COMMUNITY ACQUIRED PNEUMONIA
and
PNEUMOCOCCAL PNEUMONIA

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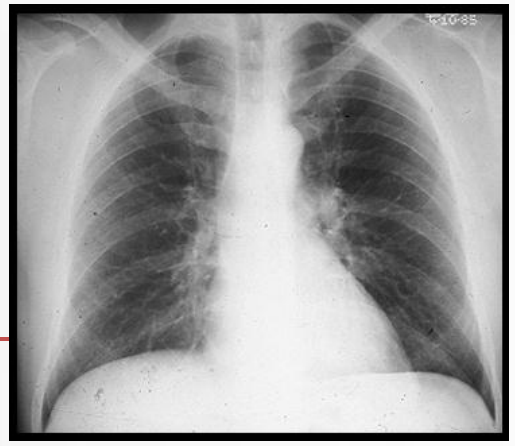
18.May.2014



1st Intercontinental Emergency Medicine Congress
ATUDER
Emergency Medicine Physicians Association of Turkey

Community Acquired Pneumonia (CAP)

- **Definition**
- **CASES**
- **Epidemiology**
- **Pathogenesis**
- **Microbiology**
- **Treatment recommendations**
- **The evidence for efficacy of different antibiotic mediations.**

Community Acquired Pneumonia

- **Definition:**
  - **… an acute infection of the pulmonary parenchyma**
  - **associated with at least some symptoms of acute infection,**
  - **accompanied by the presence of an acute infiltrate on a chest radiograph, or**
  - **auscultatory findings consistent with pneumonia, in a patient not hospitalized or residing in a long term care facility for ≥ 14 days before onset of symptoms.**

Bartlett. Clin Infect Dis 2000;31:347-82.

Cases

Case 1

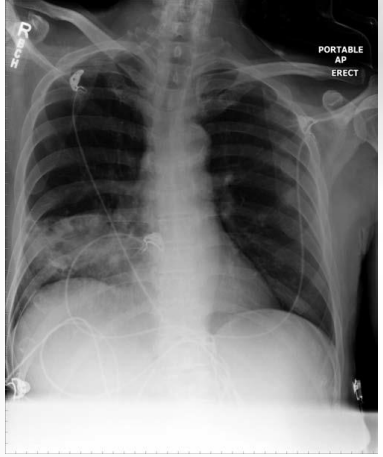
- **A 62-year-old male** with a medical history significant for **chronic alcohol abuse** presented to the ED complaining of persistent cough productive of green sputum, fevers to **40◦C** (104◦F), chills and rigors, shortness of breath, and sharp chest pain with cough and deep inspiration for 3 days.
- He reported nausea and vomiting but denied abdominal pain or diarrhea. He also denied recent travel, leg swelling or tobacco use. His last alcoholic drink was 24 hours prior to presentation.

PHYSICAL EXAMINATION

- **GENERAL APPEARANCE: The patient looked older than his** stated age. He was a cachectic and ill-appearing male, in moderate respiratory distress, speaking only three- or four-word sentences.

VITAL SIGNS

  - Temperature 40◦C (104◦F)
  - Pulse 120 beats/minute
  - Blood pressure 110/65 mmHg
  - Respirations 30 breaths/minute
  - Oxygen saturation 96% on room air
- **CARDIOVASCULAR: Tachycardic rate, regular rhythm without** rubs, murmurs or gallops.
- **LUNGS: Mild expiratory wheezes throughout all lung fields,** scattered rhonchi, crackles and egophony at the right lower and mid-lung fields.



Lab.

- CBC
  - Hb:14,9 gr/dL
- WBC: 20000 K/µL (normal 3.5–12.5 K/µL) with 35% immature bands (presence of bands abnormal)
  - Plt:186.000 /µL
- Sodium of 125 mEq/L (normal 137–145 mEq/L).

- How can you manage this patient?
- Risk stratification?
- Antibiotic?
- Hospitalization?

Case 2

- A 67-year-old woman with mild Alzheimer's disease who has a 2-day history of productive cough, fever, and increased confusion is transferred from a nursing home to the emergency department.
- According to the transfer records, she has had no recent hospitalizations or recent use of antibiotic agents.

PHYSICAL EXAMINATION

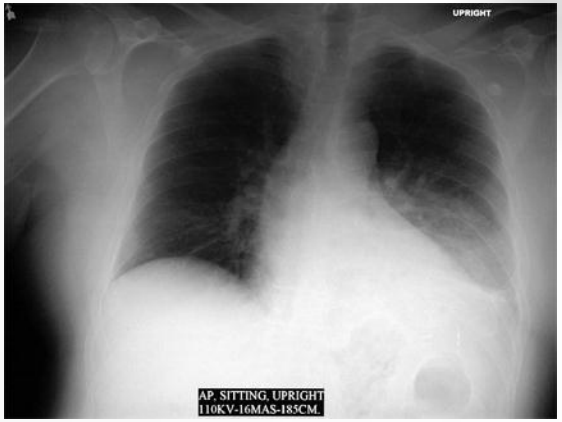
- She is oriented to person only.
- Vital Signs
  - Temperature is 38.4°C (101°F),
  - Heart rate is 120 beats per minute,
  - The blood pressure is 145/85 mm Hg,
  - The respiratory rate is 30 breaths per minute,
- The oxygen saturation is 91% while she is breathing ambient air.
- Crackles are heard in both lower lung fields.

Lab.

- CBC
  - The white-cell count is 4000/mm3,
- The serum sodium level is 130 mEq/L,
- BUN: 25 mg /dL (9.0 mmol/L).
- A radiograph of the chest shows infiltrates in both lower lobes.
- How and where should this patient be treated?

Case 3

- 34 year old, male
- Complaint: Fever, chest pain, cough, severe myaljia
- Hx:
  - Chest pain for 2 days, cough for 1 week. Hx for upper respiratory infection for 2 weeks ago.
  - Fever—4 days
  - Sputum production
  - He had complaints of severe myaljia.
- Past medical hx-Non
- Medication—Paracetamol for fever and myalgia
- Vital Sign:
  - BP: 130/70 mmHg
  - Pulse: 110/min
  - RR: 24/min
  - Fever: 38.0 ˚C
  - Pulse: 97%
- Physical exam:
  - Decreased breath sounds and crackles on left basal lobe.



Lab.

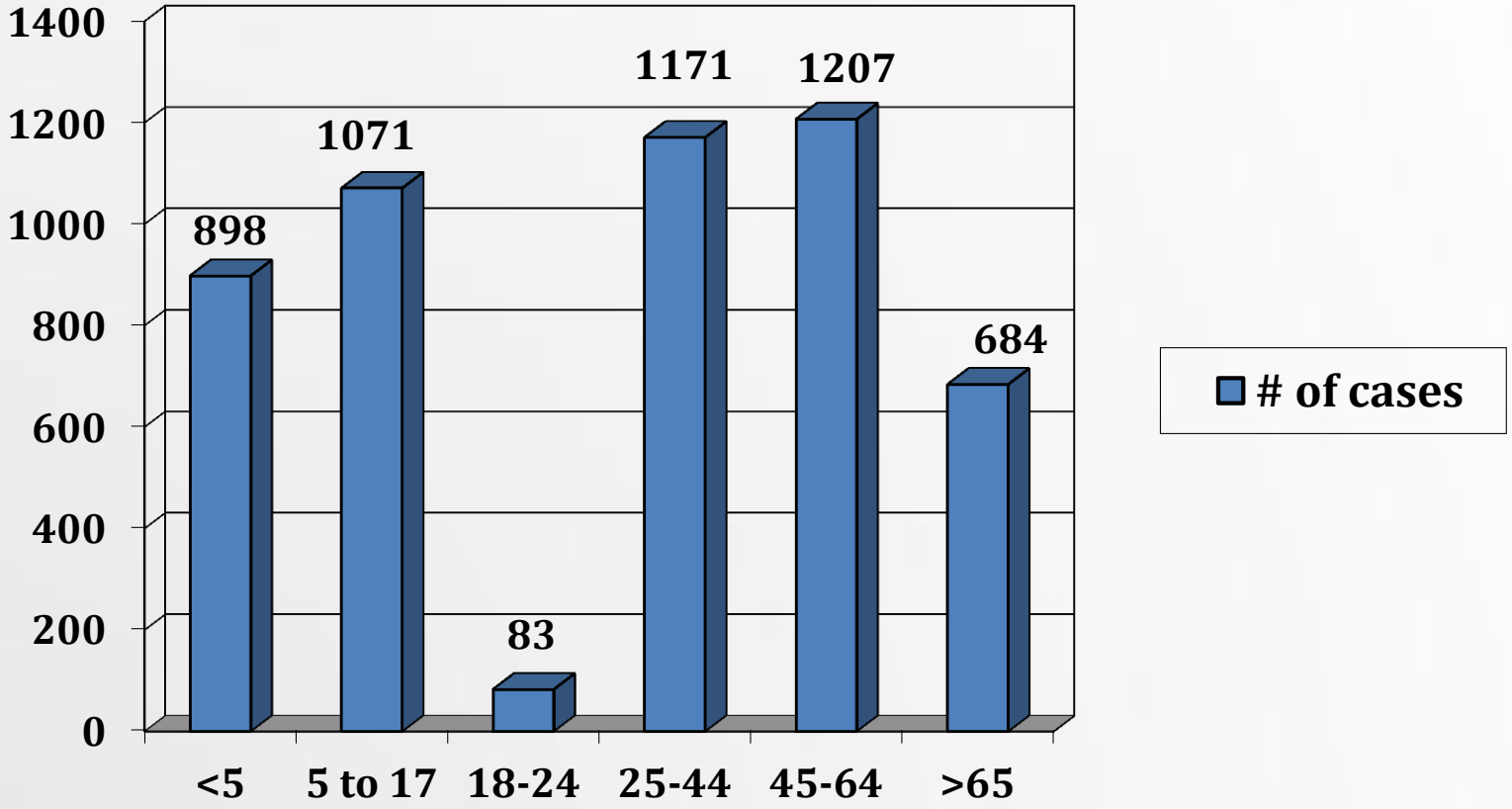
- CBC
  - Hb:14,9 gr/dL
  - WBC: 18000
  - Plt:246.000 /µL
- RFT and LFT—Normal
- Arterial Blood Gases
  - pH: 7.38
  - HCO3: 26 mEq/lt
  - pCO2: 38 mmH20
  - pO2: 65 mm H2O

- How can you manage this patient?

