Community Acquired Pneumonia

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Introduction CAP

- 4 million cases/year of CAP with
- up to 1million hospital admissions
- Incidence increasing among the elderly
  - 915,000 cases in adults ≥ 65 years
- Cost $40 billion a year

Gleason PP, et al. JAMA 1997;278:32; Clinton MJ, Chest 1992;102:174S; Marston BJ, Arch Int Med 1997;157:1709; Jackson ML, Clin Infect Dis 2004;39:1642; Augustine S, J Resp Dis 2007;38:489

Introduction CAP

- 8th leading cause of death in the US
- 6th leading cause of death in the US in those over age 65

- Mortality
  - Outpatient <1%
  - Admit (ward) 10%-14%
  - ICU 30%-40%

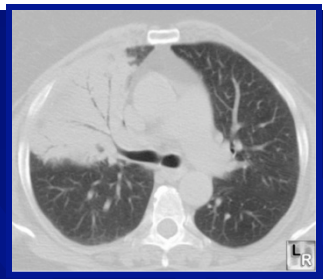
Bartlett JG et al. *Clin Infect Dis*. 2000; 31:347-382.

Gleason PP, et al. JAMA 1997;278:32; Clinton MJ, Chest 1992;102:174S; Marston BJ, Arch Int Med 1997;157:1709; Jackson ML, Clin Infect Dis 2004;39:1642; Augustine S, J Resp Dis 2007;38:489

Guidelines for CAP

- First available in 1993
- The most recent guidelines for the US were published in 2007
  - Joint effort of the American Thoracic Society (ATS) and the Infectious Diseases Society of America (IDSA)
- Clinical guidelines have proven to be useful for predicting mortality, triaging patients, treatment recommendations, and preventive measures.

Definition (IDSA)

