

## ACEP Ultrasound Simulation Case Template

**SIMULATION CASE TITLE: A Case of Severe COPD**

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**PATIENT NAME: Frank McSmoker**

**PATIENT AGE: 63**

**CHIEF COMPLAINT: Shortness of breath**

<p><b>Brief narrative description of case</b> <i>Include the presenting patient chief complaint and overall learner goals for this case</i></p>	<p>63 yo smoker with extensive copd on home oxygen comes to the emergency department short of breath. The learner should obtain a brief history as they begin interventions as the patient's vital signs are unstable. The learner should use bedside ultrasound to rule out other causes of shortness of breath during the initial presentation and use ultrasound to re-evaluate the patient if there is a change in status.</p>
<p><b>Primary Learning Objectives</b> <i>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</i></p>	<ul style="list-style-type: none"> <li>- Obtain a focused history and physical when a patient is in need of intervention</li> <li>- Analysis of ABG/VBG</li> <li>- Proper Intubation procedure</li> <li>- Troubleshooting clinical deterioration on the ventilator</li> <li>- Identifying a pneumothorax on ultrasound</li> <li>- Proper needle decompression and placement of a chest tube</li> </ul>
<p><b>Critical Actions</b> <i>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.</i></p>	<ul style="list-style-type: none"> <li>- Elicit focused history and physical exam</li> <li>- Use bedside ultrasound to see normal lung sliding and lack of b-lines</li> <li>- Begin appropriate treatment including fluids, bipap, steroids, and albuterol</li> <li>- Recognize the need for intubation and appropriate vent settings</li> <li>- Recognize a change in clinical course and re-evaluation with ultrasound</li> <li>- Recognize a tension pneumothorax on ultrasound and appropriately treat</li> </ul>
<p><b>Learner Preparation</b> <i>What information should the learners be given prior to initiation of the case?</i></p>	<p>63 yo male coming in via EMS for respiratory distress</p>
<p><b>Required Equipment</b> <i>What equipment is necessary for the case?</i></p>	<p>Cardiac monitor bedside ultrasound Bipap Intubation equipment 16 gauge needle for decompression</p>

	pneumothorax kit (pigtail catheter or traditional chest tube)
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INITIAL PRESENTATION	
<b>Initial vital signs</b>	HR: 130/min BP: 115/70 RR: 35/min O <sub>2</sub> SAT: 82% T: 97°F
<b>Overall Appearance</b> <i>What do learners see when they first enter the room?</i>	63 yo male in respiratory distress, tripodding, pursed lip breathing, using accessory muscles
<b>Actors and roles in the room at case start</b> <i>Who is present at the beginning and what is their role? Who may play them?</i>	EMS- to give initial hand off, played by anyone Respiratory therapist- to place patient on bipap, ask for settings and prompt learners of changes if needed, played by anyone Nurse- to assist with orders, played by anyone
<b>HPI</b> <i>Please specify what info here and below must be asked vs what is volunteered by patient or other participants</i>	63 yo presents with worsening SOB over the past few days. Became acutely worse today. Has been using inhalers without relief and has been using his oxygen all the time instead of just when needed. he has an increased cough but no fever or sputum. minimal leg swelling, no recent travel, nor chest pain.
<b>ROS</b>	SOB, no CP
<b>Past Medical History</b>	COPD, MI s/p stent, osteoarthritis, CHF
<b>Past Surgical History</b>	knee replacement
<b>Family History</b>	non-contributory
<b>Medications</b>	albuterol, inhaled corticosteroid, home oxygen, lasix
<b>Allergies</b>	NKDA
PHYSICAL EXAMINATION	
<b>General</b>	moderate to severe distress, alert, pursed lip breathing
<b>HEENT</b>	dry mucous membranes
<b>Neck</b>	normal

<b>Respiratory</b>	diffuse wheezing in all lung fields, prolonged expiratory phase, use of accessory muscles, good breath sounds bilaterally
<b>Cardiovascular</b>	tachycardic no M/R/G
<b>Abdomen</b>	soft NT/ND, normal bowel sounds
<b>Neurological</b>	awake alert and oriented, moving all extremities
<b>Skin</b>	cool and clammy
<b>GU</b>	normal
<b>Extremities</b>	1+ pitting edema b/l
<b>Psychiatric</b>	anxious

