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Management of Community-Acquired Pneumonia in the Ambulatory Setting

An APCCMPD Ambulatory-Care Curriculum Teaching Script

Authors **Lekshmi Santhosh, MD, MA**
University of California, San Francisco

Stacey Kassutto, MD, MA
University of Pennsylvania

Editor **Amik Sodhi, MBBS, MPH**
University of Wisconsin Hospital and Clinics

Associate Editors **Meredith Pugh, MD, MSCI**
Vanderbilt University Medical Center

Abiodun Kukoyi, MD
Emory University School of Medicine

Please find all script contributors listed on the last page.

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Management of Community-Acquired Pneumonia in the Ambulatory Setting

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Scenario 1:

Ms. JS is a 68-year-old woman with diabetes, hypertension, gastroesophageal reflux disease (GERD), chronic obstructive pulmonary disease (COPD), congestive heart failure with reduced ejection fraction, and a prior history of smoking tobacco who presents to your clinic for "recurrent pneumonias." She reports that over the last week, she has had a productive cough with yellowish sputum, low-grade fevers, and general malaise. She reports no hemoptysis, chest pain, urinary changes, or joint symptoms. Her medication list includes glargine insulin, lisinopril, aspirin, omeprazole, simvastatin, fluticasone/salmeterol, and metoprolol. On examination, she is seated comfortably in no acute distress, T 99.5 F, BP 150/75, HR 95, RR 22, SpO2 93% on room air. Head and neck exam shows poor dentition but no cervical lymphadenopathy. Cardiac exam shows a mildly elevated JVP, a regular rate and rhythm with a II/VI systolic ejection murmur. Her chest expansion is symmetric; she has no increased work of breathing but does have decreased breath sounds at the right base and egophony at the right base. She has no wheezing, clubbing, or peripheral edema. Chest X-ray shows a right lower lobe opacity without associated effusion. She has not had any recent hospitalizations. Her last course of oral antibiotics was two months ago. She was treated with levofloxacin for a one-week course.

Question 1: What are the patient's risk factors for pneumonia?

Question 2: Should any additional testing be obtained to confirm the diagnosis or direct treatment?

Question 3: Should you treat Ms. JS as an outpatient or admit her to the hospital? How do you risk-stratify patients with pneumonia in the outpatient setting?

Scenario 1 (Continued):

Ms. JS's PSI score is 68, assuming she has no laboratory abnormalities. This places her in class II, with a 0.6% risk for mortality based on her age and co-existent heart failure diagnosis. Her CURB-65 score is 1. You therefore decide she can be managed as an outpatient given that there are no other noted worrisome factors for outpatient treatment noted in her history.

Question 4: What are the most common pathogens for community-acquired pneumonia?

Question 5: What antibiotic regimens should you consider for this patient?

Question 6: Should you consider the use of steroids for treatment of pneumonia (separate from treatment of a COPD exacerbation)? What is the latest evidence on steroid use for pneumonia?

Question 7: Assuming she clinically improves, does Ms. JS need follow up imaging? If so, at what interval would you recommend?

Scenario 1 (Continued):

After reviewing the recent guidelines, you discuss with the patient that repeat imaging should not be done unless her symptoms do not resolve in the expected time course of 5 to 7 days.

Question 8: If she does not improve clinically on empiric therapy, how would you proceed?

Scenario 1 Continued):

Ms. JS comes back to your office 6 weeks later for follow-up. She notes that she felt significantly better and back to her baseline after completing the course of antibiotics you previously prescribed. However, she is now feeling poorly again in the last several days with worsening productive cough, increased sputum production and low-grade fevers to 100.5 F. A repeat CXR is done again which shows a right middle lobe opacity. Review of prior films shows that almost all her prior infiltrates have been in the same area.

Question 9: What is your approach to recurrent pneumonia? What additional testing should you consider?

Question 10: What diagnostic tests would you order if you were concerned for a systemic immunodeficiency process?

