ACEP Simulation Case Template **SIMULATION CASE TITLE: Pneumonia with septic shock** **AUTHORS: Sara Damewood**	
PATIENT NAME: Mr. Jones **PATIENT AGE: 80** **CHIEF COMPLAINT: short of breath, weakness**	
Brief narrative description of case *Include the presenting patient chief complaint and overall learner goals for this case*	CC: Shortness of breath, generalized weakness. This patient arrives with weakness and shortness of breath. He is found to have pneumonia and shows signs of multi-organ failure and critical illness. Learners should identify and demonstrate basic management of septic shock, as well as use ultrasound to guide resuscitation.
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*	Recognize septic shock in clinical presentation (MK) Understand basic management of septic shock (PC) Incorporate appropriate clinical ultrasound into medical decision making (PLI)
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 abnormal vital signs Treat septic shock Perform and interpret cardiac ultrasound Perform and interpret lung ultrasound
Learner Preparation *What information should the learners be given prior to initiation of the case?*	This scenario takes place in an ED associated with a hospital. There is a dedicated ED nurse for this critically ill patient. Lab and pharmacy services are readily available at this hospital. The hospital's intensive care unit has available beds.
Required Equipment *What equipment is necessary for the case?*	Ultrasound machine, O2 support devices, peripheral IV, EKG, IV fluids, central line kit, glucometer, temperature probe, pulse oximetry, end tidal CO2 monitor, medication "bags" (pressors, antibiotics), cardiac monitor, BP cuff Optional: BVM, ventilator, ETT, arterial line, laryngoscope, LMA

INITIAL PRESENTATION			
Initial vital signs	HR: 132 /min BP: 82/53 RR: 28/min O_2SAT: 88 % RA T: 39.5 ^oC		
Overall Appearance *What do learners see when they first enter the room?*	Patient is supine on gurney, daughter at bedside. Patient appears pale, tired and with increased respiratory effort.		
Actors and roles in the room at case start *Who is present at the beginning and what is their role? Who may play them?*	Patient: male Daughter: provides history Nurse: dedicated nursing duties for this critically ill patient		
HPI *Please specify what info here and below must be asked vs what is volunteered by patient or other participants*	Volunteered: 67 yo M with history of tobacco abuse and insulin dependent diabetes mellitus presents to the ED with fever, cough, and generalized weakness progressively worsening over the past two days. His daughter reports the patient nearly passed out with standing up today. Also reports pleuritic chest pain. Received flu shot this year. Compliant with insulin but has needed increased doses lately for elevated sugars. The patient's ED nurse is concerned that the patient is having a hard time focusing on answering her questions Must be asked: Productive cough with green sputum Had similar presentation when went to ICU with pneumonia Decreased po intake Sleeping more, and when awake seems confused Rest ROS negative		
Past Medical/Surg History	**Medications**	**Allergies**	**Family History**
tobacco abuse and insulin dependent diabetes mellitus	**Insulin**	**NKDA**	**Stroke**
Physical Examination			
General	**Tired appearing**		
HEENT	**Dry mucus membranes**		
Neck	**No LAD**		
Lungs	**Diminished breath sounds with rhonchi on right lung field**		
Cardiovascular	**Tachycardic rate, no murmurs, weak distal pulses**		
Abdomen	**Soft, nontender, normal liver size**		

Neurological	**BUE and BLE 5/5 strength, oriented to self, but not to date or place, speech fluent, CN II-XII intact, difficult focusing on questions**
Skin	**Cool and moist**
GU	**Rectal hemoccult negative, external genitalia normal**
Psychiatric	**Pleasant, confabulates**

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	
1. Baseline State Rhythm: HR: 135/min BP: 83 /54 RR: 30 /min O_2SAT: 87 % T: 40°C	Learner Actions **Recognize abnormal vital signs** **Start supplemental O2** **Obtain IV access** **Start IV fluids** **Order labs** **Order Xray** **Order EKG** **Blood glucose**	Modifiers HR improves to 120, BP improves to 85/42 with IVF, otherwise worsens O2 improves to 93%, RR to 26 with 2L NC, otherwise worsens EKG with sinus tachycardia Glucose 375 Triggers All abnormal vitals addressed All orders placed for appropriate workup
2. Resuscitation Rhythm: sinus tach HR: 120/min BP: 85 /54 RR: 26 /min O_2SAT: 93 % 2LNC T: 40°C All imaging now unavailable for 2 hours	Learner Actions **Perform and interpret ultrasound**	Modifiers Patient steadily deteriorates despite fluids without ultrasound performed Triggers Ultrasound interpreted as PNA, hyperdynamic function, and small IVC. Correct antibiotics (broad spectrum) More fluids
3. Resuscitation Rhythm: sinus tach HR: 120/min BP: 85 /54 RR: 26 /min O_2SAT: 93 % 2LNC T: 40°C	Learner Actions: **Start antibiotics** **Reassess vitals, provide more fluids** **Treat hyperglycemia**	Modifiers Patient steadily deteriorates despite fluids without antibiotics Triggers Correct antibiotics (broad spectrum) More fluids Insulin gtt

