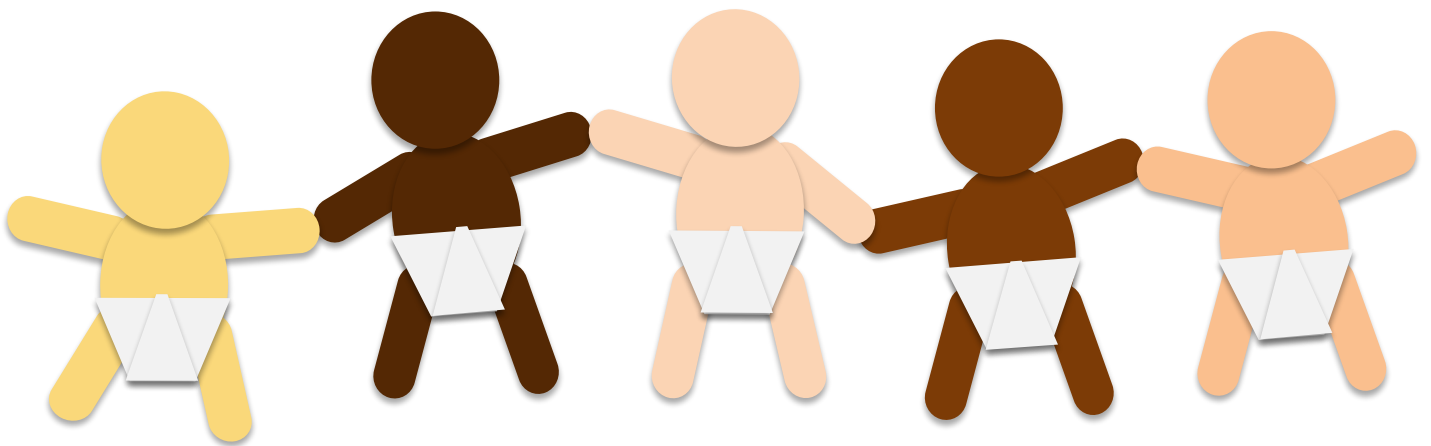


SimBox+ *Tele* SimBox

Severe Traumatic Brain Injury



Emergency Department/Hospitalist/Resident



At the end of this simulation, the participants will be able to:

1. Verbalize the systematic evaluation of an acutely injured pediatric patient using principles of Advanced Trauma Life Support.
2. Properly assign score to describe the mental status of a pediatric trauma patient.
3. Demonstrate two interventions required for stabilization of a pediatric patient with severe head injury.

Overall Scenario Schema

3 mins

Prebrief:

Use the narrated video or your own script ([sample script](#))

2 mins

Prepare for the arrival of the patient:

Assign roles, assemble equipment etc.

Example roles: Team Leader, Airway, Bedside Survey, Respiratory Tx, Parent Liaison, Bedside Nurse, Medication Nurse, Recorder.

10 mins

Run Case

STEM: A 5 year old boy is brought to the Emergency Department with a head injury after a motor vehicle collision.

Use the [video](#) with the animation and pre-recorded vital signs.

15 mins

Debrief:

Use the narrated video or your own script ([sample script](#)).

10 mins

Option: Re-run scenario

“You will hear a brief EMS dispatch and then see a two minute countdown clock as you prepare for the arrival of the patient.” [Link to TBI Video](#)

Video: “ED this is ALS Unit 1, coming in with an 5 year old boy who was improperly restrained during a high speed motor vehicle collision. He is alert and crying but has a hematoma on the right side of his scalp. We have immobilized his c-spine. His heart rate is 140, he is saturating 99% on a non-rebreather. We are working on getting a blood pressure, but have not been able to get IV access. We will arrive in 2 minutes. ”

2 minute warning

- Team assembles + confirms roles
- Performs resuscitation equipment check
- Dons personal protective equipment
- Calls for help per local protocol: surgery, anesthesia, trauma activation

“Patient has arrived.”

Time 0

- Applies patient monitors, pulse oximeter, BP cuff, checks temp
- Estimates weight
- Asks for IV access and blood tests as per institution protocol
- Begins primary survey

Facilitator states: “Weight is 20kg. Placing the monitors and working on IV access and labs.”

