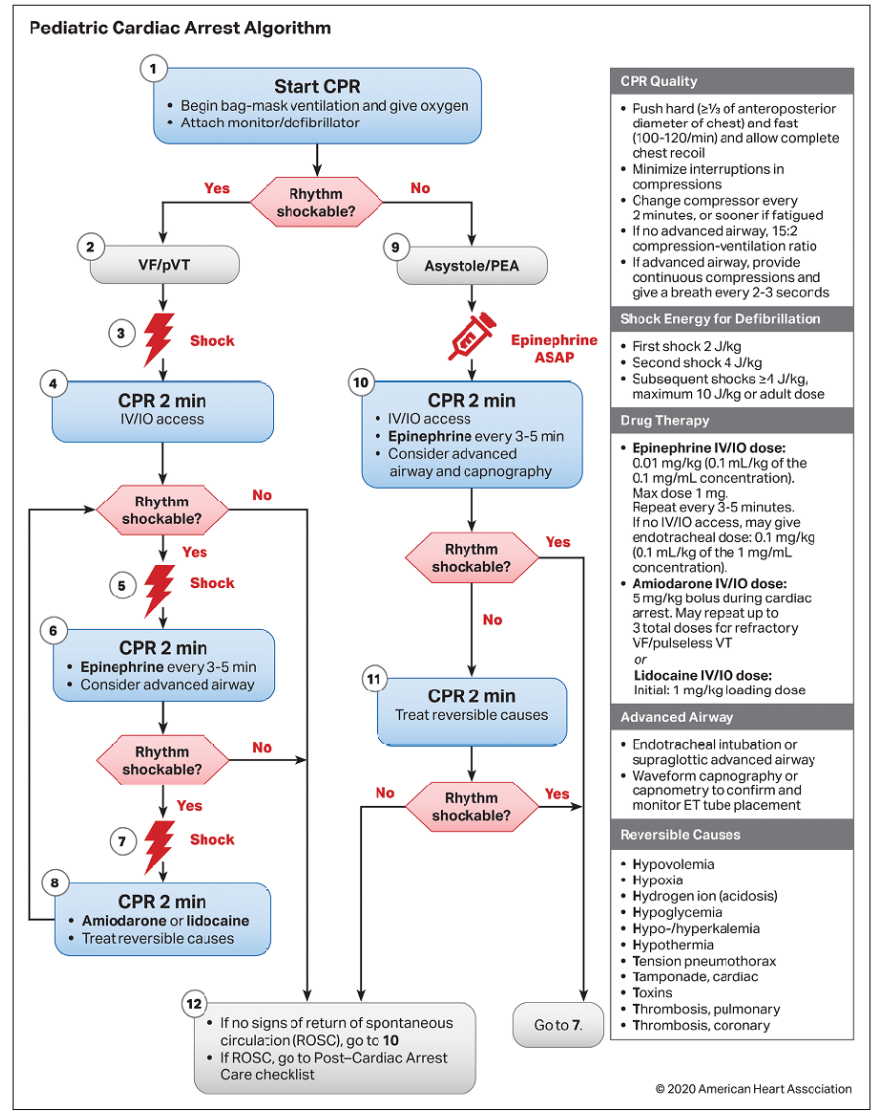


Figure 7. Pediatric Cardiac Arrest Algorithm.
ASAP indicates as soon as possible; CPR, cardiopulmonary resuscitation; ET, endotracheal; HR, heart rate; IO, intraosseous; IV, intravenous; PEA, pulseless electrical activity; and VF/pVT, ventricular fibrillation/pulseless ventricular tachycardia.

