SIMULATION

Status Asthmaticus

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ABSTRACT:

Audience: Emergency medicine residents, internal medicine residents, medical students

Introduction: Asthma affects 4%-5% of the population in the United States, and accounts for approximately 2 million emergency department visits, 484,000 hospitalizations, and >4,000 deaths per year.[1] Thus, it is important for the emergency physician to be able to quickly identify and provide the correct management for a patient presenting with an acute asthma exacerbation.

Educational Objectives: At the end of this case, the learners should be able to diagnose an asthma exacerbation, provide the appropriate medications, determine when intubation is necessary, and describe the general principles of ventilator management in an asthmatic patient.

Educational Methods: This case was written to be run as a high-fidelity simulation. However, it may also be run as a moderate- or low-fidelity simulation, or as an oral boards case.

Research Methods: The educational content was evaluated by the learners immediately after completion and debriefing of the scenario. The efficacy of the content was assessed by oral feedback.

Results: The overall feedback was positive, and residents found it to be very useful to run through the whole management algorithm of a patient presenting in extremis due to status asthmaticus.

Discussion: Overall, the educational content of this case was effective. The PGY-1 residents who were at the end of their first year of residency found it to be particularly helpful in the preparation for their PGY-2 year, which is the time that they become responsible for managing all of the high-acuity ambulance runs that enter the emergency department. By implementing this case, the authors learned that the case can easily lend itself to a thorough and high-yield debriefing session for learners of all levels. For example, the approach to a critically-ill patient may be discussed with medical students, while teaching the medical management of status asthmaticus and the nuances of ventilator management may be more useful for junior and senior residents.

Topics: Status asthmaticus, respiratory failure, ventilator management.

USER GUIDE

List of Resources:

Learner Audience:
Medical students, interns, junior residents, senior residents

Time Required for Implementation:
Instructor Preparation: 20-30 minutes
Time for case: 10-15 minutes
Time for debriefing: 10-30 minutes

Recommended Number of Learners per Instructor:
2-5

Topics:
Status asthmaticus, respiratory failure, ventilator management.

Objectives:
By the end of this simulation session, the learner will be able to:

1. Make the diagnosis of an asthma exacerbation
2. Discuss the appropriate pharmacologic treatment for an asthma exacerbation
3. Recognize the clinical signs that may predict impending respiratory failure
4. Describe the general principles of ventilator management in an asthmatic patient

Linked objectives and methods:
Asthma affects 4%-5% of the population in the United States, and accounts for approximately 2 million emergency department visits, 484,000 hospitalizations, and >4,000 deaths per year.[1] It is important for the emergency medicine physician to quickly diagnose an asthma exacerbation and provide the appropriate treatment. This simulation scenario will allow the learners to evaluate and diagnose a patient presenting with a severe asthma exacerbation (objective 1). The learners will need to provide the appropriate medical therapy for a severe asthma exacerbation (objective 2), and recognize the clinical findings that herald impending respiratory failure (objective 3). The learners will need to intubate the patient and initiate appropriate ventilator management (objective 4).

Recommended pre-reading for instructor:
Any emergency medicine text on the management of asthma. For example:

- Cydulka R, Bates C. Asthma. In: Adams J, Barton ED, Collings JL, DeBlieux PM, Gisondi MA, Nadel ES, eds *Emergency Medicine: Clinical Essentials*. 2nd ed. Philadelphia, PA: Elsevier/Saunders; 2013:397-403.

Results and tips for successful implementation:
This scenario was designed for residents and medical students to diagnose and treat a patient presenting with a severe asthma exacerbation in the emergency department. The scenario was designed to be run as a high-fidelity simulation, but may also be run as a moderate- or low-fidelity simulation, or as an oral boards case. The scenario allows the learners to treat a patient with a severe asthma exacerbation that is refractory to conventional treatment and eventually requires intubation. It also allows learners to discuss the principles of ventilator management in a severe asthmatic. This scenario was initially piloted on approximately 20 emergency medicine residents, and was run in groups of 3-5 participants, ranging from PGY-1 to PGY-3 residents. The response of the learners was positive, and PGY-1 residents who were about to make the transition to PGY-2 year found it particularly useful since it exposed them to the management of critically ill patients.