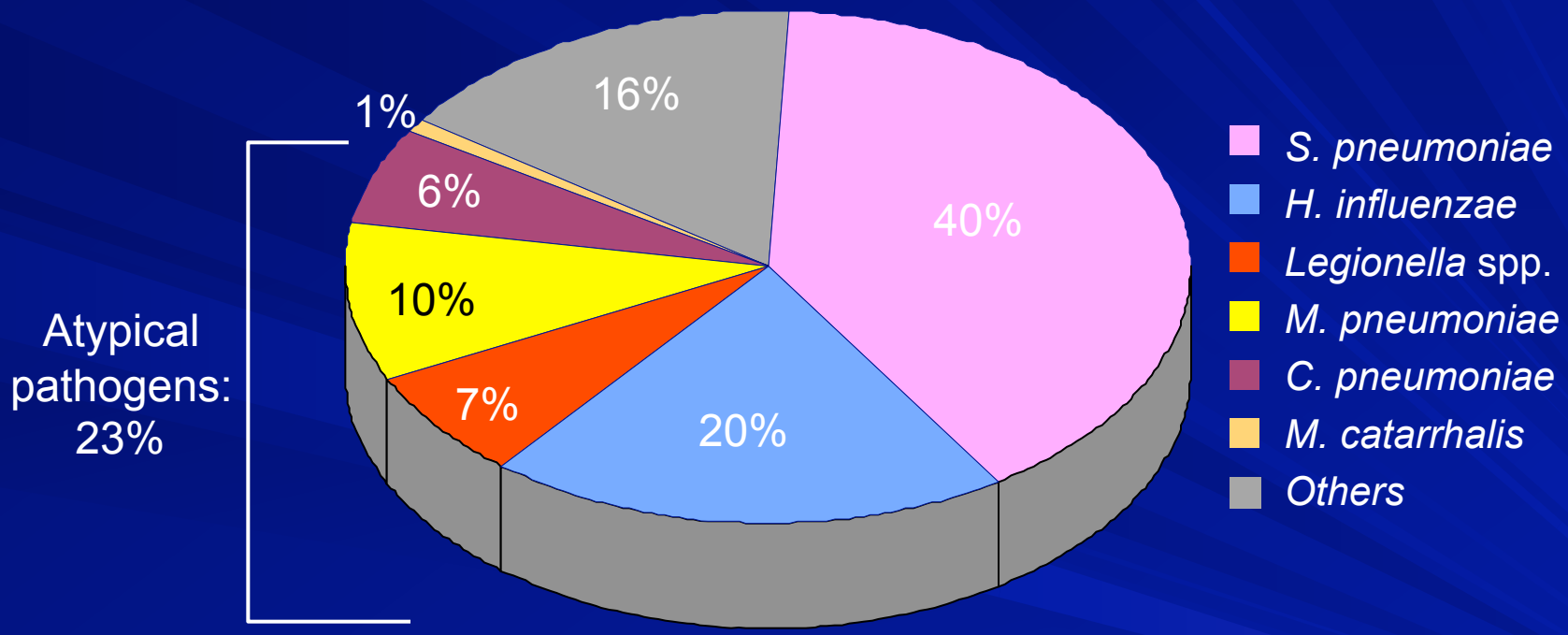


- Acute infection of the pulmonary parenchyma accompanied by:
  - Acute infiltrate on CXR or auscultatory findings consistent with pneumonia
  - And usually two of the following:
    - **fever** or hypothermia
    - rigors, sweats
    - new **cough** with or without sputum (or change in color)
    - chest discomfort
    - **dyspnea**
  - In the elderly, more common to be afebrile/ hypothermic, and **altered mental status** sometimes is the ONLY complaint.

Classification of Infections:

- **Healthcare-associated Pneumonia (HCAP)**
  - An infection in a patient who:
    - was hospitalized in an acute care hospital for ≥ 2 days within 90 days of the infection
    - resides in a nursing home or long-term care facility
    - received recent iv antibiotic therapy, chemotherapy or wound care within the past 30 days of the infection
    - attended a hospital or hemodialysis clinic
- **Hospital-acquired pneumonia (HAP)**
  - An infection/pneumonia that occurs ≥48 hrs after admission and was not incubating at admission
- **Ventilator-associated Pneumonia (VAP)**
  - pneumonia at > 48-72 hrs after endotracheal intubation

CAP: Key Bacterial Pathogens



2-5% CA Staphylococcus has been reported

Reimer LG, Carroll KC. *Clin Infect Dis.*1998;26:742-748; Marrie TJ. *Infect Dis Clin North Am.* 1998;12:723-740; Bartlett JG et al. *Clin Infect Dis.* 1998;26:811-838.

Epidemiologic Considerations in CAP

Condition	**Commonly Encountered Pathogens**
Alcoholism	*S.Pneumoniae* (including DRSP), anaerobes, Gram-negative bacilli, tuberculosis
COPD/smoker	*S. pneumoniae, H, infuenza, M. catarrhalis, Legionella*
Nursing home residency	*S. pneumoniae*, Gran-negative bacilli, *H. infuenza, S. aureus*, anaerobes, *C. pneumoniae*, tuberculosis
Poor Dental Hygiene	Anaerobes

Epidemiologic Considerations in CAP

Condition	**Commonly Encountered Pathogens**
Epidemic Legionnaire's disease	*Legionella* species
Exposure to bats	*Histoplasma capsulatum*
Exposure to birds	*Chlamydia psittaci, Cryptococcus neoformans, H. capsulatum*
Exposure to rabbits	*Francisella tularensis*