### 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?*

<b>PATIENT STATUS</b>	<b>LEARNER ACTIONS, MODIFIERS &amp; TRIGGERS TO MOVE TO THE NEXT STATE</b>	
<p>1. Baseline</p> <p>Rhythm: ST HR: 130/min BP: 115/70 RR: 35/min O<sub>2</sub>SAT: 82% T: 97°F</p>	<p><u>Learner Actions:</u></p> <ul style="list-style-type: none"> <li>place patient on bipap</li> <li>obtain focused history and physical</li> <li>Use ultrasound to see normal lung sliding and lack of b-lines</li> </ul>	<p><u>Modifiers:</u></p> <p><i>Changes to patient condition based on learner action</i></p> <ul style="list-style-type: none"> <li>If placed on bipap O<sub>2</sub>Sat goes up to 92%, RR: 28, and HR 120, if not O<sub>2</sub> sat continues to fall</li> <li>If learner asks for chest x-ray it will be unavailable, nurse can prompt to think about using ultrasound</li> </ul> <p><u>Triggers:</u></p> <p><i>For progression to next state</i></p> <ul style="list-style-type: none"> <li>place patient on bipap</li> </ul>
<p>2.</p> <p>Rhythm: ST HR: 120 /min BP: 115 /70 RR: 12/min O<sub>2</sub>SAT: 90% T: 97°F</p>	<p><u>Learner Actions:</u></p> <ul style="list-style-type: none"> <li>recognize a change in mental status</li> <li>Interpret ABG/VBG</li> <li>set up and successfully intubate patient using RSI</li> <li>chose appropriate vent settings</li> </ul>	<p><u>Modifiers:</u></p> <ul style="list-style-type: none"> <li>If learner does not recognize need for intubation RT or Nurse can prompt that patient seems different, if they still do not intubate patient will start to brady and arrest</li> </ul> <p><u>Triggers:</u></p> <ul style="list-style-type: none"> <li>intubate patient</li> </ul>

<p>3.</p> <p>Rhythm: ST HR: 110 /min BP: 115/70 RR: 18 /min O<sub>2</sub>SAT:94 % T: 97°F</p>	<p><u>Learner Actions:</u></p> <ul style="list-style-type: none"> <li>● Order and interpret cxr (ET tube in place, no pneumothorax, hyperinflated lungs)</li> <li>● Interpret rest of the labs</li> <li>● start appropriate post intubation sedation</li> </ul>	<p><u>Modifiers:</u></p> <ul style="list-style-type: none"> <li>● if learners do not sedate patient appropriately, patient should trigger vent alarm and bite tube</li> </ul> <p><u>Triggers:</u></p> <ul style="list-style-type: none"> <li>● completion of learners actions</li> </ul>
<p>4.</p> <p>Rhythm: ST HR: 150/min BP: 85/40 RR: 20 /min O<sub>2</sub>SAT:70 % T: 97 °F</p>	<p><u>Learner Actions:</u></p> <ul style="list-style-type: none"> <li>● recognize a change in status</li> <li>● successfully troubleshoot the vent and patient (DOPES)</li> <li>● Use bedside Ultrasound to recognize pneumothorax</li> <li>● identify landmarks for needle decompression, followed by chest tube</li> </ul>	<p><u>Modifiers:</u></p> <ul style="list-style-type: none"> <li>● If learner does not recognize change in status, patient will go into PEA arrest</li> <li>● If learner asks for CXR it will be unavailable and the room will be too noisy to properly hear breath sounds, until learner needle decompresses the patient will continue to deteriorate</li> <li>●</li> </ul> <p><u>Triggers:</u></p> <ul style="list-style-type: none"> <li>● chest tube placement</li> </ul>
<p>5.</p> <p>Rhythm: ST HR: 110/min BP: 130/70 RR: 10/min O<sub>2</sub>SAT:94 % T: 97 °F</p>	<p><u>Learner Actions:</u></p> <ul style="list-style-type: none"> <li>● Call the ICU to disposition patient and give proper hand off</li> </ul>	<p><u>Modifiers:</u></p> <ul style="list-style-type: none"> <li>●</li> </ul> <p><u>Triggers:</u></p> <ul style="list-style-type: none"> <li>●</li> </ul>