References/suggestions for further reading:

1. Cydulka R, Bates, C. Asthma. In: Adams JG, Barton ED, Collings JL, DeBlieux PM, Gisondi MA, Nadel ES, eds. *Emergency Medicine: Clinical Essentials*. 2nd ed, Philadelphia, PA: Elsevier; 2013:397-403.
2. National Institutes of Health, National Heart, Lung, and Blood Institute, National Asthma Education and Prevention Program: Expert Panel Report 3: guidelines for the diagnosis and management of asthma. NIH Publication No. 08-4051. August 2007. US Department of Health and Human Services: Bethesda, MD.
3. Fanta C. Management of acute exacerbations of asthma in adults. In: Hollingsworth H, ed. *UpToDate*. Waltham, MA: UpToDate Inc. https://www.uptodate.com/contents/acute-exacerbations-of-asthma-in-adults-home-and-office-management. Updated February 28, 2019. Accessed August 5, 2019.
4. Thomson C, Hasegawa K. Invasive mechanical ventilation in adults with acute exacerbations of asthma. In: Hollingsworth, H ed. *UpToDate.* Waltham, MA: UpToDate Inc. https://www.uptodate.com/contents/invasive-mechanical-ventilation-in-adults-with-acute-exacerbations-of-asthma. Updated September 26, 2018. Accessed August 5, 2019.

5. Swaminathan A. Life-threatening asthma. CoreEM. http://coreem.net/core/life-threatening-asthma/. Published September 30, 2015. Accessed October 30, 2018.

INSTRUCTOR MATERIALS

Case Title: Status Asthmaticus

Case Description & Diagnosis (short synopsis): The patient is a 25-year-old-male who presents to the emergency department (ED) with complaints of difficulty breathing. The patient will report a history of asthma requiring hospitalization and intubation in the past. The patient's physical exam will be significant for tachycardia, tachypnea, accessory muscle use, expiratory wheezes, and mild hypoxia. Learners should recognize the diagnosis of an acute asthma exacerbation and start the appropriate medical treatment. The patient will become increasingly short of breath and altered, ultimately requiring intubation and intensive care unit (ICU) admission.

Equipment or Props Needed:
High-fidelity mannequin
Cardiac monitor, pulse oximeter
Blood pressure cuff
Intravenous (IV) bags and tubing
Prop medications
Intubation equipment (including endotracheal tube, stylet, 10cc syringe, and laryngoscope blade)
Bag valve mask
Non-rebreather oxygen mask
Nebulizer
Crash cart with defibrillator

Confederates needed:
Nurse to assist with management of the patient
Pulmonology/Critical care physician for consultation and ICU admission (can be voiced by simulation operator)

Stimulus Inventory:
#1 Chest Radiograph (CXR)
#2 Electrocardiogram (ECG)

Background and brief information: The scenario takes place in a community emergency department. The patient is a 25-year-old male who presents with complaints of difficulty breathing.

INSTRUCTOR MATERIALS

Initial presentation: The patient presents from home and drove himself in by private automobile.

How the scenario unfolds: Upon arrival to the ED, the patient will be awake and complaining of difficulty breathing. Learners should quickly assess the patient's airway, breathing, and circulation, while simultaneously placing the patient on a cardiac monitor and pulse oximeter, obtaining vital signs, providing supplementary oxygen, and obtaining IV access. The patient's initial vitals will be significant for tachycardia, tachypnea, and mild hypoxia. Participants should obtain a history and complete a focused physical exam. On physical exam, the patient will have diffuse expiratory wheezes with a prolonged expiratory phase, tachypnea, and accessory muscle use. The learners should quickly make the diagnosis of an acute asthma exacerbation.

The patient should be treated with albuterol (either in the form of multiple breathing treatments or continuously), ipratropium bromide, and corticosteroids. Participants may also consider starting the patient on magnesium sulfate and subcutaneous epinephrine or terbutaline. If treatment is administered promptly, the patient will experience mild improvement of his symptoms. If non-invasive positive pressure ventilation is ordered, the participants will be notified that the machine will need to be retrieved from the intensive care unit and will not be available for approximately 20 minutes. If these medications are not administered quickly, the patient will decompensate into cardiac arrest with pulseless electrical activity (PEA). If the patient decompensates into PEA, participants should start CPR and treatment according to advanced cardiac life support (ACLS) guidelines. However, he will only regain return of spontaneous circulation (ROSC) if he is intubated, since the cause of his PEA cardiac arrest is hypoxia.

If the above medications were properly administered, the patient will experience mild improvement, but will then become more somnolent, with a decreasing respiratory rate and poor air exchange when auscultated on physical exam. Participants should recognize that the patient requires intubation for respiratory failure. If the patient is not intubated, he will become more hypoxic and decompensate into cardiac arrest with PEA. Again, the patient will only be able to regain ROSC if participants intubate him.

Once the patient is intubated, the simulation operator may act as a respiratory therapist and ask the participants to verbalize what general ventilator settings they would like to apply to this patient. If participants are unsure, they may also request consultation from a

pulmonary/critical care specialist over the phone. The patient should ultimately be admitted to the ICU for further management.

