# Pneumonia in the Hospital

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# Introduction

**The terms:**

- *Hospital-acquired (or nosocomial) pneumonia (HAP),*
- *Ventilator-associated pneumonia (VAP) and*
- *Healthcare-associated pneumonia (HCAP)*

Considered as important causes of morbidity and mortality despite improved antimicrobial therapy, supportive care and prevention.

# Definition

The 2016 Infectious Diseases Society of America distinguish the following types of pneumonia:

- Hospital-acquired (or nosocomial) pneumonia (HAP)
- Ventilator-associated pneumonia (VAP)

IDSA/American Thoracic Society (ATS) guidelines, 2016

Healthcare-associated pneumonia (HCAP) included in the prior guidelines discarded in 2016's guidelines.

# Hospital-acquired pneumonia (HAP)

Pneumonia that occurs 48 hours or more after admission and did not appear to be incubating at the time of admission.

# Ventilator-associated pneumonia (VAP):

A type of HAP that develops more than 48 to 72 hours after endotracheal intubation.

## Healthcare-associated pneumonia (HCAP):

**R**efers to pneumonia acquired in healthcare facilities such as nursing homes, hemodialysis centers and outpatient clinics or during a hospitalization within the past three months.

These individuals were falsely believed to be at an increased risk for infection with multidrug-resistant (MDR) organisms because of such contact.

# Prevalence

- In the United States, HAP is the second most common nosocomial infection (after urinary tract infections), occurring in an estimated 5-10 patients per 1,000 hospital admissions.

- Hospital-acquired respiratory disease in Bangladesh representing 1.7% of all patient hospital admissions.

(*Clinical Infectious Diseases*, Volume 50, Issue 8, 15 April 2010, Pages 1084–1090)

# Etiology of HAP

The specific bacterial etiology varies geographically down to the institutional level.

**Common causes of HAP:**

- ***P aeruginosa***
- ***Staphylococcus aureus, including MSSA and MRSA***
- ***Klebsiella pneumoniae***
- ***Escherichia coli***
- ***Non-Enterobacteriaceae bacteria such as S marcescens and Acinetobacter species are less common causes***

# Risk factors for HAP

- Thoracic surgery
- Depressed consciousness
- CKD
- Use of PPIs

# Risk factors for MDR Pneumonia

- IV antibiotic use within last 90 days
- Pre existing structural Lung disease

# Diagnosis

- Clinical
- Radiological
- Microbiological (Non-invasive)
- Microbiological (Invasive)
- Blood tests

# Diagnosis: Clinical

- New onset of fever
- Cough, purulent sputum
- Tachypnea
- Crepts, Bronchial breath sound, Plural rub
- Hypoxia

# Diagnosis: Radiological

- CXR
- Chest CT

# Diagnosis: Microbiological
## (gram stain and culture )

**Non-invasive**

- Samples of lower respiratory tracts (Maybe collected via
  - a) invasive
  - b) non invasive)
- Sputum (spontaneous/ induced)
- Endotraceal aspirate

# Diagnosis: Microbiological

Invasive

- Protected specimen brush (PSB)
- Bronchoalveolar Lavage (BAL)

# Diagnosis : Blood tests

- Leucopenia/Leucocytosis
- Culture
- ABG
- Electrolytes
- Renal and liver function

# Differential Diagnoses

- Non infectious process
  - ARDS
  - Heart failure
  - PE
  - Atelectesis
  - Chemical pneumonitis
  - Neoplasm
  - Pulmonary haemorrhage
- Extra pulmonary source
  - Sepsis

# Treatment : Empiric regimen

- Coverage for S aureus, P. aeruginosa, and other gram-negative bacilli.

**Low risk patients:**

- If MRSA is not suspected, then initiate one of the followings:

  - ✓ Piparacillin Tazobactam
  - ✓ Cefepime
  - ✓ Levofloxacin
  - ✓ Imipenem/ Meropenem

- If MRSA is suspected add

  - ✓ Vancomycin or Linezolid

# Patients at high risk of mortality

**Use a 3 drug regimen consider using 2 agents from different classes that target *Pseudomonas aeruginosa* and other gram-ve bacteria as well as one agent effective against MRSA**

**Anti-pseudomonal coverage**

- **beta-lactam/beta-lactam-like**
  - **piperacillin-tazobactam**
  - **cefepime or ceftazidime**
  - **Imipenem or meropenem**
  - **Aztreonam**

# Patients at high risk of mortality (contd.)

## Non-beta-lactams

- levofloxacin
- an aminoglycoside such as amikacin or tobramycin

- for MRSA coverage add one of
  - vancomycin
  - linezolid

**Duration of antibiotic treatment: Approximate 7 days**

# RESPONSE TO THERAPY

## Modification of Empiric Antibiotic Regimens

- Empiric antibiotics may need modification once the results of blood or respiratory tract cultures become available.
- Modification may be necessary if a resistant or unsuspected pathogen is found in a nonresponding patient.
- Therapy can be narrowed according to culture and sensitivity report.

# RESPONSE TO THERAPY (Cont.)

## Defining the Normal Pattern of Resolution

- Resolution of HAP can be defined either clinically or microbiologically.
- Using this approach, clinical improvement usually becomes apparent after the first 48–72 hours of therapy.