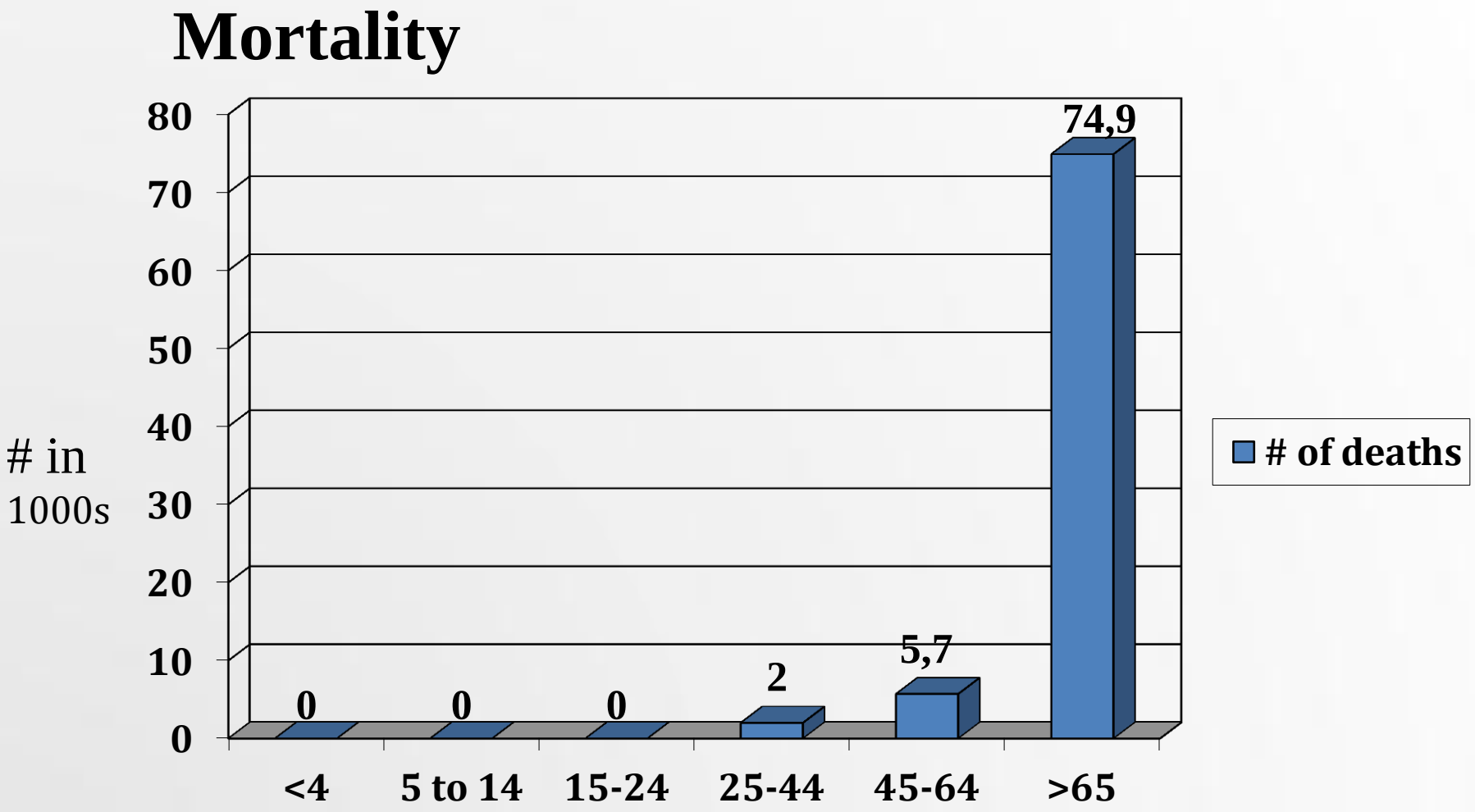
Community Acquired Pneumonia

- **Epidemiology:**
  - **Overall rate in adults—5-6/1000 cases**
  - **increases with aging.**
  - **Seasonal variation—occurs more during the winter months.**
  - **Higher in men.**
  - **Mortality 2-30%**
    - **<1% for those not requiring hospitalization**
    - **Up to 23% mortality during 30-day follow-up among patients who require hospitalization.**
  - **Streptococcus pneumonia is the most common cause of pneumonia worldwide.**

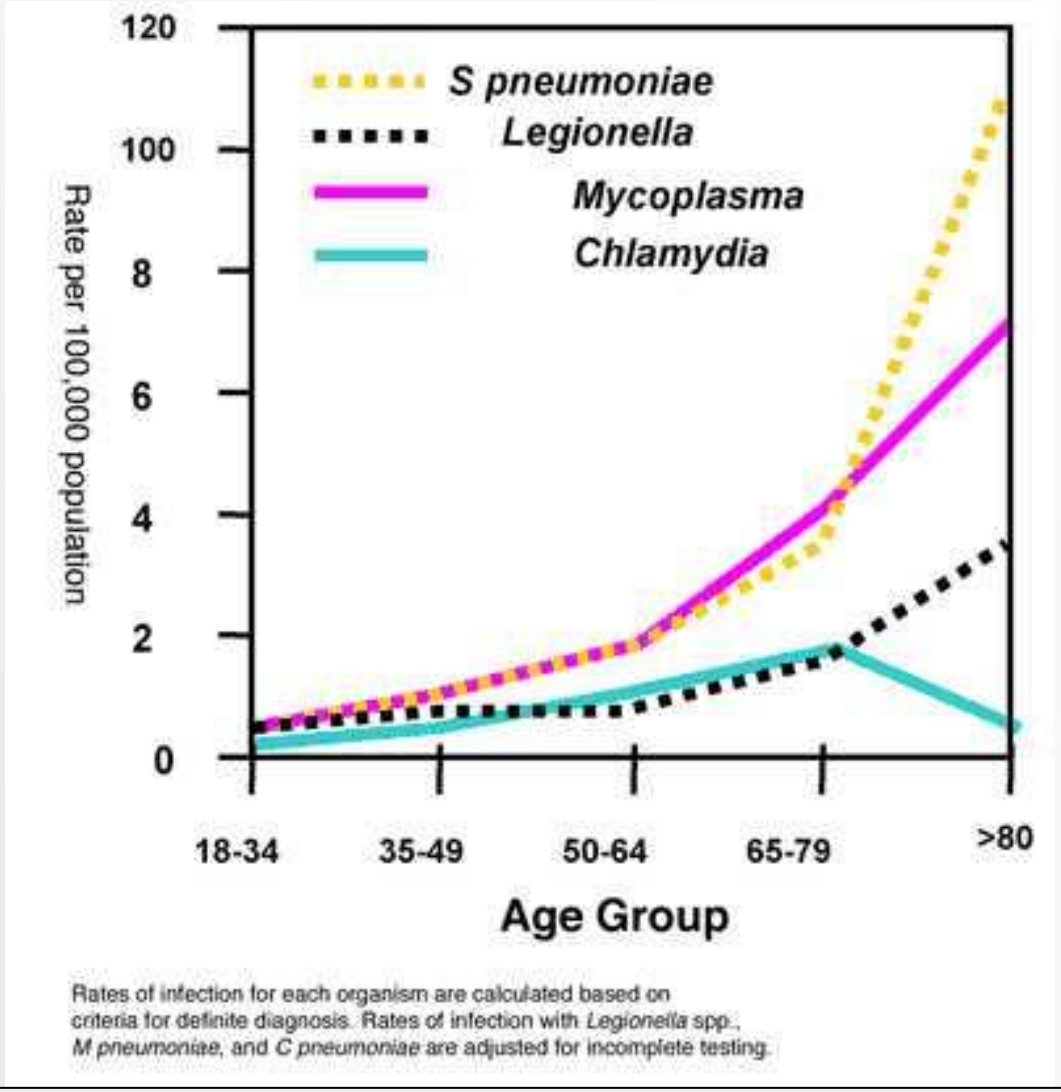
Community Acquired Pneumonia



Community Acquired Pneumonia



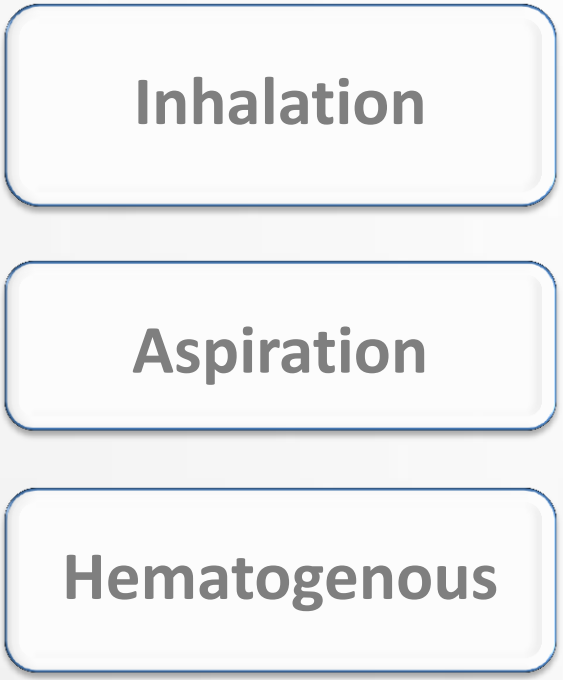
Age-specific Rates of Hospital Admission by Pathogen



Marston BJ, Plouffe JF, File TM Jr, Hackman BA, Salstrom SJ, Lipman HB, Kolczak MS, Breiman RF. Incidence of community-acquired pneumonia requiring hospitalization. Results of a population-based active surveillance Study in Ohio. The Community-Based Pneumonia Incidence Study Group. Arch Intern Med. 1997;157(15):1709-18.