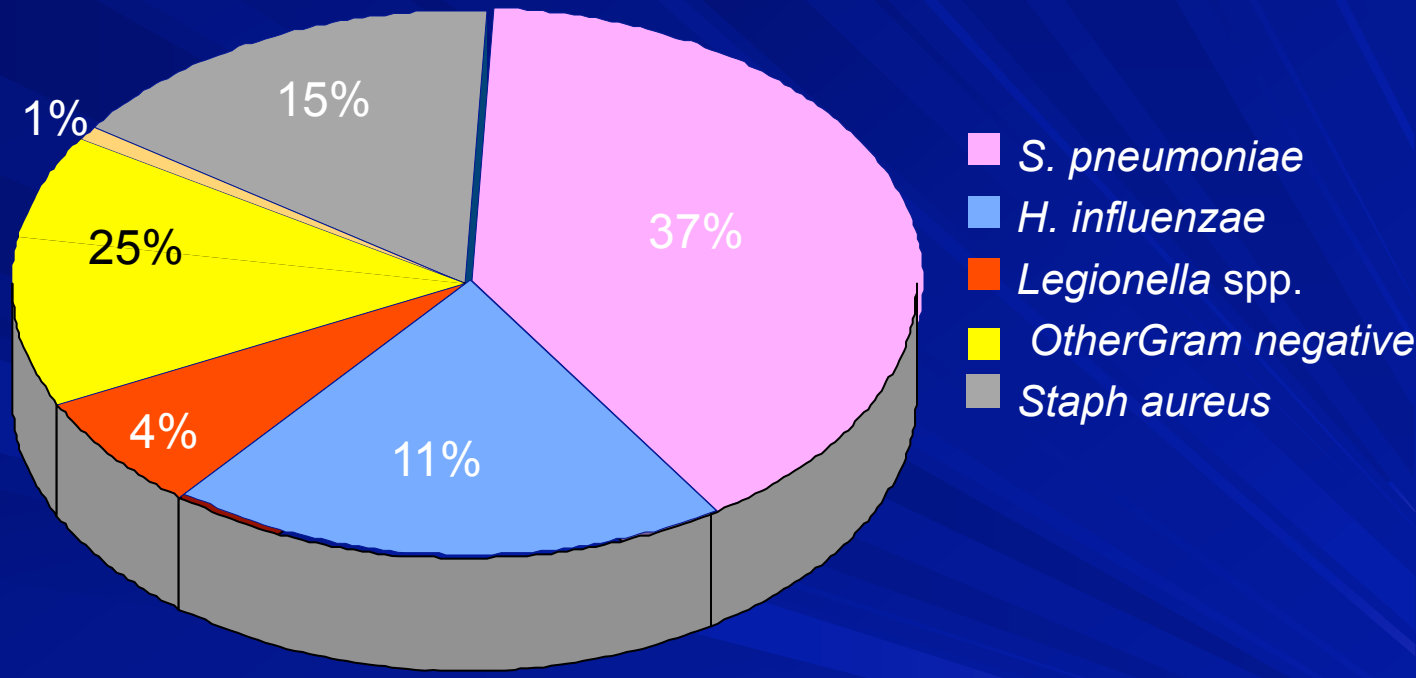
Epidemiologic Considerations in CAP

Condition	**Commonly Encountered Pathogens**
Travel to southwest US	*Coccidioidomycosis*
Exposure to farm animals or parturient cats	*Coxiella burnetti* (Q fever)
Influenza active in the community	*Influenza, S. pneumoniae, S. aureus, H. influenzae*
Suspected large-volume aspiration	Anaerobes, chemical pneumonitis, or obstruction

Epidemiologic Considerations in CAP

Condition	**Commonly Encountered Pathogens**
Structural disease of lung (bronchiectasis, cystic fibrosis, etc)	*P. aeruginosa, Pseudomonas cepacia, S. aureus*
Injection drug use	*S. aureus,* anaerobes, tuberculosis, *Pneumocystis carinii*
Endobronchial obstruction	Anaerobes
Recent antibiotic therapy	Drug-resistant pneumococci, *P. aeruginosa*

HCAP: Key Pathogens



HAP and VAP show a progressive higher incidence of Gram negatives and MDR

Approach to diagnosis of CAP

- History (sick contacts, exposures, travel, pets, risks for immunosuppression)
  - Nursing home, recent admission, antibiotics, smoking status, skin rashes, dental work COPD, vaccination status, exposure to animals, nausea, vomiting, unconscious
- Physical exam
- CXR (pa/lat)
- Labs: CBC, chemistry, LFT's, blood cultures, sputum, ABG if hypoxic

Case

- 45 yr old man presents to ER
- Cough, dyspnea, recent flu-like illness followed by sudden onset of fever and weakness
- Hx: 10 pack-year smoker, DM II
- Exam:
  - HR 100, RR 24, BP normal, T 38C, basal crackles
- SaO2 93%,
- WBC 13,000
- BUN 7.8

Case

Based on this person's level of illness, what is the most appropriate next step?

1. Admit to ward
2. Treat and send home
3. Ask for CT scan
4. Consult infectious disease specialist
5. Sputum culture

Can you stratify Patients According to Risk of Mortality?

- Hospital admission decision
- – CURB-65 severity of illness score (based on confusion, uremia, respiratory rate, low blood pressure, age 65 years of greater)
- – PSI (Pneumonia Severity Index) another more complicated stratification

CURB - 65

Clinical Factor	Points
C- Confusion	1
U- Urea > 19mg/dL	1
R- Respiratory Rate ≥ 30/min	1
B – BP: Systolic < 90 mmHg Diastolic ≤ 60 mmHg	1
65- Age > 65 years	1
Total	

