Management of COPD exacerbations: Self-Assessment Module

Companion to ATS CLINICAL PRACTICE SERIES: Management of COPD exacerbations

Feemster LC, Pasnick SD, Weinstock T, Chartterjee RS, Wilson KC, Thomson CC. ATS/ABIM Maintenance of Certification Self-Assessment Module: Management of COPD exacerbations. American Thoracic Society

American Thoracic Society

Title	**Management of COPD exacerbations**	
Question	#1	
Multiple Choice Question Stem:	A 56-year-old man with known COPD, FEV1 30% predicted, presents with cough productive of yellow sputum, shortness of breath and wheeze. A plain chest film is without acute infiltrate. His oxygen saturation is 96% and he does not desaturate with exertion. In addition to oral corticosteroids, you prescribe a 10-day course of doxycycline.	
Question:	**Which of the following clinical outcomes is associated with the use of antibiotics to treat outpatient COPD exacerbations?**	
Answer Choices:	A	Reduced mortality.
	B	Reduced length of stay if a subsequent hospitalization occurs.
	C	Reduced rates of hospital admission.
	D	Reduced rates of treatment failure and increased time until future exacerbations.
	E	Fewer adverse events.
Correct Answer:	**D. Reduced rates of treatment failure and increased time until future exacerbations.**	
Rationale:	According to the ERS/ATS guideline statement, systematic review of the literature suggests that antibiotics used in the setting of outpatient management of COPD exacerbations reduce the rate of treatment failure and increase the time until the next exacerbation (Choice D is correct). There is not enough data to assess the impact of antibiotics used in this setting on mortality, rate of hospitalization, or length of stay for a subsequent hospital admission (Choice A, B, and C are incorrect). There is a trend toward more adverse events among patients treated with antibiotics. (E is incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#2	
Multiple Choice Question Stem:	A 61-year-old woman with a history of COPD with recurrent episodes of exacerbations, including multiple hospitalizations, presents to your outpatient clinic with wheeze, cough and green sputum production without hemoptysis. She is afebrile and her oxygen saturation is 94%, which is her baseline. Her symptoms are typical of her past COPD exacerbations, previously managed with oral corticosteroids alone.	

Question:	**Which of the following pharmacologic treatments for the patient's COPD exacerbation are consistent with ATS/ERS recommendations?**	
Answer Choices:	A	Oral prednisone, starting at 60 mg daily and tapering off over a 21-day period.
	B	Continue chronic inhaled therapies without the addition of prednisone or antibiotics unless she develops worsening hypoxia.
	C	Oral prednisone, starting at 40 mg daily for 10 days, followed by a chronic dose of 10 mg daily to prevent recurrent exacerbations.
	D	Admission to the hospital for IV corticosteroids due to recurrent exacerbations.
	E	Oral prednisone 40 mg daily for 5 days along with a 10-day course of Doxycycline.
Correct Answer:	**E. Oral prednisone 40 mg daily for 5 days along with a 10-day course of Doxycycline.**	
Rationale:	Based on systematic review of the literature, the ATS/ERS guidelines include conditional recommendations for treatment of outpatient exacerbations of COPD with a short (≤14 days) of oral corticosteroids as well as antibiotics (Choice E is correct). The recommendation for oral corticosteroids is based on the pooled results of three clinical trials showing an improvement in lung function and trend towards fewer hospitalizations among patients receiving corticosteroids. The recommendation for antibiotics is based on the pooled results of two clinical trials showing a reduction in treatment failure and increased time to next exacerbation among patients receiving antibiotics. For this patient with a history of recurrent exacerbations and multiple prior hospitalizations, it is reasonable to recommend a combination of prednisone and oral antibiotics in an effort to reduce hospitalization, treatment failure, and perhaps reduce exacerbation frequency. There is a no evidence that a longer course of oral prednisone or treatment with chronic prednisone is helpful in such cases (Choices A and C are incorrect). There is no evidence that admitting a patient solely to receive intravenous corticosteroids is superior to treatment with oral corticosteroids (Choice D is also incorrect). Hypoxia is not a requirement for treatment of outpatient exacerbations with prednisone or antibiotics. (Choice B is incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#3	
Multiple Choice Question Stem:	A 63-year-oldman with known COPD with chronic bronchitic features presents to your office with complaints of increased cough productive of clear sputum (no purulence) and progressive dyspnea, consistent an exacerbation of COPD.	

Question:	**Which of the following statements is true regarding treatment with antibiotics for ambulatory patients with a COPD exacerbation in the absence of purulent sputum?**	
Answer Choices:	A	Antibiotics have been shown to be beneficial only if sputum purulence is present.
	B	Antibiotics have the potential improve quality of life, even in the absence of sputum purulence.
	C	Antibiotics have the potential to reduce the risk of treatment failure, even in the absence of sputum purulence.
	D	Antibiotics have the potential to decrease mortality, even in the absence of sputum purulence.
	E	Antibiotics have the potential improve rates of hospitalization even in the absence of sputum purulence
Correct Answer:	**C. Antibiotics have the potential to reduce the risk of treatment failure, even in the absence of sputum purulence.**	
Rationale:	On the basis of the systematic reviews, antibiotic therapy in COPD exacerbations in the outpatient setting reduce the risk of treatment failure regardless of sputum production or purulence of sputum (Choice C is correct, choice A is incorrect). There is no evidence that antibiotics used in this setting improve quality of life, decrease mortality or improve rates of hospitalization (Choice B, D, and E are incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016;	
Question	#4	
Multiple Choice Question Stem:	A 71-year-old woman is admitted to the hospital with a COPD exacerbation. She is quite dyspneic and is having difficulty taking oral medications. Corticosteroids are administered intravenously in the emergency department. On Day 2 of her hospitalization, she is feeling improved and is able to swallow her blood pressure pills and eat all of her breakfast.	
Question:	**Should this patient continue on intravenous corticosteroids?**	
Answer Choices:	A	No, oral corticosteroids are preferred when possible since there is no significant difference in treatment failure, yet oral therapies are likely more cost effective.
	B	Yes, because intravenous corticosteroids reduce risk of readmission when compared to oral corticosteroids.
	C	Yes, because intravenous corticosteroids reduce length of hospitalization when compared to oral corticosteroids.