CAP – Pathogenesis

- Inhalation, aspiration and hematogenous spread are the 3 main mechanisms by which bacteria reaches the lungs



Pathogenesis

- **Primary inhalation**: when organisms bypass normal respiratory defense mechanisms or when the Pt inhales aerobic GN organisms that colonize the upper respiratory tract or respiratory support equipment
- **Aspiration**: occurs when the patient aspirates colonized upper respiratory tract secretions
  - Stomach: reservoir of GNR that can ascend, colonizing the respiratory tract.
- **Hematogenous**: originate from a distant source and reach the lungs via the blood stream.

Community Acquired Pneumonia

- **Risk Factors for pneumonia**
  - **age**
  - **smoking**
  - **asthma**
  - **immunosuppression**
  - **institutionalization**
  - **COPD**
  - **PVD**
  - **Dementia**
  - **HIV/AIDS**

Community Acquired Pneumonia

- **Risk Factors in Patients Requiring Hospitalization**
  - **older, unemployed**
  - **common cold in the previous year**
  - **asthma, COPD; steroid or bronchodilator use**
  - **Chronic disease**
  - **amount of smoking**

Farr BM. Respir Med 2000;94:954-63

Community Acquired Pneumonia

- **Risk Factors for Mortality**
  - **age**
  - **bacteremia (for *S. pneumoniae)***
  - **extent of radiographic changes**
  - **degree of immunosuppression**
  - **amount of alcohol**

Community Acquired Pneumonia

Microbiology

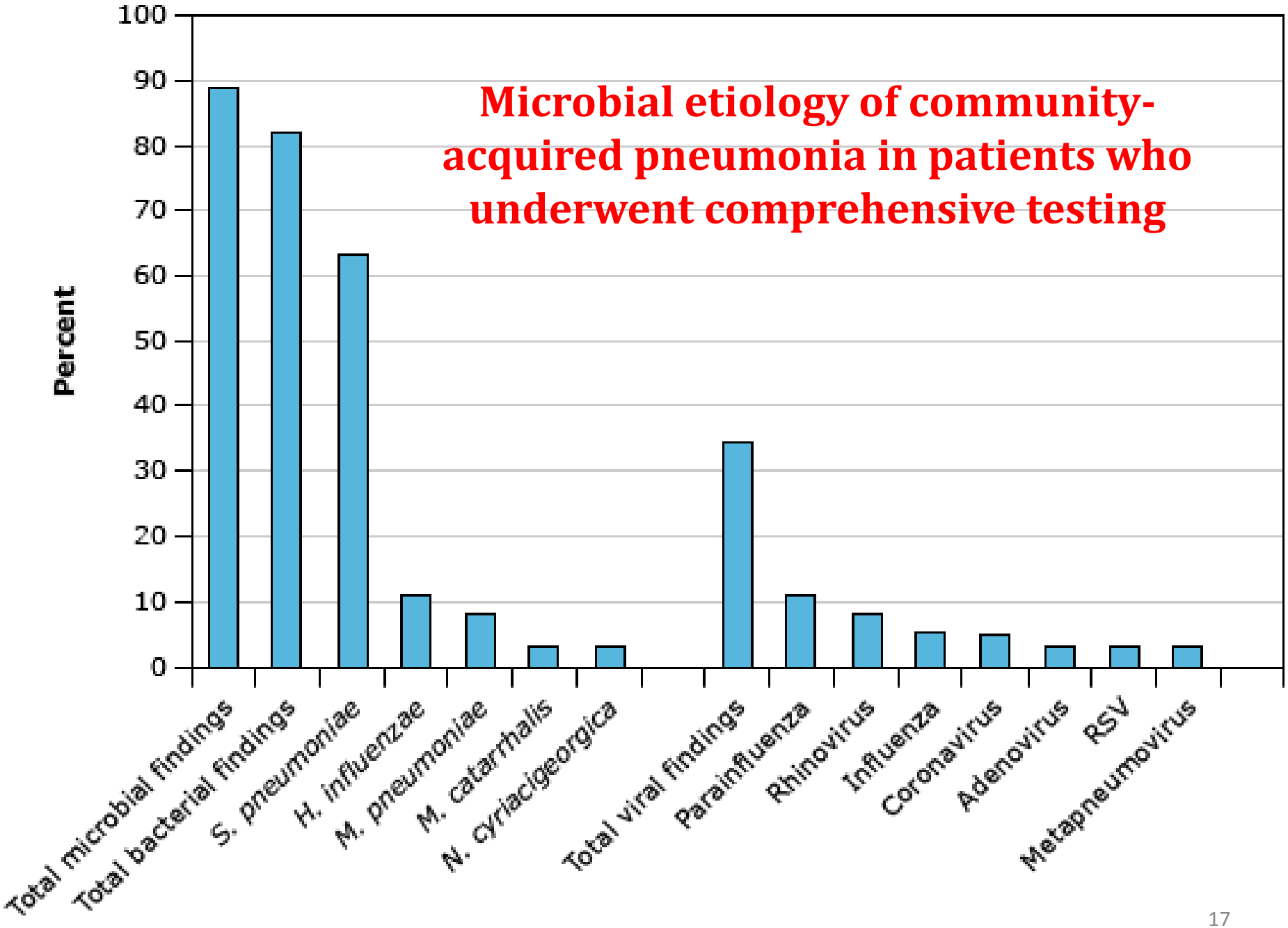
- ***S. pneumoniae*: 20-60%**
- ***H. influenzae*: 3-10%**
- ***Chlamydia pneumoniae*: 4-6%**
- ***Mycoplasma pneumonaie*: 1-6%**
- **Legionella spp. 2-8%**
- ***S. aureus*: 3-5%**
- **Gram negative bacilli: 3-5%**
- **Viruses: 2-13%**

40-60% - NO CAUSE IDENTIFIED

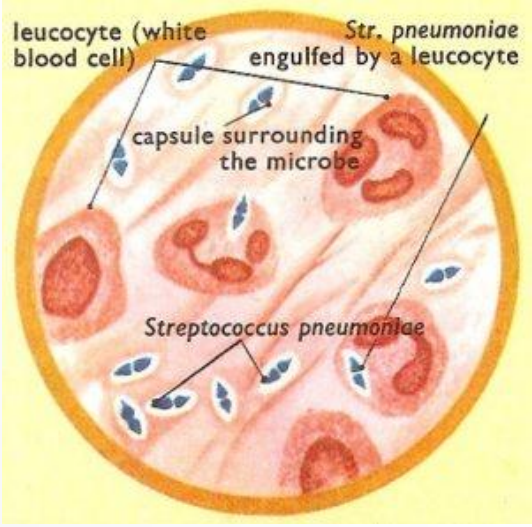
2-5% - TWO OR MORE CAUSES

Bartlett. NEJM 1995;333:1618-24

Microbial etiology of community-acquired pneumonia in patients who underwent comprehensive testing



Streptococcus pneumonia
(Pneumococcus)