Pediatric Tachycardia With a Pulse Algorithm

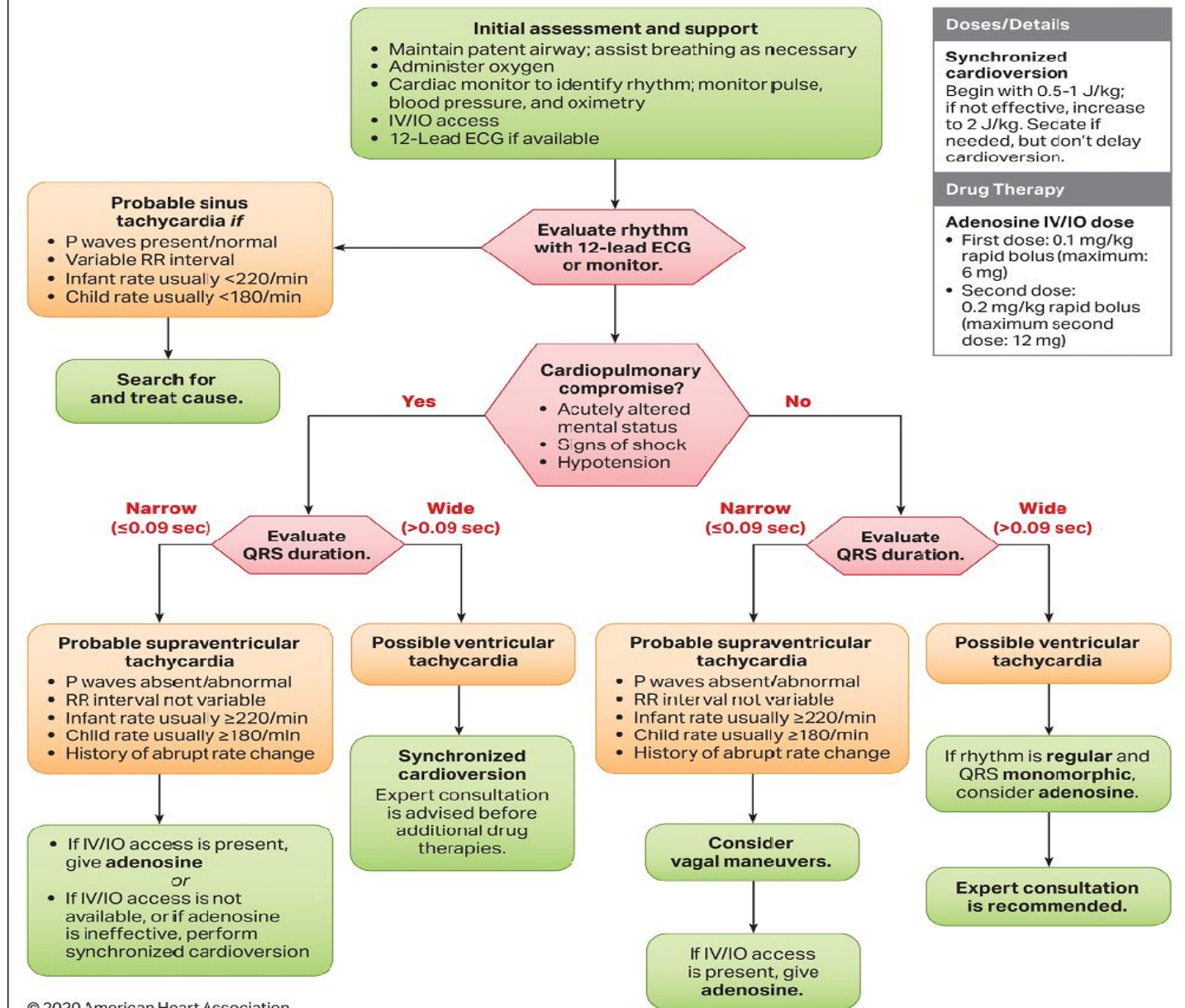


Figure 13. Pediatric Tachycardia With a Pulse Algorithm.
CPR indicates cardiopulmonary resuscitation; ECG, electrocardiogram; IO, intraosseous; and IV, intravenous.