Lim, WS, Thorax 2003;58:377

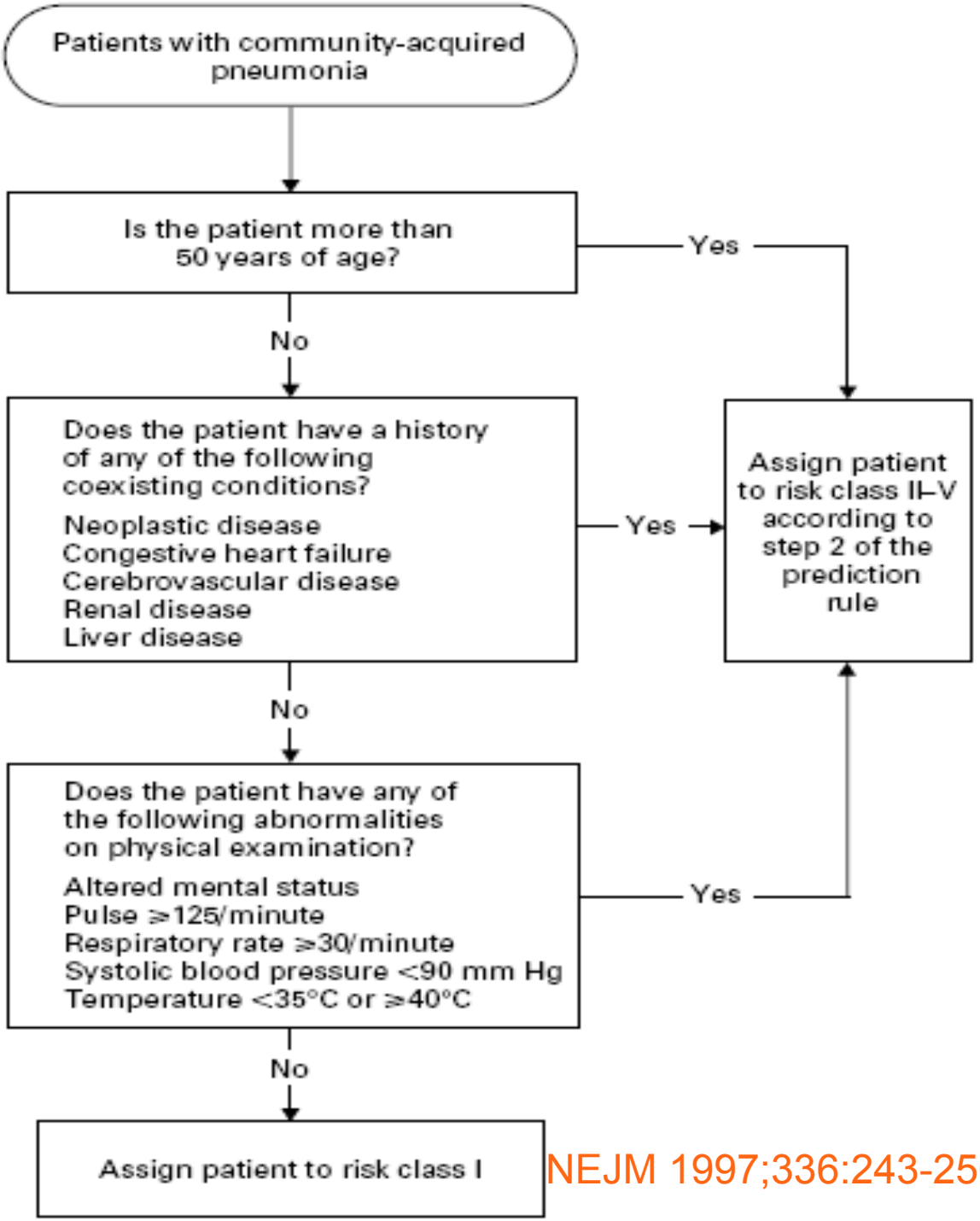
CURB- 65 Score

CURB-65 score	Deaths/total (%)*	Recommendation†
0	7/1,223 (0.6)	Low risk; consider home treatment
1	31/1,142 (2.7)	
2	69/1,019 (6.8)	Short inpatient hospitalization or closely supervised outpatient treatment
3	79/563 (14.0)	Severe pneumonia; hospitalize and consider admitting to intensive care
4 or 5	44/158 (27.8)	