Step 1
Primary survey

HR 140
BP 90/53
RR 40
Sats 98% RA
Temp 36.1
ETCO2 33

Performs primary survey:

- A Airway is patent, patient is crying, C-spine immobilized with collar
- B Breath sounds equal bilaterally, SpO2 99% on RA, placing NRB
- C Femoral pulses 2+, CRT 2 sec, HR 140, BP 90/53
- D PERRL, moves all limbs. AVPU: responds to Verbal stimuli
GCS 11/15 [V3 V4 M4]
- E T 36.1, removes all clothes and places warm blankets
large hematoma on the right parietal scalp

“22G IV obtained in the left AC. POC dextrose is 120.”

Step 2
Secondary survey

HR 140
BP 90/53
RR 40
Sats 98% RA
ETCO2 33

Performs head to toe secondary survey:

- Positive finding: hematoma to the right scalp, R hemotympanum present
- Verbalizes concern for head injury and hemorrhagic shock
- Requests second point of access
- Orders x-ray of the chest +/- pelvis
- OPTION: Team performs FAST

"Patient is now intermittently moaning, is less responsive, and his oxygen saturations are dropping. FAST is negative, abdominal exam is normal."

Step 3
Hypoxia/ NRB

HR 140
BP 90/54
RR 15
Sats 88%NRB
ETCO₂ 45

- Verbalizes change in clinical status, restarts primary survey:
 - A: Intermittently moaning. Airway unobstructed, no secretions or oral injuries.
 - B: Intermittently apneic, taking 10-15 breaths per minute. Saturations in the high 80s. Clear bilateral breath sounds.
- Begins bag-valve-mask ventilation on 100% O₂.

"You are performing bag-valve-mask ventilation with 100% FiO₂ with good seal, good chest rise, and improvement in the patient's SpO₂."

Step 4
BVM

HR 100
BP 90/54
Sats 99% BVM

- Verbalizes improvement in oxygenation and ventilation with BVM
- Verbalizes concern for intracranial bleed or hemorrhagic shock causing respiratory failure
- Verbalizes the need for endotracheal intubation
- Utilizes airway checklist to prepare for intubation

"You are ready to proceed with intubation."

Step 5
Intubation

HR 100
BP 90/54
Sats 99%

- Performs endotracheal intubation
- Confirms appropriate ETT placement with CXR
- Places C-collar back on (if removed for intubation with manual c-spine immobilization)

"The heart rate seems to be dropping."

Step 6
ETT
Bradycardia

HR 67
BP 144/87
RR 20
Sats 99%
ETCO₂ 35

- Verbalizes change in clinical status + restarts primary survey:
 - A: Intubated with 5.0 cuffed tube at 16 cm at the teeth.
 - B: Ventilated on PCAC 20/5, rate of 15, saturating 99% on FiO₂ 0.3. Clear bilateral breath sounds.
 - C: Femoral pulses 2+, CRT 2 sec, HR 70s, BP 144/87 after 1L NS.
 - D: Right pupil dilated and not responsive to light after etomidate and rocuronium, no further sedation/ analgesia administered.
- Verbalizes concern for raised ICP and herniation

SAMPLE: Allergies/Medications, Birth/ Medical history, Last meal: Unknown
Events: Improperly restrained after a high speed MVC. Struck headrest. Other passengers in the car restrained, airbags deployed, all ambulating in the scene.

Step 6
ETT

Bradycardia
(continued)

HR 67
BP 144/87
RR 20
Sats 99%
ETCO2 35

- Verbalizes concern for raised ICP and herniation + critical actions:
 - Initiates ICP reducing strategies
 - Neurosurgical/PICU consultation (in house or at outside hospital, based on level of available resources)
 - Order CT head without contrast (+/- CT cervical spine)
- Place defibrillation pads and assigns roles in case CPR is needed (not included in the case)

“Head of bed is elevated to 30 degrees, ventilator settings adjusted to aim for ETCO2 30-35, hypertonic saline bolus administered. Heart rate is improving to 100. Neurosurgery and PICU have been informed and are on their way.”

