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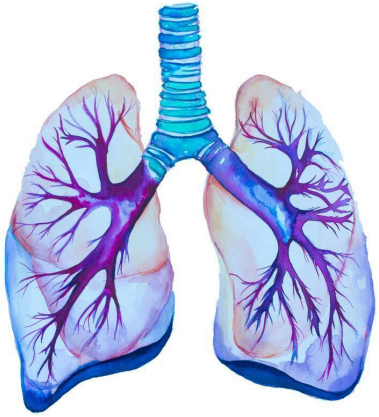


Hospital acquired Pneumonia

Color index:

- Important
- Doctor Notes
- Extra, TN

Objectives :

- Define the terms, pneumonia, community acquired pneumonia, health care associated pneumonia
- (HCAP) and ventilator associated pneumonia (VAP).
- Describe the pathogenesis of the health care associated pneumonia (hospital associated pneumonia) and VAP.
- Classify HCAP according to the time of onset .
- Name the different causative bacterial agents . Classify and describe types of VAP.
- Recognize the ways by which VAP is prevented.
- Describe the different chemotherapeutic antimicrobial agents used for the treatment of health care associated pneumonia.
- Evaluate response to treatment and recognize reasons for failure of treatment.

Pneumonia : infection of the pulmonary parenchyma.

community acquired pneumonia

- acquired in the community .
- The organisms causing it usually susceptible To antibiotics.
  Example: Streptococcus Pneumonia

Health care associated pneumonia (Nosocomial pneumonia)

- acquired **at least**[1] **48** hours (and not incubating) after admission to health care institutions .
- The organisms causing it usually resistant to antibiotics.
  Example : Pseudomonas Aeruginosa

[1]: If the symptoms occur before 48 hours (2 days) , then the infection is acquired from the community not the hospital (CAP not HAP)

Hospital Acquired Pneumonia (HAP)

Ventilator Associated Pneumonia (VAP)

- in patients with **assisted respiration** (mechanical ventilation) for a period **at least** 48 hours.

Epidemiology of Nosocomial Pneumonia :

- Nosocomial pneumonia is the **2nd** most common hospital-acquired infections after urinary tract infection
- Nosocomial pneumonia is the **leading cause** of death from hospital-acquired infections.
- The incidence of nosocomial pneumonia is highest in **ICU** (intensive care unit) patients.
- The incidence of nosocomial pneumonia in ventilated patients **(VAP)** is 10-fold **higher** than non-ventilated patients
- The reported crude **mortality** for HAP is 30% to greater than 70%.

Pathogenesis of Nosocomial Pneumonia

For **pneumonia** to occur, at least one of the following **three** conditions **must occur:**

Significant impairment of host defenses .

Introduction of a sufficient-size (high amount) inoculum to overwhelm the host's lower respiratory tract defenses

introduction of highly virulent organisms into the lower respiratory tract

The introduction caused most commonly by microaspiration of oropharyngeal secretions colonized with pathogenic bacteria.

Pathogenesis :

- Host factors
- Prior antibiotic therapy
- Invasive devices (VAP)
- Medications alter the gastric emptying and PH

