ACEP Ultrasound Simulation Case Template

SIMULATION CASE TITLE: Obstructive pyelonephritis with sepsis
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PATIENT NAME: Susie P. Stuck
PATIENT AGE: 53 year old female
CHIEF COMPLAINT: Altered mental status

Brief narrative description of case *Include the presenting patient chief complaint and overall learner goals for this case*	This is a 53 year old female who presents with altered mental status. She is found to have sepsis. Her urinalysis is marginally positive for infection. She is not fluid responsive and does not respond to pressor support. Hydronephrosis is discovered on bedside ultrasound resulting in urology consultation and operative management for source control.
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*	The primary learning objectives are to: -Address and treat patient's abnormal vital signs -Recognize refractory septic shock -Evaluate for source of sepsis -Recognize indication for urology consultation to obtain source control
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.*	-Recognize patient's abnormal vital signs -Administer appropriate IV fluid bolus and evaluate for patient response to fluid bolus -Perform physical examination -Evaluate for source of shock -Evaluate for source of infection -Perform appropriate diagnostic imaging -Recognize indication for emergency urology consultation
Learner Preparation *What information should the learners be given prior to initiation of the case?*	
Required Equipment *What equipment is necessary for the case?*	Room set up for emergency department Props: Normal chest x-ray, Ultrasound machine, ultrasound images

INITIAL PRESENTATION	
Initial vital signs	HR: 106/min BP: 142/107 RR: 25/min O$_2$SAT: 99% T: 38.1°F
Overall Appearance *What do learners see when they first enter the room?*	There is a woman who appears older than stated age lying on the gurney. She is quiet, eyes closed. IV is in place by paramedics.
Actors and roles in the room at case start *Who is present at the beginning and what is their role? Who may play them?*	EMS is present at the beginning of the case.
HPI *Please specify what info here and below must be asked vs what is volunteered by patient or other participants*	EMS volunteers a brief report about the patient, "This is Ms.Stuck. We picked her up from the local nursing home. They sent her in because they were concerned about her mental status. She started seeming "out of it" around lunch time and her mental status deteriorated throughout the afternoon. She has severe schizophrenia. Usually she will engage in simple conversations with staff at the facility, but she hasn't been this afternoon. She has been otherwise normal, had a normal breakfast and has been sitting in the recreation room watching television all day. In addition to the history of schizophrenia, she has seizure disorder and frequent urinary tract infections."
ROS	Patient is altered, not answering questions. ROS not obtainable.
Past Medical History	Schizophrenia Seizure disorder Frequent urinary tract infections
Past Surgical History	Hysterectomy
Family History	Unknown
Medications	Valprioc acid, lithium level. Medications are administered by staff at nursing facility. No missed doses.
Allergies	Codeine, Penicillin
PHYSICAL EXAMINATION	
General	Minimally responsive to questioning
HEENT	Normocephalic, without obvious abnormality, atraumatic
Neck	Supple, trachea midline, no cervical lymphadenopathy
Respiratory	Clear to auscultation bilaterally, no wheezes, crackles or rales

Cardiovascular	Tachycardic, no murmurs, rubs or gallops
Abdomen	Soft, no masses, patient groans slightly with palpation of the abdomen.
Neurological	Patient does not answer questions appropriately. She will mumble answers but is unintelligible. She localizes pain and opens her eyes with painful stimuli. No obvious cranial nerve deficit. Moves all extremities equally. Not cooperative with strength testing.
Skin	Warm. Dry. No rashes.
GU	Groans with CVA palpation on right. Patient pushes examiner's hand away and says "Stop!"
Extremities	No lower extremity edema, peripheral pulses palpation, symmetric
Psychiatric	Unable to assess. Patient not answering questions.