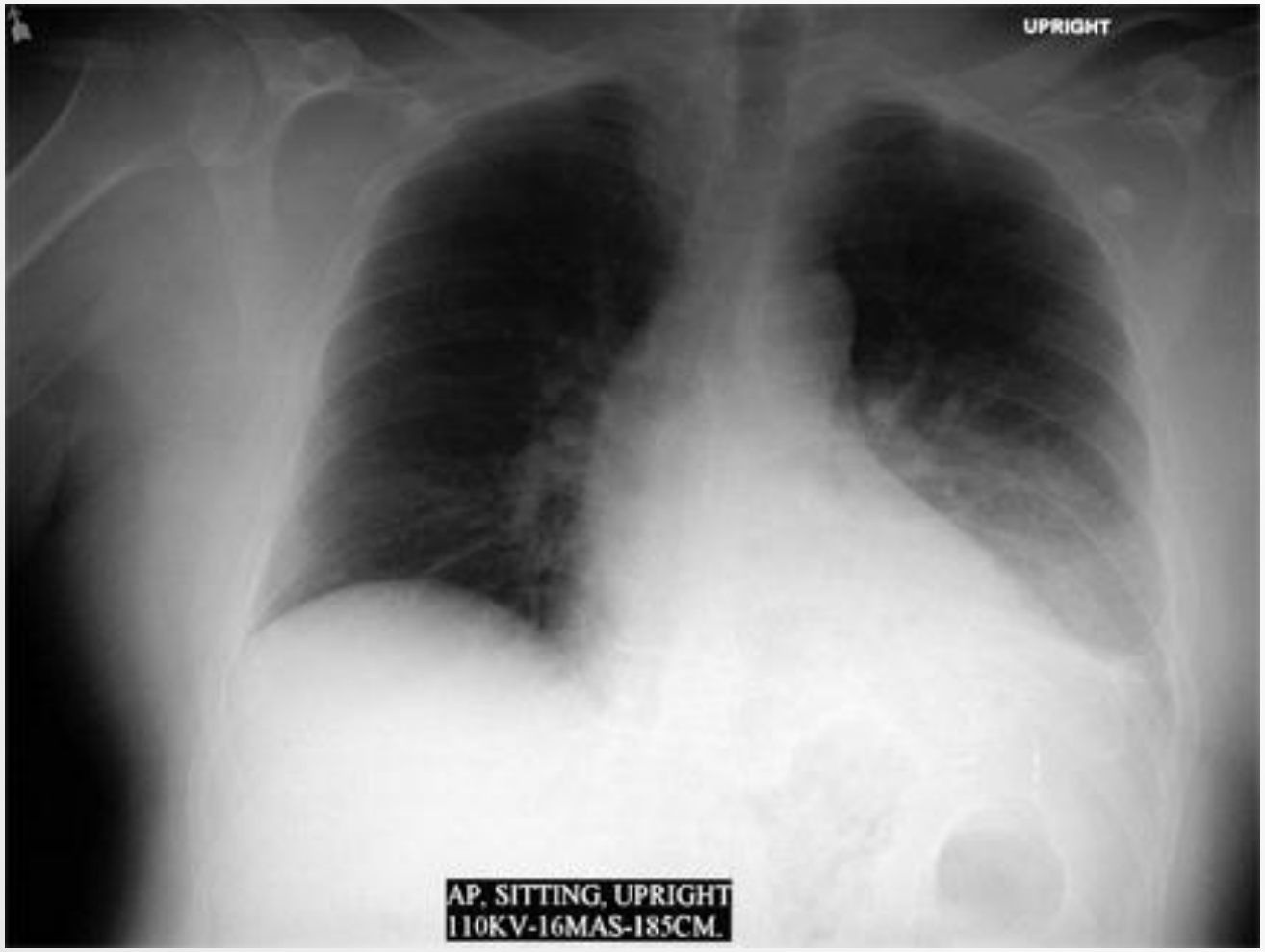


- Most common cause of CAP
- About 2/3 of CAP are due to S.pneumoniae
- These are gram positive diplococci
- Typical symptoms (e.g. malaise, shaking chills fever, rusty sputum, pleuritic chest pain, cough)
- Lobar infiltrate on CXR
- May be immunosuppressed host
- 25% will have bacteremia – serious effects

Risk Factors for Pneumococcal Pneumonia

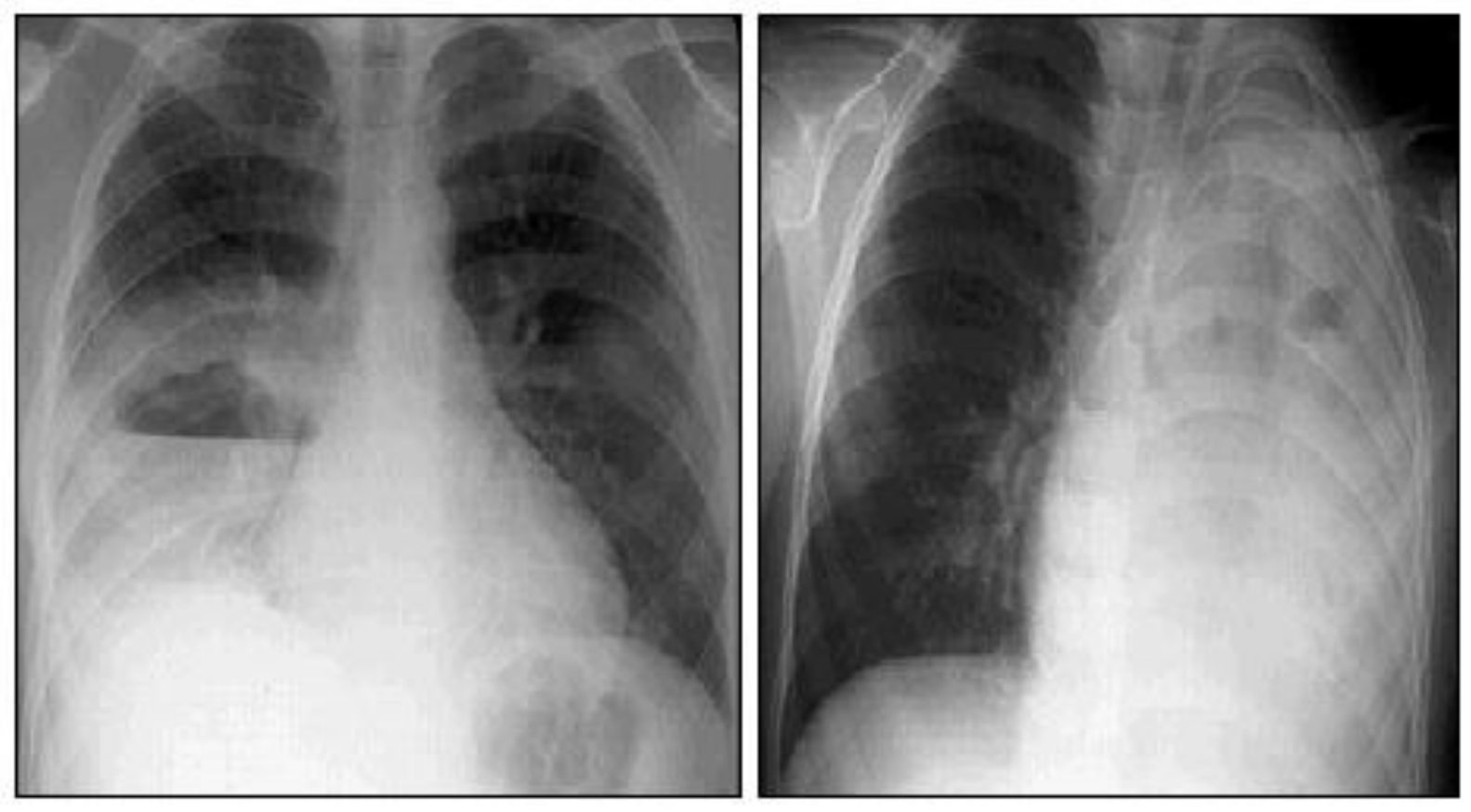
- Influenza infection
- Alcohol abuse
- Smoking--(x4 fold ⇧)
- COPD and asthma
- Hyposplenism or splenectomy
- Immunocompromise---HIV (x50-100 fold ⇧), MM, SLE, Transplant
- Others---homeless, pregnancy, crack cocaine use, incarceration

64 year old male with insulin dependent diabetes mellitus.
He was admitted with bacteremic pneumococcal pneumonia.
Note the left lower lobe opacity.