Resuscitation Education Science

Deliberate practice and Mastery learning

In situ Education

Gamified Learning and virtual reality

Developing system of care

Team training In Situ (TIS)

"***Simulations that are Physically integrated into the clinical environment***"

Patterson MD, Blike GT, Nadkarni VM. In Situ Simulation: Challenges and Results. In: Henriksen K, Battles JB, Keyes MA, et al., editors. Advances in Patient Safety: New Directions and Alternative Approaches (Vol. 3: Performance and Tools). Rockville (MD): Agency for Healthcare Research and Quality (US); 2008 Aug. Available from: https://www.ncbi.nlm.nih.gov/books/NBK43682/

SimKIDS

TIS at Sickkids

- 12 Scenarios
- Every week
- Between 8-10 am
- Unannounced

TABLE 1. Team Training Scenarios

1	Severe asthma
2	Bronchiolitis
3	Cyanotic heart disease
4	Status epilepticus
5	Anaphylaxis
6	Ventriculoperitoneal shunt with raised intracranial pressure
7	Myocarditis with ventricular tachycardia
8	Diabetic ketoacidosis with altered level of consciousness
9	Methanol ingestion
10	Septic shock with pulseless electrical activity
11	Congenital adrenal hyperplasia with hyperkalemia
12	Hypothermia