Step 7
ETT
HR 100s

HR 100
BP 90/50
RR 20
Sats 98%
ETCO2 34

- Verbalizes change in clinical status + restarts primary survey:
 - A: Intubated with 5.0 cuffed tube at 16 cm at the teeth.
 - B: Ventilated on PCAC 20/5, RR of 20, saturating 99% on 30% FiO₂. ETCO₂ 35. Clear bilateral breath sounds.
 - C: Femoral pulses 2+, CRT 2 sec, HR 100, BP 100/50
 - D: Pupils currently equal and slightly responsive.
- Verbalizes the patient is ready for transfer to the CT scanner
 - Formulates sedation/ analgesia plan (E.g., propofol and fentanyl)
 - Verbalizes supplies to take with them at the scanner, including medications (E.g., further hypertonic saline boluses)

“CT head shows a large right parietal epidural bleed with surrounding edema and midline shift. Patient required one more hypertonic saline bolus in the CT but otherwise remained relatively stable. Transport team (or Neurosurgery/ PICU) has arrived.”

Wrap up

HR 100
BP 90/50
RR 20
Sats 98%
ETCO2 34

- Hands off to receiving team; E.g., “5 year old boy with large epidural bleed causing herniation, now intubated and ventilated with improved ICP s/p hypertonic saline x2”
- Formulates plan for safe transfer
- Updates family
- Debriefs medical team

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

| TASK | | DONE CORRECTLY | NOT DONE CORRECTLY | NOT DONE |
|----------------------|---|----------------|--------------------|----------|
| Medical knowledge | Verbalize a complete primary survey. | | | |
| | Verbalize a complete secondary survey. | | | |
| | Ensure cervical spine immobilization throughout the resuscitation, including intubation. | | | |
| | Verbalize a mental status evaluation (glasgow coma score, AVPU, other). | | | |
| | Initiate appropriate ventilation (avoid hyperventilation). | | | |
| | Verbalize concern for increased intracranial pressure. | | | |
| | Initiate two interventions to decrease intracranial pressure e.g. head of bed elevation, targeted ventilation (ETCO2 30-35), hypertonic saline, pain management/ sedation. | | | |
| Team-centered care | Verbalize assembly of the necessary staff, equipment, and resources to care for an ill pediatric patient, including weight-/ age-appropriate equipment and medication dosing. | | | |
| | Demonstrate effective teamwork and communication (i.e. designate leader/roles, directed orders, closed-loop communication, shared mental model). | | | |
| | Deliver appropriate handoff to receiving facility, transport team etc. | | | |
| 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). | | | |

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.

PRIMARY VS SECONDARY BRAIN INJURY

Primary brain injury

Direct, immediate and often irreversible injury due to:

- ❑ Acceleration/ deceleration injuries causing diffuse axonal injury
- ❑ Hemorrhage from impact leading to contusions, subdural/ epidural/ subarachnoid/ intraparenchymal hemorrhage
- ❑ Skull fractures

Secondary brain injury

Injury due to **ischemia, hypoxia and edema** occur due to inflammation from biochemical/ cellular/ metabolic responses to direct injury.

Mitigation:

- ❑ Maintain oxygenation
- ❑ Maintain blood pressure
- ❑ Prevent any further injury to head and neck

Impending Uncal Brainstem Herniation

Hypertension with bradycardia or tachycardia



Dilated pupil due to ipsilateral 3rd cranial nerve palsy



Abnormal/ irregular breathing pattern (Cheyne-Stokes respirations)



Contralateral hemiparesis, decorticate posturing →decerebrate posturing → respiratory insufficiency

Cerebral Perfusion Pressure CPP

CPP is the net pressure gradient pressure that drives cerebral O₂ delivery.

CPP = MAP - ICP

Mean Arterial Pressure (MAP)
IntraCranial Pressure (ICP)

Elevated ICP = Sustained ICP over 20 mmHg > 5 min

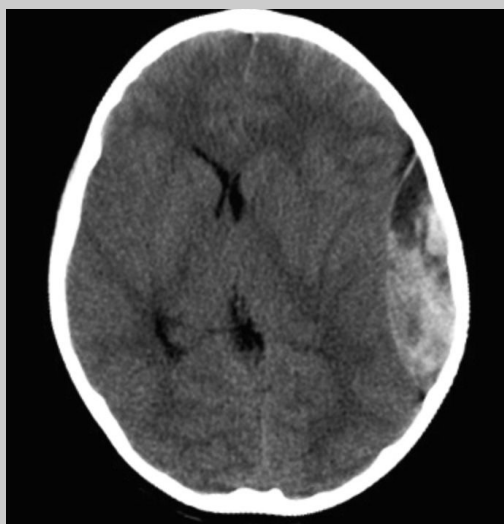
- Mild: 20-29 mmHg
- Moderate: 30-40 mmHg
- Severe: > 40 mmHg