	D	Yes, because intravenous corticosteroids reduce the likelihood of ICU transfer when compared to oral corticosteroids
	E	Yes, because intravenous corticosteroids reduce mortality in COPD exacerbations requiring hospitalization when compared to oral corticosteroids.
Correct Answer:	**A. No, oral corticosteroids are preferred when possible since there is no significant difference in treatment failure, yet oral therapies are likely more cost effective.**	
Rationale:	The ERS/ATS clinical practice guideline conducted a systematic review that did not demonstrate any significant difference in outcomes between oral and intravenous corticosteroids used in the treatment of COPD exacerbations in the inpatient setting. Oral corticosteroids allow for simplified administration and are less expensive than intravenous formulations (Choice A is correct, and Choices B-E are incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016; 2. De Jong YP, Grotjohan HP, Postma DS, Kerstjens HA, van den Berg JW. Oral or IV prednisolone in the treatment of COPD exacerbations: a randomized, controlled, double-blind study. Chest 2007; 132(6):1741-7. 3. Ceviker Y, Sayiner A. Comparison of two systemic steroid regimens for the treatment of COPD exacerbations. Pulm Pharmacol Ther 2014; 27(2):179-183.	
Question	#5	
Multiple Choice Question Stem:	A 64-year-old man is admitted to the hospital with a COPD exacerbation.	
Question:	**According to the ERS/ATS guidelines, which of the following statements is correct regarding the use of intravenous corticosteroids in hospitalized patients with COPD exacerbations?**	
Answer Choices:	A	There is an increased risk for major adverse side effects with intravenous corticosteroids compared with oral administration.
	B	Intravenous corticosteroids should be reserved for patients who are unable to take medications orally.
	C	Intravenous corticosteroids reduce mortality compared with oral administration.
	D	Intravenous corticosteroids reduce the length of hospitalization compared with oral administration.
	E	Intravenous corticosteroids reduce the risk of treatment failure compared with oral administration.
Correct Answer:	**B. Intravenous corticosteroids should be reserved for patients who are unable to take medications orally**	

Rationale:	According to the ERS/ATS guidelines, there is no significant difference in outcomes between oral and intravenous corticosteroids, including length of hospitalization, treatment failure or mortality (Choices C, D and E are incorrect). None of the trials studied reported any major adverse effects of either oral or intravenous corticosteroids (Choice A is incorrect). Therefore, intravenous steroids should be reserved for patients who are unable to take medications orally (Choice B is correct).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016; 2. De Jong YP, Grotjohan HP, Postma DS, Kerstjens HA, van den Berg JW. Oral or IV prednisolone in the treatment of COPD exacerbations: a randomized, controlled, double-blind study. Chest 2007; 132(6):1741-7. 3. Ceviker Y, Sayiner A. Comparison of two systemic steroid regimens for the treatment of COPD exacerbations. Pulm Pharmacol Ther 2014; 27(2):179-183.	
Question	#6	
Multiple Choice Question Stem:	A 64-year-old woman was admitted to the hospital with a COPD exacerbation complicated by hypercarbic respiratory failure requiring ICU admission. She has now been extubated for 24 hours and your ICU resident suggests initiating pulmonary rehabilitation while the patient is still “in-house”.	
Question:	**Which of the following outcomes is associated with the initiation of pulmonary rehabilitation <u>during hospitalization</u> in patients admitted with a COPD exacerbation?**	
Answer Choices:	A	Reduced time to next exacerbation
	B	Improved lung function
	C	Decreased exercise capacity
	D	Increased mortality
	E	Reduction in readmission rate
Correct Answer:	**D. Increased mortality**	
Rationale:	Despite the variability in trials assessed, the pooled data presented in the ERS/ATS guidelines demonstrated that when pulmonary rehabilitation was initiated during an admission for COPD exacerbation, there was an increase in mortality (D is correct). Similarly, in this population there was in an increase exercise capacity (C is incorrect), however, there was no significant difference in the rate of hospital readmissions (E is incorrect). Lung function and time to next exacerbation were not outcomes evaluated in the guideline summary for pulmonary rehabilitation (A and B are incorrect).	

Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#7	
Multiple Choice Question Stem:	A 68-year old male with COPD on chronic home oxygen presents to the emergency department with increased cough and sputum production for several days. The patient is noted to be in moderate respiratory distress and appears sleepy, but answers questions appropriately. Arterial blood gas reveals hypoxemia and hypercarbia.	
Question:	**What is the next best step in the management of this patient?**	
Answer Choices:	A	Place an endotracheal tube and initiate mechanical ventilation
	B	Increase supplemental oxygen delivery via non-rebreather mask
	C	Obtain a non-contrast CT of the chest to evaluate for pneumonia
	D	Initiate non-invasive mechanical ventilation
	E	Initiate continuous nebulized albuterol
Correct Answer:	**D. Initiate non-invasive mechanical ventilation**	
Rationale:	A meta-analysis of 21 trials of non-invasive ventilation in patients with COPD exacerbations found that non-invasive ventilation reduced the need for intubation, mortality, complications of therapy, and length of both hospital stay and ICU stay in patients with acute or acute-on-chronic respiratory failure due to a COPD exacerbation. The 2014 GOLD Strategy document states that, in patients with acute respiratory failure due to a COPD exacerbation, NIV improves respiratory acidosis and decreases the intubation rate, mortality, respiratory rate, severity of breathlessness, complications (e.g., ventilator associated pneumonia), and length of hospital stay. The ERS/ATS guidelines recommend that hospitalized patients with acute or acute-on-chronic hypercapnic respiratory failure due to a COPD exacerbation be treated with non-invasive ventilation (strong recommendation, low quality of evidence). (Choice D is correct, A and B are incorrect). Although further imaging and inhaled medications are reasonable further along the patient's clinical course, he is currently in moderate respiratory distress and his breathing should be stabilized as the first priority. (Choices C and E are incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	

