Pneumonia

Created on 8th May 2023

---

2. # References:

Information

Pneumonia is lung inflammation caused by bacterial infection, in which air sacs fill with pus and may become solid

Important

- It is important to know the typical and atypical causes of community acquired pneumonia. See bb83b6
- First line investigation is *always* **CXR**. This is to differentiate with Bronchitis, which has similar symptoms but does not need Abx
- Patinets can be treated outpatient, in hospital, and in ICU. Steps on choosing the right decision are in # *Hospitalisation choice*:
- Patients treated outpatient require # *Low-severity treatment*. Patients hospitalised require # *Medium-severity treatment*. Patients in ICU require # *High-severity treatment*
- Repeat CXR should *only* be done 4-6 weeks, since it takes that long for resolution. Repeat 4-6 weeks if >50yo for malignancy

Pathophysiology

Community acquired pneumonia (CAP):

^3f21f8
Pneumonia acquired outside hospital, or within 72 hours of admission into the hospital. It is also called *Lobar Pneumonia*, as it normally only affects the lobes. The following are the common bacterial causes:
Typical	Atypical
S.Pneumonia	Mycoplasma
H.Influenza	Chlamydia
S.Aureus	Legionella (atypicals)

Nosomcomial pneumonia (including HAP):

These are often caused by **Gram negatives** (*pseudomonas, Klebsiella, E. Coli*) or *Staph Aureus*
| Hospital-Acquired | Ventilator-Acquired |

| ---------- | ---------- |
| Onset > 72hr of hospitalization | Onset >48hr after ventilation |

Recurrent pneumonia:

This describes when pneumonia recurs quickly after being previously treated. The likely cause can be found on CXR:

1. If consolidation is on **different lung regions**, it is likely from Immunodeficiency (see HIV, Cystic Fibrosis)
2. If consolidation is in the **same lung region**, it can be an airway obstruction (e.g. *malignancy*) or Bronchiectasis
    1. The next best scan is a CT scan, to rule out malignancy
3. If consolidation recurrently occurs in the right middle/lower lobe, it is likely **aspiration** of stomach acid and microorganisms. See # Aspiration Pneumonia

Aspiration pneumonia:

This is pneumonia due to aspiration of bacteria (commonly Klebsiella or S. Aureus), normally from gastric contents. It has a slow-onset of symptoms over days, which can help differentiate between it and Pneumonitis, which has an acute onset after witness aspiration

	Pneumonitis	**Pneumonia**
Genera Pathogenesis	Irritation from aspiration of gastric acid	Aspiration of bacteria
Clinical features	Acute onset dyspnea and hypoxemia	SLow onset of pneumonia in patient with spiration risk factors
Diagnosis	Clinical	X-Ray
Treatment	Suctioning, oxygen	Antibiotics

History

Signs

Symptoms

Typical CAP	Atypical CAP	Aspiration Pneumonia
Fever	Fever (milder)	Foul-smelling sputum (due to aspiration of gastric content)
Cough	Cough (milder)	
Dyspnea	Dyspnea (milder)	
Pleuritic chest pain	Pleuritic chest pain (milder)	
	Respiratory distress (rare)	

Risk factors:

Risk factors include:
Pneumonia	Aspiration Pneumonia
	Reduced consicousness (anasthesia)
	Seizures
	Heavy alcohol use
	Dysphagia from neuromuscular weakness

Questions to ask

> *"Do you notice any fever? Cough?"*
> *"Do you have pain when you breath in?"*
> "*Any recent history of surgery with anaesthetics? Drink recently? Any seizures?"* See # *Risk factors*:* of Aspiration Pneumonia
> *"Was the flem a very foul smell?"* See # *Symptoms** of Aspiration Pneumonia

---

Examination findings

Key Findings	Result	Explanation	
Consolidation	- Bronchial breath sounds - Dullness to percussion - Increased vocal resonance/fremitus - Egophony present		

You can differentiate this with Pleural Effusion, which has similar findings:
| Pneumonia or Consolidation | Effusion |

| ---------- | ---------- |
Bronchial breath sounds	Decreased/absent breath sounds
Dullness to percussion	Dullness to percussion
Increased fremitus	Decreased fremitus
Egophony present	Egophony present

Investigations

Key Tests	Result	Explanation
CXR	Lobe consolidation (Typical CAP)	- Diagnoses whether its Pneumonia - Helps exclude Bronchitis, which has similar symptoms but does not need abx - Commonly Right Upper lobe
	Interstitiall infiltrate (Atypical CAP)	
CT scan	Potential malignancy	- Helps identify cause of recurrant pneumonia caused by malignancy. See # *Recurrent pneumonia*: - Used when recurrent pneumonia, CXR shows consoldiation in same lung region