4 types of herniation

Subfalcine or cingulate, Central Uncal Tonsillar

Monro Kellie Doctrine:

Intracranial compartment is incompressible



This large temporal epidural hematoma is associated with midline shift and compression of the ventricular system. The dark swirls within the hematoma represent rapid arterial bleeding.

Graphic 79566 Version 2.0 © 2023 UpToDate, Inc. and/or its affiliates. All Rights Reserved



GOAL: Neuroprotection

A

- Intubate if:**
 - Signs of respiratory failure
 - GCS<8 or rapidly declining
 - Loss of airway protective reflexes
 - Hemodynamic instability
- In-line c-spine immobilization during intubation**
- Head of bed @15-30 degrees, head midline, c-collar (not too tight)



B

- Goal of **targeted ventilation**
- Prevent hypoxia
- Avoid hypocarbia ($\text{PaCO}_2 < 30$ mmHg decreases cerebral blood flow increases risk of cerebral ischemia)
- Discuss goals with Neurosurgery and ICU team:
 - Goal PCO_2 of 35-40 mmHg if intubated, no herniation
 - Goal PCO_2 of 30-35 mmHg if acute herniation

C

- Treat hypotension* with the goal of **euvolemia**.
- *Caveat: excess fluid resuscitation contributes to cerebral edema

D

- Goal of **euglycemia**
- Goal of **neuroprotection**
- Treat pain, ensure appropriate sedation
- May consider seizure prophylaxis (IV keppra load)
- Treat **cerebral edema**: **3% Hypertonic saline (HTS)** 5 mL/kg over 10-20 min (*Mannitol is less preferred as it causes osmotic diuresis that can lead to hypotension*)

DISPOSITION:**CALL FOR HELP/ TRANSPORT/ NEUROSURGERY/ ICU EARLY**

E

- Goal of **normothermia** (antipyretics, cooling blankets), avoid hypothermia.

Pre-Alert Checklist

- Activate Trauma Team
- Introduce team + assign key roles
- Don PPE
- Check equipment +monitors: warmed crystalloids + blankets, medications
- Obtain weight + dosages cognitive aid
- Notify CT/ OR and blood bank

Assessment via A T L S

Primary Survey: ABCDEs

- A**irway: shoulder roll, c-spine precautions
- B**reathing: oxygenate, **BMV** if needed
- C**irculation: IV access, control hemorrhage
- D**isability: neuro exam, ✓ **D**extrose
- E**xpose*: control **E**nvironment (warmer)

Secondary Survey (+“FGHI”)

- Full set of vital signs + POCUS e FAST
- F**riendly: Child Life presence
- G**lucose: give if <60
- G**ive comfort (pain control)
- H**ead-to-toe examination:
log roll early to remove backboard
- H**istory: take a **SAMPLE**
- I**maging + labs: (post menarche +βHcg)

Get **FGHI**
With it!



Level Of Consciousness

Easier to assess with AVPU
Alert | Voice | Pain | Unresponsive

**HEMODYNAMIC INSTABILITY
HYPOTENSION IN PEDIATRIC HEMORRHAGIC SHOCK
IS A LATE FINDING → PEA ARREST**

- poor perfusion, tachycardia
- decreased mental status + pain response

CONSIDER EARLY BLOOD TRANSFUSION
pRBC 10cc/Kg | MTP 1:1:1 | Consider TXA

TRAUMA + HEMODYNAMIC INSTABILITY

- Perform rapid assessment in shock due to
- extracranial blood loss
 - intracranial in neonates with open skull sutures
 - Intrathoracic injuries
 - intra-abdominal or pelvic injuries
 - open fractures (closed femur fractures)
 - consider eFAST especially if suspect obstructive shock arising from blunt trauma