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<tr><td></td><td colspan="2">2. Ram FS, Picot J, Lightowler J, Wedzicha JA. Non-invasive positive pressure ventilation for treatment of respiratory failure due to exacerbations of chronic obstructive pulmonary disease. Cochrane Database Syst Rev. 2004; 1:CD004104.
3. Carrera M, Marin JM, Anton A, Chiner E, Alonso ML, Masa JF et al. A controlled trial of noninvasive ventilation for chronic obstructive pulmonary disease exacerbations. J Crit Care 2009; 24(3):473-14.
4. Wang C. Collaborative Research Group of Noninvasive Mechanical Ventilation for Chronic Obstructive Pulmonary Disease. Early use of non-invasive positive pressure ventilation for acute exacerbations of chronic obstructive pulmonary disease: A multicentre randomized controlled trial. Chin Med J 2005; 118(24):2034-40.
5. Global Initiative for Chronic Obstructive Lung Diseases. Global strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease (Revised 2011). Global Inititative for Chronic Lung Disease, Inc; 2011.</td></tr>
<tr><td>Question</td><td colspan="2">#8</td></tr>
<tr><td>Multiple Choice Question Stem:</td><td colspan="2">A 72-year old woman presents to the emergency department with acute hypoxic and hypercapnic respiratory failure secondary to a COPD exacerbation. She is initiated on non-invasive ventilation, as well as steroids and antibiotics. Her respiratory rate and oxygen saturation improve and she asks to discontinue bi-level non-invasive ventilation because she is feeling claustrophobic.</td></tr>
<tr><td>Question:</td><td colspan="2">What is the best strategy for weaning this patient’s non-invasive ventilation?</td></tr>
<tr><td rowspan="5">Answer Choices:</td><td>A</td><td>Change from bi-level to CPAP and recheck an arterial blood gas</td></tr>
<tr><td>B</td><td>Discontinue non-invasive ventilation and initiate high flow nasal cannula</td></tr>
<tr><td>C</td><td>Continue non-invasive ventilation for at least 24 hours before attempting to wean</td></tr>
<tr><td>D</td><td>Continue bi-level but wean the FiO2 to 0.4 prior to discontinuing</td></tr>
<tr><td>E</td><td>More research is needed to identify best strategies for weaning non-invasive ventilation</td></tr>
<tr><td>Correct Answer:</td><td colspan="2">E. More research is needed to identify best strategies for weaning non-invasive ventilation</td></tr>
<tr><td>Rationale:</td><td colspan="2">Meta-analysis of 21 trials supports the use of non-invasive ventilation in patients with hypercapnic respiratory failure due to COPD exacerbation. However, no trials or guidelines exist that address specific questions such as optimal technique and interface, titration strategies, or weaning strategies (Choice E is correct, Choices A-D are incorrect).</td></tr>
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Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#9	
Multiple Choice Question Stem:	A 69-year old male presents with acute-on-chronic hypercapnic respiratory failure and is started on non-invasive ventilation. He is diagnosed with a COPD exacerbation and is prescribed systemic corticosteroids and antibiotics. He appears to be breathing comfortably and is responding to questions appropriately while on the non-invasive ventilation.	
Question:	**Which of the following outcomes is most likely among patients with hypercapnic respiratory failure treated with non-invasive ventilation?**	
Answer Choices:	A	Shorter length of ICU stay
	B	Increased rate of nosocomial pneumonia
	C	No difference in in-hospital mortality
	D	Reduction in total days of steroid therapy
	E	More rapid weaning of supplemental oxygen requirement
Correct Answer:	**A. Shorter length of ICU stay.**	
Rationale:	A meta-analysis of 21 trials of non-invasive ventilation in patients with COPD exacerbations found that non-invasive ventilation reduced the need for endotracheal intubation, mortality, complications of therapy, and length of both hospital and ICU stay in patients with acute or acute-on-chronic respiratory failure due to a COPD exacerbation (Choice A is correct). Rates of nosocomial infection were incompletely reported and therefore not analyzed (Choice B is incorrect). Duration of steroid therapy or weaning times were also not addressed (Choice D and E are incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#10	

Multiple Choice Question Stem:	Two patients present to the emergency department with shortness of breath and increased sputum production. Both are diagnosed with COPD exacerbations. Patient A is admitted to the hospital for non-invasive ventilation and IV antibiotic therapy. Patient B is discharged home with prescriptions for oral steroids and antibiotics. The discharging physician is considering home-based management for both patients.	
Question:	**What is the effect of home-based management on hospital readmission rates in these patient populations?**	
Answer Choices:	A	Home-based management reduces hospital readmissions in patients discharged from the emergency department, but not those discharged from the inpatient medical floor
	B	Home-based management has no effect on readmission rates in either patient population
	C	Home-based management is associated with reduced hospital readmission rates in patients discharged from the emergency department and from the inpatient medical floor.
	D	Home-based management reduces hospital readmissions in patients discharged from the inpatient medical floor, but not those discharged from the emergency department
	E	Home-based management increases readmission rates for patients discharged from the emergency department, but decreases rates for patients discharged from the inpatient medical floor
Correct Answer:	**C. Home-based management is associated with reduced hospital readmission rates in patients discharged from the emergency department and from the inpatient medical floor.**	
Rationale:	A meta-analysis of 9 trials comparing home-based management to usual care in patients with COPD exacerbations found that home-based management reduced hospital readmissions and was associated with a trend toward lower mortality (Choice C is correct). These effects did not differ between patients who were discharged directly from the emergency department and those who were discharged after hospitalization (Choices A, B, D, and E are incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016 2. Ram FS, Picot J, Lightowler J, Wedzicha JA. Non-invasive positive pressure ventilation for treatment of respiratory failure due to exacerbations of chronic obstructive pulmonary disease. Cochrane Database Syst Rev. 2004; 1:CD004104. 3. Carrera M, Marin JM, Anton A, Chiner E, Alonso ML, Masa JF et al. A controlled trial of noninvasive ventilation for chronic obstructive pulmonary disease exacerbations. J Crit Care 2009; 24(3):473-14. 4. Wang C. Collaborative Research Group of Noninvasive Mechanical Ventilation for Chronic Obstructive Pulmonary Disease. Early use of	

	non-invasive positive pressure ventilation for acute exacerbations of chronic obstructive pulmonary disease: A multicentre randomized controlled trial. Chin Med J 2005; 118(24):2034-40.	
Question	#11	
Multiple Choice Question Stem:	An 81-year old woman is admitted to the hospital with an acute exacerbation of COPD. She briefly requires non-invasive ventilation, but is rapidly weaned to supplemental oxygen vial nasal cannula. She is treated with antibiotics and steroids and is anxious to return home, but is still requiring significantly more oxygen than her 2lpm baseline.	
Question:	**Which of the following discharge strategies reduces hospital readmissions in similar patients with COPD exacerbations?**	
Answer Choices:	A	Keep the patient in the hospital until her oxygen requirement returns to baseline
	B	Discharge with a home-based management program
	C	Transfer to a skilled nursing facility with respiratory therapists on staff
	D	Discharge with next-day primary care follow-up
	E	Discharge with non-invasive ventilation for use at night
Correct Answer:	**B. Discharge with a home-based management program.**	
Rationale:	Home-based management programs offer the option of an early assisted hospital discharge or an alternative to hospitalization in patients presenting to the emergency department with a COPD exacerbation. A meta-analysis of 9 trials comparing home-based management to usual care in patients with COPD exacerbations found that home-based management reduced hospital readmissions and was associated with a trend toward lower mortality (Choice B is correct).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016 2. Jeppesen E, Brurberg K, Vist G, Wedzicha J, Wright J, Greenstone M, et al. Hospital at home for acute exacerbations of chronic obstructive pulmonary disease. Cochrane Database Syst Rev 2012; (5):CD003573. 3. Skwarska E, Cohen G, Skwarksi K, Lamb C, Bushell D, Parker S, et al. Randomised controlled trial of supported discharge in patients with exacerbations of chronic obstructive pulmonary disease. Thorax 2000; 55(11):907-12.	