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Educational Objectives:

1. Define the different risk factors for bacterial pneumonia seen in the ambulatory setting
2. Describe an approach to recurrent pneumonias in the outpatient setting
3. Describe a treatment plan for ambulatory care of pneumonia
4. Review indications for outpatient vs. inpatient management of pneumonia

Scenario 1:

Ms. JS is a 68-year-old woman with diabetes, hypertension, gastroesophageal reflux disease (GERD), chronic obstructive pulmonary disease (COPD), congestive heart failure with reduced ejection fraction, and a prior history of smoking tobacco who presents to your clinic for "recurrent pneumonias." She reports that over the last week, she has had a productive cough with yellowish sputum, low-grade fevers, and general malaise. She reports no hemoptysis, chest pain, urinary changes, or joint symptoms. Her medication list includes glargine insulin, lisinopril, aspirin, omeprazole, simvastatin, fluticasone/salmeterol, and metoprolol. On examination, she is seated comfortably in no acute distress, T 99.5 F, BP 150/75, HR 95, RR 22, SpO2 93% on room air. Head and neck exam shows poor dentition but no cervical lymphadenopathy. Cardiac exam shows a mildly elevated JVP, a regular rate and rhythm with a II/VI systolic ejection murmur. Her chest expansion is symmetric; she has no increased work of breathing but does have decreased breath sounds at the right base and egophony at the right base. She has no wheezing, clubbing, or peripheral edema. Chest X-ray shows a right lower lobe opacity without associated effusion. She has not had any recent hospitalizations. Her last course of oral antibiotics was two months ago. She was treated with levofloxacin for a one-week course.

Question 1: What are the patient's risk factors for pneumonia?

- Epidemiology of community-acquired pneumonia:
  - Very common: approximately 5-7 cases/1000 persons/year.
  - Annual age-adjusted incidence of over 1.5 million unique community acquired pneumonia (CAP) hospitalizations annually. (Ramirez JA et al, 2017)

- Risk factors for CAP (which are additive):
  - Age $\geq$ 65 years
  - Underlying chronic lung disease (e.g. COPD, bronchiectasis)
  - Underlying increased risk for aspiration (dysphagia, intoxication, denture use, etc.)
  - Immunocompromised state (diabetes, HIV, stem cell transplant, etc.)

- Exposures (tobacco, alcohol, unstable housing)
- Metabolic disorders (hypoxemia, malnutrition, etc.)
- Recent bronchoscopy or intubation
- Viral infection (e.g.: influenza, COVID-19)
- Medications (Proton pump inhibitors, antipsychotics, possibly inhaled steroids)

For Ms. JS, her risk factors include her age, COPD, diabetes, and use of PPI and inhaled steroids.

Question 2: Should any additional testing be obtained to confirm the diagnosis or direct treatment?

Apart from demonstrating an infiltrate on chest imaging, no other routine tests are recommended to confirm the diagnosis or direct treatment of non-severe community-acquired pneumonia (CAP) in the outpatient setting***.***

According to the 2019 American Thoracic Society/Infectious Diseases Society of America (ATS/IDSA) Guidelines on CAP (Metlay J et al, 2019), routine sputum Gram stain and culture in adults with CAP managed in the outpatient setting is not recommended. Blood cultures in the outpatient setting are also not recommended as their yield in outpatient adults with non-severe CAP is low (2%). Additionally, they rarely result in an appropriate change in empiric therapy and could lead to false positive results from skin contaminants, such as coagulase-negative staphylococci, which are not recognized as CAP pathogens. Pneumococcal urinary antigen testing in outpatient adults with CAP is not recommended. Legionella urinary antigen testing in outpatient adults with CAP is not recommended except in cases where indicated by epidemiological factors, such as association with a Legionella outbreak or recent travel. When influenza viruses are circulating in the community ATS/IDSA guidelines recommend testing for influenza with a rapid influenza molecular assay, such as the influenza nucleic acid amplification test, which is preferred over a rapid influenza diagnostic test, such as an antigen test. We also recommend considering testing for COVID-19 based on local community prevalence. Otherwise testing can be considered but should not routinely be performed.

Table 1 lists the criteria for severe CAP. Guideline recommendations for diagnostic testing are different for these patients. Current guidelines recommend obtaining pre-treatment Gram stain and culture of respiratory secretions and blood cultures for patients with severe disease. It is likely that these severe CAP patients will be managed in the inpatient setting.