Optional: For senior learners, the simulation operator may verbalize that the ventilator alarm is going off and detecting high plateau pressures if inappropriate settings are ordered (such as a high respiratory rate, high tidal volumes, I:E ratio less than 1:3, etc). The simulation operator can work with the participants as they adjust the various parameters and have the alarm stop once appropriate settings are established. If inappropriate settings are continuously ordered, the sim operator may have the patient decompensate (eg, tension pneumothorax requiring needle decompression, breath stacking requiring manual decompression, etc).

Critical actions:

1. Assess the patient's airway, breathing, and circulation
2. Connect the patient to a cardiac monitor and pulse oximeter, and obtain an initial set of vital signs
3. Obtain IV line access
4. Provide supplementary oxygen to the patient
5. Make the diagnosis of an asthma exacerbation
6. Start the appropriate treatment for a severe asthma exacerbation, including albuterol, ipratropium, corticosteroids, magnesium, epinephrine/terbutaline
7. Recognize impending respiratory failure and intubate patient
8. Verbalize correct principals of ventilator management in an asthmatic or obtain specialist consultation if unsure
9. Admit patient to the ICU

INSTRUCTOR MATERIALS

Case title: Status Asthmaticus

Chief Complaint: This is a 25-year-old-male presenting with a chief complaint of difficulty breathing.

Vitals: Heart Rate (HR) 120 Blood Pressure (BP) 130/80 Respiratory Rate (RR) 30
Temperature (T) 37.0°C Oxygen Saturation (O_2Sat) 89% on room air (RA)

General Appearance: 25-year-old male, appears stated age, in moderate distress

Primary Survey:

- **Airway:** Patent
- **Breathing:** Diffuse expiratory wheezes bilaterally, prolonged expiratory phase, positive accessory muscle use, speaking in 3 to 5-word sentences
- **Circulation:** 2+ carotid and femoral pulses, tachycardic

History:

- **History of present illness:** The patient is a 25-year-old male who presents with a chief complaint of difficulty breathing. He states that symptoms started earlier in the day and have gotten progressively worse. Symptoms are associated with wheezing. The patient has a history of asthma and states that this feels similar to prior asthma exacerbations. The patient has used an inhaled albuterol metered dose inhaler (MDI) at home with mild relief. He will state that he has been hospitalized for an asthma exacerbation multiple times as a child and has required intubation in the past. The patient denies chest pain, vomiting, fevers, and syncope. He does endorse two days of rhinorrhea and cough preceding this presentation.
- **Past medical history:** Asthma, including hospitalization and intubation.
- **Past surgical history:** Denies.
- **Patient's medications:** Albuterol MDI.
- **Allergies:** No known allergies to medication.
- **Social history:** Smokes cigarettes occasionally. Occasional alcohol use. Denies illicit drug use.
- **Family history:** Father has asthma.

Secondary Survey/Physical Examination:

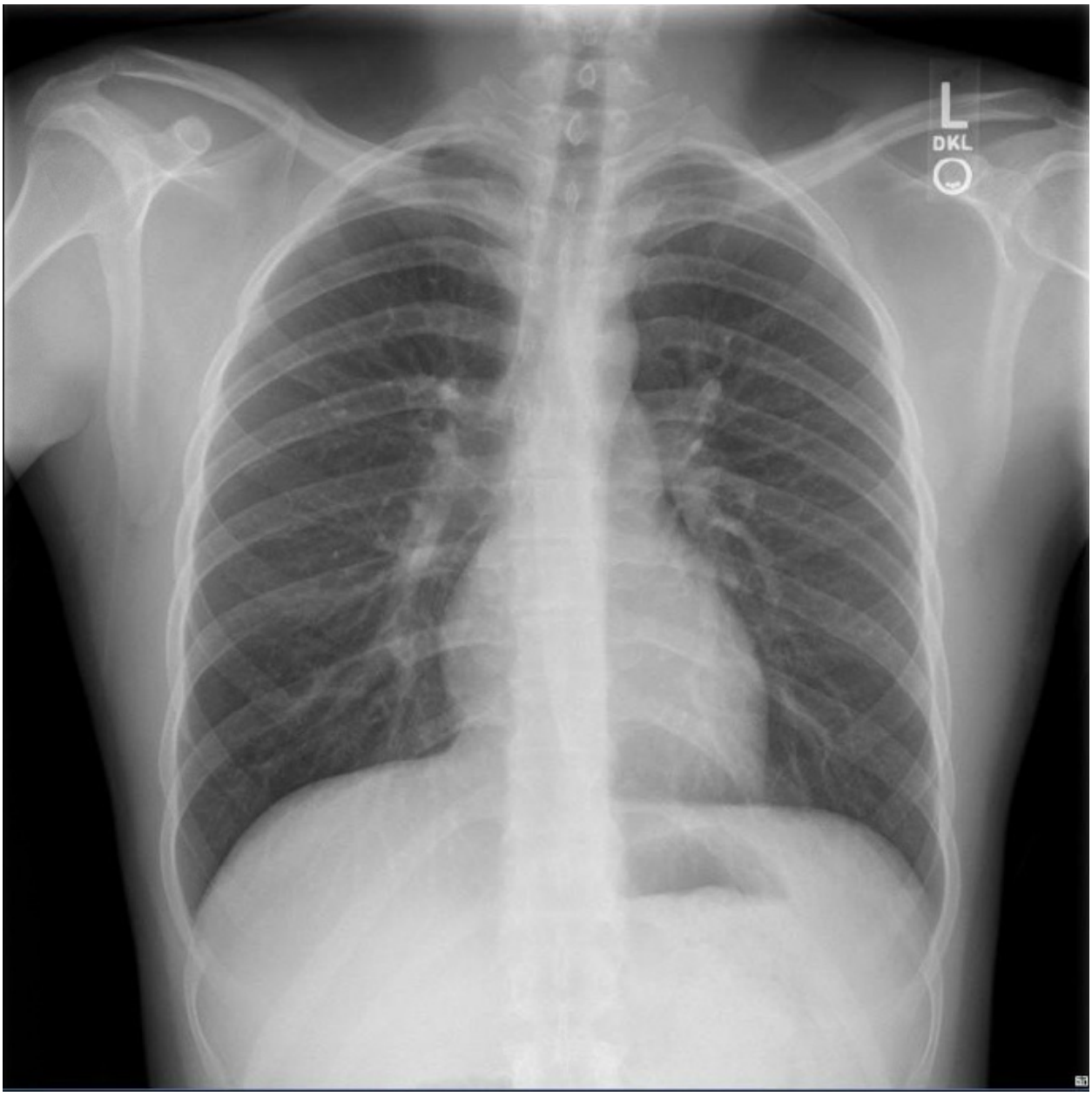
- **General appearance:** Moderate distress, increased work of breathing.