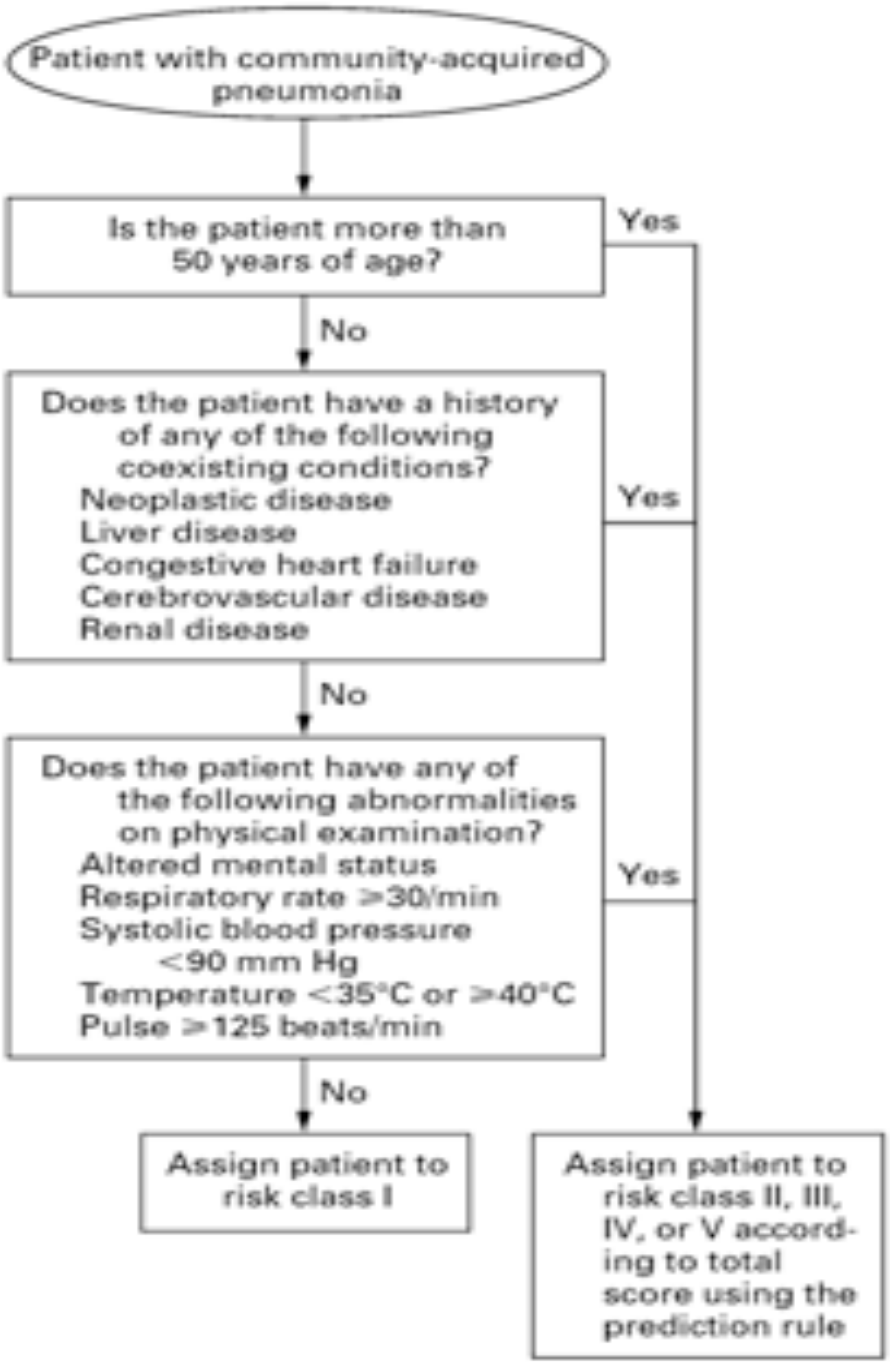
Thorax. 2003;58:377-382.

Pneumonia

PORT Prediction Rule for Mortality Risk Assessment



NEJM 1997;336:243-250



Characteristic	No. of Points Assigned
Demographic factors	
Age	
Men	Age (in yr)
Women	Age (in yr) − 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 mm Hg	+20
Temperature <35°C or ≥40°C	+15
Pulse ≥125 beats/min	+10
Laboratory and radiographic findings	
Arterial pH <7.35	+30
Blood urea nitrogen ≥30 mg/dl (11 mmol/liter)	+20
Sodium <130 mmol/liter	+20
Glucose ≥250 mg/dl (14 mmol/liter)	+10
Hematocrit <30%	+10
Partial pressure of arterial oxygen <60 mm Hg or oxygen saturation <90%	+10
Pleural effusion	+10

Stratification of Risk Score

Risk	Risk Class	Score	Mortality
Low	I	Based on algorithm	0.1%
Low	II	≤70	0.6%
Low	III	71–90	0.9%
Moderate	IV	91–130	9.3%
High	V	>130	27.0%