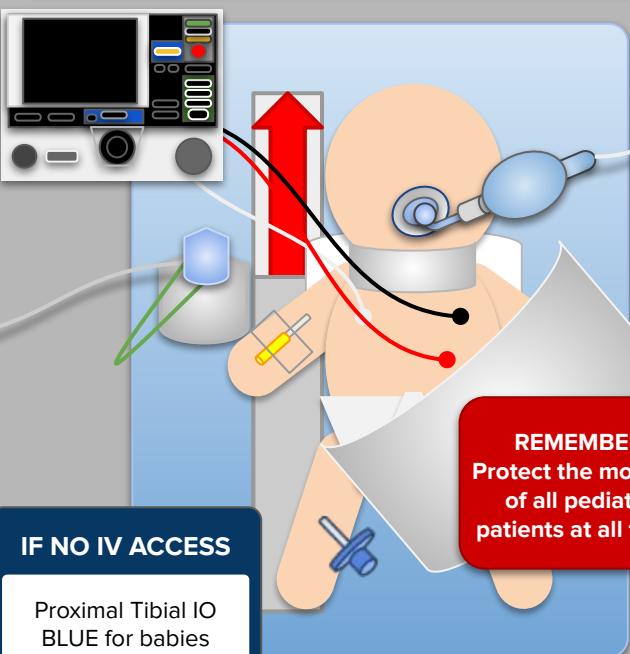
**DISPOSITION: ARE PEDIATRIC SUBSPECIALISTS
AVAILABLE AT YOUR FACILITY?**

Involve consultants early and arrange early transfer if no resources for pediatric care

**KEY ANATOMICAL DIFFERENCES IN
YOUNGER PEDIATRIC PATIENTS**

Normal vital signs vary with age

- Infants and small children have larger heads & short necks → high c-spine injuries, atlantoaxial instability (also in Trisomy 21)
- Airway is small and anterior, tongue is relatively large, prone to obstruct: shoulder roll helpful
- Solid organs are larger relative to patient size → solid organ injury with blunt trauma
- Body surface area → hypothermia prone
- Skeletal immaturity → plastic skeletal deformities



@DrM_Kou

NOT ALL TRAUMA ARRIVES VIA EMS. UPGRADE ACCORDINGLY

Trauma patients may not always arrive via EMS, especially to non-trauma designated facilities. Use this flashcard to help you take care of your patient.

AVPU
Alert
Responds to Verbal stimuli
Responds to Painful stimuli
Unresponsive

TRAUMA Mental Status Evaluation

| GCS | |
|-----------------------------|-----------|
| Eye opening | |
| Spontaneous | 4 |
| Response to verbal command | 3 |
| Response to pain | 2 |
| No eye opening | 1 |
| Best verbal response | |
| Oriented | 5 |
| Confused | 4 |
| Inappropriate words | 3 |
| Incomprehensible sounds | 2 |
| No verbal response | 1 |
| Best motor response | |
| Obeys commands | 6 |
| Localizing response to pain | 5 |
| Withdrawal response to pain | 4 |
| Flexion to pain | 3 |
| Extension to pain | 2 |
| No motor response | 1 |
| Total | 15 |

History: SAMPLE

- S Signs and symptoms
- A Allergies
- M Medications
- P Past medical history
- L Last meal
- E Events

PRIMARY SURVEY

A

Airway:

- Patent (talking/crying)
- Obstructed (blood/ vomit)
- At risk (facial trauma, mandible fracture)
- ETT/SGA in place (size, cuff, depth)
- Need for c-collar/ c-spine precautions?