Question	#12	
Multiple Choice Question Stem:	A health systems administrator is evaluating a home-based management program for patients who present to the emergency department with COPD exacerbations. She asks for your advice regarding the cost of running such a program compared to the potential costs of more and longer hospital admissions.	
Question:	**What do you tell the administrator regarding the cost analyses of 4 recent trials of home-based management for COPD exacerbations?**	
Answer Choices:	A	All 4 trials showed lower costs associated with home-based management
	B	Home-based management is associated with higher costs compared to hospitalization, but this is balanced by lower hospital readmission rates
	C	Home-based management is associated with lower costs if the professional team is limited to a nurse and respiratory therapist
	D	Two trials showed significantly lower costs with home-based management compared to usual care, while 2 showed no significant difference
	E	There are no significant differences between the costs of home-based management and the cost of usual care
Correct Answer:	**D**. **Two trials showed significantly lower costs with home-based management compared to usual care, while 2 showed no significant difference**	
Rationale:	A meta-analysis of 9 trials comparing home-based management to usual care in patients with COPD exacerbations found that home-based management reduced hospital readmissions and was associated with a trend toward lower mortality. Among the 4 trials that analyzed cost, 2 found lower costs with home-based management, 1 found a trend toward lower costs with home-based management, and 1 showed no difference.	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016 2. Jeppesen E, Brurberg K, Vist G, Wedzicha J, Wright J, Greenstone M, et al. Hospital at home for acute exacerbations of chronic obstructive pulmonary disease. Cochrane Database Syst Rev 2012; (5):CD003573. 3. Skwarska E, Cohen G, Skwarksi K, Lamb C, Bushell D, Parker S, et al. Randomised controlled trial of supported discharge in patients with exacerbations of chronic obstructive pulmonary disease. Thorax 2000; 55(11):907-12.	

Question	#13	
Multiple Choice Question Stem:	A 58-year old smoker with COPD presents to your office complaining of increased sputum production and sputum purulence for 1 week. Your resident diagnoses a COPD exacerbation and prescribes a course of oral prednisone.	
Question:	**What is your feedback regarding his treatment plan for this patient?**	
Answer Choices:	A	Corticosteroids have been shown to improve lung function, but the addition of antibiotics may increase the time until the next exacerbation
	B	Antibiotics should be added as it has been shown to reduce the risk of COPD-related mortality
	C	Nocturnal non-invasive ventilation should be added as it has been shown to shorten the duration of exacerbations
	D	This plan is appropriate; antibiotics are contraindicated unless a sputum culture is positive
	E	Corticosteroids are contraindicated due to sputum purulence and concern for infection
Correct Answer:	**A. Corticosteroids have been shown to improve lung function, but the addition of antibiotics may increase the time until the next exacerbation**	
Rationale:	Meta-analysis of trials examining the treatment of COPD exacerbations in the ambulatory setting has suggested the following: Antibiotic therapy reduces the risk of treatment failure and increases the time between COPD exacerbations; oral corticosteroids improve lung function and is associated with a trend toward fewer hospitalizations. Neither antibiotics nor noninvasive ventilation have been shown to affect mortality or duration of exacerbation in this clinical setting.	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016 2. Walters J, Gibson P, Wood-Baker R, Hannay M, Walters E. Systemic corticosteroids for acute exacerbations of chronic obstructive pulmonary disease. Cochrane Database Syst Rev 2009; 1: CD001288. 3. Quon BS, Gan WQ, Sin DD. Contemporary management of acute exacerbations of COPD: a systematic review and metaanalysis [Review]. Chest 2008; 133(3):756-66. 4. Schweiger T, Zdanowicz M. Systemic corticosteroids in the treatment of acute exacerbations of chronic obstructive pulmonary disease. Am J Healt-Syst Pharm 2010; 167:1061-9. 5. Ram FS, Rodriguez-Roisin R, Granados-Navarrete A, Garcia-Aymerich J, Barnes NC. Antibiotics for exacerbations of chronic obstructive pulmonary disease [Review]. Cochrane Database Syst Rev 2006; 2:CD004403. 6. Puhan MA, Vollenweider D, Latshang T, Steurer J, Steurer-Stey C. Exacerbations of chronic obstructive pulmonary disease: when are	

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Question	#14	
Multiple Choice Question Stem:	A 71-year old man is admitted to the hospital with cough, increased sputum production, and fatigue. He is diagnosed with a COPD exacerbation and started on IV antibiotics and oral prednisone. The following day, he asks to speak with you and wants to know why he is being treated with prednisone instead of "stronger IV steroids."	
Question:	**What information do you provide your patient regarding the route of steroid administration in patients hospitalized with COPD exacerbations?**	
Answer Choices:	A	Oral steroids are associated with decreased rate of treatment failure compared to IV steroids
	B	IV steroids are associated with an increased risk of serious adverse events compared or oral steroids
	C	No significant differences in outcomes have been identified when oral steroids are compared to IV steroids
	D	Oral steroids are associated with a slight increase in mild adverse events such as GI upset, but are significantly cheaper than IV steroids
	E	IV steroids have greater bioavailability than oral steroids, but are associated with increased length of hospital stay
Correct Answer:	**C. No significant differences in outcomes have been identified when oral steroids are compared to IV steroids**	
Rationale:	A meta-analysis pooling data from 2 trials comparing IV vs. oral steroids for the treatment of patients hospitalized with COPD exacerbations suggests the following: there are no significant differences in treatment failure, mortality, hospital readmissions, or length of hospital stay. IV steroids may be associated with an increased risk of mild adverse effects.	
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	3. Ceviker Y, Sayiner A. Comparison of two systemic steroid regimens for the treatment of COPD exacerbations. Pulm Pharmacol Ther 2014; 27(2):179-183.	
Question	#15	
Multiple Choice Question Stem:	A 58-year-old man with a history of oxygen dependent COPD is admitted to the hospital for shortness of breath and chest tightness attributed to a COPD exacerbation. The patient has never attended pulmonary rehabilitation, and is interested in participating now.	
Question:	**Based on the recent ATS/ERS guideline summary, when is the most appropriate time to begin a pulmonary rehabilitation program?**	
Answer Choices:	A	During the patient's current hospitalization
	B	Within 3 weeks after discharge
	C	Between 1-2 months after discharge
	D	Between 2-6 months after discharge
	E	Never – pulmonary rehabilitation is not recommended for patients hospitalized for an exacerbation.
Correct Answer:	**B. Within 3 weeks after discharge.**	
Rationale:	Stratified analyses of 13 studies examining the benefit of pulmonary rehabilitation among patients hospitalized for an exacerbation of COPD showed that programs initiated around 3 weeks after discharge from the hospital decreased rates of readmission and improved quality of life (Choice B is correct, C-E are incorrect). Initiation of pulmonary rehabilitation during an index hospitalization has been associated with increased mortality (Choice A is incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016 2. Greening NJ, Williams JE, Hussain SF, Harvey-Dunstan TC, Bankart MJ, Chaplin EJ, Vincent EE, Chimera R, Morgan MD, Singh SJ, Steiner MC. An early rehabilitation intervention to enhance recovery during hospital admission for an exacerbation of chronic respiratory disease: randomized controlled trial. BMJ (2014); 8:349.	
Question	#16	
Multiple Choice Question Stem:	A 78- year-old woman presents to your office 1 week after discharge from the hospital for COPD exacerbation. She was initiated on an oral steroid taper and placed on antibiotics. She asks whether or not she would benefit from attending pulmonary rehabilitation.	
Question:	**Which of the following outcomes is most likely for this patient if she starts a pulmonary rehabilitation program within 3 weeks after discharge?**	