PORT Score

Total Points	Class	Treat	Mortality
None (see step 1)	I	Outpatient	0.4%
≤70	II	Outpatient	0.6%
71-90	III	Brief Inpatient	2%
91-130	IV	Inpatient	8-9%
≥130	V	Inpatient	20-30%

NEJM 1997;336:243-250

Modified ATS Criteria of Severity

- 2 of baseline (minor) clinical parameters:
  - Systolic BP < 90 mm Hg
  - Multilobar involvement
  - PaO2/FiO2 <250

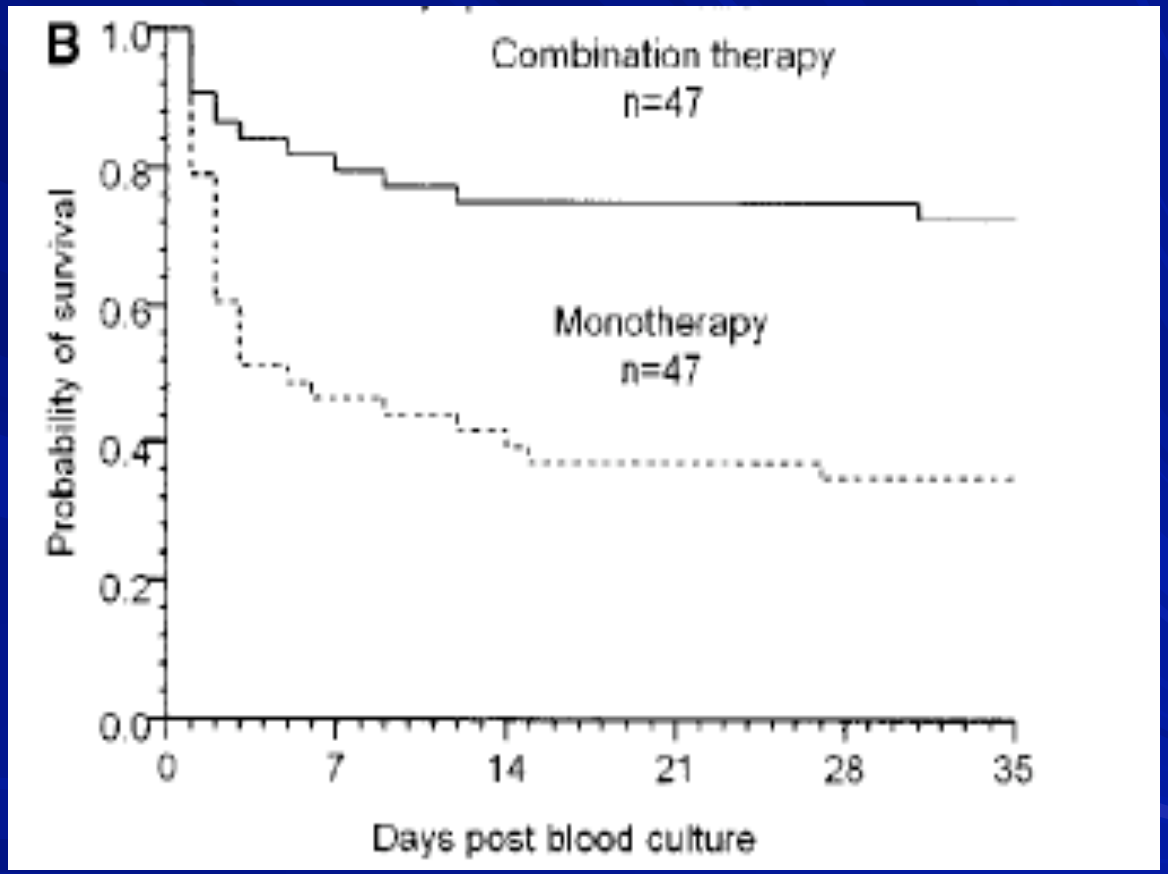
    or
- 1 of 2 major parameters
  - Requirement of mechanical ventilation
  - Septic shock

AJRCCM 1998; 158:1102-8

Role of Combination Therapy in CAP

Combination Therapy in Severe CAP

- Prospective, multicenter observational study
- 844 adults bacteremia S. pneumoniae
- Critically ill mortality reduced 23% vs 55 %, p=0.0015



AJRCCM 2004;170-440-444

Table 2. *Group II: Outpatient, With Cardiopulmonary Disease and/or Other Modifying Factors*