INSTRUCTOR MATERIALS

- **HEENT:**
  - **Head:** Normocephalic, atraumatic
  - **Eyes:** Pupils 4mm equal bilaterally, no discharge
  - **Ears:** within normal limits
  - **Nose:** within normal limits
  - **Throat:** No erythema, no tonsillar exudates. Uvula midline. No trismus, no drooling
- **Neck:** No swelling, full range of motion.
- **Heart:** Tachycardic, regular rhythm, no audible murmurs
- **Lungs:** Diffuse expiratory wheezes bilaterally, prolonged expiratory phase, positive accessory muscle use, speaking in 3 to 5-word sentences
- **Abdominal/GI:** Soft, non-tender, non-distended, no guarding, no rigidity
- **Genitourinary**: within normal limits
- **Rectal**: within normal limits
- **Extremities:** No lower extremity edema, no calf tenderness
- **Back**: within normal limits
- **Neuro:** Alert and oriented, equal upper and lower extremity strength 5/5 bilaterally, able to ambulate without difficulty, GCS 15
- **Skin:** No rashes, slightly diaphoretic
- **Lymph:** within normal limits
- **Psych:** within normal limits

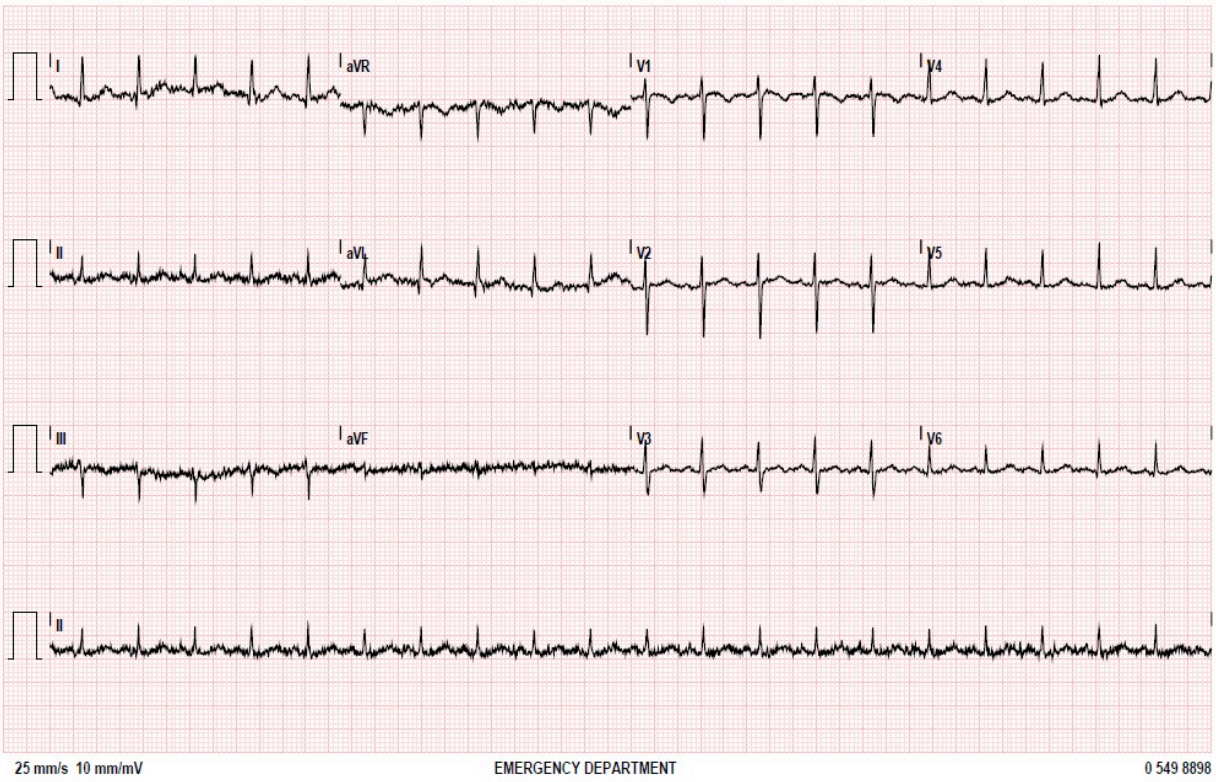
Results:

Chest Radiograph
(author's own image)



INSTRUCTOR MATERIALS

Electrocardiogram (ECG) showing sinus tachycardia
(author's own image)



OPERATOR MATERIALS

SIMULATION EVENTS TABLE:

Minute (state)	Participant action/ trigger	Patient status (simulator response) & operator prompts	Monitor display (vital signs)
0:00 (Baseline)	Assess patient's airway, breathing, and circulation Attach patient to cardiac monitor and pulse ox Obtain initial set of vital signs Start supplementary oxygen Obtain IV access	Patient will report a chief complaint of difficulty breathing. Patient will have expiratory wheezes, tachypnea, and accessory muscle use on initial examination. If participants order a bedside peak expiratory flow reading, they will be notified that the patient is too short of breath to tolerate this test.	T 37.0°C HR 120 BP 130/80 RR 30 O_2sat 89% (room air) If supplemental O_2 administered: HR 120 BP 130/80 RR 26 O_2sat 95%
02:00	Participants should make the diagnosis of asthma exacerbation Participants should start treatment for asthma (consider albuterol, ipratropium, corticosteroids, epinephrine, terbutaline, magnesium) Participants may request CXR and ECG	If asthma treatment is started: Patient will feel mildly improved symptomatically. His O_2 sat and respiratory rate will improve. He will continue to have wheezes on exam. If asthma treatment is not started: Patient will become increasingly hypoxic and tachypneic. If the participants order non-invasive positive pressure ventilation, they will be informed that the machine is currently being transported from the ICU, and will not be available for the next 20 minutes.	If asthma treatment is started: HR 120 BP 130/80 RR 22 O_2sat 98% If asthma treatment is not started: HR: 130 BP: 140/90 RR: 35 O_2sat: 70%

OPERATOR MATERIALS

Minute (state)	Participant action/ trigger	Patient status (simulator response) & operator prompts	Monitor display (vital signs)
	Participants may order labs; however, they will not return by the end of the case		
04:00	Participants should recognize that patient is in impending respiratory failure and prepare to intubate patient	If asthma treatment was started: Patient will experience brief period of symptomatic improvement; however, this will be followed by recurrent symptoms and quickly progress to lethargy, with a slowing respiratory rate and worsening hypoxia. If asthma treatment still not started: Patient will decompensate into pulseless electrical activity (PEA) cardiac arrest -If the participants intubate the patient and initiate high-quality CPR and management per advanced cardiac life support (ACLS) protocol, the patient will gain return of spontaneous circulation (ROSC). If patient is not intubated, he will not regain ROSC since the cause of his PEA arrest is hypoxia.	If asthma treatment is started: HR: 130 BP: 100/60 RR: 10 O_2sat: 70% If treatment still not started: PEA cardiac arrest If intubated and managed per ACLS after PEA: HR: 120 RR: Vent setting BP: 90/60 O_2sat: 100% on vent
06:00	Participants should intubate patient for respiratory failure Participants may obtain pulmonary consultation	If patient is intubated: Hypoxia and heart rate will improve Participants should then verbalize the general principles of ventilator settings that they would like to start on patient. If they are unsure, they may obtain a pulmonary consultation. If patient is not intubated: Patient will become more hypoxic and decompensate into PEA arrest	Intubated: HR: 110 BP: 90/60 RR: vent setting O_2sat: 100% on vent Not intubated: PEA cardiac arrest.