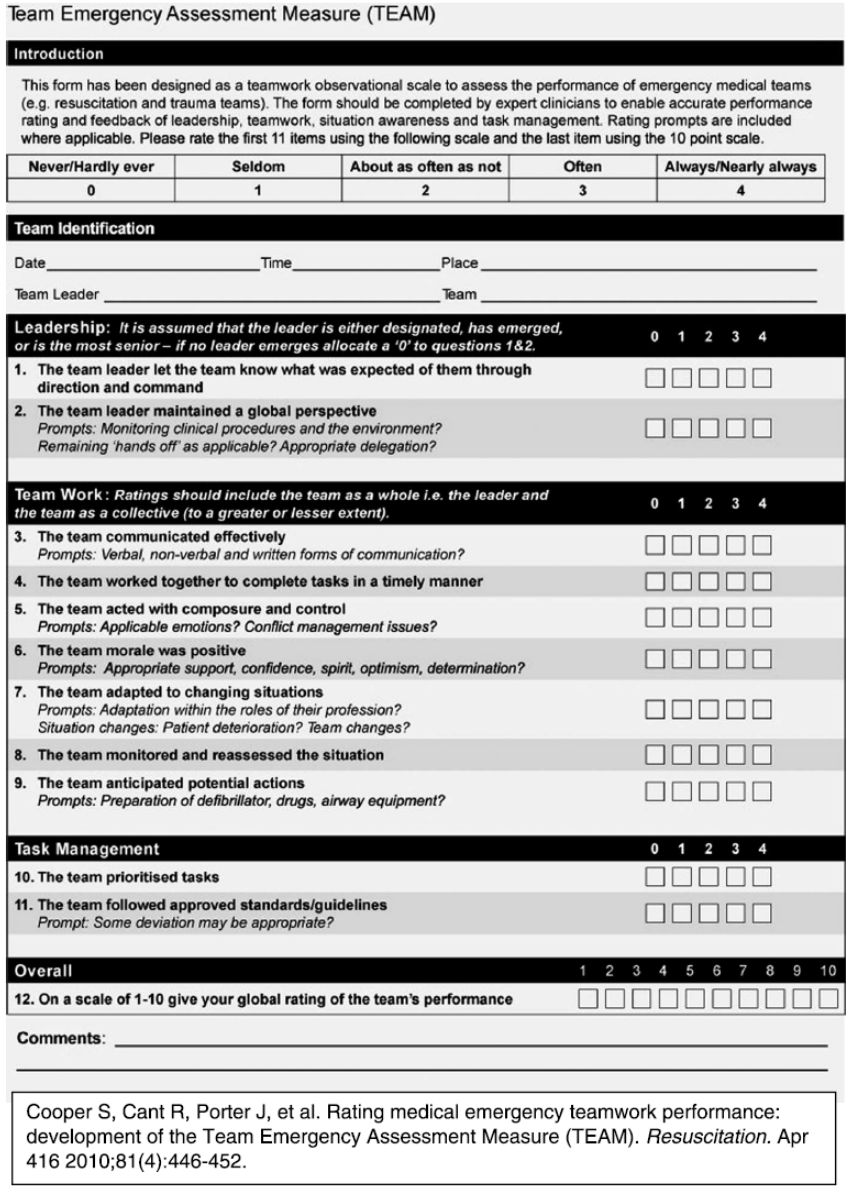
SimKIDS

Checklist

Septic shock scenario

No.	Action	Specifics	Not Done	Done Poorly or Partially	Done Well	Team Function or Critical Times
2	Oxygen mask					
3	monitors					
4	I.O x 2					
5	Blood work:	Bloodwork				
		Blood culture				
		Accu-check				
		iStat				
6	Fluids :	1st 20 cc/kg				
		2nd 20 cc/kg				
		3rd 20 cc/kg				
7	Pressors:	Epinephrine				
8	Antibiotics:	Ceftriaxone				
		Vancomycin				
9	RSI					
	Premed	+/- Atropine				
	Sedation	Ketamine				
	Paralytic agent	Sux vs Roc				
10	PEA management	CPR – rate, depth, recoil				
		Epinephrine				
11	Consultants/ assistance:	PICU				
12	Sepsis Pathway	Documentation (real time)				
13	Leadership + Role Definition					
	Lead	Identifies self + announce "Leader"				
	Lead	Ask team for names + roles				
	2nd Team	Ask if they can help				
	Lead	Assigns team 2 to Airway				

Team Emergency Assessment Measure Score



Team Emergency Assessment Measure (TEAM)

Introduction

This form has been designed as a teamwork observational scale to assess the performance of emergency medical teams (e.g. resuscitation and trauma teams). The form should be completed by expert clinicians to enable accurate performance rating and feedback of leadership, teamwork, situation awareness and task management. Rating prompts are included where applicable. Please rate the first 11 items using the following scale and the last item using the 10 point scale.

Never/Hardly ever	Seldom	About as often as not	Often	Always/Nearly always
0	1	2	3	4

Team Identification

Date_____ Time_____ Place_____

Team Leader _____ Team _____

Leadership: *It is assumed that the leader is either designated, has emerged, or is the most senior – if no leader emerges allocate a '0' to questions 1&2.*	0	1	2	3	4
1. **The team leader let the team know what was expected of them through direction and command**	☐	☐	☐	☐	☐
2. **The team leader maintained a global perspective** *Prompts: Monitoring clinical procedures and the environment? Remaining 'hands off' as applicable? Appropriate delegation?*	☐	☐	☐	☐	☐

Team Work: *Ratings should include the team as a whole i.e. the leader and the team as a collective (to a greater or lesser extent).*	0	1	2	3	4
3. **The team communicated effectively** *Prompts: Verbal, non-verbal and written forms of communication?*	☐	☐	☐	☐	☐
4. **The team worked together to complete tasks in a timely manner**	☐	☐	☐	☐	☐
5. **The team acted with composure and control** *Prompts: Applicable emotions? Conflict management issues?*	☐	☐	☐	☐	☐
6. **The team morale was positive** *Prompts: Appropriate support, confidence, spirit, optimism, determination?*	☐	☐	☐	☐	☐
7. **The team adapted to changing situations** *Prompts: Adaptation within the roles of their profession? Situation changes: Patient deterioration? Team changes?*	☐	☐	☐	☐	☐
8. **The team monitored and reassessed the situation**	☐	☐	☐	☐	☐
9. **The team anticipated potential actions** *Prompts: Preparation of defibrillator, drugs, airway equipment?*	☐	☐	☐	☐	☐

Task Management	0	1	2	3	4
10. **The team prioritised tasks**	☐	☐	☐	☐	☐
11. **The team followed approved standards/guidelines** *Prompt: Some deviation may be appropriate?*	☐	☐	☐	☐	☐

Overall	1	2	3	4	5	6	7	8	9	10
12. **On a scale of 1-10 give your global rating of the team's performance**	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments: _____

Cooper S, Cant R, Porter J, et al. Rating medical emergency teamwork performance: development of the Team Emergency Assessment Measure (TEAM). *Resuscitation.* Apr 416 2010;81(4):446-452.

The Use of Statistical Process Control Charts to Evaluate Interprofessional Education Sessions Embedded Into a Pediatric Emergency In situ Resuscitation Program

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Summary Statement: The rigorous evaluation of simulation in healthcare to improve resuscitations and team functioning can be challenging. Statistical process control (SPC) charts present a unique methodology to enable statistical rigor when evaluating simulation. This article presents a brief overview of SPC charts and its advantages over traditional before and after methodologies, followed by an exemplar using SPC to evaluate an in situ team training program with embedded interprofessional education sessions.
(*Sim Healthcare* 14:121–128, 2019)

Key Words: Statistical process control, in situ simulation, team training, pediatric emergency medicine

VRR

VIRTUAL RESUS ROOM

Welcome to the Virtual Resus Room!