B

Breathing/ Ventilation: Expose chest

- Describe any injury and chest rise
- Auscultate- Air entry/ Symmetry
- Support- O2/ BVM

C

Circulation: Check

- Pulses- central
- Perfusion, especially of injured sites
- IV location or access need
- Vitals: HR and BP
- Active bleeding- apply pressure

D

Disability:

- Level of consciousness- GCS/ AVPU
- Pupillary size and reaction
- Check dextrose
- Possible toxidrome findings

E

Exposure/ Environment: remove clothes

- Check temperature
- +/- apply warm blankets
- Consider warm IV fluids

Roll patient/ remove backboard:

- Palpate spinous processes
- Check rectal tone

Potential Interventions

AIRWAY PROTECTION

- Suction
- NPA, OPA,
- LMA with BMV
- ETT, cricothyrotomy
- C-spine protection

BETTER BREATHING

- O2,
- CXR
- needle decompression, thoracostomy
- nebulizers

ADDRESS SHOCK

- IV/ IO, central access
- POC labs
- crystalloid, blood products, MTP
- pericardiocentesis

STOP THE BLEED- MANAGE FRACTURES

- wound packing, tourniquet
- traction splint
- pelvic binder
- spinal precautions
- neuroimaging

PAIN MANAGEMENT

DISPOSITION/TRANSFER

REMEMBER TO CALL FOR HELP EARLY

Treat any significant findings during each step before proceeding. Restart the primary survey with any life-threatening change in patient condition or significant intervention.

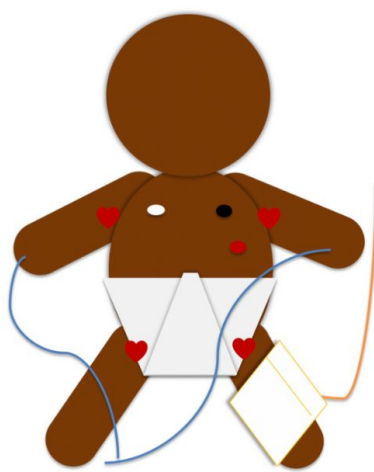
OVER FOR SECONDARY SURVEY

VERBALIZING THE PRIMARY SURVEY

Example (normal patient): Verbalize in clear, loud voice

A
B
C
D
E

- Airway is patent and maintained, patient is crying. C-collar in place.
- Breath sounds equal bilaterally, symmetric chest rise. Trachea midline.
- Patient alert, eyes open, moving spontaneously & following commands. Pupils reactive, 4mm-> 2mm b/l.
- 2+ femoral pulses, CRT 2 sec. HR 120, BP 100/60. PIV in left hand.
- Temperature 36.5 C. Clothes removed, no obvious injuries, bruises or bleeding. No spinal tenderness. No bruises/ abrasions to the back.



NEURO ASSESSMENT

Pupils equal bilaterally, reactive to light. Spontaneous eye opening, patient is alert, oriented and obeys commands: GCS is 15. Normal upper and lower motor and sensory function. No lateralizing signs.



VERBALIZING THE SECONDARY SURVEY

Example (normal patient): Verbalize in clear, loud voice

- No scalp lacerations, contusions, fractures. No hemotympanum. No facial injury, nasal septal hematoma or CSF leak. No oral injury, loose teeth or jaw malalignment. No tracheal deviation.
- No signs of blunt or penetrating injury to the entire chest or neck. No accessory respiratory muscle use. Clear, bilateral breath sounds. Normal heart sounds. No tenderness, subcutaneous emphysema, crepitation upon palpation of the entire chest or clavicles.
- No signs of blunt, penetrating injury, or internal bleeding. Abdomen is soft and non-tender to palpation. No guarding or rebound.
- No contusions, hematomas or lacerations at the perineum. No blood at the urethral meatus. No pelvic instability.
- No contusions, lacerations or deformity upon inspection of the upper or lower extremities. No tenderness, crepitation, on palpation. Full range of motion of all major extremity joints. Normal peripheral pulses.
- No signs of injury to the entire back. No tenderness to palpation of the cervical, thoracic or lumbar spine. No palpable step-offs. Rectal tone intact.

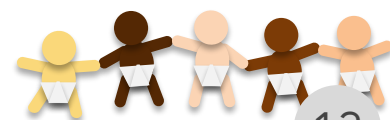
Thank you for participating! We would love to hear your feedback:

Please have the participants scan this QR code at the end of the simulation.