4. Resuscitation 4L IVF given total HR 100 BP 85/40 02 saturation on 2L 85% RR 32 Patient now more short of breath with crackles in all lung fields	Learner Actions **Repeat US IVC and lung** **Address respiratory status (NIPPV, more O2)**	Modifiers IVC is now large and plethoric, B lines seen Identify and address increasing respiratory distress Triggers Dependent on level of learner and desire of educator for level of complexity of case: Interpret ultrasound correctly, address worsening hemodynamics NIPPV v intubation
5. Resuscitation HR 100 BP 80/60 O2 94% BiPIP or vent RR 22 CXR finally done, PNA and pulmonary edema CT head no acute	Learner Actions **Address persistent hypotension despite fluid therapy (pressors, central line)**	Modifiers Managing septic shock after IVF not effective. Choice of pressor in septic shock Triggers Dependent on level of learner and desire of educator for level of complexity of case: Interpret ultrasound correctly, address worsening hemodynamics Central line and pressors Arterial line Address hypotension despite fluid therapy
6. stablization HR 100 BP 110/60 O2 96% BiPIP or vent RR 22	Learner Actions **Patient stable for disposition to ICU with pressors** Call the ICU for admission	Modifiers End of case

SUPPORTING DOCUMENTS, LAB RESULTS AND MULTIMEDIA	
Lab Results	**WBC 20, Lactate 5.7, H/H 17/44, Cr 1, CO2 15, Glucose 370**
EKG	**Sinus tachycardia, normal axis, normal intervals**
CXR	**Pneumonia with edema**
Ultrasound Video Files	**Hyperdynamic** **IVC flat** **Pneumonia** **IVC full** **Pulmonary edema**

SAMPLE QUESTIONS FOR DEBRIEFING
1) What information can cardiopulmonary ultrasound provide in hypotension? **2) Describe early goal directed therapy for septic shock** **3) What are the diagnostic criteria for septic shock?**

Ideal Scenario Flow

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

For example:

> *The learners enter the room to find a patient in respiratory distress and shock. They immediately place the patient on bedside monitors and recognize that the patient is hypoxic and hypotensive. Supplemental oxygen is provided and an IV fluid bolus is ordered. The patient's respiratory distress improves but does not resolve, and hypotension is refractory to IV fluids. After performing an ultrasound of the heart and lungs, the providers note that the patient has pneumonia and is likely fluid responsive with hyperdynamic cardiac function. Antibiotics are started. Further IV fluids are given until the patient's respiratory status has continued to worsen and ultimately positive pressure ventilation or endotracheal intubation is required. Successful management of airway then requires further management of hypotension. Providers must address hypotension despite 4L of IVF given and now full IVC with pressors. Chest x-ray demonstrates pneumonia with pulmonary edema. Lab studies (if obtained) demonstrate an elevated WBC count and lactate, in setting of hyperglycemia and likely DKA. EKG is sinus tachycardia. Providers start insulin drip. The patient's blood pressure normalizes on pressor support. The providers arrange for patient admission to the medical ICU.*

Anticipated Management Mistakes

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

1. *<u>Not doing an ultrasound on patient with likely septic shock</u>: We found that the residents were not used to incorporating ultrasound into simulation cases, despite our ultrasound simulator/machine being in the room. We allowed the patient to continue to deteriorate and other imaging modalities not be available to guide them to do the ultrasound.*
2. *<u>Failure to recognize the need for second ultrasound to guide next step in therapy</u>: Some of our learners did not immediately recognize that the ultrasound could be repeat to lend important information, leading to delay in diagnosis of fluid overload. However, once they had done the first ultrasound, most learners thought to do the second when the patient's clinical status worsened. We found it helpful to allow the pulse oxygenation and BP to continue to drop to prompt another action.*
3. *<u>Uncertainty about indications for bipap vs intubation</u>: Many of our learners were unfamiliar with bipap settings and some decided to intubate instead of trying NIPPV first. Not necessarily a failed step.*