A free, interactive, collaborative approach to online simulation education.

Emergency Record Notes

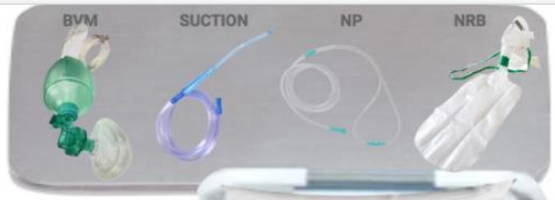
Type Notes Here

Orders

Type Orders Here

Team Roles

Type Names & Roles of Team Here



O2 FLOW RATE

___ L/min

Virtual Resus Room
@SarahFoohey 2020

MEDICATIONS GIVEN BOX

Drag medication from Medication Tray into this box to "give" medication

HR --

O2 --

BP --

RR --

T --


EPI
LIDOCAINE
ATROPINE
LEVETIRACETAM
AMIODARONE
VANCO
OTHER
BICARB
CALCIUM
D50W
NALOXONE
DILTIAZEM
CEFTRIAXONE
RINGER'S
NOREPI
EPI
Phenyl
METHYLPRED
LABETALOL
PIPTAZO
D10W
ROC
PROPOFOL
MIDAZOLAM
BENADRYL
ADENOSINE
HEPARIN
NS
SUCC
KETAMINE
LORAZEPAM
PREDNISONE
ATROVENT
VENTOLIN
AEROCHAMBER
MEDICATIONS TRAY
@SARAHFOOHEY

Gather airway equipment in this box to prepare what you need.

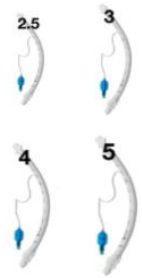
Then copy & paste to bring onto slide 1.
***Copy**: Command/Control-C*
***Paste**: Command/Control-V*
***Select multiple**: Press & hold shift while clicking objects.*

