

ACEP Ultrasound Simulation Case Template

SIMULATION CASE TITLE: Altered Mental Status in an Infant

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PATIENT NAME: Cody Parks

PATIENT AGE: 10 months old

CHIEF COMPLAINT: Altered Mental Status

Brief narrative

description of case

Include the presenting patient chief complaint and overall learner goals for this case

10 month old male infant presents to the ED by EMS with vomiting and altered mental status (AMS). Infant arrives to the ED awake but poorly interactive. Ultimately, the infant will be diagnosed with intussusception and hypovolemic shock based on the history, physical exam and ultrasound findings. Learners are expected to establish a differential diagnosis of AMS appropriate for an infant, demonstrate appropriate resuscitative interventions, and use appropriate imaging and labs to help identify the cause of AMS.

Primary Learning Objectives

What should the learners gain in terms of knowledge and skill from this case? Use action verbs and utilize Bloom's Taxonomy as a conceptual guide

1. Demonstrate knowledge of the causes of altered mental status in an infant.
2. Recognize symptoms and signs of intussusception from the history, physical exam and imaging studies.
3. Manage hypovolemic shock in an infant.
4. Establish team roles and communicate effectively as a team.

Critical Actions

List which steps the participants should take to successfully manage the simulated patient. These should be listed as concrete actions that are distinct from the overall learning objectives of the case.

1. Opens and repositions airway
2. Places patient on oxygen via non-rebreather at 10 Liters/min
3. Establishes IV or IO access
4. Initiates fluid resuscitation with 20 ml/kg of Normal saline, repeats boluses q 15 min until 60 ml/kg or until blood pressure improves.
5. Chooses appropriate lab and imaging studies to narrow the differential diagnosis of altered mental status.

Learner Preparation

What information should the learners be given prior to initiation of the case?

Learners should have pre-requisite knowledge about:

1. How to perform the primary survey (assessment of airway, breathing, circulation and disability).
2. How to stabilize an infant with altered mental status (manage airway, support breathing and circulation as needed)
3. Management of hypovolemic shock

<p>Required Equipment <i>What equipment is necessary for the case?</i></p>	<p>Monitor and leads IV and IO set up Non-rebreather, bag/valve mask, intubation supplies RSI medications epinephrine Normal saline, PRBCs IV antibiotics Ultrasound machine</p>
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INITIAL PRESENTATION	
<p>Initial vital signs</p>	<p>HR: 190/min BP: 70/40 RR: 20/min O₂SAT: 92% RA T:37.5°F</p>
<p>Overall Appearance <i>What do learners see when they first enter the room?</i></p>	<p>10 month old pale, lethargic appearing male infant lying on stretcher. Child opens eyes to stimuli and is responsive to stimuli. Mother is very anxious.</p>
<p>Actors and roles in the room at case start <i>Who is present at the beginning and what is their role? Who may play them?</i></p>	<p>Learner roles Doctor #1: Team Leader Doctor #2: Airway/IO Physician Doctor #3: Survey Physician (performs exam) Doctor #4: History Taker Nurse #1: Fluid/Medication Administration Nurse Nurse #2: Medication Preparation Nurse Nurse #3: Documenting Nurse</p> <p>Additional learners may fill in to help with airway, look up medications, and help the other participants</p> <p>Facilitator roles Instructor #1: Simulation instructor who will act as the mother and also act as debriefing facilitator</p> <p>If additional facilitators are available, some may act as an observer during the scenario and facilitate debriefing</p>
<p>HPI <i>Please specify what info here and below must be asked vs what is volunteered by patient or other participants</i></p>	<p><u>Volunteered by Mother:</u> Over the last 2 days, Cody has had lots of vomiting and fussiness. He appeared pale and lethargic today after an episode of vomiting so I called 911. He seemed dazed and wouldn't respond to my voice. I slapped his back a few times and he woke up a little, but still seems sleepy.</p> <p><u>If asked:</u> Q: Any past medical history? Previously healthy child Q: Any recent illness or injuries? He had congestion, cough and some fever last week Q: How many episodes of vomiting? Was it bilious or bloody? Vomited 8 times since last night and each episode followed an episode where he would cry and draw up his legs. Vomit looked like formula with some yellow streaks in the last few, no blood. He hasn't had much of an appetite for the last few days Q: Any fever, any meds given? No fever. I gave him a dose of Tylenol last night</p>

