

Sample Applied Exam – Medical Microbiology

Scenario 1

Domain: Community-Acquired Pneumonia

Objective(s) of the scenario:

- Outline the history, investigations, differential and treatment of patients with community-acquired pneumonia (CAP)
- Identify the criteria for severe CAP

In January, a 32-year-old woman presents to the emergency department (ED) with a 2-day history of fever, chills, cough, and shortness of breath. Chest x-ray reveals right middle lobe pneumonia. Oxygen saturation is 95% on room air. The ED physician requests a consultation.

Question 1

Outline the management of this patient including history, investigations, and treatment.

MODEL ANSWER

History:

- Sick contacts
- Travel to areas where there are novel pathogens (avian influenza, MERS CoV)
- Animal exposure – Q fever for example
- Recent antibiotic use in last 90 days - class switching
- Vaccination history - influenza
- PMH - comorbidities that make them high risk for complications of influenza and that may influence empiric therapy
 - structural lung disease, COPD, asthma, renal or cardiac disease immunocompromised states or drugs, DM
- Allergies

Investigations:

- Viral studies – COVID-19, influenza A and B (must be included)
 - NPS or NPA recommended but practices may vary depending on where candidate is from (mid turbinate or combo throat and nasal also acceptable)
- CBC / BUN creatinine – helps in assessment of severity
- Tests NOT recommended to order routinely (reduce global score if they order these without a rationale)
 - Legionella urinary antigen – unless severe or epi
 - Pneumococcal Ag–unless severe
 - Procalcitonin
 - Viral culture (if did not mention CL3)
 - No routine sputum or blood cultures unless CAP is severe or MRSA/PsA is suspected (can provide rationale)

Differential:

- Discuss the typical pathogens associated with CAP – pneumococcus, atypical pathogens, viral causes. H influenzae and Moraxella in patients with underlying lung disease



Treatment:

- Triaging for admission or not: PSI better than CURB 65.
 - PSI (sex / co morbidities / Physical exam / lab and radiographic findings)
 - Curb 65 (confusion, high urea, high RR, low BP, age >65)

(Examiner can indicate that PSI or CURB65 score indicates admission not required. Direct candidate to discuss outpatient treatment.)

- Empiric outpatient treatment
- Antibacterial:
 - no risk factors Amoxil or Doxy first line. -if they mention macrolide need to qualify based on <25% resistance.
 - If comorbidities – Amox/Clav or Ceph + doxy or macrolide OR resp Fluoro....
 - if they have had ABX in last 3 months need to class switch
- NICE guidelines indicate start ABX within 4 hours of diagnosis
- Duration – clinical stability and no less than 5 days. 7 days for MRSA or PsA.
- Antiviral

Consider oseltamivir empirically if they have risk factors for progression – can stop if the test is negative

The patient was discharged from the ED on an oral antibiotic. Three days later, the patient returns to the ED confused and in respiratory distress. Her respiratory rate is 35/min, blood pressure is 90/50 mm Hg, and her heart rate is 120 bpm. Repeat chest x-ray shows progressive multilobar pneumonia. She requires intubation and is admitted to the intensive care unit.

Question 2

You are asked for advice on management.

MODEL ANSWER

Identifies Severe CAP:

- Can define severe CAP based on ATS/IDSA guidelines [1 major (shock/need for vasopressors; resp failure requiring MV) ; or ≥ 3 minor (RR>30; PaO₂/FiO₂, 250, multilobar infiltrates; Confusion/disorientation; BUN>20; WBC<4; Plts <100; Hypothermic, hypotension req fluids]
- Discuss risk factors for Pseudomonas or MRSA (hospitalization, previous colonization/infection in last year; iv antibiotics – need local data on prevalence – this would be exemplary)
- Identify that possible COVID-19 infection even if previous testing negative.

Infection Control:

- Droplet and contact precautions
- Can discuss airborne precautions at the time of intubation and afterwards in the context of Covid (regional variations once intubated).

Consider Severe Acute Respiratory Infection:

- Discuss if travel history to regions of concern

Investigations:

- Endotracheal aspirate (or BAL) for C+S
- Endotracheal aspirate (or BAL) for SARS-CoV-2



- Blood cultures
- If influenza test was not done initially, it should be done. Lower respiratory sample should be submitted if NPS was negative
- Nasal swab for MRSA (based on risk factors)
- If SARI a concern – expanded testing based on risk and consultation with public health
- Procalcitonin
 - Use in uncomplicated CAP not necessary but may be useful in those where the average length of stay is long compared to normal 5-7 days

Empiric treatment for severe CAP:

- B lactam + macrolide or B lactam + Fluroquinolone.
- If previous MRSA or hospitalization with high MRSA add Vanco
- If previous PsA or High rates of PsA in hospital – expand to anti-pseudomonas coverage and get cultures (must justify if they use antiPsA)
- Use oseltamivir regardless of duration of symptoms in patients with influenza A (both inpatients and outpatients)

Re-evaluation at 48 hours:

- De-escalation based on ETA and blood culture results at 48hrs
- De-escalation if MRSA/PsA not identified
- Stop oseltamivir if influenza PCR negative
- NICE guidelines have criteria for discharge

Do Not Do:

- No steroids unless refractory septic shock (surviving sepsis) or part of other therapy (asthma or COP

Follow up cxr not routinely necessary post discharge (reduction in GRS if mentioned without rationale D

The following picture was taken from a sputum Gram stain at low level magnification. It is representative of the whole stain.