Organisms	Therapy
S pneumoniae including DRSP *M pneumoniae* *C pneumoniae* Mixed infection *H influenzae* Enteric Gram-negatives Respiratory viruses Miscellaneous *M catarrhalis*, Legionella spp, aspiration (anaerobes),	β-lactam (cefpodoxime, cefuroxime, high-dose amoxicillin, amoxicillin/clavulanate, plus macrolide or doxycycline, or antipneumococcal fluoroquinolone

Table 5. *Inpatients, ICU-Admitted Patients (Risk for Pseudomonas)*

Organisms	Therapy
All of the pathogens in Table 4 plus *P aeruginosa*	Selected IV antipseudomonas β-lactam (cefepime, imipenem, meropenem, piperacillin/tazobactam), plus IV antipseudomonal quinolone (ciprofloxacin), or selected IV antipseudomonas β-lactam (cefepime, imipenem, meropenem, piperacillin/tazobactam), plus IV aminoglycoside, plus IV macrolide or IV nonpseudomonal fluoroquinolone

Pneumococcal Vaccine

- Rate of disease caused by PRSP was 35% lower in 2001 than in 1999
- >65 years of age
  - ↓18% (49.5 per 100,000 vs 60.1 per 100,000)

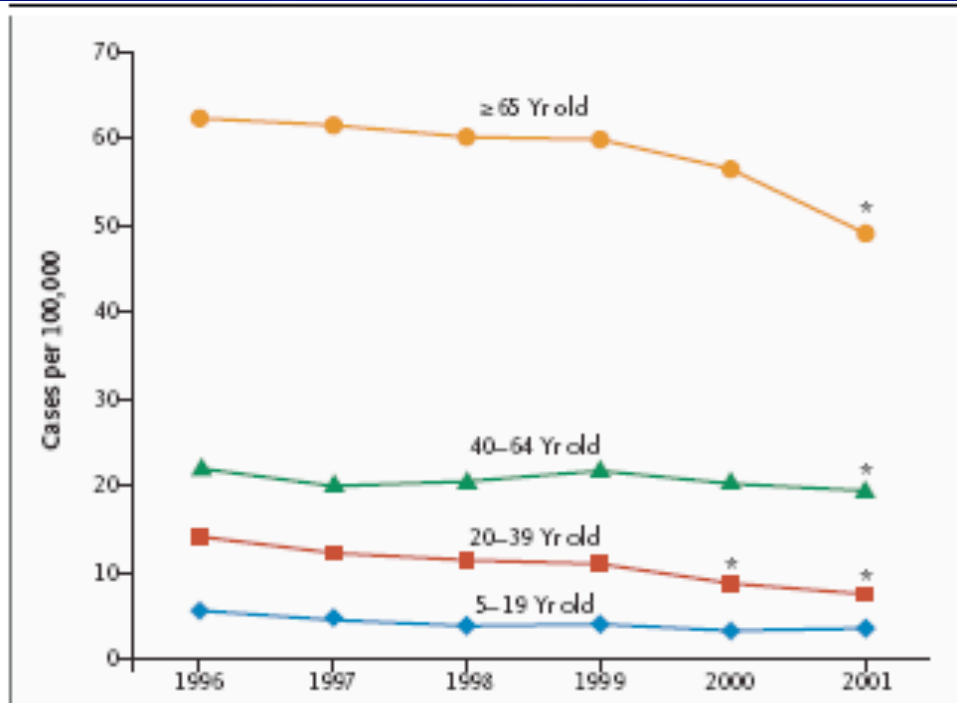


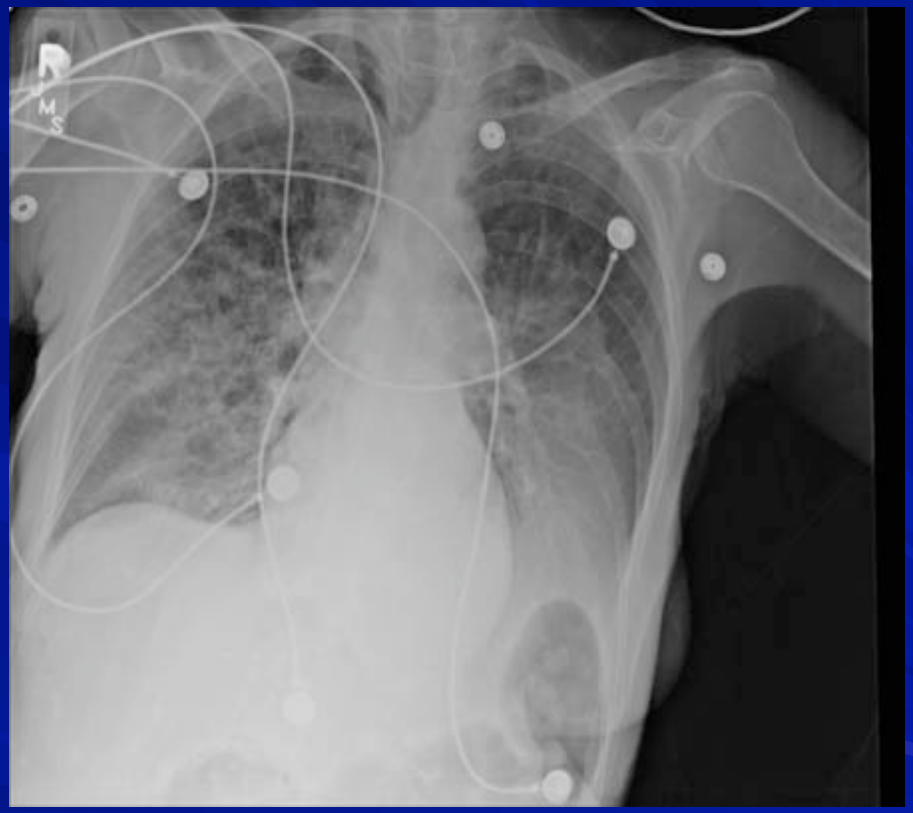
Figure 3. Rates of Invasive Pneumococcal Disease among Persons at Least Five Years Old, According to Age Group and Year.

Data are from the Active Bacterial Core Surveillance from 1996 through 2001. The 1996 and 1997 rates do not include data from New York State. Asterisks indicate $P<0.05$ for comparisons of the rate in 2000 or 2001 with the combined rate for 1998 and 1999.

NEJM 2003;348:1737-46

Case 2

- 30 y/o woman comes to ED at 4:00am with acute fever, cough, dyspnea. Recent viral syndrome
