ACEP Simulation Case Template

SIMULATION CASE TITLE: Massive PE with RV Failure
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PATIENT NAME: Eliz Johnson
PATIENT AGE: 72
CHIEF COMPLAINT: Syncope

Brief narrative description of case *Include the presenting patient chief complaint and overall learner goals for this case*	70 year old female with history of HTN, MI, CVA who presents to the ED via EMS following multiple syncopal episodes, she reports associated dyspnea on exertion. She is tachycardic and hypotensive. She is status-post right knee replacement 3 weeks ago and has recently been sedentary. Patient had a cardiac arrest en route; ROSC was obtained and she is intubated. The goal of this case is to recognize PE as a potential emergent etiology of syncope, use bedside Transesophageal Echo (TEE) to diagnose PE and help guide initial management of massive PE.
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*	- Formulate a differential diagnosis for syncope in the setting of hypotension - With a high suspicion for PE, perform bedside TEE to establish PE as a high-probability diagnosis base on RV overload & signs of RV dysfunction - Employ fluid-conservative strategy during initial management in light of TEE evidence of right heart dysfunction
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.*	- Obtain vitals and place patient on cardiac monitor - Obtain ECG - HPI, physical exam - Perform and interpret POCUS TEE findings - Identify signs of right heart dysfunction including RV dilatation, McConnell sign, D-sign, TAPSE - Avoid fluid administration and initiate vasopressor given concern for RV failure - Recognize that persistent shock state preclude complementary CT imaging - Shared decision making with patient family to administer thrombolysis

Learner Preparation *What information should the learners be given prior to initiation of the case?*	70-year-old female who presents to the ED following a syncopal episodes; she had a cardiac arrest with EMS, received one round of CPR and is intubated.
Required Equipment *What equipment is necessary for the case?*	Cardiac monitor Ultrasound machine with appropriate TEE probe Peripheral IV Medications (Norepinephrine, epinephrine and/or vasopressin)

INITIAL PRESENTATION			
Initial vital signs	HR: 121 BP: 71/49 RR: 26 O_2SAT: 96% T: 37.0°C		
Overall Appearance *What do learners see when they first enter the room?*	An elderly female lying supine in the stretcher; she is intubated. She is ill-appearing.		
Actors and roles in the room at case start *Who is present at the beginning and what is their role? Who may play them?*	Paramedics provide initial history. RN staff present as well		
HPI *Please specify what info here and below must be asked vs what is volunteered by patient or other participants*	70 year old female with history of HTN, MI, CVA who presents to the ED following syncopal episode, she reported associated dyspnea on exertion (volunteered by EMS). Family is there to provide additional information. Pleuritic chest discomfort (asked) Status post right knee replacement (asked; surgical history) Recent immobilization (asked) Non radiating chest discomfort (asked)		
Past Medical/Surg History	**Medications**	**Allergies**	**Family History**
History of CVA CAD HTN HLD s/p Right knee replacement	Aspirin Metformin Amlodipine Metoprolol	Statins	Mother had multiple miscarriages- Unknown cause

Physical Examination	
General	Appears as stated age. Ill-appearing
HEENT	Clear oropharynx, ET tube in through 20cm at lip
Neck	No JVD, neck supple
Lungs	Clear bilaterally, no accessory muscle use
Cardiovascular	Sinus tachycardia, no murmurs or gallops, intact peripheral pulses
Abdomen	No abdominal tenderness, distension, no pulsatile mass
Neurological	Patient intubated on sedation, not responding to pain or voice, pupils 3 mm bilaterally and reactive to light.
Skin	Negative skin rashes, pallor. Surgical incision along R knee. RLE edema and warmth.
GU	Negative for dysuria, flank pain
Psychiatric	Negative for agitation, confusion