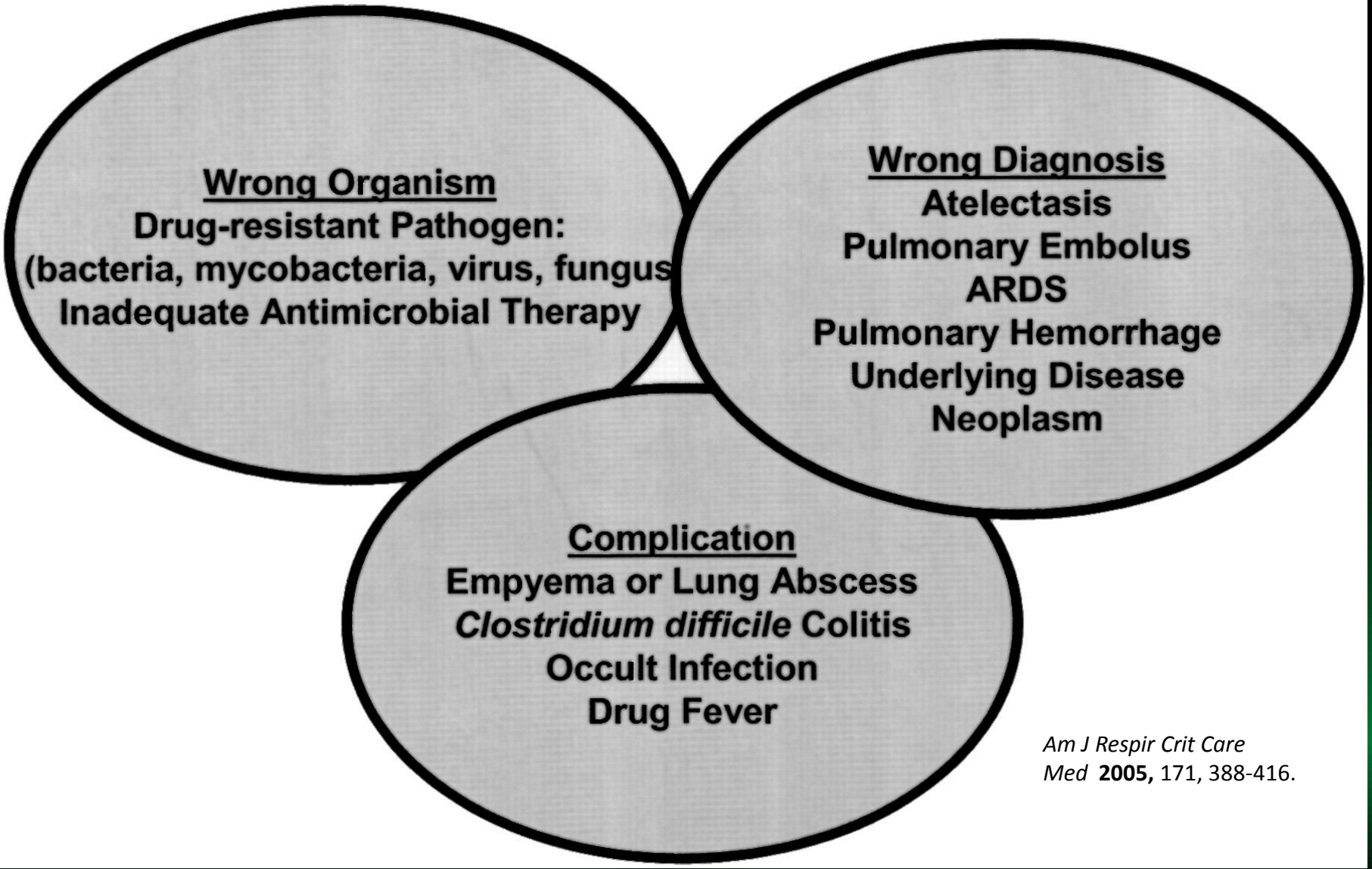
# Defining the Normal Pattern of Resolution (Cont.)

- Appropriate respiratory tract cultures can be used to define microbiologic resolution.
- Using serial cultures microbiological resolution can be defined as-bacterial eradication.
- Chest radiographs are of limited value for defining clinical improvement

# Reasons for Deterioration or Nonresolution

These include the possibility that the process being treated is not pneumonia or that certain host, bacterial, and therapeutic (antibiotic) factors have not been met.

# Assessment of Nonresponders




*Am J Respir Crit Care Med* **2005,** 171, 388-416.

# Evaluation of the Nonresponding Patient

- May be necessary to broaden antimicrobial coverage while awaiting the results of cultures and other diagnostic studies.
- An aggressive evaluation of differential diagnosis and a repeat sampling.
- Specialized radiologic procedures may be helpful in identifying anatomic reasons for failure.
- There is debate about the value of open lung biopsy in nonimmunosuppressed patients with suspected HAP, VAP, or HCAP.

# Take Home message

- Hospital acquired pneumonias are most important causes of morbidity and mortality among hospitalised patients.
- Early diagnosis and prompt treatment is the key in success of management.
- Each hospital should have their regular monitoring of organism prevalence and antibiogram.
- Prevention of HAP and VAP in high-risk patients can reduce incidences significantly.

# Thanks