ACEP Ultrasound Simulation Case Template

SIMULATION CASE TITLE: Pulmonary Embolism s/p surgery
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PATIENT NAME: James Robertson
PATIENT AGE: 46
CHIEF COMPLAINT: Chest pain and Shortness of Breath

Brief narrative description of case *Include the presenting patient chief complaint and overall learner goals for this case*	A 46 year old male with a cast on his left leg from an ankle fracture presents to the ED complaining of pleuritic chest pain and shortness of breath. The team will take a history and start workup when the patient will suddenly state he's "not feeling well" and then arrest. The team will perform ACLS consistent with the PEA algorithm and should consider IV thrombolytics. If IV thrombolytics are administered, the patient will have ROSC.
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. Recognize risk for PE and initiate the appropriate workup urgently. 2. Provide quality ACLS care, including: a. Using ETCO2 to guide resuscitation b. Minimizing pulse checks c. Appropriate 30:2 compressions: breaths ratio d. Appropriate use of medications (epinephrine and thrombolytic). Consider the administration of thrombolytics during cardiac arrest secondary to a suspected pulmonary embolism.
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.*	• Place patient on monitor / Pads • IV access • ACLS • Use ultrasound to make diagnosis • Administer tPA • Intubation
Learner Preparation *What information should the learners be given prior to initiation of the case?*	• **CT is backed up for > 2 hours**
Required Equipment *What equipment is necessary for the case?*	• Ultrasound Machine • Mechanical ventilator

Initial vital signs	HR: 120/min BP: 95/60mmHg RR: 21/min O$_2$ SAT: 93% RA T: 37.2^{o}C GCS: 15 Glucose: Normal
Overall Appearance *What do learners see when they first enter the room?*	Tachypneic patient in mild distress
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 is the historian, no family at bedside initially • Distraught wife could be added to the scenario to increase complexity for senior learners
HPI *Please specify what info here and below must be asked vs what is volunteered by patient or other participants*	A 46 year old male presents to the ED complaining of shortness of breath and pleuritic chest pain. He broke his ankle a week ago and has been in a cast since. He was just discharged home after operative repair 2 days ago. CVS: Pleuritic/Sharp chest pain across right chest Resp: SOB, worsens with ambulation/exertion
ROS	CNS: Normal HEENT: Normal CVS: Chest pain – Pleuritic/Sharp across right chest Resp: SOB, worsens with ambulation/exertion GI: Normal MSK/Neuro: Cast on Left Leg Skin: Normal
Past Medical History	None
Past Surgical History	Left ankle surgery 1 week ago
Social History	Social EtOH. Denies smoking or drugs.
Family History	None
Medications	None
Allergies	None
PHYSICAL EXAMINATION	
General	Looks tachypneic, mild distress
HEENT	Normal

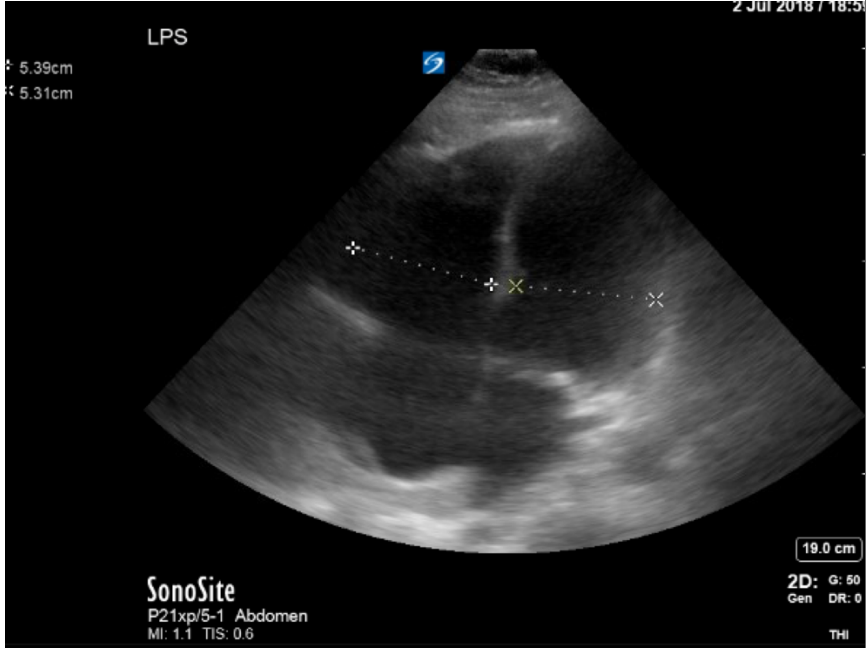|	
Neck	Normal
Respiratory	Tachypnea, BS equal
Cardiovascular	Tachycardia. No murmurs. Normal S1/S2
Abdomen	Normal
Neurological	Normal
Skin	Normal
GU	Normal
Extremities	Left leg cast (mildly swollen if removed)
Psychiatric	Normal