Pneumococcal pneumonia is the paradigm of **classic lobar bacterial pneumonia.**

Complications of pneumococcal pneumonia

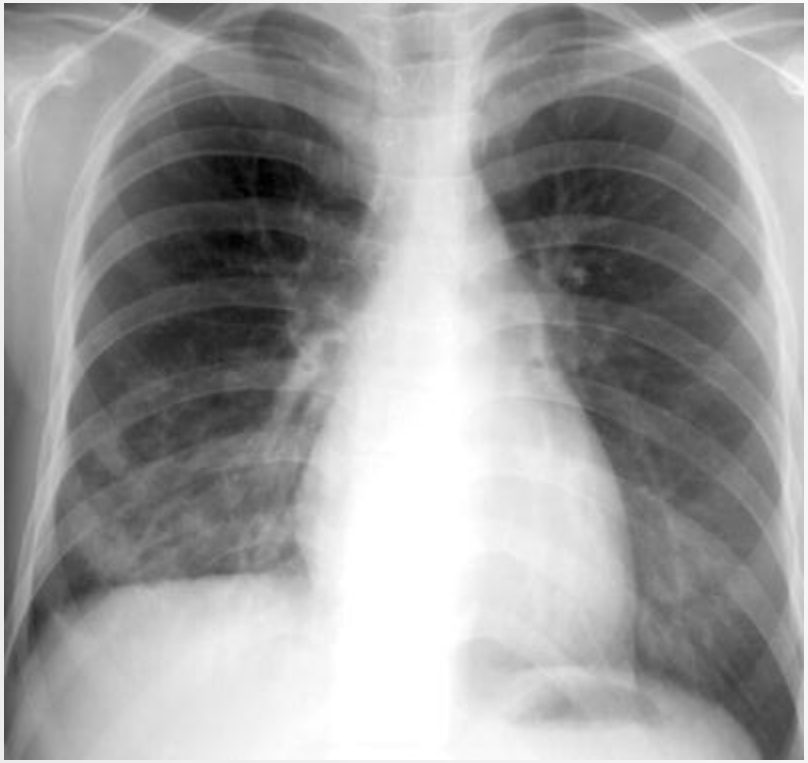


OTHER BACTERIAL PNEUMONIA

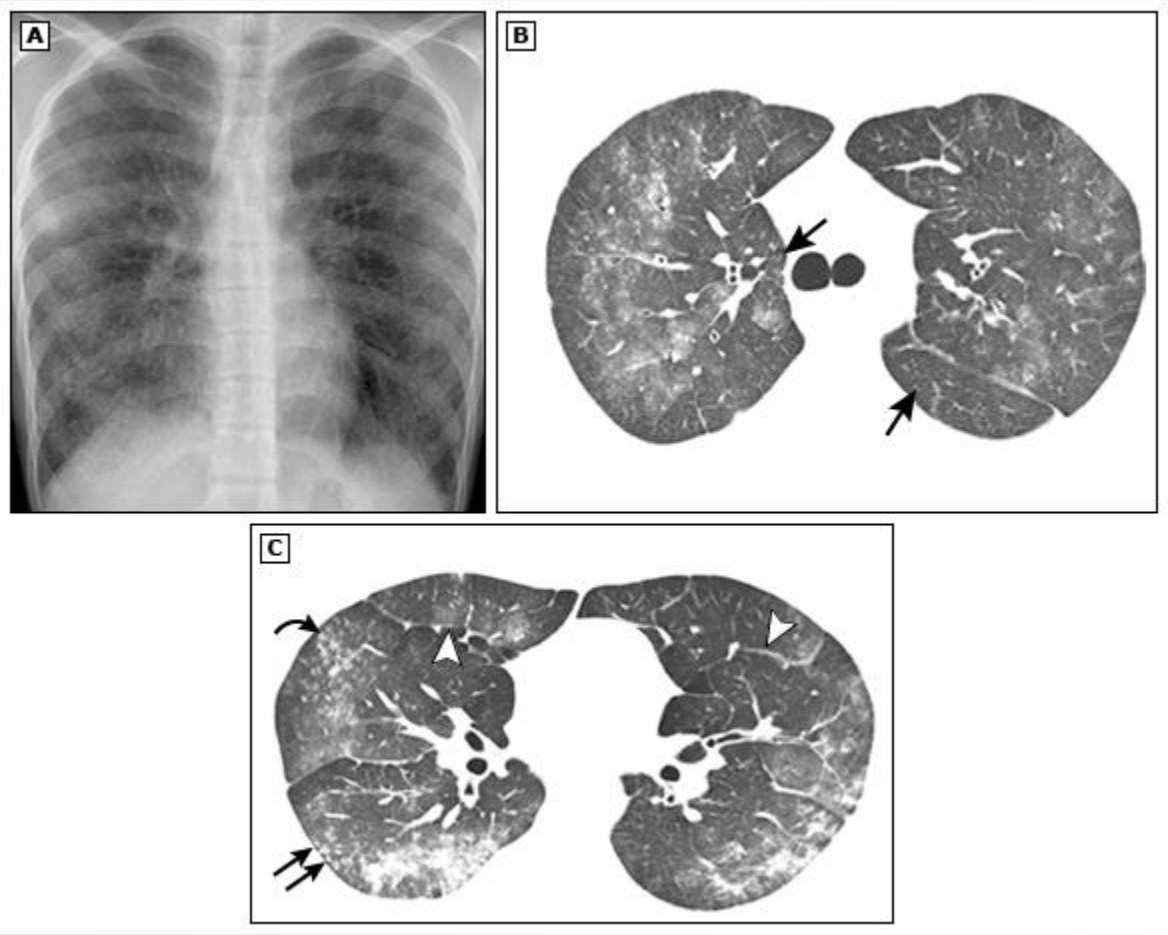
Atypical Pneumonia

- #2 cause (especially in younger population)
- Commonly associated with milder Sx's: subacute onset, non-productive cough, no focal infiltrate on CXR
- Mycoplasma: younger Pts, extra-pulm Sx's (anemia, rashes), headache, sore throat
- Chlamydia: year round, URI Sx, sore throat
- Legionella: higher mortality rate, water-borne outbreaks, hyponatremia, diarrhea

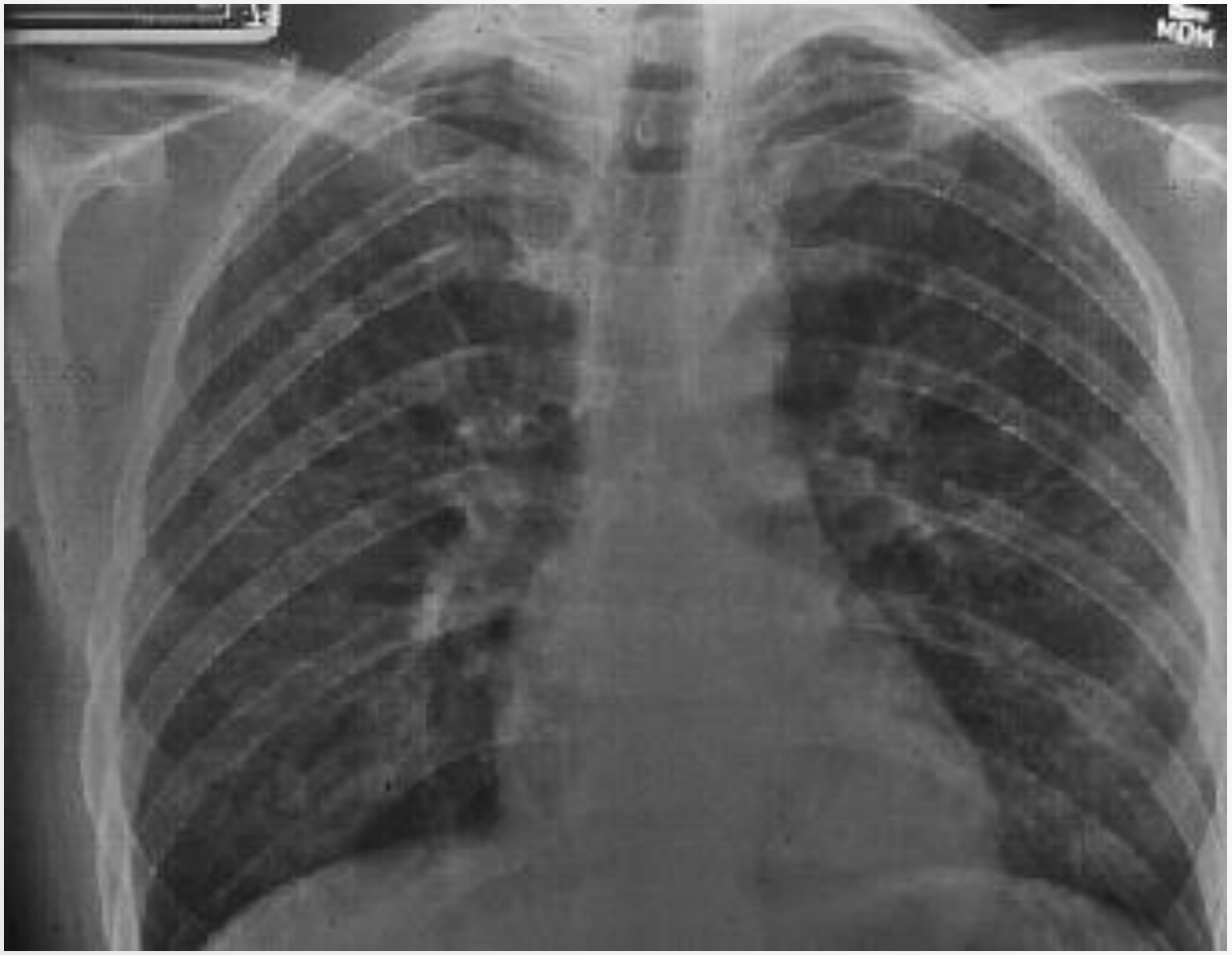
Mycoplasma pneumonia



Mycoplasma pneumonia



Pneumocystis jirovecii pneumonia in patient with AIDS



Viruses and Pneumonia

Pneumonia in the normal host

- Adults or Children
- Influenza A and B, RSV, Adenovirus, Para Influenza

Pneumonia in the immuno-compromised

- Measles, HSV, CMV, HHV-6, Influenza viruses
- Can cause a primary viral pneumonia. Cause partial paralysis of "mucociliary escalator" - increased risk of secondary bacterial LRTI. *S.aureus pneumonia* is a known complication following influenza infection.

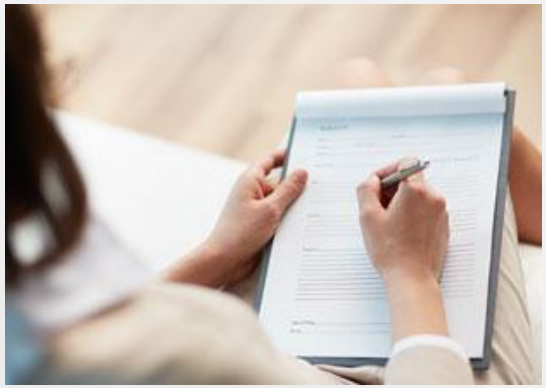
Other bacteria

- Anaerobes
  - Aspiration-prone Pt, putrid sputum, dental disease
- Gram negative
  - Klebsiella - alcoholics
  - Branhamella catarrhalis - sinus disease, otitis, COPD
  - H. influenza

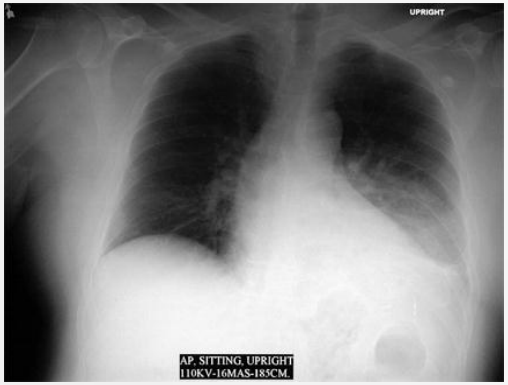
Diagnosis and Management

The approach to the patient with CAP

- begins with;



Clinical evaluation



Followed by chest radiograph

Microbiological testing

Clinical Diagnosis

- Suggestive signs and symptoms
- CXR or other imaging technique
- Microbiologic testing