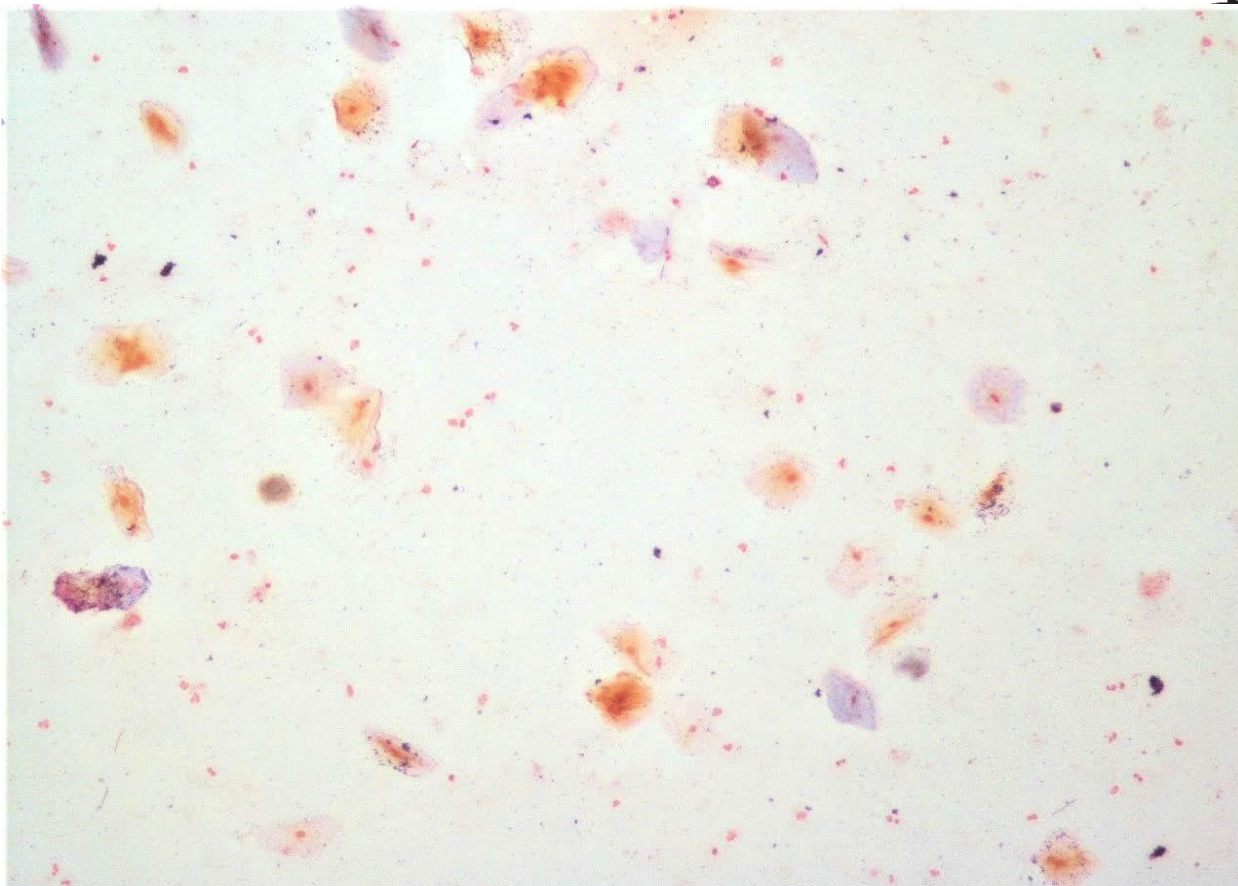


Figure 1. Sputum Gram stain at Low Level Magnification

Question 3

State if the sample should be processed for culture. Specify and justify the decision.

MODEL ANSWER

Sample has >25 squamous epithelial cells (SEC) per low power field with few neutrophils. Consequently, the sample should be rejected unless Legionella or mycobacteria culture was ordered.

Different screening criteria include:

- Rejecting samples with greater than 10 or 25 SEC
- Accepting samples with 5, 10 or 25 neutrophils per low-power field
- Accepting a sample with a positive score that adds points for neutrophils (Sum of neutrophils/LPF (10-25, +1; >25, +2), mucus (+1), and SEC/LPF (10-25, -1; >25, -2)