Table 1. IDSA/ATS Criteria for Defining Severe Community-acquired Pneumonia

One major criterion **OR** three or more minor criteria	
Major Criteria	Septic shock with need for vasopressors
	Respiratory failure requiring mechanical ventilation
Minor Criteria	Respiratory rate ≥ 30 breaths/min
	PaO_2/FIO_2 ratio ≤ 250*
	Multilobar (i.e., ≥ 2) infiltrates
	Confusion/disorientation
	Uremia (blood urea nitrogen level ≥ 20 mg/dl)
	Leukopenia (white blood cell count < 4,000 cells/μl)†
	Thrombocytopenia (platelet count < 100,000/μl)
	Hypothermia (core temperature < 36°C)
	Hypotension requiring aggressive fluid resuscitation

* PaO_2/FiO_2 ratio is the ratio of patient's oxygen in arterial blood (PaO_2) to the fraction of the oxygen in the inspired air (FiO_2).[3]

† Due to infection alone (i.e., not chemotherapy)

Table adapted from Metlay JP et al, 2019.

Procalcitonin has been studied as a biomarker to help distinguish viral versus bacterial pneumonias. IDSA/ATS Guidelines recommend initiation of empiric antibiotic therapy in adults with clinically suspected and radiographically confirmed CAP regardless of initial serum procalcitonin level. A multicenter prospective study of adults hospitalized with CAP (Self WH et al, 2017) demonstrated that no procalcitonin threshold perfectly discriminated between viral and bacterial pathogens, but higher procalcitonin strongly correlated with increased probability of bacterial pathogens, particularly typical bacteria. Some clinicians use serial procalcitonin levels to guide antibiotic discontinuation.

Question 3: Should you treat Ms. JS as an outpatient or admit her to the hospital? How do you risk-stratify patients with pneumonia in the outpatient setting?

Severity of illness is the major determinant for site of care.

Several pneumonia severity assessment tools and online calculators are available to stratify patient risk and supplement clinical judgment. The two most common validated clinical prediction tools are the Pneumonia Severity Index (PSI) and the CURB-65, both of which predict 30-day mortality. The 2019 ATS/IDSA CAP guidelines recommend using the PSI over the CURB-65 as it identifies larger proportions of patients as low risk and has a higher discriminatory power in predicting mortality.

- The **PSI (Pneumonia Severity Index)/PORT score** is based on an analysis of 14,199 inpatients with community-acquired pneumonia (Fine M et al, 1997). The rule was validated with data on 38,039 inpatients and with additional patients in the Pneumonia Patient Outcomes Research Team (PORT) cohort. Three randomized trials and multiple other observational studies have examined the effectiveness of the PSI and support the safety of using the PSI to guide the site of treatment without worsening mortality or other clinically relevant outcomes.
    - Step 1: If any of the following are present, then assign to risk class II - V and proceed to step 2:
        - Age (>50 years)
        - Coexisting disease (malignancy, liver disease, heart failure, cerebrovascular disease, renal disease)
        - Abnormal physical findings (altered mental status, tachypnea > 30/min, systolic blood pressure < 90 mm Hg, hypothermia < 30 °C or hyperthermia (> 40 °C), tachycardia > 125 bpm)
    - Step 2: Assign points based on the demographics for risk classes II, III, IV and V using Table 2, below.
    - Stratify into risk classes based on points and determine site of care
        - Class I (0 points) and Class II (<70 points) patients can be safely managed as outpatients
        - Some Class III (71-90 points) patients can be managed outpatient versus observation admission
        - All Class IV (91-130 points) and Class V (>130 points) patients should be admitted to the hospital
    - It is important to note that patients identified as low risk by the PSI may still warrant inpatient admission based on other medical/psychosocial factors.
        - PSI may underestimate severe pneumonia is in young healthy patients, since points are assigned by absolute age.
        - Complications were reported in 19% of low-risk patients admitted to the hospital and 0.9% risk of death (Marrie TJ et al, 2005).

- However, consistent use of a safe and effective scoring system such as PSI has potential to decrease unnecessary variability in admission rates, the high cost of inpatient pneumonia treatment, and the risk of hospital-acquired complications.
- On-line calculators for PSI exist on MDCalc, UptoDate and other sources.