Signs and Symptoms

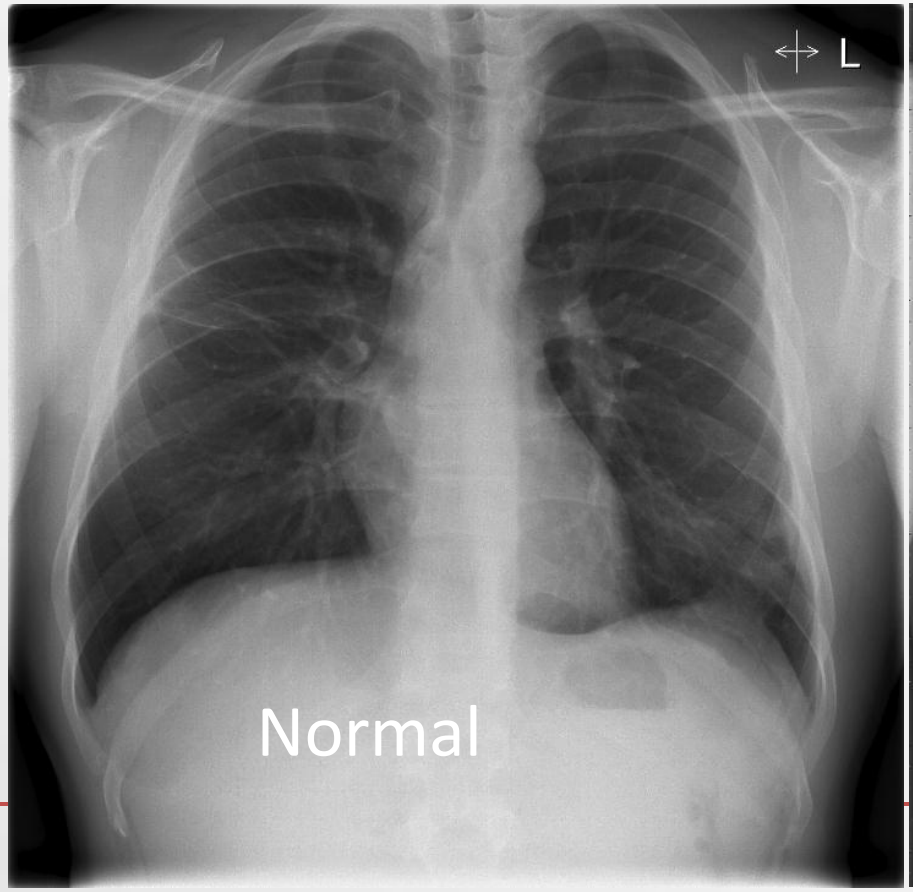
- Fever or hypothermia
- Cough with or without sputum, hemoptysis
- Pleuritic chest pain
- Myalgia, malaise, fatigue
- GI symptoms
- Dyspnea
- Rales, rhonchi, wheezing
- Egophony, bronchial breath sounds
- Dullness to percussion
- Atypical Sx's in older patients

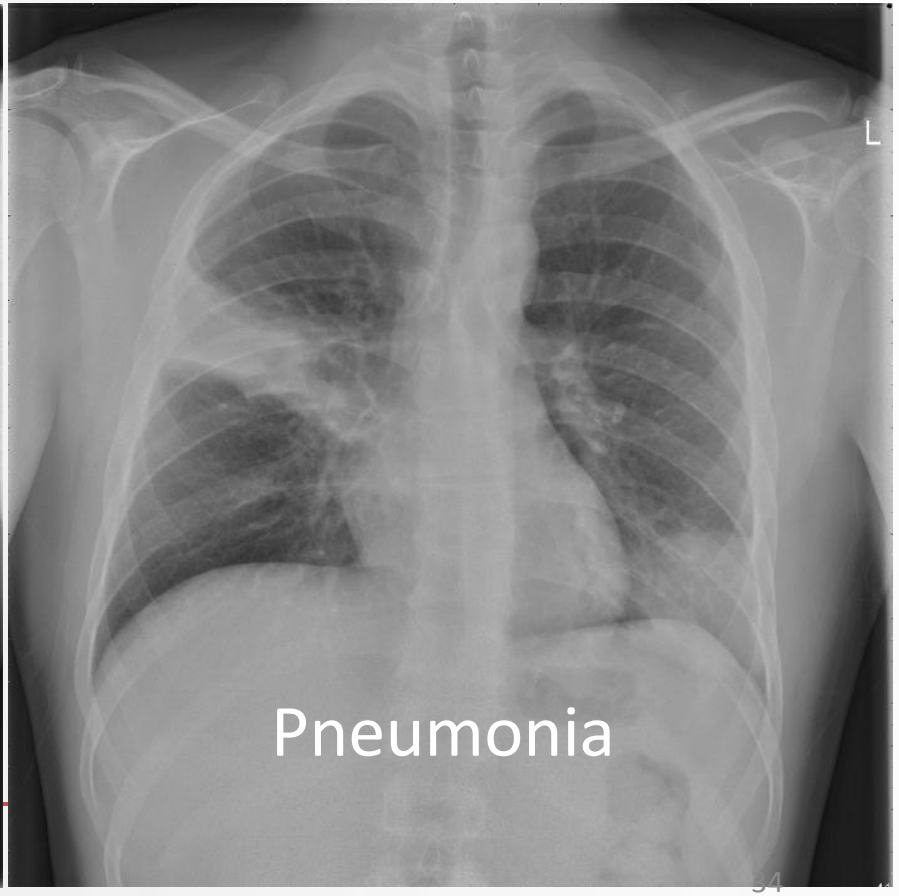
Clinical Diagnosis: CXR

- Demonstrable infiltrate by CXR or other imaging technique
  - Establish Dx and presence of complications (pleural effusion, multilobar disease)
  - May not be possible in some outpatient settings
  - CXR: classically thought of as the gold standard

Chest Radiograph

May show hyper-expansion, atelectasis or infiltrates





Clinical Diagnosis: Recommended testing

- Outpatient: CXR, sputum Cx and Gram stain not required
- Inpatient: CXR, Pox or ABG, chemistry, CBC, two sets of blood Cx's
  - If suspect drug-resistant pathogen or organism not covered by usual empiric abx, obtain sputum Cx and Gram stain.
  - Severe CAP: Legionella urinary antigen, consider bronchoscopy to identify pathogen

Community Acquired Pneumonia

Who should be hospitalized?

To Admit or Not?

Pneumonia Severity & Deciding Site of Care

- Using objective criteria to risk stratify & assist in decision outpatient vs inpatient management
- Pneumonia Severity Index (PSI)
- CURB-65
- Caveats
  - Other reasons to admit apart from risk of death
  - Not validated for ward vs ICU
  - Labs/vitals dynamic

Fine MJ, Auble TE, Yealy DM, Hanusa BH, Weissfeld LA, Singer DE, Coley CM, Marrie TJ, Kapoor WN. A prediction rule to identify low-risk patients with community-acquired pneumonia. **N Engl J Med.** 1997;336(4):243-50.

A PREDICTION RULE TO IDENTIFY LOW-RISK PATIENTS WITH COMMUNITY-ACQUIRED PNEUMONIA

MICHAEL J. FINE, M.D., THOMAS E. AUBLE, PH.D., DONALD M. YEALY, M.D., BARBARA H. HANUSA, PH.D., LISA A. WEISSFELD, PH.D., DANIEL E. SINGER, M.D., CHRISTOPHER M. COLEY, M.D., THOMAS J. MARRIE, M.D., AND WISHWA N. KAPOOR, M.D., M.P.H.

ABSTRACT

Background There is considerable variability in rates of hospitalization of patients with community-acquired pneumonia, in part because of physicians' uncertainty in assessing the severity of illness at presentation.

Methods From our analysis of data on 14,199 adult inpatients with community-acquired pneumonia, we derived a prediction rule that stratifies patients into five classes with respect to the risk of death within 30 days. The rule was validated with 1991 data on 38,039 inpatients and with data on 2287 inpatients and outpatients in the Pneumonia Patient Outcomes Research Team (PORT) cohort study. The prediction rule assigns points based on age and the presence of coexisting disease, abnormal physical findings (such as a respiratory rate of ≥30 per minute or a temperature of ≥40°C), and abnormal laboratory findings (such as a pH <7.35, a blood urea nitrogen concentration ≥30 mg per deciliter [11 mmol per liter] or a sodium concentration <130 mmol per liter) at presentation.

Results There were no significant differences in mortality in each of the five risk classes among the three cohorts. Mortality ranged from 0.1 to 0.4 per-

Hospital admission rates for pneumonia vary markedly from one geographic region to the next,[5-7] suggesting that the criteria used for hospitalization are inconsistent. Physicians often rely on their subjective impressions of a patient's clinical appearance in making the initial decision about the site of care.[8] Physicians tend to overestimate the risk of death in patients with pneumonia, and these overestimates are associated with the decision to hospitalize patients at low risk.[8]

Accurate, objective models of prognosis for community-acquired pneumonia could help physicians assess patients' risks and improve the decisions about hospitalization.[9-19] Previous models have been limit-