OPERATOR MATERIALS

Minute (state)	Participant action/ trigger	Patient status (simulator response) & operator prompts	Monitor display (vital signs)
		-If the participants intubate the patient and initiate high-quality CPR and management per advanced cardiac life support (ACLS) protocol, the patient will gain return of spontaneous circulation (ROSC). If patient is not intubated, he will not regain ROSC since the cause of his PEA arrest is hypoxia.	If intubated and managed per ACLS after PEA: HR: 120 RR: Vent setting BP: 90/60 O_2sat: n/a
08:00 Case Completion	Participants should speak to consulting pulmonologist if requested. Participants should admit the patient to the intensive care unit (ICU)	If pulmonary consultation requested, the consultant will suggest low tidal volume (6-8cc/kg), low respiratory rate (10-12 breaths/min), PEEP (positive end-expiratory pressure) of 0-5 cm H_2O, allowing for permissive hypercapnia, an I:E ratio of 1:3 to 1:5, keeping plateau pressure <30 mmHg, and titrating FiO_2 to minimum required to keep O_2 sat >90%. The patient should then be admitted to the ICU.	Intubated: HR: 110 BP: 90/60 RR: vent O_2sat: 100% on vent

Diagnosis:
Status asthmaticus, respiratory failure

Disposition:
Intensive care unit admission

DEBRIEFING AND EVALUATION PEARLS

Status Asthmaticus

Pearls:

- **Background**:
  - Asthma is a chronic inflammatory disorder, characterized by increased responsiveness of the airways to multiple stimuli, resulting in inflammation that causes wheezing, breathlessness, chest tightness, and coughing.[1]
  - Asthma affects 4%-5% of the population in the United States.[1]
  - Asthma accounts for approximately 2 million ED visits, 484,000 hospitalizations, and >4,000 deaths per year.[1]
- **Clinical presentation:**
  - Early symptoms include sensation of chest constriction and coughing.
  - As exacerbation progresses, wheezing becomes more noticeable, expiration is prolonged, patient may use accessory muscles of respiration.[1]
  - Findings of impending respiratory arrest may include use of accessory muscles, paradoxical respirations, and altered mental status.[1]
- **Treatment**:
  - **Beta 2-agonist medications:**
    - Preferred initial rescue medications for acute bronchospasm.[1]
    - Causes bronchodilation, also inhibits release of inflammatory mediators and promotes mucociliary clearance.[1]
    - Subcutaneous terbutaline or epinephrine may be used in those unable to tolerate medications through a nebulizer.[1]
    - **Albuterol**:
      - 2.5-5mg every 20 mins for 3 doses, then 2.5-10mg every 1-4 hours as needed. [1,2,3]
      - If patient unable to tolerate albuterol spaced out at these intervals, administration of continuous albuterol (10-15mg/hr) can be considered.
    - **Epinephrine**:
      - 0.3-0.5mg of 1:1000 concentration epinephrine, subcutaneously every 20 mins for 3 doses. [1,2]
    - **Terbutaline**:
      - 0.25mg of 1mg/ml every 20 mins subcutaneously for 3 doses. [1,2]
  - **Anticholinergics**:
    - Aerosolized ipratropium should be administered to patients with a severe exacerbation of asthma.
    - **Ipratropium bromide:**

- Nebulizer solution 0.5mg every 30 minutes for 3 doses, then every 2-4 hours as needed. [1,2]
- May mix in same nebulizer as albuterol.
- Should not be used as first line therapy, should be added to beta agonist therapy.

- **Corticosteroids**:
  - Thought to produce beneficial effects by reducing inflammation and restoring beta-2 agonist responsiveness.[1]
  - Data shows that corticosteroids, administered within 1 hour of ED arrival, reduces need for hospitalization.[1]
  - Data regarding optimal dose is lacking. Prednisone 40-60mg PO, or methylprednisolone 60-125mg IV, is usually adequate.[1,2]
- **Magnesium**:
  - Inhibition of calcium influx into airway smooth muscle cells may cause bronchodilator activity in acute asthma.[3]
  - Indicated for those with life-threatening exacerbation or whose exacerbation remains severe after one hour of intensive conventional therapy.[3]
  - Dose is 2mg magnesium IV over a 20-minute period.[3]
- **Other adjunctive treatments:**
  - Can be considered if patients are unresponsive to initial treatments listed above.[2]
  - Several case reports have described successful treatment with IV **ketamine**.[3]
  - Inhaled anesthetics (ex: **halothane**) have shown effectiveness in case reports.[3]
  - **Heliox** (mixture of helium and oxygen) has demonstrated effectiveness in several studies; however, routine use is not recommended due to conflicting data about efficacy.[3]
- **Intubation and mechanical ventilation:**
  - 3%-5% of all patients hospitalized for acute asthma exacerbation develop respiratory failure and require invasive mechanical ventilation.[4]
  - The goal of mechanical ventilation is to maintain oxygenation and decrease work of breathing, while waiting for bronchodilators and steroids to reverse bronchoconstriction and airway inflammation.[4]
  - Intubation itself does not fix underlying problem of bronchoconstriction and can cause dynamic hyperinflation.[5]