Table 2. Point Scoring System for Step 2 of the PSI for risk classes II, II, IV and V

Demographic	**Points assigned**
Age (men)	Age (year)
Age (women)	Age (year) – 10
Nursing home resident	+10
Neoplastic disease	+30
Liver disease	+20
Congestive heart failure	+10
Cerebrovascular disease	+10
Renal disease	+10
Altered mental status	+20
Respiratory rate ≥ 30/min	+20
Systolic blood pressure < 90 mmHg	+20
Temperature < 35°C or ≥ 40°C	+15
Pulse ≥ 125/min	+10
Arterial pH < 7.35	+30
Blood urea nitrogen ≥ 30 mg/dL	+20
Sodium < 130 mmol/liter	+20
Glucose ≥ 250 mg/dL	+10
Hematocrit < 30%	+10
Partial pressure of arterial oxygen < 60 mmHg	+10
Pleural effusion	+10

Table adapted from Fine M et al, 1997

Although the PSI has had its safety and effectiveness in guiding site of care well validated, it can be cumbersome for some to use, particularly in the outpatient setting, and thus many prefer to use the CURB-65 prediction model. However, this tool has not had its safety and effectiveness as rigorously validated as the PSI.

- The **CURB-65 score** has a higher specificity for mortality prediction than PSI (52.2%) but lower sensitivity.
  - It is based on five factors that are easily assessed at the bedside:
    - **Confusion**
    - **BUN > 19 mg/dL**
    - **Respiratory Rate ≥ 30/min**
    - **Systolic BP < 90 mm Hg or Diastolic BP ≤ 60 mm Hg**
    - **Age ≥ 65 years**
  - 30-day mortality is < 1% if 0 factors; 42% with 4 factors (Capelastegui A et al, 2006).
  - Patients with scores of 0-1 can typically be treated as an outpatient; patients with scores ≥2 should be admitted (Lim WS et al, Thorax 2003).
  - The CRB-65 does not require testing for BUN, which may be more convenient to use in the outpatient setting. The CRB-65 score has good utility to predict pneumonia severity when BUN is not available for review (Bauer T et al, 2006).

One study (Aujesky D et al, 2005) found that the PSI was slightly more accurate at identifying patients at low risk than CURB.

Other factors that influence the need for hospital admission include ability to maintain oral intake, mental illness, cognitive impairment, poor medication adherence, history of substance abuse, impaired functional status, severe comorbid conditions, or complex social circumstances.

Scenario 1 (Continued):

Ms. JS's PSI score is 68, assuming she has no laboratory abnormalities. This places her in class II, with a 0.6% risk for mortality based on her age and co-existent heart failure diagnosis. Her CURB-65 score is 1. You therefore decide she can be managed as an outpatient given that there are no other noted worrisome factors for outpatient treatment noted in her history.

Question 4: What are the most common pathogens for community-acquired pneumonia?

- Microbiology: *Streptococcus pneumoniae* is the most commonly identified bacterial cause of CAP, although with the widespread use of the pneumococcal vaccine, its incidence is beginning to decrease. Respiratory viruses are also commonly identified pathogens for CAP. However, the majority of CAP cases do not have an identified pathogen, up to 62% in some inpatient studies. Other common pathogens in the ambulatory setting to consider include: *Chlamydia pneumoniae, Haemophilus influenza, Mycoplasma pneumoniae,* influenza, and *Legionella pneumophila.*
- Table 3, below, contains some special considerations for pathogens based on host risk factors.

Table 3. Epidemiology and Specific Risk Factors Related to Pathogens in Community-Acquired Pneumonia