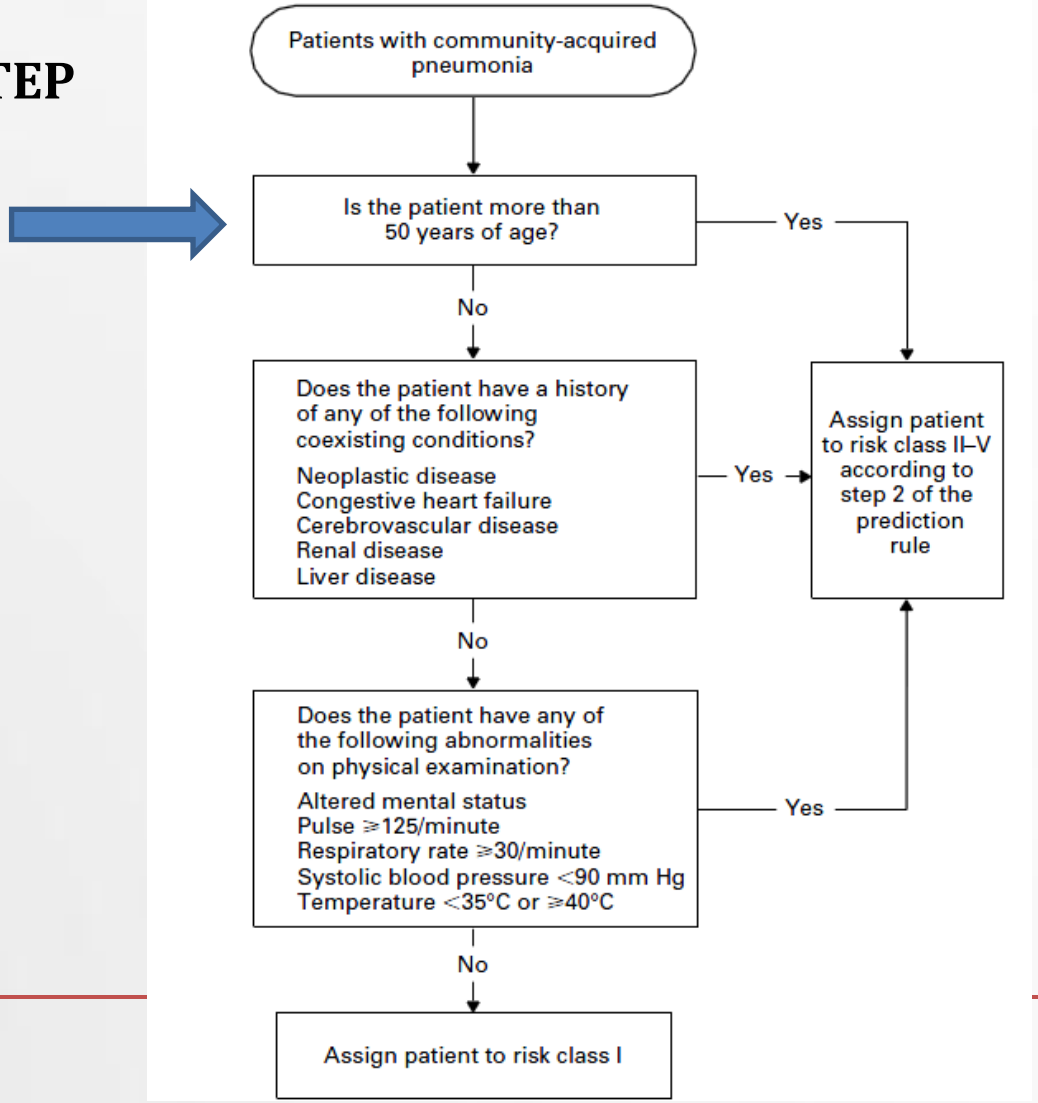
failure to validate findings in independent patient

Patient outcome Research Team (PORT) system

Pneumonia Severity Index (PSI)

Pneumonia Severity Index (PSI)

- **EVALUATED IN 2 STEP**



Pneumonia Severity Index for CAP

Characteristic	Points assigned
Demographic Factor	
Age (in years)	
• Men Age	Age
• Women Age	Age – 10
Nursing home resident	+10
Coexisting illnesses	
• Neoplastic disease	+30
• Liver disease	+20
• Congestive heart failure	+10
• Cerebrovascular disease	+10
• Renal disease	+10
Findings on Physical Examination	
Altered mental status	+20
Respiratory rate ≥30/min	+20
Systolic blood pressure <90 mmHg	+20
Temperature <35◦C or ≥40◦C	+15
Pulse ≥125 beats/min	+10
Laboratory and X-ray Findings	
Arterial pH <7.35	+30
Blood urea nitrogen ≥30 mg/dL	+20
Sodium <130 mmol/liter	+20
Glucose ≥250 mg/dL	+10
Hematocrit <30%	+10
Partial pressure of arterial oxygen <60 mmHg or O2 saturation <90%	+10
Pleural effusion	+10

PSI Class	30-day mortality
I***	0.1%
II (less than 70 points)	0.6%
III (71–90 points)	0.9%
IV (91–130 points)	**9.3%**
V (more than 130 points)	**27%**

For class I***,**

Age less than 50 years;
No cancer,
No congestive heart failure,
No cerebrovascular,
No renal disease
No liver disease;
Normal vital signs/examination.

CURB 65 Rule – Management of CAP

CURB65	
Symptom	**Points**
Confusion	1
Urea>7 mmol/l	1
Respiratory rate>=30	1
S**B**P<90mmHg, D**B**P=<60mmHg	1
Age>=**65**	1

The risk of death at 30 days increases as the score increases

- 0—0.7%
- 1—3.2%
- 2—13.0%
- 3—17.0%
- 4—41.5%
- 5—57.0%

Who Should be Hospitalized?

Class I and II	Usually do not require hospitalization
Class III	May require brief hospitalization
Class IV and V	Usually do require hospitalization

Severity of CAP with poor prognosis

RR > 30; $PaO_2/FiO2 < 250$, or $PO_2 < 60$ on room air

Need for mechanical ventilation; Multi lobar involvement

Hypotension; Need for vasopressors

Oliguria; Altered mental status

CAP – Criteria for ICU Admission

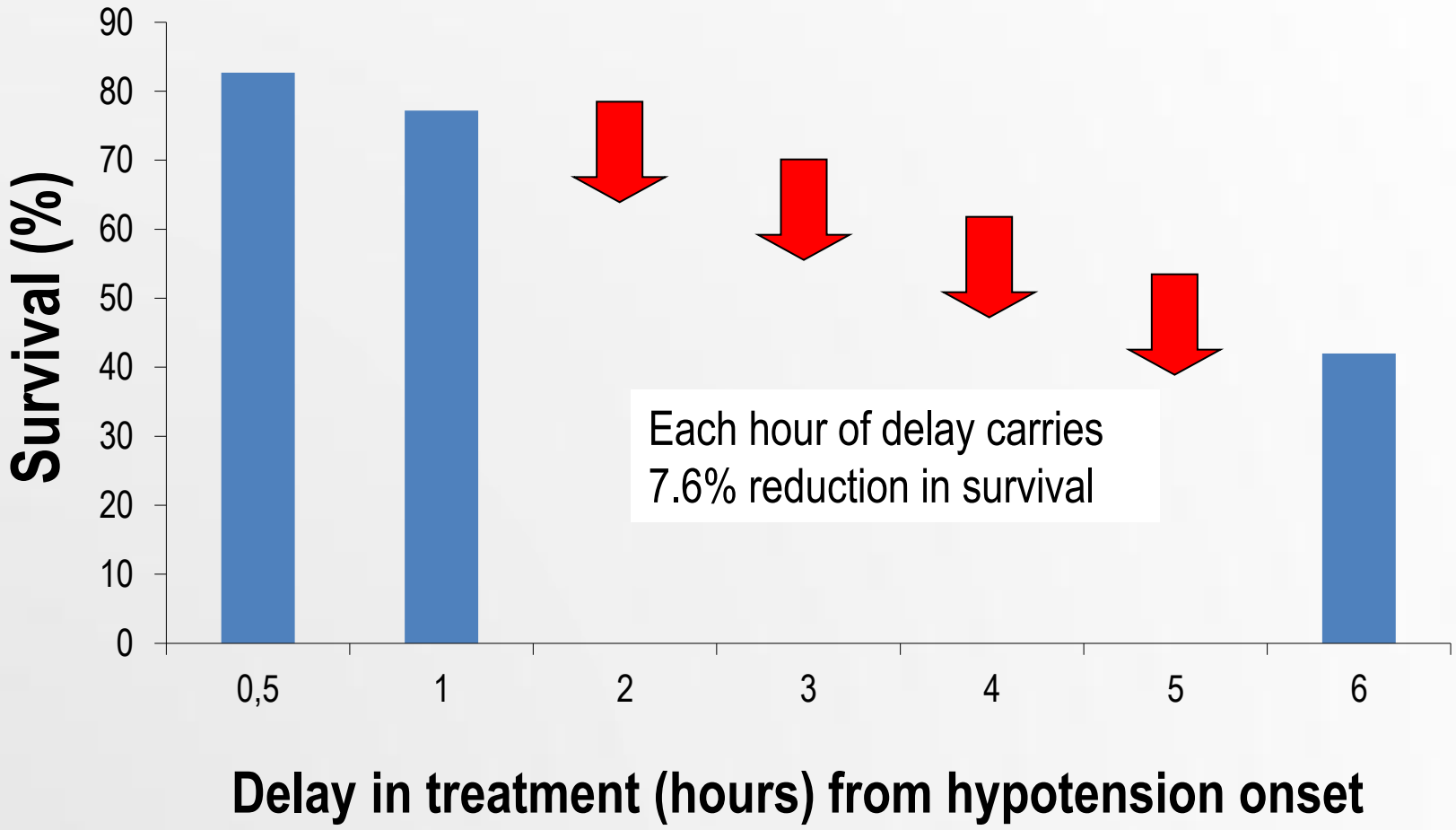
Major criteria

- Invasive mechanical ventilation required
- Septic shock with the need of vasopressors

Minor criteria (least 3)

- Confusion/disorientation
- Blood urea nitrogen ≥ 20 mg%
- Respiratory rate ≥ 30 / min; Core temperature < 36ºC
- Severe hypotension; PaO2/FiO2 ratio ≤ 250
- Multi-lobar infiltrates
- WBC < 4000 cells; Platelets <100,000

New data – The Speed of Delay ! (Class 4,5)



Kumar, et al. Crit Care Med 2006;34:1589–1596

CAP – Complications

- Hypotension and septic shock
- 3-5% Pleural effusion; Clear fluid + pus cells
- 1% Empyema thoracis pus in the pleural space
- Lung abscess – destruction of lung .
- Single (aspiration) anaerobes, *Pseudomonas*
- Multiple (metastatic) *Staphylococcus aureus*
- Septicemia – Brain abscess, Liver Abscess
- Multiple Pyemic Abscesses

WHAT ABOUT THE ANTIBIOTIC CHOICE?