	because he seemed uncomfortable. He was crying more than usual
ROS	General: No fever, chills, decreased appetite Resp: No cough, no SOB, mild clear rhinorrhea GI: Emesis x 8, no diarrhea, no blood in the stool GU: no hematuria, no wet diapers in the last 12 hours Neuro: Fussiness last night, report of lethargy prior to arrival to the ED
Past Medical History	Born full term at 38 weeks via normal spontaneous vaginal delivery
Past Surgical History	No history of surgeries
Family History	Parents and 4 year old sibling are all in good health. Sibling had an upper respiratory infection and some vomiting a few days ago.
Medications	Tylenol was given last night. Child takes no daily medications
Allergies	No known drug allergies
PHYSICAL EXAMINATION	
General	A pale, lethargic appearing infant, minimally interactive on exam
HEENT	Small sunken, anterior fontanel, no skull hematomas, PERRL, eyes sunken, tympanic membranes are normal, dry mucous membranes, oropharynx is clear
Neck	Supple neck, single occipital lymph node palpated
Respiratory	Lungs clear to auscultation bilaterally, no retractions, breath sounds symmetric, decreased respiratory effort
Cardiovascular	Regular rhythm, tachycardia, no murmurs, rales or gallops, peripheral and central pulses 1+ bilaterally, cap refill is 4 seconds
Abdomen	Distended, diffusely tender abdomen, moderate guarding, no hepatosplenomegaly
Neurological	PERRL, decreased mental status with slight withdrawal of all extremities to painful stimuli, does not open eyes except to stimuli, weak cry with painful stimulation
Skin	No rashes, petechiae or bruises noted.
GU	Circumcised male infant with bilaterally descended testicles
Extremities	Normal range of movement of upper and lower extremities, no edema
Psychiatric	

SCENARIO STATES, MODIFIERS AND TRIGGERS

This section should be a list with detailed description of each step than may happen during the case. If medications are given, what is the response? Do changes occur at certain time points? Should the nurse or other participant prompt the learners at given points? Should new actors or participants enter, and when? Are there specific things the patient will say or do at given times?

PATIENT STATUS	LEARNER ACTIONS, MODIFIERS & TRIGGERS TO MOVE TO THE NEXT STATE	
<p>1. Baseline</p> <p>Rhythm: Sinus Tachycardia HR: 190 /min BP:70/40 RR: 20 /min O₂SAT: 92 % RA T: 37.5 °F</p>	<p><u>Learner Actions:</u></p> <ol style="list-style-type: none"> 1. Opens airway and places Non-rebreather (NRB) at 10 L/min 2. Attempts IV access 3. Orders NS bolus 20 ml/kg 4. Orders bedside glucose 5. Orders CBC, BMP, VBG with lytes, Serum drug screen, urine drug screen, UA, blood culture, urine culture. 6. Considers antibiotics 7. Obtains an EKG 8. Orders CXR and CT head without contrast 9. Considers LP 	<p><u>Modifiers: Changes to patient condition based on learner action</u></p> <ol style="list-style-type: none"> 1. O₂sats improve to 97% on NRB; if interventions not performed sats continue to decrease to 89% on RA. 2. IV attempt unsuccessful, places an IO 3. After first bolus, BP improves to 72/41; if continues with IV attempts and does not place IO or give first bolus within the first 2 to 3 minutes then BP drops to 65/38 and HR increases to 200. 4. Glucose 75 mg/dl 5. Labs currently pending, will be given in the next phase 6. Nurse may prompt if antibiotics not discussed: "Doctor, do you want to give antibiotics?" 7. EKG is sinus tachycardia, otherwise normal. 8. CXR and CT head are normal. <p><u>Triggers: For progression to next state</u></p> <ol style="list-style-type: none"> 9. After 5 minutes or once above tasks are completed, patient moans and draws up legs then becomes unresponsive and apneic. A large bloody stool is noted in the diaper.
<p>2.</p> <p>Rhythm: Sinus Tachycardia HR: 180 /min BP: 69 / 38 RR: 0/min O₂SAT:89 % if on NRB, 82% if on RA T: 37.5 °F</p>	<p><u>Learner Actions:</u></p> <ol style="list-style-type: none"> 1. Opens airway and begins bag/mask ventilation. May proceed to intubation and manually ventilate. 2. Administers second NS bolus 20 ml/kg. 3. Orders imaging of the abdomen: Abdominal XR, US, CT 4. Considers ordering coags and type and screen. Results of previously ordered labs given. 	<p><u>Modifiers:</u></p> <ol style="list-style-type: none"> 1. O₂ sats improve to 97%. Some learner groups may elect to bag the patient and not proceed to intubation. Ending the scenario does not require that they have intubated. Should use RSI. If need for bag/mask ventilation or intubation not recognized, O₂ sats will continue to decrease and HR will drop to 40 /min. If ventilation and chest compressions are administered then HR will improve to 150. If not recognized, nurse may prompt, "There is a change in vital signs." 2. With second bolus, BP improves to 74/45 and HR improves to 175. 3. Abdominal XR shows a target sign without free air, US identifies intussuseption. If only CT of the abdomen is ordered, nurse may prompt:

		<p>“Doctor, do you want to do an ultrasound while we are waiting to go to CT.”</p> <p><u>Triggers:</u></p> <p>5. On bedside ultrasound, FAST is negative but a 3 cm mass in the RUQ is identified and the diagnosis of intussusception is made.</p>
<p>3.</p> <p>Rhythm: Sinus Tachycardia HR: 175 /min BP: 75/45 RR: 20/min with assisted ventilation O₂SAT: 97% on O₂ T: 37.6°F</p>	<p><u>Learner Actions:</u></p> <ol style="list-style-type: none"> 1. Consults radiology for air contrast enema. 2. Pediatric surgery is consulted. 3. Orders third NS bolus of 20 ml/kg 4. Maintenance IV fluids ordered. 	<p><u>Modifiers:</u></p> <ol style="list-style-type: none"> 1. Radiology is unable to reduce the Intussusception using air contrast enema. 2. Patient is transferred to the OR or tertiary care facility for further management. 3. With third bolus, BP improves to 80/50 and HR to 160. <p><u>Triggers:</u></p> <ol style="list-style-type: none"> 4. Learners are prompted with “The OR is ready for your patient or the transport team is here to transport your patient.”

SUPPORTING DOCUMENTS, LAB RESULTS AND MULTIMEDIA	
Lab Results	<p>CBC: WBC 14,000, Hematocrit 41%, platelets 278,000 CMP: Na 135mEq/L, K 4.3mEq/L, Cl 103mEq/L, HCO₂ 12 mEq/L, BUN 20 mg/dL, creatinine 0.3mg/dL, glucose 75mg/dL, Ca 9.8mg/dL, albumin 4.1g/dL, ALT 43g/dL, AST 42 g/dL, Alk Phos 150 U/L, TBili 0.9mg/dL, DBili 0.1mg/dL VBG: pH 7.28, pO₂ 45mmHg, pCO₂ 45, BE -13 Serum Drug Screen: neg Urine Drug Screen:neg UA: amber colored, specific gravity 1.030, otherwise negative Blood Culture: Pending</p>
EKG	See attached file
CXR CT imaging	See attached file

Ultrasound Video Files	See attached file
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SAMPLE QUESTIONS FOR DEBRIEFING
<p>1) What are some of the causes of altered mental status in an infant and what labs or imaging would you order to narrow the differential diagnosis?</p> <p>2) What are the symptoms and signs of hypovolemic shock in an infant? Discuss the management of hypovolemic shock.</p> <p>3) What are the symptoms and signs of intussusception? What age range is affected? What would you expect to see on imaging? How is it treated?</p>

Ideal Scenario Flow

Provide a detailed narrative description of the way this case should flow if participants perform in the ideal fashion.

The learner enters the room to find a pale, lethargic appearing child lying on the stretcher. With a history of a brief altered mental status event in the home, child is examined and found to have decreased mental status with tachycardia, signs of dehydration and low blood pressure. Provider places supplemental oxygen and io access and begins fluid resuscitation. Bedside glucose is ordered and is 75 mg/dl. The learner considers the differential diagnosis of altered mental status in an infant and orders appropriate labs and imaging to narrow the differential diagnosis, including CBC, CMP, blood gas, UA, CT head, tox screens and CXR. After five minutes, the child moans and suddenly goes limp and unresponsive. The mother is frantically crying that “Cody isn’t moving, what’s wrong with my baby, help him”. The baby is noted to be apneic and breathing is supported with bag/mask ventilation. Fluid resuscitation is continued and the child is noted to have a bloody stool with a distended and tender abdomen. . At this time provider takes the ultrasound machine and performs a FAST exam that is negative and performs an intussusception US that shows a 3cm mass in the RUQ consistent with an intussusception. Surgery and radiology are notified, an air contrast enema is performed by radiology and is unsuccessful. Pediatric surgery is notified and the child is taken to the OR for reduction.

Anticipated Management Mistakes

Provide a list of management errors or difficulties that are commonly encountered when using this simulation case.

1. Difficulty with recognized altered mental status: Due to the need to suspend disbelief and the

difficulty of mimicking altered mental status with a manikin, multiple prompts are built into the history and physical exam that should aid in the recognition of altered mental status.

- 2. Failure to recognize hypovolemic shock and the need for aggressive fluid resuscitation: Some of our learners did not immediately recognize that the patient had signs of hypovolemic shock and required aggressive fluid resuscitation. We found it helpful to allow the BP to continue to drop and the patient to become bradycardic to prompt the need for resuscitation.*
- 3. Failure to recognize the need for airway management: Some of our learners did not immediately recognize when the patient required airway management. We found it helpful to allow the pulse oxygenation to continue to drop despite supplemental oxygen to prompt the need for bag/mask ventilation or intubation.*
- 4. Uncertainty about the differential diagnosis of altered mental status in infants: Some learners were unfamiliar with some causes of altered mental status in an infant and did not realize that intussusception may cause altered mental status in this age group. We created specific debriefing materials to cover this information.*