SUPPORTING DOCUMENTS, LAB RESULTS AND MULTIMEDIA	
Lab Results	ABG- pH: 7.15/72/90/29 CBC- 10.5/14/35/300 CHEM7- WNL Trop- 0.01 BNP- 100
EKG	Sinus tachycardia otherwise wnl

CXR	CXR (post-intubation)- Hyperinflated lungs, ETT in place, no pneumothorax
Ultrasound Video Files	Normal sliding B and M modes (on presentation) Normal lung tissue without B-Lines  Post intubation- no sliding on right chest B and M mode and normal sliding on left

SAMPLE QUESTIONS FOR DEBRIEFING
<ol style="list-style-type: none"> <li>1) When do you intubate a patient in respiratory distress? What factors do you need to consider? what are your alternative treatments?</li> <li>2) What is your differential and plan of action for a patient that decompensates on the vent?</li> <li>3) How do you interpret an ABG? How do you select proper Vent settings?</li> </ol>

### **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. They immediately place the patient on bedside monitors and recognize that the patient is hypoxic and tachycardic. Supplemental oxygen is provided and they call for bipap. They do a focused ultrasound exam that shows normal lung sliding and no b-lines. As soon as bipap arrives, they place the patient on bipap and the patient's respiratory distress improves but does not resolve. At the same time they order IV steroids and albuterol. After completing a physical examination and obtaining an appropriate history, they obtain labs and the providers note that the patient's mental status has worsened and ultimately endotracheal intubation is required. The learners use proper RSI medication and place the patient on sedation. Successful intubation permits further evaluation of the patient with diagnostic studies. Chest x-ray shows ET tube in place and hyperinflated lungs, laboratory studies demonstrate an ABG which shows acute on chronic respiratory acidosis, otherwise normal labs, EKG is sinus tachycardia. After intubation the patient decompensates becoming hypotensive and tachycardic, the learner runs through a differential for decompensation on the ventilator and use the bedside ultrasound to demonstrate a pneumothorax. They successfully needle decompress with immediate improvement of vital signs.*

*They then place a chest tube. The learners then 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. Difficulty with bedside monitors: We found when using this case with medical students that many of our learners did not know how to properly connect EKG leads to the bedside monitor. We modified our sessions to include an introduction to simulation cases that includes a tutorial for connecting patients to bedside monitoring.*
- 2. Failure to recognize the need for intubation: Learners will need to understand when a patient needs to be intubated. It is important to note that COPD patients will reach a point where they will become tired and intubation will be required. It will be helpful to allow the pulse oxygenation to continue to drop despite bipap to prompt the need for intubation.*
- 3. Failure to place patient on proper ventilator settings: It is important in patients with COPD to place on proper ventilator settings. A good place to start is AC, Tidal volume of 8cc/kg, RR 10 (with a goal I:E ratio of 1:4-5), FiO<sub>2</sub>- to maintain O<sub>2</sub> sat 92%, PEEP 0-5. The goal is to allow the patient enough time to exhale and prevent breath stacking.*
- 4. Not recognizing need for chest tube: It will be important for learners to recognize the change in clinical course and how to properly diagnose pneumothorax at the bedside. A good mnemonic for identifying and fixing complication related to ventilators is*

*D.O.P.E.S.?*

- Displaced ET tube / ET tube cuff not inflated or has a leak*
- Obstruction of ET tube*
- Pneumothorax*
- Equipment malfunction (disconnection of the ventilator, incorrect vent settings, etc.)*
- Stacking (breath stacking / Auto- PEEP; click [here](#) for a review)*

*D.O.T.T.S.*

- Disconnect – Disconnect patient from the ventilator*
- Oxygen – Oxygenate patient with a BVM and feel for resistance as you bag*
- Tube position / function – Did the ET tube migrate? Is it kinked or is there a mucus plug?*
- Tweak the vent – Are the settings correct for this patient?*
- Sonogram (ultrasound) – Sonogram to look for pneumothorax, mainstem intubation, etc.*