Colonization of the Aerodigestive tract

Aspiration

Bacteremia from other organ infections

Infection from the blood

Inhalation

Bronchiolitis

Bronchopneumonia

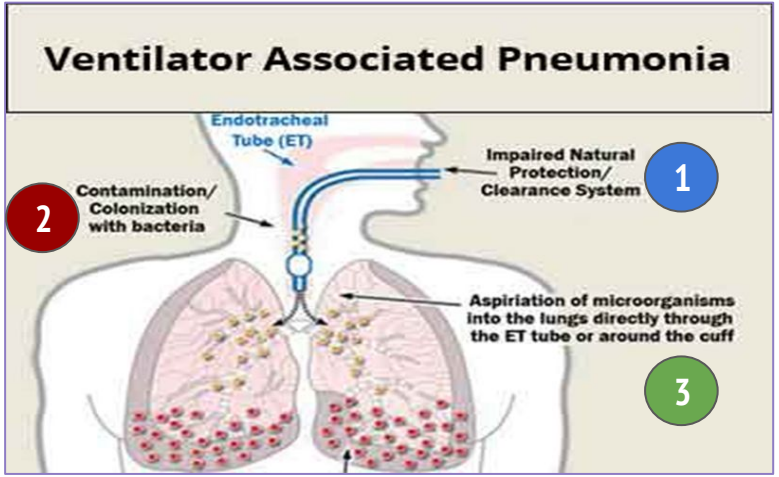
Lung abscess

Bacteremia ,cause infections to other organs

Pathogenesis of Ventilator Associated Pneumonia

Pathogenesis :

1. Mechanical ventilation prevents mechanical clearance by cough and the mucociliary escalator.
2. Bacterial colonization of the aerodigestive tract
3. Aspiration of contaminated secretion into the Lower airway



Prevention For VAP

When we have patients with **assisted respiration** , we should do some of these procedures to prevent Ventilator Associated Pneumonia (VAP):

by oral decontamination

By oral regimen : Gentamicin, Colistin ,Vancomycin **cream**
(Treat treating oropharyngeal **colonization** could prevent VAP)

Non-pharmacologic strategies

-**Effective hand washing** and use of protective gowns and gloves
-Semirecumbent positioning (prevention of aspiration)
-Avoidance of large gastric volume
-Oral (non-nasal) intubation
-Continuous subglottic suctioning
-Humidification with heat and moisture exchanger
-Posture change

Pharmacologic strategies

- Stress-ulcer prophylaxis
- Combination antibiotic therapy
- Prophylactic antibiotic therapy
- Chlorhexidine oral rinse
- Prophylactic treatment of neutropenic patients
- Vaccines

Classification of nosocomial pneumonia

(According to the onset)

By Classifying Pneumonia according to the onset , we can identify the group of organisms causing it .

Early-onset nosocomial pneumonia

Occurs during the first 4 days of admission.

- S. pneumoniae
- MSSA (Methicillin sensitive S.Aureus)
- H.Influenza
- Anaerobes

Late-onset nosocomial pneumonia

occurs more than 4 days of admission.

- Gram negative organisms , like: Pseudomonas aeruginosa , Acinetobacter
- Enterobacteriaceae , like : (Klebsiella, Enterobacter, serratia)
- MRSA (Methicillin resistance S.Aureus)

In the case of VAP , the Classification is :

Note :The same Principle Applied to VAP , but we start counting the days of The onset of the disease from the tracheal intubation , not from the Admission to the hospital

Early-onset VAP

within 48-72 hours after tracheal intubation

Late-onset VAP

after 72 hours after tracheal intubation

Causative Agents

Enteric Gram negative bacilli

most frequently in patients:

- With late-onset disease
- with serious underlying disease often already on broad-spectrum antibiotics.

(Prior use of broad-spectrum antibiotics and an immunocompromised state make resistant Gram-negative organisms more likely.)

S. aureus

Staph aureus

most frequently in patients:

- Ventilated patients after head trauma, neurosurgery, and wound infection.
- received prior antibiotics.
- Prolonged care in ICU.

Specially MRSA(methicillin resistant S.aureus) is commonly in patients who:

- Received corticosteroids
- Undergone mechanical ventilation >5 days
- Presented with chronic lung disease

Pseudomonas aeruginosa , Acinetobacter

most frequently in patients:

- With late-onset pneumonia.
- in ventilated patients.

The frequency of ICU-acquired P. aeruginosa carriage or colonization/infection was 23.4% at 7 days and 57.8% at 14 days.

Anaerobes

most frequently in patients:

- predisposed to aspiration .
- anaerobes occurred more often with oropharyngeal intubation than nasopharyngeal intubation.

