

Diagnosis of Pneumonia – Dr. Dier

Investigations of community acquired pneumonia

- The objectives are to:
 - A. Exclude other conditions that mimic pneumonia
 - B. Assess the severity
 - C. Identify the development of complications

Radiological investigations in patients with CAP

- In **bronchopneumonia** patchy non homogenous mostly basal opacity, while in lobar **pneumonia**, a homogeneous opacity localized to the affected lobe or segment usually appears within 12-18 hours of the onset of the illness.
- Clinical-radiographic dissociation is seen often in patients with *Mycoplasma pneumoniae* or viral pneumonia.
- *Chest radiographs of patients with Mycoplasma infection often suggest a more serious infection than does the appearance of the patient or the physical examination.*
- *The converse is true in patients with Pneumocystis carinii infection, who may appear quite ill despite normal or nearly normal chest radiographs.*
- *This may also be true early in the course of acute bacterial pneumonias, when pleuritic chest pain, cough, purulent sputum, and inspiratory crackles may precede specific radiographic findings by many hours.*
- A "**negative**" radiograph can never rule out the possibility of acute bacterial pneumonia when the patient's symptoms and signs point to this diagnosis.
- **Standard posteroanterior and lateral chest radiography are mandatory.** Although the pattern of infiltration may establish a **specific microbiologic etiology**, chest films are most useful for providing essential information on the distribution and **extent of involvement**, as well as potential pneumonic **complications** like parapneumonic effusion

Microbiological investigations in patients with CAP

- All patients
 - Sputum: direct smear by Gram and Ziehl-Neelsen stains. Culture and antimicrobial sensitivity testing
 - Blood culture: frequently positive in pneumococcal pneumonia
 - Serology: acute and convalescent titres for *Mycoplasma*, *Legionella*, and viral infections. Pneumococcal antigen detection in serum or urine
 - PCR: *Mycoplasma* can be detected from swab of oropharynx
 - *Severe community-acquired pneumonia Follow Curb-65 scoring of severity*
 - *The above tests plus consider:*
 - *Tracheal aspirate, induced sputum, bronchoscopy or percutaneous needle aspiration.*
 - *Serology: Legionella antigen in urine. Pneumococcal antigen in sputum and blood.*
 - *Immediate IgM for Mycoplasma*
 - *Cold agglutinins: positive in 50% of patients with Mycoplasma*
- For selected patients
 - Pleural fluid: should always be sampled when present in more than trivial amounts, preferably with ultrasound guidance

Other investigations

- **Pulse oximetry:** Provides a non-invasive method of measuring arterial oxygen saturation (SaO₂) and monitoring response to oxygen therapy.
- **Arterial blood gas:** Is important in those with SaO₂ < 93% or with features of severe pneumonia, to identify ventilatory failure or acidosis.
- **The white cell count:** May be normal or only marginally raised in pneumonia caused by atypical organisms, a neutrophil leucocytosis of more than 15 × 10⁹/L favors a bacterial etiology.
- **Urea and electrolytes:** And liver function tests should also be checked.
- **C-reactive protein (CRP):** Is typically elevated.
- **CSF analysis:** Should be considered in every patient with confusional state to exclude disseminated infection into CNS

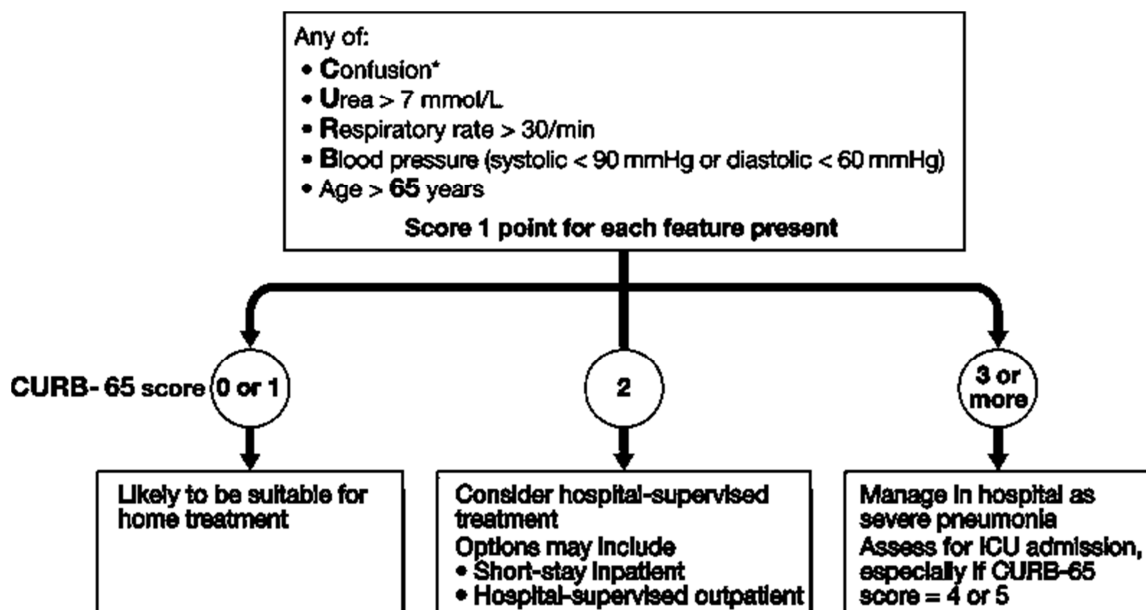
A) Exclude other conditions that mimic pneumonia

Differential diagnosis of pneumonia “mimic pneumonia”

- Pulmonary infarction
- Pulmonary/pleural TB
- Pulmonary oedema (can be unilateral)
- Pulmonary eosinophilia
- Malignancy: bronchoalveolar cell carcinoma
- Rare disorders: cryptogenic organising pneumonia/bronchiolitis obliterans organising pneumonia (COP/BOOP)

B) Assess the severity

- Assessment of disease severity
- The CURB-65 scoring system helps guide antibiotic and admission policies, and gives useful prognostic information.