- Decreased expiratory flow can be caused by bronchospasm, mucus plugging, and airway inflammation and edema, and prolongs the time needed to complete exhalation.[4]
- When the lungs are unable to adequately empty between breaths due to insufficient expiratory time, dynamic hyperinflation occurs.[4]
- Dynamic hyperinflation can cause barotrauma and pneumothorax, as well as decreased cardiac output secondary to increased intrathoracic pressure.[4]

- In order to decrease the risk of dynamic hyperinflation, the following can be done to ensure that the patient has an adequate time to fully expire the breath that is delivered by the ventilator:
  - Decreasing the **respiratory rate** (to give more time to expire a breath) at the expense of allowing PaCO2 to rise (**permissive hypercapnia**), which avoids breath stacking and prevents hyperinflation.[5]
  - Adjusting the **inspiratory: expiratory (I:E) ratio** to allow for increased expiratory time.[4]
  - Decreasing the **tidal volume**, which decreases the volume that the patient needs to exhale before the next breath and shortens inspiratory time.
  - Increasing **inspiratory flow**, which shortens inspiratory time.
  - Maintaining extrinsic **positive end-expiratory pressure** (PEEP) at less than 80% of the intrinsic PEEP, or 5 cm H_2O if intrinsic PEEP is <10 cm H_2O.[4]
  - Maintaining **plateau pressure** (a reflection of pressure experienced by alveoli) at <30 mmHg. If pressure is >30 mmHg, consider lowering respiratory rate and tidal volume.[5]
- Suggested initial ventilator settings:[4,5]
  - Respiratory rate: 10-12 breaths/min
  - Tidal volume: 6-8 ml/kg of ideal body weight
  - I:E ratio (1:3 up to 1:5) to allow increased expiratory time
  - PEEP 0-5cm H_2O[5]
  - Inspiratory flow: 80L/min as initial upper limit
  - FiO2 at 100% initially, then titrate downwards as tolerated to maintain SpO2 >90%
  - Minute ventilation: <115 ml/kg/min[4]

DEBRIEFING AND EVALUATION PEARLS

- **Ventilator troubleshooting:**
  - "**DOPES**" mnemonic describes the most common causes of hypoxia and hemodynamic instability after intubation and mechanical ventilation.[5]
  - **D**isplacement of the endotracheal tube
    - Visually inspect placement using laryngoscope.[5]
  - **O**bstruction of the endotracheal tube
    - Use suction catheter or bougie to ensure that it isn't obstructed.[5]
  - **P**neumothorax (tension)
    - Can be confirmed using bedside ultrasound.[5]
    - Treatment with needle thoracostomy followed by chest tube.
  - **E**quipment failure
    - Disconnect endotracheal tube from the ventilator and provide breaths with bag-valve mask.[5]
  - **S**tacked breaths
    - Disconnect endotracheal tube from the ventilator and forcibly exhale patients by pushing down on their anterior chest wall.[5]

SIMULATION ASSESSMENT

Status Asthmaticus

Learner: _____

Assessment Timeline

This timeline is to help observers assess their learners. It allows observer to make notes on when learners performed various tasks, which can help guide debriefing discussion.

Critical Actions:	0:00
1. Assess the patient's airway, breathing, and circulation 2. Connect the patient to a cardiac monitor and pulse oximeter, and obtain an initial set of vital signs 3. Obtain IV line access 4. Provide supplementary oxygen to the patient 5. Make the diagnosis of an asthma exacerbation 6. Start the appropriate treatment for a severe asthma exacerbation, including albuterol, ipratropium, corticosteroids, magnesium, epinephrine/terbutaline 7. Recognize impending respiratory failure and intubate patient 8. Verbalize correct principals of ventilator management in an asthmatic, or obtain specialist consultation if unsure 9. Admit patient to the ICU	

SIMULATION ASSESSMENT

Status Asthmaticus

Learner: _____

Critical Actions:

☐ Assess the patient's airway, breathing, and circulation
☐ Connect the patient to a cardiac monitor and pulse oximeter, and obtain an initial set of vital signs
☐ Obtain IV line access
☐ Provide supplementary oxygen to the patient
☐ Make the diagnosis of an asthma exacerbation
☐ Start the appropriate treatment for a severe asthma exacerbation, including albuterol, ipratropium, corticosteroids, magnesium, epinephrine/terbutaline
☐ Recognize impending respiratory failure and intubate patient
☐ Verbalize correct principals of ventilator management in an asthmatic, or obtain specialist consultation if unsure
☐ Admit patient to the ICU