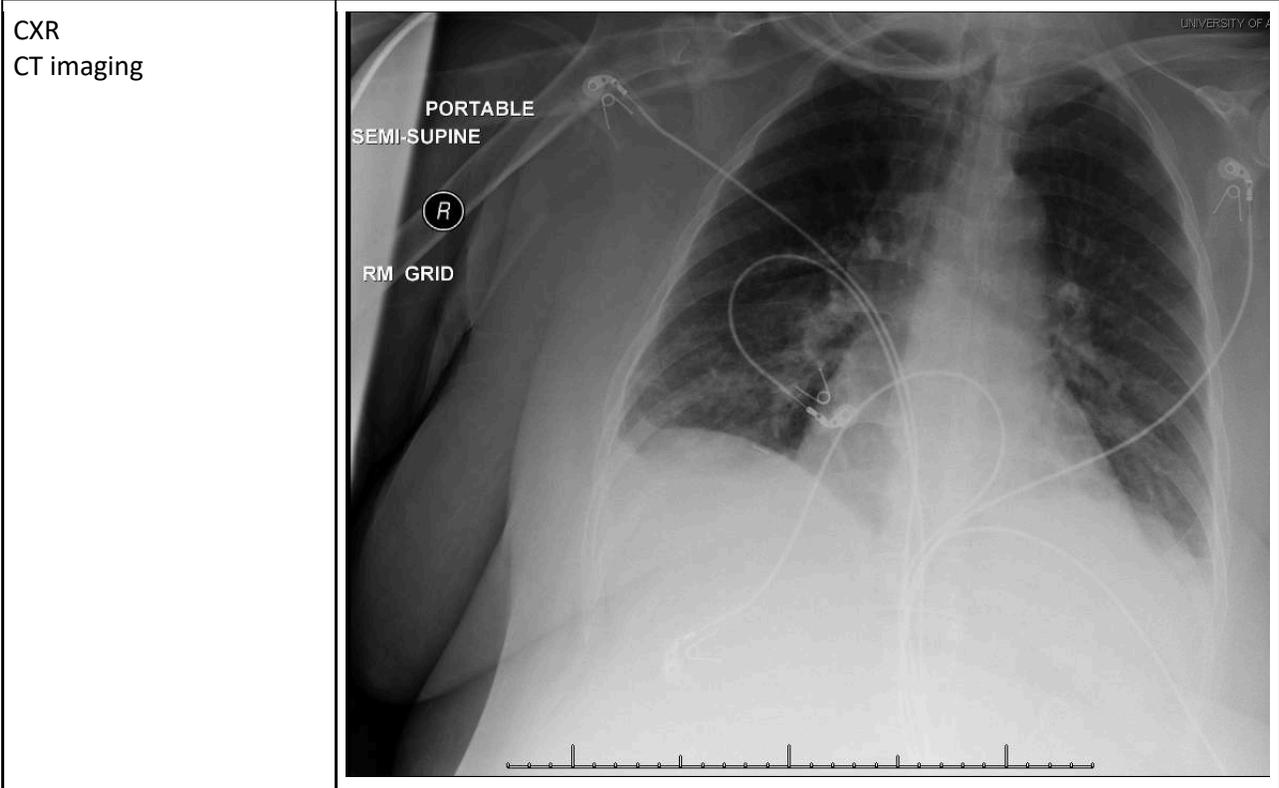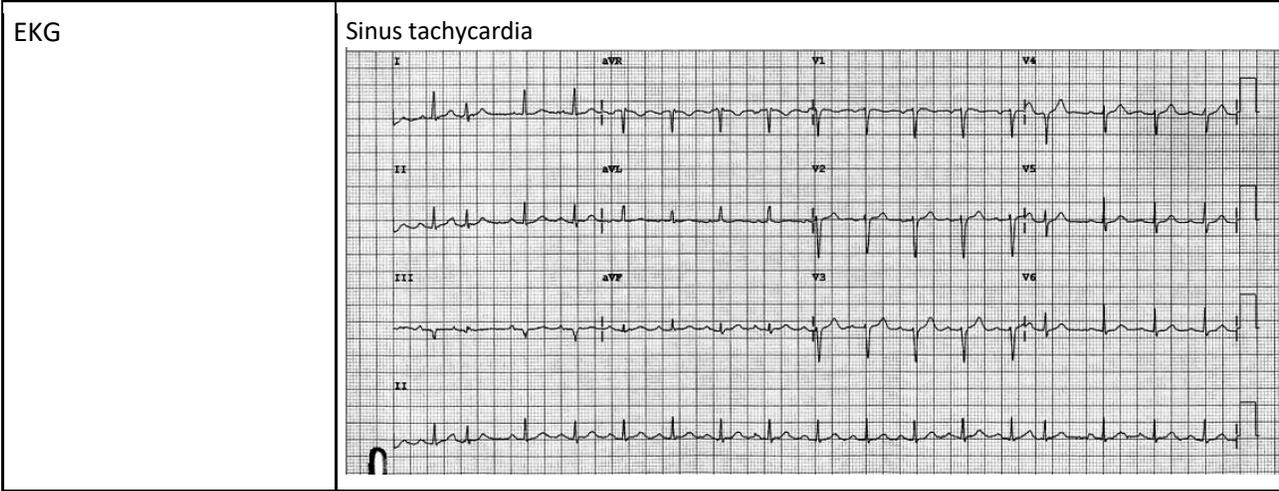| PATIENT STATUS	LEARNER ACTIONS, MODIFIERS & TRIGGERS TO MOVE TO THE NEXT STATE	
1. Baseline Rhythm: ST HR: 106/min BP: 142/107 RR: 25/min O$_2$SAT: 99% T: 38.1°F	Learner Actions: • Place patient on monitor • Recognize abnormal vital signs • Recognize sepsis based on vital signs • Administer fluid bolus	Modifiers: *Changes to patient condition based on learner action* • Patient's heart rate will transiently improve with fluid bolus. Triggers: • Learner verbalizes administration of IV fluid bolus
2. Rhythm: ST HR: 91/min BP: 140/98 RR: 25/min O$_2$SAT: 99% T: 38.1°F	Learner Actions: • Order diagnostics (CBC, CMP, coagulation studies, VBG, venous lactate, CXR, blood cultures, urinalysis, valproic acid level, lithium level, EKG)	Modifiers: • Urinalysis shows 19 WBCs, nitrite positive Triggers: • Learner verbalizes needing diagnostics to look for infectious source.