GLIDESCOPE

OPA

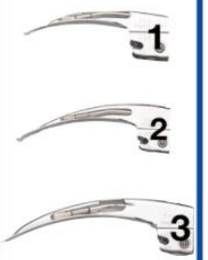
NPA

ET TUBES



LARYNGOSCOPE HANDLE

MAC BLADES



MILLER BLADES

GLIDE BLADES

LMA

BOUGIE

MCGILLS

NEEDLE CRIC

ETCO2

PEEP

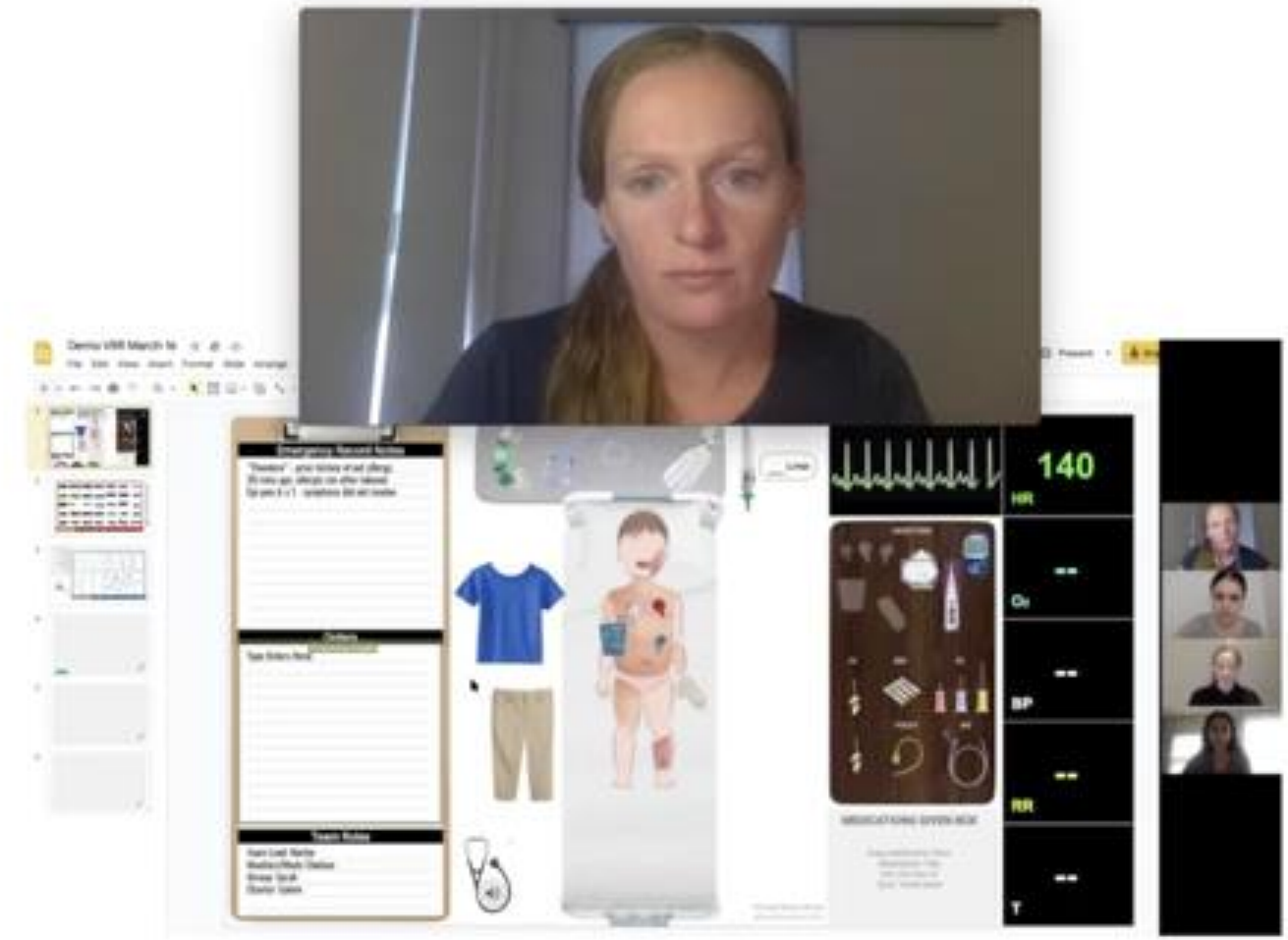
NEBULIZER

VIRAL FILTER

INLINE SUCTION

PEDS AIRWAY TRAY

@SarahFookey


140
HR
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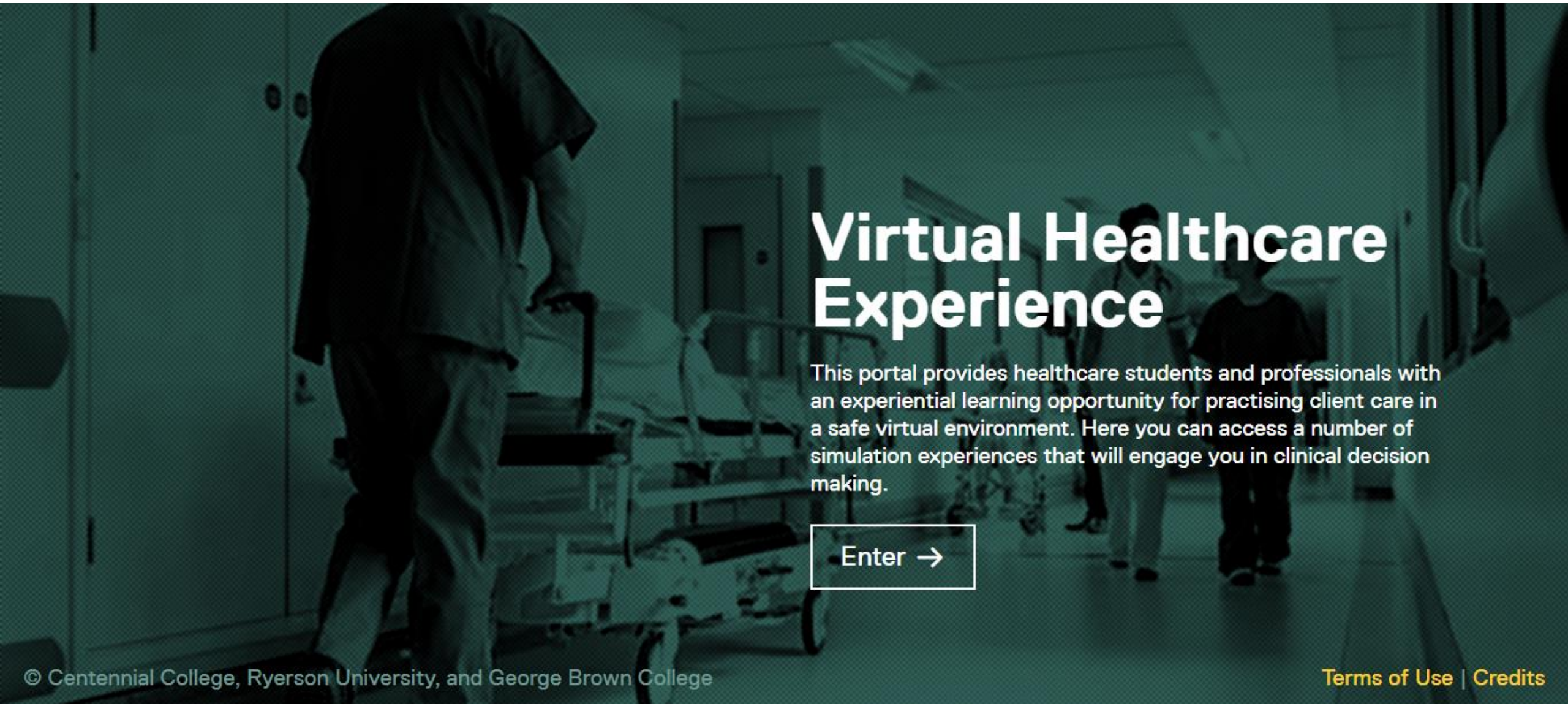
Filming VGS

Courtesy : ©Mastrilli & Verkuyl, 2020

Filming VGS

Courtesy : ©Mastrilli & Verkuyl, 2020


Virtual Healthcare Experience
This portal provides healthcare students and professionals with an experiential learning opportunity for practising client care in a safe virtual environment. Here you can access a number of simulation experiences that will engage you in clinical decision making.
Enter →
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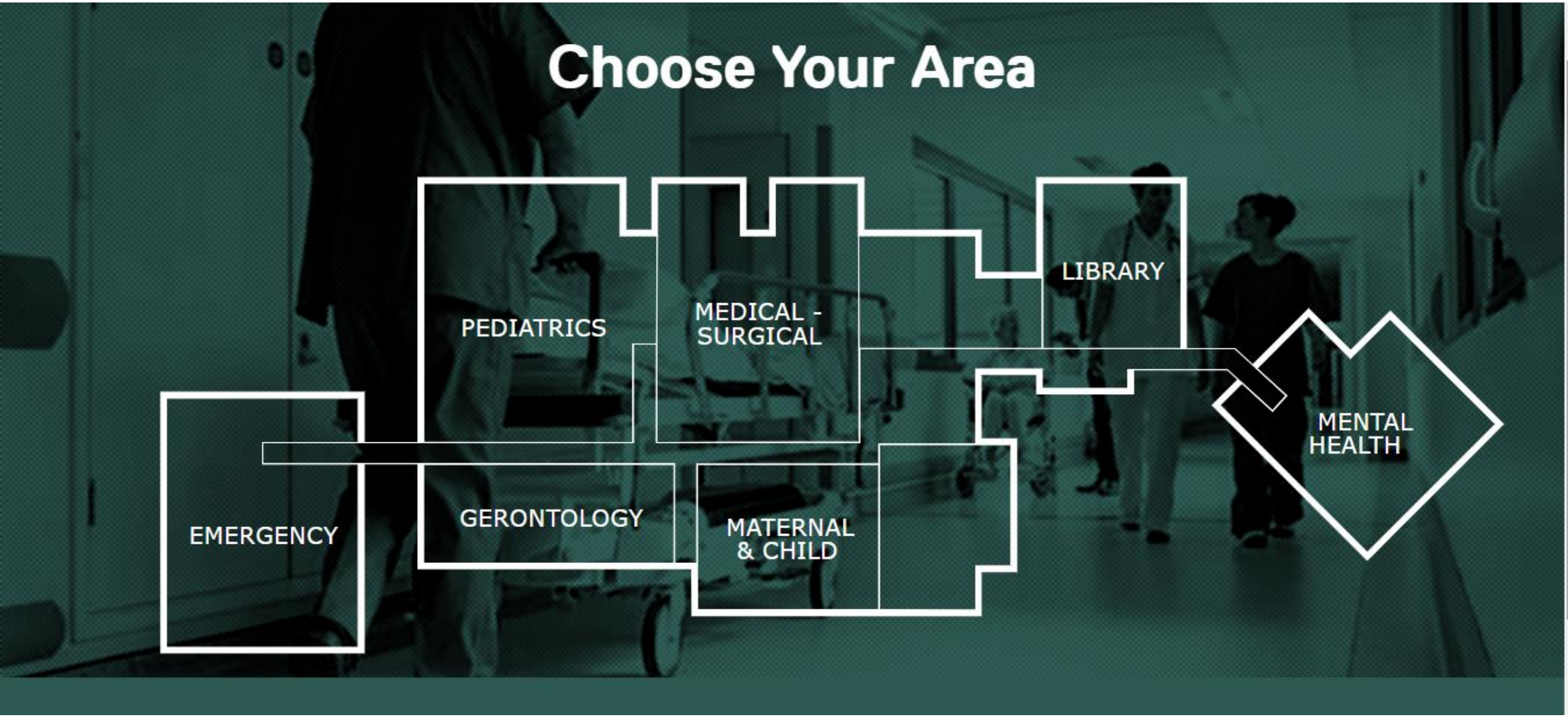
Choose Your Area
PEDIATRICS
MEDICAL - SURGICAL
LIBRARY
MENTAL HEALTH
EMERGENCY
GERONTOLOGY
MATERNAL & CHILD

MENU

LEARNING OBJECTIVES

