Hospital Acquired Pneumonia

With Dr Lauren Troy, Respiratory Physician at Royal Prince Alfred Hospital, New South Wales, Australia

Introduction
Hospital-acquired pneumonia is a serious condition that significantly increases patients’ morbidity and mortality. This podcast talks about an approach to patients that develop pneumonia in hospital.

Case 1 – You are called to review a 58-year-old male with a history of diabetes and peripheral vascular disease who presented earlier in the week with leg pain. He was found to have critical limb ischaemia and underwent an endovascular revascularisation. Tonight, four days following admission, he is noted to be febrile to 38.5 degrees, with a respiratory rate of 24 and the nurse tells you that he has been coughing.

1. Initial questions over the phone?

- What are the vital signs?
  - Any evidence of haemodynamic instability?
  - Oxygen saturation & respiratory rate can give you an indication of how compromised the patient is from a respiratory point of view
Any other clinical features that can you help you to triage the patient & how urgently you need to see them eg. level of consciousness (particularly important in a septic patient)

You go and see the patient, take a history and on examination and (you) notice that their heart rate and blood pressure are okay, but their oxygen saturation is a bit low at 93% and they have reduced air entry in the left lung. You order a chest X-ray, which shows new left lower lobe consolidation.

2. Outline your assessment approach by the bedside:

You should perform a targeted history, examination and relevant investigations to either confirm or exclude a diagnosis of pneumonia rapidly, so that appropriate treatment can be initiated early

What are the clinical and radiological features required to make a diagnosis of pneumonia?

- Need to have at least 2 of 4 features:
  - Elevated white cell count
  - Fever >38 degrees celsius
  - New purulent cough
  - New infiltrates on chest X-ray that either are progressive or persistent

How to differentiate pneumonia from atelectasis in post-operative surgical patients?

- The distinction can be subtle. In this case, the history of new coughing is a good clue
- Dense consolidation on chest X-ray is unlikely to represent atelectasis (which is usually more subtle and looks like volume loss rather than consolidation)
- Evidence of respiratory or haemodynamic compromise suggests a more serious condition than atelectasis

What other important differential diagnoses should you consider when reviewing the patient?

- Atelectasis – particularly if the patient has recently had surgery
- Aspiration pneumonia
- Pleural effusion
- Pulmonary embolism
  - If large enough, can cause lung infarction that may look like consolidation on CXR.
- Congestive cardiac failure

3. Investigations for hospital-acquired pneumonia
Blood tests: FBC, biochemistry
Chest X-ray
ECG: ensure not compromised in terms of coronary ischaemia or arrhythmias
ABG, to assess:
  - pH – Is the patient acidotic? Is it a metabolic or respiratory acidosis (based on rest of ABG)?
  - Metabolic acidosis could be due to lactic acidosis from sepsis, acute renal failure or a number of other complications
  - PaO2 – to assess degree of hypoxaemia
  - PaCO2 – might be elevated if patient has background of COPD or heart failure
Blood& sputum cultures – incredibly useful if identify an organism to direct choice and duration of antibiotic therapy. Should ideally be taken prior to initiation of antibiotics

Should you do the ABG on air or on oxygen?
- It depends on the severity of the patient’s respiratory compromise
- If the patient requires supplemental oxygen to preserve adequate oxygen saturations, it would be dangerous to take them off oxygen to prove that they’re hypoxic (which we already know, hence the PaO2 on ABG will not add much additional information)
- The ABG is more important to assess for presence of acidosis and hypercapnoea, so if the patient has a significant oxygen requirement – leave it on!

4. Management of hospital-acquired pneumonia (HAP)

Assessing the severity of pneumonia:
- In CAP, we can use available well-validated tools eg. SMART-COP, CORB, CURB-65 and PSI
- In HAP, severity is judged on the patient’s haemodynamics and level of ventilatory support required

Empiric therapy:
- The choice of empiric therapy is based on the likelihood of the patient having a multi-drug resistant (MDR) organism
  - Low likelihood of MDR organism – treat according to severity of pneumonia:
    - Mild pneumonia: amoxycillin + clavulanate
    - Moderate – severe: IV ceftriaxone
  - High chance of MDR organism (ICU, wards with high rates of MDR organisms or patients known to be colonised):
IV tazocin +/- vancomycin +/- other targeted antibiotics (eg. gentamicin)

- All patients with severe sepsis or septic shock, regardless of MDR status should be considered for intensive care management and should be treated empirically with very broad-spectrum antibiotics (tazocin)

**When to escalate care to ICU?**

- If the patient has higher ventilatory requirements than what can safely be managed on a general ward. if the patient is requiring a non-rebreather mask, or if they need to be placed onto high-flow oxygen, then an ICU review is necessary
- Consider appropriateness elderly frail patients may not be appropriate for ICU. This should be discussed with the consultant

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**Case 2** - A 72-year-old female who was brought into the ED with acute stroke symptoms and then admitted to the stroke unit. A few days later she develops a fever of 38.8 degrees. You are the intern covering the neurology ward and are asked to review the patient for fever, associated with coughing and hypoxia.

1. **Initial questions over the phone?**

   - Same as in previous case: vital signs, other clinical features to help you triage the urgency for medical review

2. **Outline your assessment approach by the bedside**

   - **History:**
     - Risk factors for aspiration pneumonia:
       - Neurological conditions that compromise coordination of upper airway & swallowing muscles eg. stroke, reduced GCS due to any cause, Parkinson's disease, bulbar dysfunction
       - Heavy EtOH intake
       - Respiratory compromise (increased respiratory rate increases aspiration risk)
       - Recent general anaestheisa
       - Deconditioning, frailty - especially elderly patients who have been institutionalised
     - Recent vomiting
Examination:
- Evidence of risk factors for aspiration eg. impaired GCS or underlying neurological condition

3. Investigations for aspiration pneumonia
- Chest X-ray: classic location of aspiration pneumonia is right lower lobe (due to orientation of right main bronchus) but patients can still aspirate into the left lung
- Same as for hospital-acquired pneumonia

4. Management of hospital-acquired pneumonia
- Main organisms responsible for aspiration pneumonia in hospitalised patients:
  - Organisms that commonly colonise nasopharynx, oropharynx and GIT: streptococcus, staphylococcus, gram negative organisms, anaerobes
- Empirical antibiotic therapy for aspiration pneumonia:
  - Similar to HAP, except that metronidazole needs to be added for anaerobic coverage if the patient is commenced on a cephalosporin such as ceftriaxone
  - Don’t need to add metronidazole if the empiric therapy is Augmentin or tazocin, as these have broad enough anaerobic cover
- Other measures:
  - Chest physiotherapy
  - Institution of safe swallowing – “nil by mouth” in after hours setting, early assessment by speech pathologist to determine appropriate diet & further testing if required eg. modified barium swallow to assess ongoing risk

Take home messages
- Hospital-acquired pneumonia is a serious condition with high associated morbidity & mortality:
  - Increases patients’ length of stay, contributes to further morbid conditions
  - Mortality rate in the range of 20-30%
Therefore, we need to treat patients early, appropriately and aggressively. If you are worried about the patient, especially if they have abnormal vital signs or a high ventilatory requirement, call for someone senior and don't be afraid to ask for help.

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