Community Acquired Pneumonia

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Objectives

- Pneumonia definitions
- Epidemiology
- Microbiology
- Clinical Pathway
  - Diagnosis
  - Site of care
  - Treatment
  - Stewardship considerations

Community Acquired Pneumonia

Pulmonary infection acquired outside of a hospital environment

Nosocomial Pneumonia

HCAP (health care-associated pneumonia) has fallen from grace and no longer recognized in ATS / IDSA guidelines

Hospital-acquired pneumonia: pulmonary infection occurring at least 48 hours after admission

Ventilator-associated pneumonia: pulmonary infection occurring at least 48 hours after endotracheal intubation

CAP Epidemiology

A year in the U.S.:

5 million cases
1.2 million hospitalizations
55,000 deaths

Setting:

70% outpatient
30% inpatient

CAP Epidemiology

Age Group	Incidence of Pneumonia-Related Hospitalizations (95% CI) *no. of cases per 10,000 adults per year*
18-49 yr	6.7 (6.1-7.3)
50-64 yr	26.3 (24.1-28.7)
65-79 yr	63.0 (56.4-70.3)
≥80 yr	164.3 (141.9-189.3)

Jain S, Self WH, Wunderink RG, et al. Community-Acquired Pneumonia Requiring Hospitalization among U.S. Adults. *N Engl J Med.* 2015;373(5):415-427. doi:10.1056/NEJMoa1500245

Causative Agents

- High proportion without organism found
  - Difficulty in obtaining samples
    - Low sensitivity of diagnostic tests
  - Antibiotic use prior to collection
  - Viruses not investigated

Microbial Causes of CAP

- *Strepococcus pneumoniae*
- *Mycoplasma Pneumoniae*
- *Haemophilus influenzae*
- *Chlamydia pneumoniae*
- *Legionella* pneumophila

Respiratory Viruses

- Influenza A / B
- Metapneumovirus
- Adenovirus
- Respiratory syncytial virus
- Parainfluenza
- Coronavirus (COVID-19)

"Typical" versus "Atypical"

Typical pathogens

S. pneumoniae, Haemophilus influenzae, S. aureus

Atypical pathogens

- cannot be cultured on standard media / seen on gram stain
- intrinsic resistance to β-lactams

Mycoplasma pneumonia, Chlamydia pneumoniae, Legionella pneumophila

Respiratory viruses

- Influenza, adenoviruses, human metapneumoviruses, respiratory syncytial virus, coronaviruses

Clinical Manifestations

Constitutional
- Febrile
- Tachycardia
- Chills

Cough
- Productive or non-productive

Dyspnea

Pleuritic chest pain

Physical exam (sensitivity / specificity 58 / 67%)
- Tachypnea
- Accessory muscle use
- Tactile fremitus
- Percussion vary from dull to flat
- Crackles, bronchial breath sounds, pleural friction rub

Diagnostic Criteria
IDSA Guideline Criteria

New pulmonary infiltrate on chest image

Respiratory symptoms (at least 1)

At least one other symptom / finding of illness

CAP Clinical Pathway

Diagnosis and Site of Care

- Hypoxia
- Pneumonia Severity Index
- CURB-65

Pneumonia Severity Index (PSI/PORT)

- 20-point scoring system
  - Age / Sex
  - co-morbidities
  - Vitals
  - labs (BUN, glucose, pH, pO2)
- Five risk categories

Class I (low risk)	Physical examination findings, no comorbidities or laboratory findings
Class II (low risk)	≤70 points
Class III (low risk)	71–90 points.
Class IV (moderate risk)	91–130 points
Class V (high risk)	>130 total points

CURB-65

- 2 categories (severe [3-5] or non-severe[0-2])
- In Europe there is use of CRB-65 (do not use blood urea)

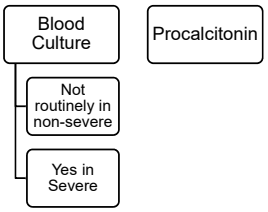
Variable	Value
Confusion	New disorientation person, place or time
Urea	BUN >19 mg/dL
Respiratory rate	≥30
Blood pressure	Systolic < 90 mmHg, and/or diastolic ≤ 60 mmHg
Age	≥ 65 years