Important

> - First line investigation is *always* **CXR**. This is to differentiate with Bronchitis, which has similar symptoms but does not need Abx

Additional Tests	Result	Explanation
Sputum culture	Test for bacterial cause	Not needed since Abx used are broad spectrum and cover most causes. See # *Community acquired pneumonia* (CAP):* for common causes
Calcitonin	Increased in bacterial lower RTI	Serum biomaker, sometimes used for diagnosis or guide therapy

---

Management

Treatments

Acute management

Hospitalisation choice:

Most patients can have CAP treated as outpatients. If so, treatment should follow low severity (see # *Low-severity treatment*) However, there are two main ways they should be hospitalised:

1. If the patient is Hypoxemic, **always hospitalise**
2. If their CRB-65 score is >= 1. See # *CURB65* for calculation and mortality
    1. If blood results are possible, use CURB-65. See # *CURB65*

Hospitalised patients should be treated with medium-severity treatment. See # *Medium-severity treatment*

It's possible to use the SMART-COP score to identify if the patient needs ICU care in hospital See # *SMART-COP*: for calculation. These patients need # *High-severity treatment*

Low-severity treatment:

Monotherapy:

Treatment should occur over 5-7 days. If not improving, consider escalating to combination therapy (See # Combination therapy) and admission to hospital

For typical community acquired pneumonia
Drug	Dose	Reasoning
Amoxicillin	1g PO q8h	Low severity, covers rise of *S.pneumo*

For patients with suspected atypical community acquired pneumonia **OR** allergic to penicillin (choose one):
Drug	Dose	Reasoning		
Doxycyline	100mg PO q12h	Covers atypical pathogens		
Clarithromycin	500mg PO q12h	Use if allergic to doxycycline		

Combination therapy

For typical community acquired pneumonia

Drug	Dose	Reasoning
Amoxicillin	1g PO q8h	Low severity, covers rise of *S.pneumo*
Doxycycline	100mg q12h	Covers atypical

If midly-moderately allergic to penicillin:

Drug	Dose	Reasoning		
Doxycyline	100mg PO q12h	Covers atypical pathogens		
Cefuroxime	500mg PO q12h	Use if allergic to doxycycline		

If severe allergy to penicillin:

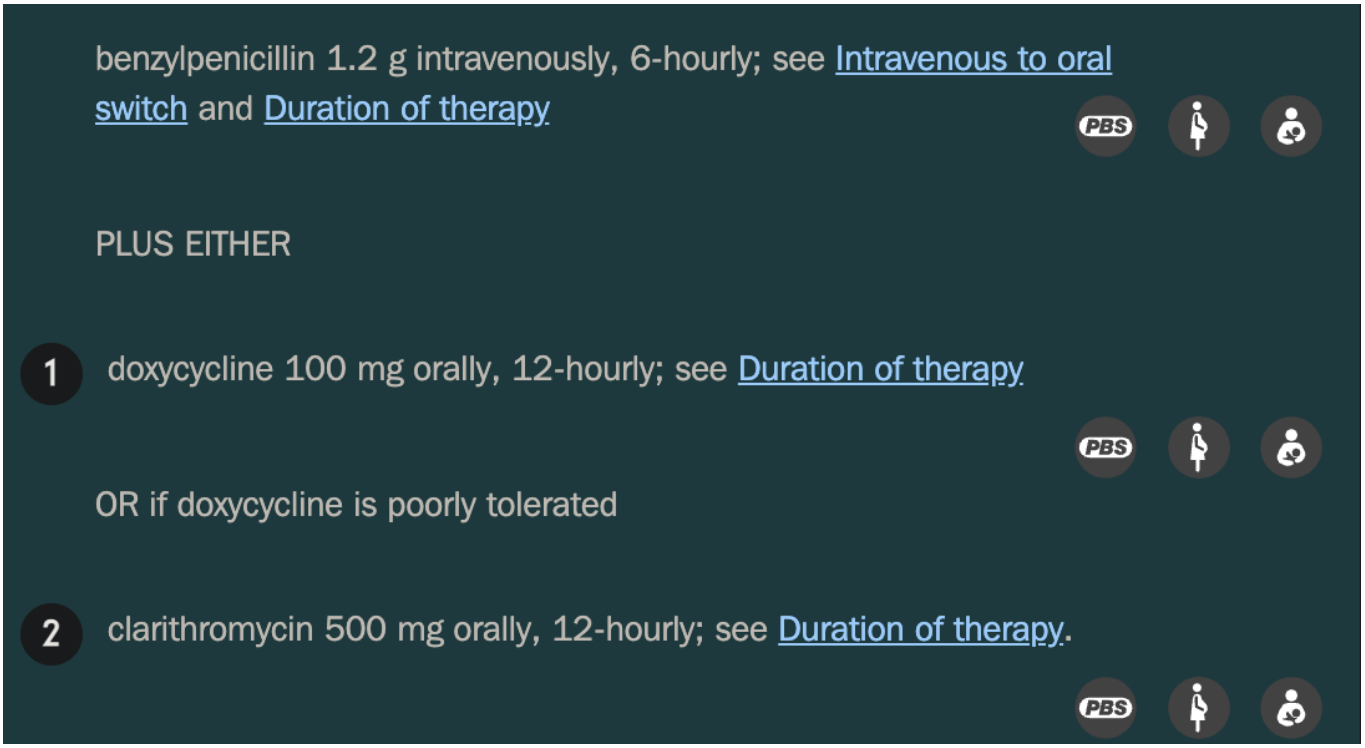
Drug	Dose	Reasoning
Moxifloxacin	400mg PO OD	