1) **SCENARIO STATES, MODIFIERS AND TRIGGERS**
2) *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: 121 BP: 71/49 RR: 26 O_2SAT: 96 T: 37°C	Learner Actions ● Place patient on cardiac monitor ● Obtain HPI and exam ● Elicit thromboembolic risk factors ● Perform a bedside TTE, and when poor views are found, use TEE to assess for evidence of PE, RV failure	Modifiers *Changes to patient condition based on learner action* • If learner attempts to order a CT scan, nurse prompts them that patient is too unstable for CT imaging • If learner attempts a TTE, the images put up are of poor quality • If learner does not attempt TEE, nurse prompts them to use TEE Triggers *For progression to next state* ● Perform a bedside TEE and identify dilated RV with clot in transit

2. Rhythm: HR: 118 BP: 81/55 RR: 31 O_2SAT: 84% T:37 ^oC	Learner Actions ● With evidence RV failure secondary to PE, avoid fluid administration ● Initiate vasopressor during phase of management and possibly pulmonary vasodilators ● Avoid large volume resuscitation	Modifiers • If fluid boluses given, BP stagnate and patient becomes hypoxic with rales on physical exam • BP minimally improves with vasopressors Triggers ● Start vasopressors.
3. Rhythm: HR: 135 BP: 82/55 RR: 23 O_2SAT: 98% on 2L NC T: 37^oC	Learner Actions ● Shared decision making with family to push tPA/TNK ● Admit to ICU/Call PE Response Team	Modifiers • If lytics given, BP and O2 saturation improve • If lytics are delayed, patient codes (asystole) Triggers ● Give tPA ● Admit to ICU ends case

SUPPORTING DOCUMENTS, LAB RESULTS AND MULTIMEDIA	
Lab Results	CBC: 11.8/11.0/34.0/285 BMP: Glu 143, Creatinine 1.26, K 3.5, Na 136 Troponin trend: 110, 150, 250 ProBNP: 8,328
EKG	Sinus tachycardia with new T-wave inversion in the inferior leads
CXR CT imaging	CXR without evidence of abnormal radiographic findings, ETT in good place CT – None
Ultrasound Video Files	TEE Images showing: RV enlargement, clot in transit in the RV

SAMPLE QUESTIONS FOR DEBRIEFING

1) **What are some thromboembolic risk factors for PE (list 4)**

2) **List 3 TEE findings that suggest possible PE**

3) **How would you asses for RV failure using TEE**

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 patient who is ill-appearing and intubated. Patient placed on the cardiac monitor, noted to be hypotensive, tachycardic but not hypoxic. Peripheral IVs placed. EMS able to provide history multiple syncopal episodes, shortness of breath with exertion, and cardiac arrest with one round of CPR. Learner elicits thromboembolic risk factors of recent right knee replacement, and sedentary due to postop knee pain. With high suspicion for PE, leader performs bedside TEE showing RV strain with evidence of a clot in transit. Learner holds off on fluid administration. Vasopressor started with minimal improvement of blood pressure. Minimized PEEP on vent. Patient still hypotensive despite vasopressors, patient considered unstable for CT imaging. Shared decision making with family to administer thrombolytics. tPA pushed, BP improve with MAP of greater than 65. Patient admitted to ICU post tPA administration.

Anticipated Management Mistakes

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

1. *Failure to consider POCUS (or TEE) during initial assessment of hypotensive patient: POCUS proves crucial in the early identification of circulatory shock etiology, it can help guide management and more importantly help avoid potential harmful measures.*

2. *Starting patient on aggressive fluid management during initial management phase: Excess preload in the setting of sub-massive or massive PE may exacerbate RV strain and impair cardiac function. Fluid-conservative strategies should be pursued in these circumstances. Small amounts of fluid bolus could be given if there is a clear evidence hypovolemia. Otherwise, fluids should be avoided.*

3. *Intubating hemodynamically unstable patient in the setting of RV failure: RV failure tends to produce a set of vicious spiral which further worsen RV dysfunction. Increase positive pressure within the chest from mechanical ventilation may increase pulmonary vascular resistance, reduce preload, and worsen RV hemodynamics. Every attempt should be made to avoid*

intubation. In this case, the patient is already intubated, but a debrief of intubation in RV failure should be discussed.