Participant Survey:



Severe TBI
Case- Specific
[Facilitator Survey:](#)



SimBox Supplement: Pre-intubation Checklist

Announce Indication for intubation

- Hypoxic respiratory failure
- Hemodynamic risk (sepsis/shock)
- Polytrauma
- CNS (GCS < 8)(see addendum)
- Status epilepticus
- Other

Perform Intubation Pre-assessment

- Mallampati score
- ASA score
- Patient weight

Caveat:

- Anatomically difficult airway
- C spine immobilization

Identify Personnel

- Junior laryngoscopist
 - State number of allowed attempts
- Supervising laryngoscopist
- Respiratory therapist
- Medication Nurse
- Bedside Nurse
- Technician (if needed)
- Pharmacist
- Difficult Airway Response Team (as per institution protocol)

Prepare Intubation Equipment (MD/RT)

- VL device and video connections

Laryngoscope check (DL and or VL)

- | | |
|---------------------------------------|-----------------|
| <input type="checkbox"/> Premie | Miller 0 |
| <input type="checkbox"/> Term neonate | Miller 0, 1 |
| <input type="checkbox"/> 6-12 months | Miller 1 |
| <input type="checkbox"/> 1-2 years | Miller 1, Mac 2 |
| <input type="checkbox"/> 2-8 years | Miller/Mac 2 |
| <input type="checkbox"/> > 8 years | Miller 2, Mac 3 |

Endotracheal tube

- ETT tube size (cuffed) Age/4+ 3.5
- Available: Tubes +/- 0.5
- ETT stylet placed and checked

Bag-Mask with PEEP valve

- Check tubing and attach to O₂

Ventilator

Alternative devices

- Backup airway (OP/NP/ LMA)
- Supraglottic airway device
- Cricothyrotomy kit/Jet Ventilation* for trained personnel only

Check monitoring and bedside equipment (RN)

- Oxygen tank (if not wall O₂)
- EtCO₂ capnography
- SpO₂
- BP
- Suction with yankauer

Select intubation medications

Induction agents

- | | |
|------------------------------------|-------------|
| <input type="checkbox"/> Etomidate | 0.3 mg/kg |
| <input type="checkbox"/> Ketamine | 1.2 mg/kg |
| <input type="checkbox"/> Propofol | 1–1.5 mg/kg |

Paralytics

- | | |
|--|----------------|
| <input type="checkbox"/> Succinylcholine < 2 y/o | 2 mg/kg |
| > 2 y/o | 1.5-2.0 mg/kg |
| <input type="checkbox"/> Rocuronium | 1 mg/kg |
| <input type="checkbox"/> Vecuronium | 0.15-0.2 mg/kg |

Sedatives and analgesics

- | | |
|------------------------------------|----------------|
| <input type="checkbox"/> Midazolam | 0.2 –0.3 mg/kg |
| <input type="checkbox"/> Fentanyl | 1 mcg/kg |
| <input type="checkbox"/> Morphine | 0.1 –m/kg |

Other meds

- | | |
|--|---------------|
| <input type="checkbox"/> Atropine (sialogogue) | 0.02 mg/kg IV |
| Max dose: 0.5 mg (child) | 1 mg (adol) |

Prepare and position patient

Position airway for success*

- Verify vascular access
- Begin apneic pre-oxygenation

Perform Time out:

- Announce procedure and backup plan
- Verify if MTP activation needed

Perform intubation

Verify tube placement:

- Visualization
- Auscultation
- EtCO₂
- Imaging
- POCUS

Plan post-intubation sedation

[Guidelines for the Management of Pediatric Severe TBI, 3rd Edition](#)

[Managing trauma patients in the community: U of T Trauma \(St. Michael's, SickKids, Sunnybrook\)](#)

[Rebellion 21: To CT or Not to CT - PECARN, CHALICE, and CATCH Algorithms via Hilary Fairbrother, MD - REBEL EM - Emergency Medicine Blog](#)

["Basics of Pediatric Trauma Assessment and Management" by Michelle Niescierenko for OPENPediatrics](#)

["Introduction to Traumatic Brain Injury" by Lisa DelSignore, MD for OPENPediatrics](#)

[The Pediatric Airway and Rapid Sequence Intubation in Trauma](#)

Genovese, T. , Roberts-Santana, C. & Wills, H. (2021). [A Trauma-Specific Assessment to Complement the National Pediatric Readiness Project](#) *Pediatric Emergency Care*, 37 (12), e1646-e1651. doi: 10.1097/PEC.0000000000002144.

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Thank you to [OPENPediatrics](#) for the animation used in the video.



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