Answer Choices:	A	Reduced risk of mortality.
	B	Prolonged time to subsequent outpatient exacerbation
	C	Reduced frequency of outpatient exacerbations.
	D	Increased risk of mortality.
	E	Fewer hospital readmissions for a COPD exacerbation and improved quality of life.
Correct Answer:	**E. Fewer hospital readmissions for a COPD exacerbation and improved quality of life.**	
Rationale:	Stratified analyses of 13 studies examining the benefit of pulmonary rehabilitation among patients hospitalized for an exacerbation of COPD showed that programs initiated around 3 weeks after discharge from the hospital decreased rates of readmission and improved quality of life (Choice E is correct, A, B, and C are incorrect). Initiation of pulmonary rehabilitation during an index hospitalization has been associated with increased mortality, but no such association has been found when programs are initiated after discharge (Choice D is incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#17	
Multiple Choice Question Stem:	A 79-year-old man with a history of COPD presents to the hospital with a COPD exacerbation. The patient has bilateral end-expiratory wheezing on lung exam, with diminished breath sounds in the lower lobes. He appears to be seated in a tripod position when you enter his room. You immediately obtain an ABG and find that his pH is 7.28 and his CO is 63, with an O2 saturation of 90% on room air. You call the respiratory therapist to the bedside.	
Question:	**What is the most appropriate next step for management of this patient's acute respiratory failure?**	
Answer Choices:	A	Place the patient on high flow nasal cannula
	B	Place the patient on 100% non-rebreather mask
	C	Start a trial of non-invasive ventilation
	D	Start continuous nebulizers, oxygen by nasal canula, and re-evaluate with an ABG in 1 hour time.
	E	Perform endotracheal intubation

Correct Answer:	**C. Start a trial of non-invasive ventilation**	
Rationale:	Non-invasive ventilation has been shown to reduce the need for endotracheal intubation, decrease mortality, as well as decrease length of hospital and ICU stay (Choice C is correct). In this case, options A and B would not help in improving the patient's hypercapnia. While giving nebulized treatments may aid in option D, placing the patient on a nasal cannula would not. Finally, intubation would not be the next step for this patient in whom a trial of non-invasive ventilation is warranted (Choice E is incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016; 2. Brochard L, Mancebo J, Wysocki M, Lofaso F, Conti G, Rauss A et al. Noninvasive ventilation for acute exacerbations of chronic obstructive pulmonary disease. New Engl J Med 1995; 333(13):817-22.	
Question	#18	
Multiple Choice Question Stem:	A 60 –year-old man with a history of COPD presents to the emergency department with increased dyspnea and cough productive of green sputum, consistent with prior COPD exacerbations. He is saturating 86% on room air, but saturations increase to 92% on 2 liters oxygen by nasal canula. On exam he has wheezes diffusely throughout both lung fields. ABG reveals no evidence of hypercarbia. You diagnose him with a COPD exacerbation and offer admission to the hospital given his oxygen requirement. However, the patient states he would rather discharged home with prescriptions for prednisone, antibiotics and oxygen with close follow-up from your hospital's new home-based management program.	
Question:	**When compared to hospital admission, home-based management programs confer which of the following benefits for patients discharged from the emergency department with a COPD exacerbation?**	
Answer Choices:	A	Reduced need for hospital readmission

	B	Longer time to first hospital readmission
	C	Reduced risk of adverse events, such as hospital acquired infections.
	D	Improved quality of life
	E	Increased patient satisfaction
Correct Answer:	**A. Reduced need for hospital readmission**	
Rationale:	A meta-analysis of 9 trials comparing home-based management to usual care in patients with COPD exacerbations found that home-based management reduced hospital readmissions and was associated with a trend toward lower mortality. (Choice A is correct). This was true of both patients discharged home early after admission and patients discharged from the emergency department. There was no difference in time to subsequent hospital readmission or in patient ratings of satisfaction (Choices A and E are incorrect). No data was available on whether or not home-based management programs improve quality of life or reduce risk of hospital-acquired infection (Choices C and D are incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#19	
Multiple Choice Question Stem:	A 55-year-old woman with a history of COPD and frequent exacerbations presents to your primary care clinic with an acute exacerbation of COPD, characterized by increased dyspnea and cough for the past 3 days. You plan to prescribe a course of doxycycline in addition to a course of oral corticosteroids, with planned follow-up by phone later this week.	
Question:	**Which of the following prescriptions is consistent with ATS/ERS recommendations regarding duration of corticosteroid therapy to treat COPD outpatient exacerbations?**	
Answer Choices:	A	Prednisone 40 mg daily X 4 days, then 30 mg daily X 4 days, then 20 mg daily X 4 days, then 10 mg daily X 4 days, then off (16 day course)
	B	Prednisone 40 mg daily X 7 days, then off
	C	Prednisone 40 mg daily X 7 days, 20 mg X 7 days, then 10 mg X 7 days and off (21 day course)