Condition	Commonly encountered pathogen(s)
Alcoholism	*Streptococcus pneumoniae,* oral anaerobes, *Klebsiella pneumoniae, Acinetobacter* species, *Mycobacterium tuberculosis*
COPD and/or smoking	*Haemophilus influenzae, Pseudomonas aeruginosa, Legionella* species, *S. pneumoniae, Moraxella catarrhalis, Chlamydophila pneumoniae*
Aspiration	Gram-negative enteric pathogens, oral anaerobes
Lung abscess	CA-MRSA, oral anaerobes, endemic fungal pneumonia, *M. tuberculosis,* atypical mycobacteria
Exposure to bat or bird droppings	*Histoplasma capsulatum*
Exposure to birds	*Chlamydophila psittaci* (if poultry: avian influenza)
Exposure to rabbits	*Francisella tularensis*
Exposure to farm animals or parturient cats	*Coxiella burnetti* (Q fever)
HIV infection (early)	*S. pneumoniae, H. influenzae, M. tuberculosis*
HIV infection (late)	The pathogens listed for early infection plus *Pneumocystis jirovecii, Cryptococcus, Histoplasma, Aspergillus,* atypical mycobacteria (especially *Mycobacterium kansasii*), *P. aeruginosa, H. influenzae*
Hotel or cruise ship stay in previous 2 weeks	*Legionella* species
Travel to or residence in southwestern United States	*Coccidioides* species, *Hantavirus*
Travel to or residence in Southeast and East Asia	*Burkholderia pseudomallei,* avian influenza, SARS
Influenza active in community	Influenza, *S. pneumoniae, Staphylococcus aureus, H. influenzae*
Cough >2 weeks with whoop or posttussive vomiting	*Bordetella pertussis*
Structural lung disease (e.g., bronchiectasis)	*Pseudomonas aeruginosa, Burkholderia cepacia, S. aureus*
Injection drug use	*S. aureus,* anaerobes, *M. tuberculosis, S. pneumoniae*
Endobronchial obstruction	Anaerobes, *S. pneumoniae, H. influenzae, S. aureus*
In context of bioterrorism	*Bacillus anthracis* (anthrax), *Yersinia pestis* (plague), *Francisella tularensis* (tularemia)

Table from Mandell L et al, 2007

Question 5: What antibiotic regimens should you consider for this patient?

If there are no comorbidities or risk factors for resistant pathogens (eg: MRSA or Pseudomonas aeruginosa positive respiratory cultures or hospitalization with parenteral antibiotics in the last 90 days), one can choose any of the following:

- amoxicillin 1g TID OR
- doxycycline 100 mg BID OR
- macrolide (only if local pneumococcal macrolide resistance is < 25%)*
    - azithromycin 500mg 1st day, then 250mg daily OR
    - clarithromycin 500 mg BID OR
    - clarithromycin ER 1,000mg daily

*Note that pneumococcal resistance to macrolides exceeds 30% in the US so macrolide monotherapy is not recommended (File TM and Ramirez JA, 2023).

If there are comorbidities present (including chronic heart, lung, liver, or renal disease; diabetes mellitus; alcoholism; malignancy; or asplenia) one can choose combination therapy with two antimicrobial agents or fluoroquinolone monotherapy:

Combination Therapy

- amoxicillin/clavulanate
    - 500 mg/125 mg TID
    - 875 mg/125 mg BID
    - 2,000 mg/125 mg BID
- OR a cephalosporin
    - cefpodoxime 200 mg BID
    - cefuroxime 500 mg BID

AND

- A macrolide or doxycycline:
    - azithromycin 500 mg on first day then 250 mg daily
    - clarithromycin 500 mg BID
    - clarithromycin ER 1,000 mg daily
    - doxycycline 100 mg twice daily

OR

Monotherapy with a respiratory fluoroquinolone

- levofloxacin 750 mg daily
- moxifloxacin 400 mg daily
- gemifloxacin 320 mg daily

It is important to note that if patients with CAP also test positive for influenza in the outpatient setting, anti-influenza treatment, such as oseltamivir, should also be prescribed independent of duration of illness before diagnosis of influenza. Similarly, if COVID-19 is confirmed and patient has risk factors for severe COVID-19, anti-viral treatment may be indicated (i.e. nirmatrelvir-ritonavir).

Regarding duration of therapy, the 2019 ATS/IDSA guidelines strongly recommend that the duration be guided by a validated measure of clinical stability (resolution of vital sign abnormalities, ability to eat, and normal mentation), and antibiotic therapy should be continued until the patient achieves stability and for no less than a total of 5 days. There is growing evidence that a shortened treatment duration of even 3 days may be sufficient for non-severe outpatient CAP, but more robust trials are needed.

For this patient with comorbidities including chronic heart and lung disease, suggest either combination therapy (amoxicillin/clavulanate or a cephalosporin plus a macrolide) or fluoroquinolone monotherapy can be used to treat her outpatient CAP. Given her recurrent infections, it is recommended to use a different antibiotic regimen than any previously used regimens. In addition, if she had any of the risk factors for resistant pathogens then a pretreatment respiratory Gram stain and culture would be recommended; however, in this case of a patient with recurrent pneumonia, it is unknown whether she meets this criteria, and more narrow antibiotic regimens are being encouraged based on the 2019 guidelines.