Summative and formative comments:

SIMULATION ASSESSMENT

Status Asthmaticus

Learner: _____

Milestones assessment:

	Milestone	Did not achieve level 1	Level 1	Level 2	Level 3
1	**Emergency Stabilization (PC1)**	☐ Did not achieve Level 1	☐ Recognizes abnormal vital signs	☐ Recognizes an unstable patient, requiring intervention Performs primary assessment Discerns data to formulate a diagnostic impression/plan	☐ Manages and prioritizes critical actions in a critically ill patient Reassesses after implementing a stabilizing intervention
2	**Performance of focused history and physical (PC2)**	☐ Did not achieve Level 1	☐ Performs a reliable, comprehensive history and physical exam	☐ Performs and communicates a focused history and physical exam based on chief complaint and urgent issues	☐ Prioritizes essential components of history and physical exam given dynamic circumstances
3	**Diagnostic studies (PC3)**	☐ Did not achieve Level 1	☐ Determines the necessity of diagnostic studies	☐ Orders appropriate diagnostic studies. Performs appropriate bedside diagnostic studies/procedures	☐ Prioritizes essential testing Interprets results of diagnostic studies Reviews risks, benefits, contraindications, and alternatives to a diagnostic study or procedure
4	**Diagnosis (PC4)**	☐ Did not achieve Level 1	☐ Considers a list of potential diagnoses	☐ Considers an appropriate list of potential diagnosis May or may not make correct diagnosis	☐ Makes the appropriate diagnosis Considers other potential diagnoses, avoiding premature closure

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	Milestone	Did not achieve level 1	Level 1	Level 2	Level 3
5	**Pharmacotherapy (PC5)**	☐ Did not achieve Level 1	☐ Asks patient for drug allergies	☐ Selects an medication for therapeutic intervention, consider potential adverse effects	☐ Selects the most appropriate medication and understands mechanism of action, effect, and potential side effects Considers and recognizes drug-drug interactions
6	**Observation and reassessment (PC6)**	☐ Did not achieve Level 1	☐ Reevaluates patient at least one time during case	☐ Reevaluates patient after most therapeutic interventions	☐ Consistently evaluates the effectiveness of therapies at appropriate intervals
7	**Disposition (PC7)**	☐ Did not achieve Level 1	☐ Appropriately selects whether to admit or discharge the patient	☐ Appropriately selects whether to admit or discharge Involves the expertise of some of the appropriate specialists	☐ Educates the patient appropriately about their disposition Assigns patient to an appropriate level of care (ICU/Tele/Floor) Involves expertise of all appropriate specialists
9	**General Approach to Procedures (PC9)**	☐ Did not achieve Level 1	☐ Identifies pertinent anatomy and physiology for a procedure Uses appropriate Universal Precautions	☐ Obtains informed consent Knows indications, contraindications, anatomic landmarks, equipment, anesthetic and procedural technique, and potential complications for common ED procedures	☐ Determines a back-up strategy if initial attempts are unsuccessful Correctly interprets results of diagnostic procedure

Standardized assessment form for simulation cases. JETem © Developed by: Megan Osborn, MD, MHPE; Shannon Toohey, MD; Alisa Wray, MD
Honda R, et al. Status Asthmaticus. JETem 2019. 4(4):S1-22. https://doi.org/10.21980/J8JW6S

SIMULATION ASSESSMENT

Status Asthmaticus

Learner: _____

	Milestone	Did not achieve level 1	Level 1	Level 2	Level 3
20	**Professional Values (PROF1)**	☐ Did not achieve Level 1	☐ Demonstrates caring, honest behavior	☐ Exhibits compassion, respect, sensitivity and responsiveness	☐ Develops alternative care plans when patients' personal beliefs and decisions preclude standard care
22	**Patient centered communication (ICS1)**	☐ Did not achieve level 1	☐ Establishes rapport and demonstrates empathy to patient (and family) Listens effectively	☐ Elicits patient's reason for seeking health care	☐ Manages patient expectations in a manner that minimizes potential for stress, conflict, and misunderstanding. Effectively communicates with vulnerable populations, (at risk patients and families)
23	**Team management (ICS2)**	☐ Did not achieve level 1	☐ Recognizes other members of the patient care team during case (nurse, techs)	☐ Communicates pertinent information to other healthcare colleagues	☐ Communicates a clear, succinct, and appropriate handoff with specialists and other colleagues Communicates effectively with ancillary staff

Standardized assessment form for simulation cases. JETem © Developed by: Megan Osborn, MD, MHPE; Shannon Toohey, MD; Alisa Wray, MD
Honda R, et al. Status Asthmaticus. JETem 2019. 4(4):S1-22. https://doi.org/10.21980/J8JW6S