SCENARIO STATES, MODIFIERS AND TRIGGERS

1. *Examiner should realize the acuity of the situation. IV, O2, Monitor and Vital Signs should be obtained immediately.*
2. *If patient uses ultrasound and identifies large RV, patient will go into cardiac arrest.*
3. *If no ultrasound is used, patient progressively worsens and will go into cardiac arrest after physical examination*
4. *Examiner should start ACLS once patient goes in cardiac arrest (PEA). Decision should be made to administer tPA.*
5. *For advanced learners, during ACLS, patients distraught wife should arrive and add complexity to the case.*
6. *If tPA is administered, ROSC will be obtained. Patient should be intubated, ETT placement confirmed with CXR. Patient is to be admitted to the ICU.*
7. *If no tPA administered, no ROSC will be obtained.*

PATIENT STATUS	LEARNER ACTIONS, MODIFIERS & TRIGGERS TO MOVE TO THE NEXT STATE

1. Baseline Rhythm: Tachycardia HR: 130/min BP: 96/61mmHg RR: 16/min O_2SAT: 95% 40% FiO_2 T: 37.1°C	<u>Learner Actions:</u> • Recognize acuity of clinical presentation. • IV / O2 / Monitor • Cardiac ultrasound	<u>Modifiers:</u> *Changes to patient condition based on learner action* • Cardiac ultrasound should be used to identify RV enlargement to suggest PE <u>Triggers:</u> *For progression to next state* • Once ultrasound used, patient goes into cardiac arrest. • If no Ultrasound used, patient goes into cardiac arrest after physical examination
2. Rhythm: PEA HR: 120/min BP: 95/60mmHg RR: 21/min O_2 SAT: 93% RA T: 37.2°C	<u>Learner Actions:</u> • Intubate patient • EtCO2 • CXR to confirm tube placement • Admit to the ICU	<u>Modifiers:</u> • tPA given → ROSC <u>Triggers:</u> • no tPA given → Asystole
3. Rhythm: HR: /min BP: / RR: /min O_2SAT: % T: °F	<u>Learner Actions:</u> •	<u>Modifiers:</u> • <u>Triggers:</u> •
4. Rhythm: HR: /min BP: / RR: /min O_2SAT: % T: °F	<u>Learner Actions:</u> •	<u>Modifiers:</u> • <u>Triggers:</u> •

5.	Learner Actions:	Modifiers:
	•	•
Rhythm:		
HR: /min		Triggers:
BP: /		•
RR: /min		
O$_2$SAT: %		
T: ᵒF		

SUPPORTING DOCUMENTS, LAB RESULTS AND MULTIMEDIA	
Lab Results	• D-Dimer: 4.3 • Troponin: 0.7
EKG	Sinus tachycardia. S1Q3T3. R axis deviation.
CXR US Image	• Proper placement of ETT •

Ultrasound Video Files	

SAMPLE QUESTIONS FOR DEBRIEFING
1) What do you believe caused the patients initial presentation?
2) What would you have differently?

Ideal Scenario Flow

The learner enter the room to find a patient in moderate respiratory distress. Immediately place the patient on Cardiac Monitor, start IV, and Supplemental oxygen. Obtain initial vitals to find the patient is hypotensive. Given the patients recent surgical history ultrasound should be utilized to identify large RV raising clinical suspicion for PE. Initial EKG shows sinus tachycardia with RBBB and S1-Q3-T3. After completing a physical examination and obtaining an appropriate history, the providers note that the patient's respiratory status has continued to worsen patient goes into cardiac arrest. Patient should be intubated to protect airway immediately. ACLS algorithm for PEA to be started. Successful intubation permits further evaluation. Given high suspicion for PE, tPA to be administered in order to obtain ROSC. CXR after intubation shows proper ETT placement. Laboratory studies (if obtained) demonstrate an elevated D-dimer and a mildly elevated troponin. Patient remains borderline hypotensive intubated. The providers arrange for

admission to the ICU. CTA should be ordered and interventional radiology consulted.

Anticipated Management Mistakes

1. *Failure to interpret ultrasound image*
2. *Failure to administer tPA early on when patient goes into cardiac arrest*