The ER Game simulates a clinical experience that promotes the application of knowledge and skills related to critical thinking and clinical decision making, related to caring for patients in the emergency department.

The learning objectives of this simulation game are to:

- Apply knowledge of physical and psychosocial factors when caring for pediatric and adult patients and their family members.
- Identify normal findings, abnormal variations, and potential complications of medical and surgical conditions, such as asthma, fractures, and Crohn's disease.
- Prioritise care based on clinical assessments and findings.

Creating an acutely ill child virtual simulation scenario using VGS –On going

- George Brown College in collaboration with several Academic and Health Care Institutions has received a grant to create an interprofessional virtual simulation of an acutely ill child scenario

- The simulation will be an open educational resource for use in preparing health care students and professionals for interprofessional care delivery

Virtual Simulation Gaming Demo

https://de.ryerson.ca/games/nursing/hospital/map.html

Take home messages

- High-quality cardiopulmonary resuscitation (CPR) is the foundation of resuscitation
- A respiratory rate of 20 to 30 breaths per minute is new for infants and children who are (a) receiving CPR with an advanced airway in place or (b) receiving rescue breathing and have a pulse
- Epinephrine as soon as CPR started usually within 5 min
- Using a cuffed endotracheal tube decreases the need for endotracheal tube changes.

- No routine use of cricoid pressure
- For out-of-hospital cardiac arrest, bag-mask ventilation results in the same resuscitation outcomes as advanced airway interventions such as endotracheal intubation
- Resuscitation does not end with return of spontaneous circulation (ROSC). Excellent post–cardiac arrest care is critically important to achieving the best patient outcomes
- Naloxone can reverse respiratory arrest due to opioid overdose, but there is no evidence that it benefits patients in cardiac arrest
- Fluid resuscitation in sepsis is based on patient response and requires frequent reassessment