	D	Prednisone 40 mg daily X 10 days, then tapering off over a one week period (17 day course)
	E	Prednisone 40 mg daily X 7 days, 20 mg X 7 days, then 10 mg X 7 days, then 5 mg daily X 7 days, then off (28 day course)
Correct Answer:	**B. Prednisone 40 mg daily X 7 days, then off.**	
Rationale:	Based on the data from three placebo-controlled randomized trials, ATS/ERS guideline recommend a short course (≤14 days) of oral corticosteroids to treat COPD exacerbations in ambulatory patients (Choice B is correct, and A, C, D, and E are in correct). Of the 3 studies included in the guideline evidence synthesis, one looked at a tapering dose of corticosteroids, another at 30 mg of prednisolone daily and the other 40 mg of prednisone daily. The guidelines do not specify use of a constant or tapering dose of steroids.	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#20	
Multiple Choice Question Stem:	A 55 year-old-woman with history of COPD comes to clinic with complaints of 4 days of increased productive cough, dyspnea and wheeze after a upper respiratory infection one week ago. She is talking in complete sentences and oxygenating well on room air. Chest x-ray shows no evidence of pneumonia. You diagnose her with an exacerbation of her COPD, and send her home with a prescription for 10 days of doxycycline and a short course of oral prednisone.	
Question:	**When compared to placebo, which of the following benefits has been shown to occur with the use of a short-course of oral corticosteroids to treat outpatient COPD exacerbations?**	
Answer Choices:	A	Improved lung function
	B	Decreased rates of treatment failure
	C	Decreased mortality
	D	Increased time between exacerbations
	E	Improved quality of life
Correct Answer:	**A. Improved lung function.**	
Rationale:	Meta-analysis of data from 3 placebo-controlled randomized trials of oral corticosteroids demonstrated that corticosteroids improve lung function as measured by forced expired volume in one second (FEV_1) (Choice A is correct). There was also a non-significant trend towards reduction in hospital admissions.	

	There were no differences in rates of treatment failure, mortality, or quality of life (Choices B, C and E are incorrect). The trials did not study time to subsequent COPD exacerbation (Choice D is incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#21	
Multiple Choice Question Stem:	A 65-year old man with history of COPD complicated by frequent outpatient and inpatient exacerbations presents to your pulmonary clinic for follow-up two weeks after being discharged from the hospital for yet another exacerbation. He reports that the biggest impact he has felt from his COPD over the past several years is an inability to do the things he used to enjoy, such as playing in the park with his grandchildren because the physical exertion is too much for him.	
Question:	**Which of the following interventions for patients experiencing a COPD exacerbation improves quality of life?**	
Answer Choices:	A	A short course of oral corticosteroids among ambulatory patients experiencing an exacerbation of COPD.
	B	Antibiotics to treat exacerbations among ambulatory patients experiencing an exacerbation of COPD.
	C	Pulmonary rehabilitation initiated within 3 weeks after discharge from the hospital following an admission for an exacerbation of COPD.
	D	Use of oral corticosteroids rather than intravenous steroids among patients hospitalized for an exacerbation of COPD.
	E	Home-based management programs for patients discharged from the emergency department with an exacerbation of COPD.
Correct Answer:	**C. Pulmonary rehabilitation initiated within 3 weeks after discharge from the hospital following an admission for an exacerbation of COPD.**	
Rationale:	Following an admission for an acute exacerbation, patients with COPD undergoing pulmonary rehabilitation within 3 weeks of discharge experienced fewer readmissions and better quality of life (Choice C is correct). Compared to placebo, oral corticosteroids had no effect on quality of life among outpatients treated for a COPD exacerbation (Choice A is incorrect). Similarly, there is no known benefit on quality of life with treatment of exacerbations in ambulatory patients with antibiotics, or with home-based management programs for patients discharged from the ED (Choices B and E are incorrect). Oral corticosteroids are preferred over intravenous steroids for patients hospitalized for a COPD exacerbation, but have no known effect on quality of life (Choice C is incorrect).	

Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#22	
Multiple Choice Question Stem:	A 65-year-old woman with a history of COPD presents to the emergency department with a 5-day history of increasing wheeze, dyspnea and productive cough with purulent sputum. During your initial exam, you find that she is awake but appears anxious, is hypoxic on room air (saturations of 86%) and tachypneic with a respiratory rate of 28 breaths/minute. Pulmonary exam reveals crackles in the right base and poor air movement bilaterally. ABG shows pH of 7.30 and pCO2 of 55. Chest x-ray shows a right lower-lobe infiltrate. You diagnose the patient with community-acquired pneumonia complicated by an exacerbation of COPD. The patient receives IV antibiotics and inhaled bronchodilators in the ED. The ED provider attempts to administer oral corticosteroids, but the patient states she is too dyspneic to try to take the pills.	
Question:	**Which of the following combination of interventions would be the best next steps for the patient at this time?**	
Answer Choices:	A	Initiation of non-invasive ventilation and administration of intravenous corticosteroids.
	B	Endotracheal intubation and administration of intravenous corticosteroids.
	C	Endotracheal intubation and placement of a nasogastric tube to facilitate oral corticosteroid administration.
	D	Initiation of non-invasive ventilation and no corticosteroids until the patient is able to tolerate oral medications.
	E	Endotracheal intubation and no corticosteroids until the patient is able to tolerate oral medications.
Correct Answer:	**A. Initiation of non-invasive ventilation and administration of intravenous corticosteroids.**	
Rationale:	The ATS/ERS guidelines make a strong recommendation for the use of non-invasive ventilation to treat acute hypercapnic respiratory failure among patients hospitalized with an exacerbation of COPD. In addition, they make a conditional recommendation for the use of oral corticosteroids over intravenous corticosteroids when a patient is able to tolerate oral intake. However, when a patient is unable to tolerate oral intake, intravenous corticosteroids are preferred over not administering steroids at all. In this particular case, the patient meets criteria for non-invasive ventilation, but cannot tolerate oral intake and intravenous steroids are therefore a reasonable choice (Choice A is correct, and Choice D is incorrect). Although endotracheal	