3. Rhythm: ST HR: 115/min BP: 100/57 RR: 25/min O_2SAT: 99% T: 38.1°F	Learner Actions: • Order broad-spectrum antibiotics avoiding beta-lactams • Verbalize that likely source is urinary tract infection	Modifiers: • Patient will become more tachycardic and hypotensive • Patient has a penicillin allergy. Triggers: • Learner orders antibiotics
4. Rhythm: HR: 120/min BP: 90/48 RR: 27/min O_2SAT: 96% T: 39.0°F	Learner Actions: • Begin administration of pressor, norepinephrine preferred.	Modifiers: • Patient will continue to be in shock despite pressors and blood pressure will continue to drop Triggers: • Learner orders pressors. Learner may order additional boluses but they will have no effect on hemodynamics.
5. Rhythm: HR: 120/min BP: 85/45 RR: 27/min O_2SAT: 96% T: 39.0°F	Learner Actions: • Learner will seek cause of hemodynamic instability/shock. • Perform bedside ultrasound. Discover hyperdynamic heart, right sided moderate hydronephrosis.	Modifiers: • Patient will continue to be shock. Triggers: • Ultrasound findings interpreted by learner as hydronephrosis.
5. Rhythm: HR: 120/min BP: 85/45 RR: 27/min O_2SAT: 96% T: 39.0°F	Learner Actions: • Consult urology for operative repair • Consult ICU for transfer of care	Modifiers: • Triggers: •

SUPPORTING DOCUMENTS, LAB RESULTS AND MULTIMEDIA	
Lab Results	CBC: WBC 18.5, Hg 10.1, Hct 31.5, Plt 485, Neutrophils 90.7%, lymphocytes 4.1%, monocytes 5.2%, eosinophils 0.0%, basophils 0.0% CMP: Na 128, K 4.0, Cl 102, Co2 18, BUN 22, Cr 1.1, Glu 86, Ca 8.3 Troponin 0.01

	Valprioc acid level: 89 µg/mL Lithium level: 0.05 mmol/L VBG: pH 7.3, p)2 57, pC)2 28.2, 15.7 Venous lactate: 2.9
EKG	Sinus tachycardia
CXR CT imaging	
Ultrasound Video Files	RUSH exam images files uploaded: Cardiac RUQ– demonstrates hydronephrosis LUQ Aorta IVC

SAMPLE QUESTIONS FOR DEBRIEFING
1) What did you consider when the patient was not responsive to resuscitation?
2) What are the challenges in diagnosing obstructed pyelonephritis?
3) If the ultrasound had not been diagnostic, what would be your next step(s) in management?

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

The learners enter the room to find a patient who is altered but responsive on the gurney. The paramedics are available to provide history and have already placed an IV. Patient cannot provide any history. The patient is mildly tachycardic, tachypneic and has a fever. She meets sepsis vital signs. The learner orders an IV fluid bolus. After completing a physician examination and attempting to obtain further history from patient, EMS or chart review, the providers begin testing to identify infectious source. After collection of blood cultures, broad-spectrum antibiotics are initiated with care to avoid beta-lactams given patient's reported penicillin allergy. Learner notes that patient's urinalysis is positive, other testing is consistent with sepsis. The patient's hemodynamic deteriorate. The learner may attempt another fluid bolus or initiate vasopressor support. The patient will continue to deteriorate. The learner attempts to identify another cause of shock. They may verbalize a differential for other causes of shock and consider other diagnostic testing. Bedside ultrasound will reveal right sided hydronephrosis. The learner then initiates consult to urology for definitive operative treatment and arranges for patient's care to be transferred to the ICU service.

Anticipated Management Mistakes
Provide a list of management errors or difficulties that are commonly encountered when using this simulation case.
1. Failure to recognize abnormal vital signs consistent with sepsis
2. Failure to broadly consider etiology for worsening septic shock.
3. Attention to patient allergy list.