Infectious Diseases Society of America/American Thoracic Society consensus guidelines (2007)

Infectious Diseases Society of America/American Thoracic Society Consensus Guidelines on the Management of Community-Acquired Pneumonia in Adults

Lionel A. Mandell,[1,a] Richard G. Wunderink,[2,a] Antonio Anzueto,[3,4] John G. Bartlett,[7] G. Douglas Campbell,[8] Nathan C. Dean,[9,10] Scott F. Dowell,[11] Thomas M. File, Jr.[12,13] Daniel M. Musher,[5,6] Michael S. Niederman,[14,15] Antonio Torres,[16] and Cynthia G. Whitney[11]

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Mandell LA, Wunderink RG, Anzueto A, et al. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. **Clin Infect Dis 2007;44:Suppl** 2:S27-S72.

MAJOR ARTICLE

Predicting Antimicrobial Resistance in Invasive Pneumococcal Infections

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(See the editorial commentary by Pantosi and Moro on pages 1298–1300)

Background. The prevalence of multiantimicrobial resistance among *Streptococcus pneumoniae* continues to increase worldwide. In patients presenting with infection possibly due to pneumococci, recognition of risk factors that would identify those likely to have an antibiotic-resistant isolate might assist clinicians in choosing the most appropriate empirical therapy.

Methods. A prospective cohort study of invasive pneumococcal infection was conducted in Toronto, Canada. Risk factors for antimicrobial resistance were evaluated by means of univariate and multivariate modeling.

Results. A total of 3339 patients with invasive pneumococcal infection were identified between 1995 and 2002. Multivariate modeling revealed that risk factors for infection with penicillin-resistant as opposed to penicillin-susceptible pneumococci were year of infection (odds ratio [OR], 1.28; $P < .001$), absence of chronic organ system disease (OR, 1.72; $P = .03$), and previous use of penicillin (OR, 2.47; $P = .006$), trimethoprim-sulfamethoxazole (TMP-SMX; OR, 5.97; $P < .001$), and azithromycin (OR, 2.78; $P = .05$). Infection with TMP-SMX–resistant pneumococci was associated with absence of chronic organ system disease (OR, 1.64; $P = .001$) and with previous use of penicillin (OR, 1.71; $P = .03$), TMP-SMX (OR, 4.73; $P < .001$), and azithromycin (OR, 3.49; $P = .001$). Infection with macrolide-resistant isolates was associated with previous use of penicillin (OR, 1.77; $P = .03$), TMP-SMX (OR, 2.07; $P = .04$), clarithromycin (OR, 3.93; $P < .001$), and azithromycin (OR, 9.93; $P < .001$). Infection with fluoroquinolone-resistant pneumococci was associated with previous use of fluoroquinolones (OR, 12.1; $P < .001$), current residence in a nursing home (OR, 12.9; $P < .001$), and nosocomial acquisition of pneumococcal infection (OR, 9.94; $P = .003$).

Conclusions. Knowledge of antimicrobial use during the 3 months before infection is crucial for determining appropriate therapy for a patient presenting to the hospital with an illness for which *S. pneumoniae* is a possible cause. Nosocomial acquisition and nursing home acquisition are significant risk factors for infection with fluoroquinolone-resistant pneumococci.

Vanderkooi OG, Low DE, Green K, Powis JE, McGeer A. Predicting antimicrobial resistance in invasive pneumococcal infections. Clin Infect Dis 2005;40:1288-97

Empirical antibiotic treatment of community-acquired pneumonia

Patient variables	Treatment options
OUTPATIENTS	
Previously well and no antibiotic use within 3 mo	**Macrolide (erythromycin, clarithromycin, azithromycin) OR Doxycycline**
Comorbidities* or antibiotic use within 3 mo	**Respiratory fluoroquinolone (moxifloxacin, levofloxacin, gemifloxacin) OR Telithromycin OR Beta-lactam (high-dose amoxicillin or amoxicillin-potassium clavulanate, cefpodoxime proxetil, cefuroxime, cefprozil, cefdinir + macrolide**
High level of macrolide-resistant *S pneumoniae*	**Respiratory fluoroquinolone OR Telithromycin**

Outpatient treatment

- The key to appropriate therapy is adequate coverage of
  - Streptococcus pneumoniae and
  - atypical bacterial pathogens (mycoplasma, chlamydia, and legionella).

- For outpatients, the coverage of atypical bacterial pathogens is most important, especially for young adults.***

- Macrolides, doxycycline, and fluoroquinolones are the most appropriate agents for the atypical bacterial pathogens.

*** Wunderink RG, Waterer GW. Community-acquired pneumonia.N Engl J Med. 2014;370(19):1863.

INPATIENTS	
General ward	Respiratory fluoroquinolone OR Beta-lactam (cefotaxime sodium, ceftriaxone sodium, ampicillin sodium-sulbactam sodium, ertapenem + macrolide (azithromycin, clarithromycin) OR Beta-lactam plus telithromycin OR Beta-lactam plus doxycycline
ICU (*Pseudomonas* is *not* an issue)	Beta-lactam (cefotaxime, ceftriaxone, ampicillin-sulbactam, ertapenem + macrolide (azithromycin) OR Beta-lactam plus respiratory fluoroquinolone
ICU (*Pseudomonas is* an issue)	Beta-lactam (piperacillin sodium, cefepime HCl, imipenem, meropenem (plus either ciprofloxacin or levofloxacin OR Beta-lactam plus aminoglycoside plus macrolide (azithromycin
ICU (*S aureus* ,especially CA-MRSA, is a consideration)	Add linezolid or vancomycin to an appropriate CAP regimen

IDSA: Inpt Management-Severe/ICU

- One of two major criteria:
  - Mechanical ventilation
  - Septic shock, OR
- Two of three minor criteria:
  - SBP≤90mmHg,
  - Multilobar disease
  - PaO2/FIO2 ratio < 250
- Organisms: S. pneumo, Legionella, GN, Mycoplasma, viral, ?Pseudomonas

Switch to Oral Therapy

- Four criteria:
  - Improvement in cough and dyspnea
  - Afebrile on two occasions 8 h apart
  - WBC decreasing
  - Functioning GI tract with adequate oral intake
- If overall clinical picture is otherwise favorable, can can switch to oral therapy while still febrile.

Duration of Therapy

- Minimum of 5 days
- Afebrile for at least 48 to 72 h
- No > 1 CAP-associated sign of clinical instability
- Longer duration of therapy

If initial therapy was not active against the identified pathogen or complicated by extra pulmonary infection

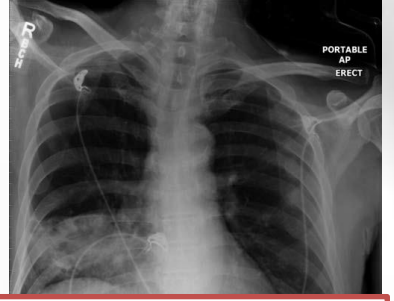
Prevention

- Smoking cessation
- Vaccination per ACIP recommendations
  - Influenza
    - Inactivated vaccine for people >50 yo, those at risk for influenza compolications, household contacts of high-risk persons and healthcare workers
    - Intranasal live, attenuated vaccine: 5-49yo without chronic underlying dz
  - Pneumococcal
    - Immunocompetent ≥ 65 yo, chronic illness and immunocompromised ≤ 64 yo

OUR CASES?.....

Cases

Case 1



- The patient's calculated Pneumonia Severity Index (PSI) score was 117 (62 points for male age, 10 points for respiratory rate greater than 29, 15 points for temperature greater than or equal to 40◦C and 20 points for sodium less than 130 mEq/L), which placed him in Risk Class IV.
- This estimated his 30-day mortality risk at 9.3%.
- The patient received moxifloxacin 400 mg IV, albuterol nebulized treatments and was admitted to the medicine service.
- Intravenous antibiotics were continued, and the patient's symptoms improved by hospital day #3, at which time he was afebrile with a room air oxygen saturation of 98%.
- He was discharged on hospital day #4 to complete a ten-day course of oral moxifloxacin, with close follow up arranged with his primary care provider.
- He was encouraged to stop drinking, and was given resources to assist him.

Case 2

- **The woman has a CURB-65 score of 4, suggesting that she would benefit from inpatient therapy.**
- **She has at least four minor criteria for severe community-acquired pneumonia (confusion, respiratory rate ≥30 breaths per minute, multilobar infiltrates, and uremia).**
- **Although ICU admission may be prudent, she would clearly benefit from further evaluation.**
- **We would measure the arterial blood gas and lactate levels, given the high respiratory rate and low saturation,and hydrate aggressively.**
- **As a nursing home resident, the patient meets the current criteria for health care–associated pneumonia.**
- **However, since she has no pneumonia-specific MDR risk factors but does have risk factors for severe community-acquired pneumonia, we would initiate treatment with ceftriaxone and azithromycin.**
- **Influenza testing should be requested if she has presented during the appropriate season, and empirical oseltamivir started if the local influenza rate is high.**
- **We would not obtain blood cultures or attempt to obtain sputum cultures because of the low likelihood of the presence of pathogens resistant to usual treatment for community-acquired pneumonia.**

Summary

- Patients with CAP appropriate for the outpatient setting have a low mortality
  - (less than 1%) compared to hospitalized patients, who have a mortality rate of approximately 15%.
- *Streptococcus pneumoniae* is the most commonly diagnosed etiology of CAP among hospitalized patients.
- Laboratory tests have little use in outpatient management of patients with CAP, whereas tests obtained on admitted patients should include electrolytes, blood urea nitrogen, serum glucose and complete blood count (CBC).
- Blood cultures should be obtained in seriously ill and admitted patients with CAP, preferably before the initiation of antibiotics.
- Disease-specific prediction rules (e.g., Pneumonia Severity Index and CURB-65) can be used to assess the initial severity of pneumonia, predict the risk of death and aid in deciding which patients diagnosed with CAP require hospital admission.

Questions? Comments?

THANK YOU