	intubation would be the next step if the patient failed a trial of non-invasive ventilation, it is not currently indicated (Choices B, C and E are incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#23	
Multiple Choice Question Stem:	A 65-year-old patient with a history of very severe COPD (post-bronchodilator forced expiratory volume in one second (FEV1) 28% predicted) complicated by frequent exacerbations, obstructive sleep apnea (on nightly continuous positive airway pressure (CPAP), anxiety and post-traumatic stress disorder, is brought in by medics. The patient was last seen by his son the day before and had been complaining of increased difficulty breathing and increased somnolence for the past several days. Upon arrival to the emergency department, the patients is hemodynamically stable, but arousable only to sternal rub. Lung exam reveal diffuse wheezing. Chest x-ray shows only hyperinflation. Initial blood gas shows pH 7.20 with a pCO2 of 85, while other labs are normal. Urine toxicology is negative. You admit the patient to the medical intensive care unit with a diagnosis of acute hypercapneic respiratory failure due to a COPD exacerbation.	
Question:	**Which of the following factors precludes the use of non-invasive ventilation for treatment of the patient's hypercapnic respiratory failure?**	
Answer Choices:	A	Chronic use of non-invasive ventilation to treat sleep apnea at home.
	B	Severity of his chronic airflow obstruction.
	C	Obtundation to the point of not being able to protect his airway.
	D	Frequency of hospitalization for treatment of COPD exacerbations.
	E	History of anxiety and post-traumatic stress disorder.
Correct Answer:	**C. Obtundation to the point of not being able to protect his airway.**	
Rationale:	The ATS/ERS guidelines make a strong recommendation for the initiation of non-invasive ventilation to treat acute or acute-on-chronic hypercapneic respiratory failure among patients hospitalized for an exacerbation of COPD. Evidence to support his recommendation is based upon a meta-analysis of 21 trials of non-invasive ventilation in the hospital setting. Common reasons for exclusion from these studies that are addressed in the guidelines include: inability to cooperate, inadequate airway protection, inability to clear secretions, high risk for aspiration and presence of facial deformities (Choice C is correct, choices A, B, D, and E are all incorrect).	

Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#24	
Multiple Choice Question Stem:	A 63-year-old woman with a history of COPD presented to the emergency department with an acute exacerbation of COPD. She was initially in mild respiratory distress with hypercapnia on initial arterial blood gas. She received a dose of oral corticosteroids and was then initiated on non-invasive ventilation with reported initial improvement. You are called to admit the patient to the medical intensive care unit. When you arrive to see the patient, she appears to be in moderate distress and is grabbing at her facemask stating that she cannot breathe. Respiratory therapy is at the bedside attempting to optimize her pressure settings to no avail. Repeat blood gas shows worsening hypercapnia.	
Question:	**Which of the following combination of interventions would be the best next steps for the patient at this time?**	
Answer Choices:	A	Continue current plan of non-invasive ventilation and but stop oral corticosteroids and escalate care by initiating intravenous corticosteroids .
	B	Perform endotracheal intubation, initiation of mechanical ventilation, and administration of intravenous corticosteroids.
	C	Perform endotracheal intubation, initiation of mechanical ventilation, and placement of a nasogastric tube to facilitate oral corticosteroid administration.
	D	Perform endotracheal intubation, initiation of mechanical ventilation, and stop corticosteroids until the patient can again tolerate oral medications.
	E	Continue current plan of non-invasive ventilation and but stop corticosteroids as they do not appear to be helping the patient.
Correct Answer:	**C. Perform endotracheal intubation, initiation of mechanical ventilation, and placement of a nasogastric tube to facilitate oral corticosteroid administration.**	
Rationale:	The ATS/ERS guidelines make a strong recommendation for the use of non-invasive ventilation to treat acute hypercapnic respiratory failure among patients hospitalized with an exacerbation of COPD. However, this patient appears to be failing the trial of non-invasive ventilation and endotracheal intubation is therefore indicated (Choices A and E are incorrect). The guidelines recommend oral corticosteroids over intravenous corticosteroids when possible. Currently, there is no reason to suspect that the patient would not be able to have oral corticosteroids administered through a nasogastric tube once	

	intubated (Choice C is correct, choices B and D are incorrect). If a nasogatric tube could not be placed or she developed a contraindication to oral medications, then intravenous therapy would be preferred over no corticosteroids.	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#25	
Multiple Choice Question Stem:	A patient presents to pulmonary clinic with a complaint of frequent exacerbations of COPD. She states that over the past several years, she feels that her exacerbations are occurring more and more frequently, particularly during the winter months.	
Question:	**Which of the following interventions increases the time to next COPD exacerbation?**	
Answer Choices:	A	Treatment of exacerbations of COPD in outpatients with a short course of oral corticosteroids.
	B	Treatment of hypercapnic respiratory failure with non-invasive ventilation among patients hospitalized for an exacerbation of COPD.
	C	Home-based management programs for patients presenting to the emergency department with an exacerbation of COPD.
	D	Treatment of exacerbations of COPD in outpatients with a course of antibiotics.
	E	Enrollment in pulmonary rehabilitation within 3 weeks after a hospitalization for an exacerbation of COPD.
Correct Answer:	**D. Treatment of exacerbations of COPD in outpatients with a course of antibiotics**	
Rationale:	Meta-analysis of two randomized trials showed that an outpatient course of antibiotics reduced treatment failure and lengthened time until subsequent repeat COPD exacerbation (Choice D is correct). In three trials examining benefits of oral corticosteroids for outpatients, no data was present on time to next exacerbation (Choice A is incorrect). Time to next exacerbation was not an outcome of interest for the panel when assessing possible benefits of non-invasive ventilation, and is therefore not addressed in the clinical practice guideline (Choice B is incorrect). Similarly, time to next exacerbation was not assessed among patients receiving home-based management, although time to first readmission was no different for this group when compared to usual care (Choice C is incorrect). Enrollment in pulmonary rehabilitation with three weeks of hospital discharge is associated with fewer readmissions and	

	increased quality of life; time to next exacerbation is not addressed in the guideline (Choice E is incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#26	
Multiple Choice Question Stem:	An ATS/ERS task force recently published guidelines for the management of COPD exacerbations in the inpatient and ambulatory settings. Taking into account a number of factors (including the benefits versus risks of an intervention, quality of the evidence, feasibility and acceptability), the task force made recommendations "for" or "against" specific interventions.	
Question:	**Which of the following interventions used to treat COPD exacerbations received a "strong recommendation" from the task force for its use?**	
Answer Choices:	A	Home-based management programs for patients presenting to the emergency department with an exacerbation of COPD.
	B	Treatment of exacerbations of COPD in outpatients with a course of antibiotics.
	C	Enrollment in pulmonary rehabilitation after a hospitalization for an exacerbation of COPD.
	D	Treatment of exacerbations of COPD in outpatients with a short course of oral corticosteroids.
	E	Treatment of hypercapneic respiratory failure with non-invasive ventilation among patients hospitalized for an exacerbation of COPD.
Correct Answer:	**E. Treatment of hypercapneic respiratory failure with non-invasive ventilation among patients hospitalized for an exacerbation of COPD.**	
Rationale:	The task force made a strong recommendation in support of non-invasive mechanical ventilation in patients with acute hypercapneic respiratory failure (Choice A is correct). The task force mad conditional recommendations in favor of: 1) a short course of oral corticosteroids to treat ambulatory patients with an exacerbation; 2) antibiotics to treat ambulatory patients with an exacerbation; 3) oral over intravenous corticosteroids for hospitalized patients; 4) home-based management programs; and 5) pulmonary rehabilitation within 3 weeks of discharge after hospitalization for an exacerbation (Choices A, B, C and D are incorrect). The panel also made a conditional recommendation against the initiation of pulmonary rehabilitation prior to discharge after hospitalization for an exacerbation of COPD.	

Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#27	
Multiple Choice Question Stem:	A 70-year-old man is admitted to the hospital for an exacerbation of COPD. Prior to discharge, he tells you that he is interested in participating in pulmonary rehabilitation in hopes of reducing future COPD-related hospital admissions.	
Question:	**Which of the following characteristics of a pulmonary rehabilitation program is likely the most important factor to consider when determining if a patient will derive benefit from his participation?**	
Answer Choices:	A	Administration of the program by a board-certified pulmonologist.
	B	Provision of psychosocial support.
	C	Education of patients in specific breathing techniques
	D	Inclusion of nutritional support for all patients.
	E	Appropriate timing of program initiation.
Correct Answer:	**E. Appropriate timing of program initiation.**	
Rationale:	A meta-analysis of 21 trials of pulmonary rehabilitation showed wide variation in the components of various pulmonary rehabilitation programs, limiting ability to assess ideal components of the programs or how best to implement them. However, timing of initiation does appear to be important. Patients initiating pulmonary rehabilitation prior to discharge from the hospital have increased mortality, while patients initiating the program within 3 weeks after discharge have decreased readmission rates and improved quality of life (Choice E is correct, Choices A-D are incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	

Question	#28	
Multiple Choice Question Stem:	An ATS/ERS task force recently published guidelines for the management of COPD exacerbations in the inpatient and ambulatory settings. Taking into account a number of factors (including the benefits versus risks of an intervention, quality of the evidence, feasibility and acceptability), the task force made recommendations "for" or "against" specific interventions.	
Question:	**Which of the following interventions used to treat COPD exacerbations received a "conditional recommendation" from the task force AGAINST its use?**	
Answer Choices:	A	Home-based management programs for patients presenting to the emergency department with an exacerbation of COPD.
	B	Treatment of exacerbations of COPD in outpatients with a course of antibiotics.
	C	Initiation of pulmonary rehabilitation prior to discharge during a hospitalization for an exacerbation of COPD.
	D	Treatment of exacerbations of COPD in inpatients with a course of oral corticosteroids.
	E	Treatment of hypercapnic respiratory failure with non-invasive ventilation among patients hospitalized for an exacerbation of COPD.
Correct Answer:	**C. Initiation of pulmonary rehabilitation prior to discharge during a hospitalization for an exacerbation of COPD.**	
Rationale:	The task force made a conditional recommendation against the initiation of pulmonary rehabilitation prior to discharge after hospitalization for an exacerbation of COPD due to its association with increased mortality in stratified post-hoc analyses (Choice C is correct). The panel made a strong recommendation in support of non-invasive mechanical ventilation in patients with acute hypercapnic respiratory failure (Choice E is incorrect). The task force mad conditional recommendations in favor of: 1) a short course of oral corticosteroids to treat ambulatory patients with an exacerbation; 2) antibiotics to treat ambulatory patients with an exacerbation; 3) oral over intravenous corticosteroids for hospitalized patients; 4) home-based management programs; and 5) pulmonary rehabilitation within 3 weeks of discharge after hospitalization for an exacerbation (Choices A, B, and D are incorrect).	

Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	
Question	#29	
Multiple Choice Question Stem:	A 45-year-old man with a history of COPD presents to primary care clinic with increased respiratory symptoms consistent with an exacerbation. He is talking in complete sentences, saturating well on room air, with only scattered wheezes present on lung exam, without rales or rhonchi. You recently reviewed published guidelines from the ATS/ERS and plan to treat the patient as recommended with a short course of oral corticosteroids and a course of antibiotics.	
Question:	**Which of the following statements regarding antibiotics used to treat exacerbations of COPD in ambulatory patients is most correct?**	
Answer Choices:	A	All patients should receive a 10-day course of doxycycline.
	B	All patients should receive a 5-day course of Azithromycin.
	C	All patients should receive a 7-day course of Amoxicillin/clavulanate
	D	All patients should receive a 8-day course of trimethoprim/sulfamethoxazole
	E	Local resistance patterns should determine which antibiotic is used.
Correct Answer:	**E. Local resistance patterns should determine which antibiotic is used.**	
Rationale:	The ATS/ERS guidelines give a conditional recommendation for treatment of outpatient exacerbations with a course of oral antibiotics. Studies included in a meta-analysis used to inform the recommendation compared placebo to a variety of antibiotics, including amoxicillin/clavulanate, doxycycline, trimethoprim/sulfamethoxazole, or amoxicillin for 7-10 days. The guidelines do not give a recommendation as to which of these antibiotics or courses is superior, and instead state that local resistance patterns should help determine which antibiotic should be used (Choice E is correct, Choices A-D are incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	

Question	#30	
Multiple Choice Question Stem:	A health systems administrator is evaluating a home-based management program for patients who present to the emergency department or are admitted to hospital with COPD exacerbations. She asks for your advice regarding how institution of such a program might affect patient and clinician ratings of satisfaction with care.	
Question:	**What is the effect of home-based management on satisfaction ratings among patients and their clinicians?**	
Answer Choices:	A	Increased satisfaction on behalf of patients, but not clinicians.
	B	Increased satisfaction on behalf of clinicians, but not patients.
	C	Increased satisfaction on behalf of both patients and clinicians.
	D	No difference in satisfaction ratings in either patients or clinicians.
	E	Increased satisfaction in the short term for both patients and clinicians, but in the long-term decreased satisfaction.
Correct Answer:	**D. No difference in satisfaction ratings in either patients or clinicians.**	
Rationale:	A meta-analysis of nine trials found that home-based management reduced rates of hospital readmission and suggested a trend toward lower mortality among participants when compared to usual care. No differences were found in "satisfaction" with care on the part of either patients or clinicians, although most patients indicated they would rather receive treatment at home if possible (Choice D is correct, Choices A-C and E are incorrect).	
Bibliography:	1. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PMA, Albert RK, Anzueto A, Criner GJ, Papi A, Rabe KF, Rigau D, Sliwinski P, Tonia T, Vestbo J, Wilson KC, Krishnan JA. Management of COPD exacerbations: A European Respiratory Society/American Thoracic Society (ERS/ATS) guideline. Am J Respir Crit Care Med 2016	