If midly allergic to Doxycycline

Drug	Dose	Reasoning		
Clarithromycin	500mg PO w12h			
Cefuroxime	500mg PO q12h			

Medium-severity treatment

For moderate severity CAP, use a two-drug regime:



High-severity treatment

For high severity CAP, use a two-drug regime:

1 ceftriaxone 2 g intravenously, daily; for patients with septic shock or requiring intensive care support, use ceftriaxone 1 g intravenously, 12-hourly. See Patient review, intravenous to oral switch and duration of therapy

PBS

OR

1 cefotaxime 2 g intravenously, 8-hourly; for patients with septic shock or requiring intensive care support, use cefotaxime 2 g intravenously, 6-hourly. See Patient review, intravenous to oral switch and duration of therapy

PBS

PLUS (with either of the above regimens)

azithromycin 500 mg intravenously, daily; see Patient review, intravenous to oral switch and duration of therapy.

PBS

If the patient has *S. Aureus*, consider treatment of it knwoing the increased prevelance of MRSA:

vancomycin intravenously; see Principles of vancomycin use for dosing and principles of use. Consider a 25 to 30 mg/kg loading dose for patients with septic shock or requiring intensive care support. See Patient review, intravenous to oral switch and duration of therapy.

PBS

Stop therapy with vancomycin if testing identifies a patient does not have *S.Aurueus*

Follow-up management

Follow up management should include secondary CXR after **4-6 weeks**. There should also be one 6-12 weeks later for patients >50yo. This is due to the fact that pneumonia in these patients

can occur because of a malignancy. This can be hidden by the lobar pneumonia, but can be present after resolution

Important

> - Repeat CXR should *only* be done 4-6 weeks, since it takes that long for resolution. Repeat 4-6 weeks if >50yo for malignancy

Criteria

CRB-65:

	Risk factor	Points
C	acute-onset confusion	1
R	respiratory rate 30 breaths/minute or more	1
B	systolic blood pressure lower than 90 mmHg, or diastolic blood pressure 60 mmHg or lower	1
65	age 65 years or older	1

↓

Interpretation of CRB-65 score		
Risk of death (30-day mortality)	**Site of care [NB1]**	**Total points**
1%	likely suitable for management in the community	0
5 to 12%	consider referral to hospital	1 to 2
up to 33%	urgent hospital admission	3 to 4

CURB-65

	Risk factor	Points
C	acute-onset confusion	1
U	uraemia (serum urea greater than 7 mmol/L, or blood urea nitrogen greater than 19 mg/dL)	1
R	respiratory rate 30 breaths/minute or more	1
B	systolic blood pressure lower than 90 mmHg, or diastolic blood pressure 60 mmHg or lower	1
65	age 65 years or older	1

↓

Interpretation of CURB-65 score		
Risk of death (30-day mortality)	**Site of care [NB1]**	**Total points**
less than 3%	outpatient, unless there are factors for admission (eg comorbidities, social circumstances)	0 to 1
9%	inpatient	2
15 to 40%	inpatient, and consider if intensive care support is required (especially for patients with CURB-65 score of 4 to 5)	3 to 5

SMART-COP:

	Risk factor	Points
S	systolic blood pressure lower than 90 mmHg	2
M	multilobar chest X-ray involvement	1
A	albumin lower than 35 g/L	1
R	respiratory rate **50 years or younger:** 25 breaths/minute or more **older than 50 years:** 30 breaths/minute or more	1
T	tachycardia 125 beats/minute or more	1
C	acute-onset confusion	1
O	oxygen low **50 years or younger:** PaO_2 less than 70 mmHg, or O_2 saturation 93% or lower, or PaO_2/FiO_2 less than 333 **older than 50 years:** PaO_2 less than 60 mmHg, or O_2 saturation 90% or lower, or PaO_2/FiO_2 less than 250	2
P	arterial pH less than 7.35 [NB1]	2

↓

Total points score (maximum 11)

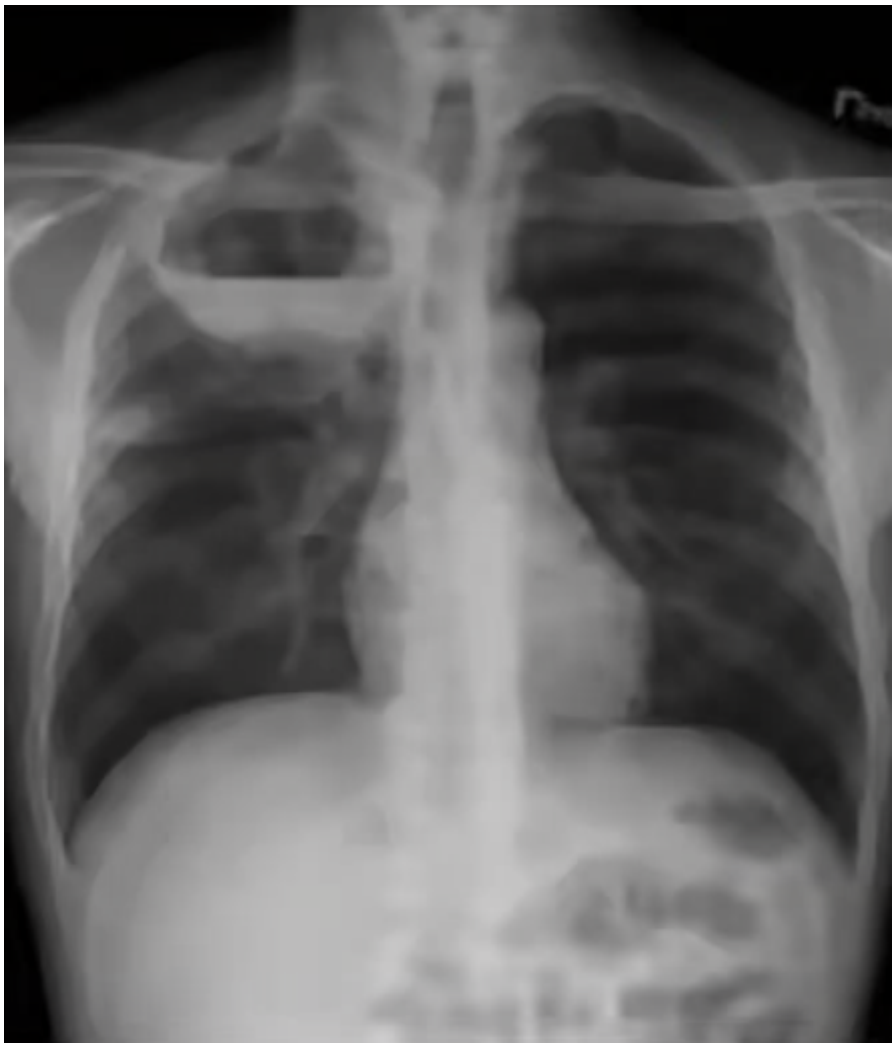
↓

Interpretation of SMART-COP score

Risk of needing IRVS [NB2]	Risk of death (30-day mortality)	Total points
low	up to 2%	0 to 2
moderate (1 in 8)	5 to 13%	3 to 4
high (1 in 3)	11 to 18%	5 to 6
very high (2 in 3)	33%	7 or more

Complications

1. A major complication of # *Aspiration pneumonia*: is a Lung Abscess. This will show as a contained, fluid-filled space in lungs with a "Air fluid level".
    1. It is predominantly by anaerobes, sometimes S. Aureus or Klebsiella



    2. This should be diagnosed via a CXR or CT scan, treated with broad spectrum antibiotics

---

Extra

Relevant notes:

1. Comparison between Spiromotry and PFM

References:

1. *Boads and Beyond - STEP 2:* Etc...