Treatment of Nosocomial Pneumonia

-Most initial therapy is **empiric** (not specific for a pathogen), **because the pathogen is not identified or results are not available when antimicrobial decisions are made in most patients , So :**

1. **Initially be treated with a broad- spectrum antibiotic regimen aimed at covering all likely bacterial pathogens .**
2. **This regimen should subsequently be narrowed, according to the result of culture.**

American Thoracic Society has divided patients into three groups, each with a set of probable pathogens :

Dr note:

- these groups help us to guess the pathogen , by using the patient status .
- Guessing the pathogen help us to choose a more specific Empiric antimicrobial therapy

1 **Group 1**
mild to moderate HAP with no risk factor

3 **Group 2**
mild to moderate HAP with risk factor

2 **Group 3**
a-severe HAP , **early-onset** with no risk factor
b-severe HAP , **late-onset** or with risk factor

- **mild to moderate** HAP , **monotherapy** has been shown to be effective
- **severe** HAP in which infection with resistant organisms is likely, **combination** therapy probably should be instituted until culture result are available.

Antibiotics used in HAP

note: Synergy means :cooperation of two agents to produce an effect larger than the sum of their separate effects.

- **Vancomycin + Linezolid** (better due to less nephrotoxicity)

for Patients with **S. aureus** infection .

- Combination of **Antipseudomonal drugs**

There is controversy (جدال) in the Combination of **Antipseudomonal drugs :**

1. **-antipseudomonal Beta-lactam with an Aminoglycoside.(**Synergy but potential nephrotoxicity.)
2. **-antipseudomonal Beta-lactam with a Fluoroquinolone.(no** synergy but reduced nephrotoxicity)

Response to the therapy

If no clinical response is noted or deterioration occurs, we need to consider:

Infectious causes:

- Resistant pathogen
- Superinfection
- Unusual pathogens
- Lung abscess
- Extrapulmonary infection

Noninfectious events:

- **Heart**: congestive heart failure (CHF)
- **Lung**: fibroproliferative acute respiratory distress syndrome (ARDS), pulmonary emboli, Atelectesis.

Quiz :

1)For severe HAP in which infection with resistant organisms is likely , What is the appropriate therapy must be applied to the patient?		
A.surgery	B.combination therapy	C.monotherapy
2) To treat pneumonia we initially use		
A.Narrow spectrum antibiotic	B.Broad spectrum antibiotic	C.Neither, wait for the result of the culture
3) Which of the following can cause pneumonia to patient who had Received corticosteroids		
A.Anaerobes	B.MSSA	C.MRSA
4)The common causes of late-onset pneumonia, particularly in ventilated patients are		
A. P. aeruginosa and Acinetobacter	B. S. Aureus	C.Anaerobes
5) a patient had been admitted to the hospital, and after 12h He developed a symptoms for pneumonia ,what is the most likely type of pneumonia he had .		
A.HAP	B. CAP	C.VAP

Answers : 1-B 2-B 3-C 4-A 5-B

SAQ

1-Name the organism which can cause health care associated pneumonia (HCAP)?
2-What is the difference between the duration of early and late onset of nosocomial pneumonia?
3-List two important processes required for pathogenesis of VAP.
4-How can we prevent VAP?
5-There are three factors may be influenced the pathogen, mention them.
6-If a patient with kidney problems has pneumonia, what is the preferable drug we can use?
7-If a patient was in the ICU on a ventilator and he has head trauma or neurosurgery (for example they had brain tumor and went through a surgery) with gram positive cocci in cluster. What is the most likely causative agent?
8-What are the symptoms of Pneumonia?
9-A patient with HAP growing MRSA what is the drug of choice? Why?

Answers

1. Pseudomonas aeruginosa
2. Early onset occurs in the first 4 days, late onset in more than 4 days.
3. Bacterial colonization of the aerodigestive tract, and Aspiration of contaminated secretion into the Lower airway. 4. By topical Gentamicin, Colistin, Vancomycin cream given every 6h for 3 weeks
5. coexisting illnesses, prior treatment, and length of hospitalization.
6. Linezolid
7. S. aureus .
8. Fever, abnormal chest x-ray and vital signs are decreased.
9. Linezolid, because it has less toxicity which means there will be less kidney damage.

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Thanks

Editing file

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