CAP: Severe features

Major criteria (1 needed)	Minor criteria (3 needed)
• Need for vasopressors • Need for mechanical ventilation	• Tachypnea • P/F <250 • Multilobar infiltrates • Confusion/disorientation • Uremia (>20) • Leukopenia • Thrombocytopenia • Hypothermia • Hypotension requiring aggressive fluids

Diagnostic Testing

Bloodwork



Diagnostic Testing

Respiratory

Respiratory Culture
- Not routinely if non-severe, routinely if severe
- Yes if:
  - Hospitalization with IV Abx in last 90 days
  - Anti-MRSA or pseudomonal coverage initiated
  - Advanced structural lung disease

MRSA nasal swab
- Hospitaliation with IV Abx in the last 90 days
- Anti-MRSA coverage initiated
- Severe and h/o MRSA colonization or infection in the past year

Diagnostic testing

Viral

Flu / COVID swabs	• If presence in community, potential exposure
Respiratory Viral Panel	• In severe infection if available

CAP Pathway: Diagnostic Testing

Urine

- Legionella
  - Determine based on epidemiologic factors
- Pneumococcus
  - Not routinely in non-severe

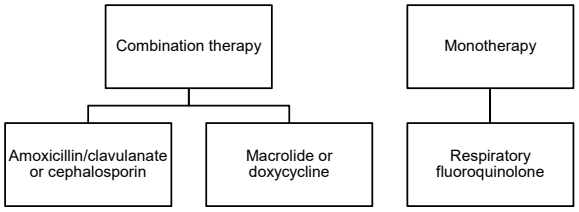
Antibiotic Selection

Outpatient – no comorbidities

High dose Amoxicillin	Doxycycline	Macrolide (Azithromycin, clarithromycin)

Antibiotic Selection

Outpatient – with co-morbidities



Antibiotic Selection

Inpatient – non-severe

Standard

β-lactam
- Ampicillin-sublactam
- Ceftriaxone
- Ceftoxamine

Atypical Coverage
- Macrolide
- Doxycycline

Monotherapy

Respiratory Fluoroquinolone (Levofloxacin or Moxifloxacin)

Antibiotic Selection

Inpatient – non-severe MRDO coverage

MRSA coverage
- Vancomycin
- Linezolid

Anti-pseudomonal = adjust β-lactam
- Piperacillin / tazobactam
- Cefipime
- Ceftazadine
- Imipenem
- Meropenem

Antibiotic Selection

Inpatient - Severe

Standard regimen is the same as non-severe
- Do not recommend fluoroquinolone monotherapy, can be in combination with β-lactam

Anti-MRSA / Anti-Pseudomonal Coverage
- Hospitalization with IV Antibiotics in the past 90 days
- Otherwise same decision factors as non-severe

Antibiotic Selection

Duration

- Minimum 3-5 days — Most patients achieve stability within the first 48-72 hours so 5 days is typically appropriate
- MRSA or *P. aeruginosa* minimum 7 days
- Longer courses — Complicated by infection at other sites (meningitis, endocarditis, etc); Infection by less-common pathogen (eg *Burkholderia*, *Mycobacterium tuberculosis*)

Follow-up

Stewardship Considerations

- Assess for clinical stability / improvement (vitals, oxygenation, mental status)
- Determine pathogen-directed therapy based on culture data
- Procalcitonin
- MRSA Nasal Swab

Antibiotic Selections

Oral De-escalation

No MDRO risk factors:

- Amoxicillin + clavulanate (500 + 125 mg TID or 875/2000 + 125 mg BID)
- Cefpodoximine 200 mg PO BID
- Cefuroxime 500 mg PO BID

MDRO Risk Factors

- Levofloxacin 750 mg PO q24h

Antiviral

COVID

Ambulatory:

- nirmatrelvir/ritonavir (PO), Remdesivir (IV), monoclonal Abs if circulating susceptible

Hospitalized

- Not hypoxemic: if high risk remdesivir x3 days
- Hypoxemic: corticosteroids, remdesivir
  - IL-6 inhibitors (tocilizumab) in progressive / severe with high inflammatory markers
  - JAK inhibitors (barticitinib) in severe

Antiviral

Influenza

- Neuraminidase inhibitors (oseltamivir, inhaled zanamivir, IV peramivir, baloxavir)

Discharge Considerations

- Vaccination (in eligible populations)
  - Pneumococcal
  - Influenza
  - COVID-19
  - RSV
- Smoking cessation
- Ensure proper therapy for control of chronic conditions

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