Question 6: Should you consider the use of steroids for treatment of pneumonia (separate from treatment of a COPD exacerbation)? What is the latest evidence on steroid use for pneumonia?

Current guidelines do not support routine use of corticosteroids for outpatients with CAP. The points below summarize results of several studies and meta-analyses that have evaluated use of corticosteroids in hospitalized, severe CAP.

- In 2015, two RCTs showed that systemic corticosteroids were beneficial for some hospitalized patients with community-acquired pneumonia (Blume CA et al, 2015; Torres A et al, 2015).
- A Cochrane meta-analysis of 13 trials involving ~ 2000 adults showed that systemic steroids significantly lowered mortality in patients with severe CAP (8% vs. 13%, NNT = 19) but had no effect on mortality in patients with non-severe CAP (Stern A et al, 2017). Length of stay was also shortened by ~3 days.
- The CAPE COD study (Dequin PF et al, 2023) was a multicenter double-blind randomized control trial comparing patients with severe CAP in the ICU who received hydrocortisone (200 mg total daily for 4 to 7 days) versus placebo. It demonstrated a significant reduction in mortality as well as need for intubation and vasopressor support by day 28 without significant increase in hospital-acquired infections or gastrointestinal bleeding.
- A detailed review of this topic is outside the scope of this ambulatory curriculum, but recent meta-analyses point toward reduction in mortality (Bergmann F et al, 2023) and reduction in time to clinical stability and length of stay (Briel M et al, 2018) in hospitalized patients with CAP treated with corticosteroids.

Question 7: Assuming she clinically improves, does Ms. JS need follow up imaging? If so, at what interval would you recommend?

For patients who respond clinically with resolution of symptoms within the expected 5 to 7 days, current 2019 ATS/IDSA guidelines recommend against obtaining routine follow-up chest imaging. Previously, it was thought that patients over the age of 50 should have a repeat chest x-ray in 7-12 weeks to evaluate for undiagnosed lung malignancy. However, the referred study predominantly evaluated male patients in the Veterans Affairs system with a high smoking prevalence. The positive yield from repeat imaging ranges from 0.2% to 5.0% however this was primarily driven by patients who were former or current smokers who would qualify for lung cancer screening. With the evolution of recommendations for low dose CT chest imaging to screen for lung cancer, it is expected this will be more reliable and effective than post-CAP follow up chest imaging.

Scenario 1 (Continued):
After reviewing the recent guidelines, you discuss with the patient that repeat imaging should not be done unless her symptoms do not resolve in the expected time course of 5 to 7 days.

Question 8: If she does not improve clinically on empiric therapy, how would you proceed?

General Approach to Pneumonia that Does Not Improve; questions to consider:

1. Could this simply be the normal time course of a resolving pneumonia?
2. Could this be a new complication of pneumonia?
3. Could this be the "wrong bug"? (i.e. not bacterial pneumonia)
4. Could this be the "wrong drug"? (i.e. inappropriate antibiotic therapy)
5. Could this be the "wrong diagnosis"? (i.e. non-infectious pneumonia mimics)

1. Could this simply be the normal time course of a resolving pneumonia?

Normal resolution of pneumonia is not well defined, but patients typically have subjective improvement in vital signs within three days, but cough and fatigue may take 14 days or longer to improve. Chest X-rays may only show radiographic clearing after several weeks, especially in patients with comorbid conditions.

2. Could this be a new complication of pneumonia?

Care should be taken to screen for complications of pneumonia, such as empyema or lung abscess, especially in patients with ongoing fevers despite antibiotic therapy. Ultrasound and CT are useful modalities to evaluate for these complications, in addition to the physical exam.

3. Could this be the "wrong bug"? (i.e. not bacterial pneumonia)

In patients who do not respond to bacterial pneumonia therapy, we should consider if patients may have a viral etiology, fungal etiology, or mycobacterial etiology (M. TB, NTM). History and physical should be reassessed to assess patients' risk for these types of infections.