C) Identify the development of complications

Complications of pneumonia

- Para-pneumonic effusion
- Empyema
- Retention of sputum causing lobar collapse
- DVT and pulmonary embolism
- Pneumothorax, particularly with Staph. aureus
- Suppurative pneumonia/lung abscess
- ARDS, renal failure, multi-organ failure
- Ectopic abscess formation (Staph. aureus)
- Hepatitis, pericarditis, myocarditis, meningoencephalitis
- Pyrexia due to drug hypersensitivity

Management

- Many cases of CAP can be managed successfully without identification of the organism, particularly if there are no features indicating severe disease.
- A full range of microbiological tests should be performed on patients with severe CAP.
- The most important aspects of management include:
 1. Oxygenation
 2. Fluid balance
 3. Antibiotic therapy
 4. In severe or prolonged illness, nutritional support may be required.

Oxygen

- Should be administered to all patients with tachypnea, hypoxemia, hypotension or acidosis with the aim of maintaining the $\text{PaO}_2 \geq 8 \text{ kPa}$ (60 mmHg) or $\text{SaO}_2 \geq 92\%$.
- High concentrations ($\geq 35\%$), preferably humidified, should be used in all patients who do not have hypercapnia associated with COPD.
- Assisted ventilation should be considered at an early stage in those who remain hypoxemic despite adequate oxygen therapy. NIV may have a limited role but early recourse to mechanical ventilation is often more appropriate

Intravenous fluids

- Should be considered in those with severe illness, in older patients and in those with vomiting. Otherwise, an adequate oral intake of fluid should be encouraged.
- Inotropic support may be required in patients with circulatory shock .

Antibiotic treatment

- The initial choice of antibiotic is guided by clinical context.
- In most patients with uncomplicated pneumonia a 7-10-day course is adequate, although treatment is usually required for longer in patients with Legionella, staphylococcal or Klebsiella pneumonia.
- Oral antibiotics are usually adequate unless the patient has severe illness, impaired consciousness, loss of swallowing reflex or malabsorption.

Antibiotic treatment (continued)

- **Uncomplicated CAP**
 - Amoxicillin 500 mg 8-hourly orally or Clarithromycin 500 mg 12-hourly orally
- **If Staphylococcus is cultured or suspected**
 - Flucloxacillin 1-2 g 6-hourly i.v.plusClarithromycin 500 mg 12-hourly i.v.
- **If Mycoplasma or Legionella is suspected**
 - Clarithromycin 500 mg 12-hourly orally or i.v. plusRifampicin 600 mg 12-hourly i.v. in severe cases
- **Severe CAP**
 - Clarithromycin 500 mg 12-hourly i.v. or Erythromycin 500 mg 6-hourly i.v. -- plus:
 - Co-amoxiclav 1.2 g 8-hourly i.v. or
 - Ceftriaxone 1-2 g daily i.v. or
 - Cefuroxime 1.5 g 8-hourly i.v. or
 - Amoxicillin 1 g 6-hourly i.v. plus flucloxacillin 2 g 6-hourly i.v.
- **Treatment of pleural pain** It is important, in order to allow the patient to breathe normally and cough efficiently. For the majority, simple analgesia with paracetamol or NSAIDs is sufficient. In some patients, opiates may be required but these must be used with extreme caution in patients with poor respiratory function.
- **Physiotherapy** may be helpful to assist expectoration in patients who suppress cough because of pleural pain or when mucus plugging leads to bronchial collapse.

Indications for referral to ITU

- CURB score 4-5 failing to respond rapidly to initial management
- Persisting hypoxia ($\text{PaO}_2 < 8 \text{ kPa}$ (60 mmHg)) despite high concentrations of oxygen
- Progressive hypercapnia
- Severe acidosis
- Circulatory shock
- Reduced conscious level

Prognosis

- Most patients respond promptly to antibiotic therapy. However, fever may persist for several days and the chest X-ray often takes several weeks or even months to resolve, especially in old age.
- Delayed recovery suggests either that a complication has occurred. or that the diagnosis is incorrect. Alternatively, the pneumonia may be secondary to a proximal bronchial obstruction or recurrent aspiration.
- The mortality rate in adults managed at home is very low (< 1%); hospital death rates are typically between 5 and 10%, but may be as high as 50% in severe illness.

Discharge and follow-up

- The decision to discharge a patient depends on home circumstances and the likelihood of complications.
- A chest X-ray need not be repeated before discharge in those making a satisfactory clinical recovery.
- Clinical review should be arranged around 6 weeks later and a chest X-ray obtained if there are persistent symptoms, physical signs or reasons to suspect underlying malignancy.

Prevention

- The risk of further pneumonia is increased by smoking, so current smokers should be advised to stop.
- Influenza and pneumococcal vaccination should be considered in selected patients
- In developing countries, tackling malnourishment, indoor air pollution, and encouraging immunization against measles, pertussis and Haemophilus influenzae type b are particularly important in children.