4. Could this be the "wrong drug"? (i.e. inappropriate antibiotic therapy)

Penicillin-resistant Streptococcus pneumoniae, MRSA, drug-resistant Pseudomonas aeruginosa, and atypical infections (i.e. Legionella) are all possibilities to consider in patients who are not responding appropriately to antibiotic therapy. Antibiotic dosing should also be double-checked (For example: did a patient have therapeutic vancomycin troughs while inpatient? Was dosing adequate for patients with extremes of BMI? Etc.) Additionally, remember that risk factors for resistant pathogens include prior respiratory isolation of MRSA or *P. aeruginosa* or recent hospitalization AND receipt of parenteral antibiotics (in the last 90 days). Even when these risk factors are present, consider concurrent atypical pathogen coverage.

5. Could this be the "wrong diagnosis"? (i.e. non-infectious pneumonia mimics)?

As a pulmonologist, this is a key part of our evaluation since many noninfectious etiologies of pulmonary opacities can mimic pneumonia. Non-infectious causes such as neoplasia (either primary or metastatic, particularly with endobronchial lesions), immunologic/autoimmune disorders (such as vasculitis, cryptogenic organizing pneumonia, non-specific interstitial pneumonia, sarcoidosis), drug-related pneumonitis, and vascular events (pulmonary embolism/pulmonary infarct) should be considered in

the appropriate clinical context. If the patient has true recurrent pulmonary infections, the possibility of recurrent aspiration events should be considered, and immunodeficiency should be considered, especially in younger patients.

Scenario 1 (Continued):
Ms. JS comes back to your office 6 weeks later for follow-up. She notes that she felt significantly better and back to her baseline after completing the course of antibiotics you previously prescribed. However, she is now feeling poorly again in the last several days with worsening productive cough, increased sputum production and low-grade fevers to 100.5 F. A repeat CXR is done again which shows a right middle lobe opacity. Review of prior films shows that almost all her prior infiltrates have been in the same area.

Question 9: What is your approach to recurrent pneumonia? What additional testing should you consider?

Generally speaking, the approach is defined by either:

- Recurrent opacity in a particular anatomic region suggesting possible local anatomic abnormality (ex: tumor, vascular abnormality, retained foreign body, bronchiectasis, bronchomalacia, stenosis, etc.). These may be investigated with CT scan and/or bronchoscopy in the appropriate setting.
    - Recurrent aspiration is also a consideration, particularly if opacities are present in the lung bases. Work-up may include referral to speech language pathology and consideration of testing such as a modified barium swallow
- Recurrent opacity in varied regions of the lung.
    - Associated recurrent sinopulmonary infections suggests potential underlying immunodeficiency syndrome (ex: cystic fibrosis, immotile cilia syndrome, HIV, etc.) or another mimic of recurrent infection (vasculitis, cryptogenic organizing pneumonia, etc.).

More detailed imaging of the chest with CT scanning is likely warranted for further characterization given the recurrent nature of her infections.

Question 10: What diagnostic tests would you order if you were concerned for a systemic immunodeficiency process?

Quantitative immunoglobulins and HIV would be reasonable screening tests. IgG subclass deficiency is among the most common immunodeficiency detected.

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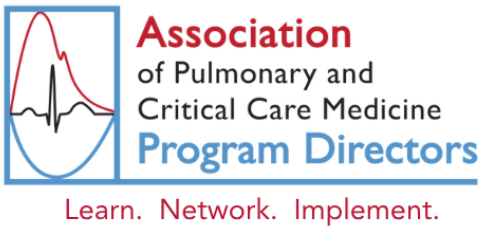

Authors
Lekshmi Santhosh, MD, MAEd
Associate Professor of Clinical Medicine | Pulmonary/Critical Care & Hospital Medicine
Associate Program Director | Pulmonary & Critical Care Fellowship
Associate Program Director | Internal Medicine Residency
Director | DOM Medical Grand Rounds
Medical Director | UCSF Post-COVID OPTIMAL Clinic
University of California, San Francisco

Stacey Kassutto, MD, MA
Director, Internal Medicine Residency Simulation Education
Core Faculty, Pulmonary Fellowship Education
Associate Director, Medical Education Leadership Track
Assistant Professor of Clinical Medicine
University of Pennsylvania

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