- Severely hypoxemic
- Intubated
- Tx: 3rd Gen Ceph plus FQ



Case 2

- Gram stain of ET aspirate reveal Gram positive cocci in clusters
- Vancomycin is added
- Patient with Multi-organ dysfunction; expires at 4:00 pm
- CA-MRSA isolated
  - PVL+ (Panton Valentine Leukocidin)

Community-acquired MRSA

- Severe, rapidly progressing, necrotizing pneumonia
- Associated with skin and soft tissue infections
- Hx of preceding influenza-like illness
- May be related to staphylococcal virulence factor PVL
- Resistant to all β-lactams including cephalosporins, cefamycins, and carbapenems

Community-acquired MRSA

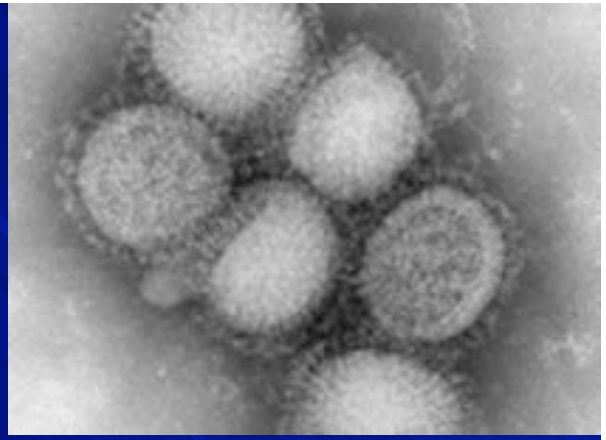
- For toxin-producing strains, antibiotics that inhibit protein synthesis may be better
  - Linezolid or clindamycin (not vanco!!!!)
- Characteristics:
  - Mean age
  - Underlying disorder
  - Prior influenza
  - Received appropriate tx
  - Highly virulent pathogen

Clin Infect Dis. 2005; 40: 1376

Conclusions

- S. Pneumonia remains the most important pathogen in CAP
- Several tools available to identify high risk candidates
- Local rates of bacterial resistance should be considered in the selection of antimicrobial tx.
- Legionella should be covered in all empiric regimens of severe CAP
- Watch out for severe viral pneumonia
- Look out CA-MRSA

Novel H1N1 Flu



- Influenza virus
- Quadrupple resonant virus.
  - Contains genes from pig, bird and human influenza viruses
  - a combination that has never been observed before anywhere in the world
- Spreads from human to human

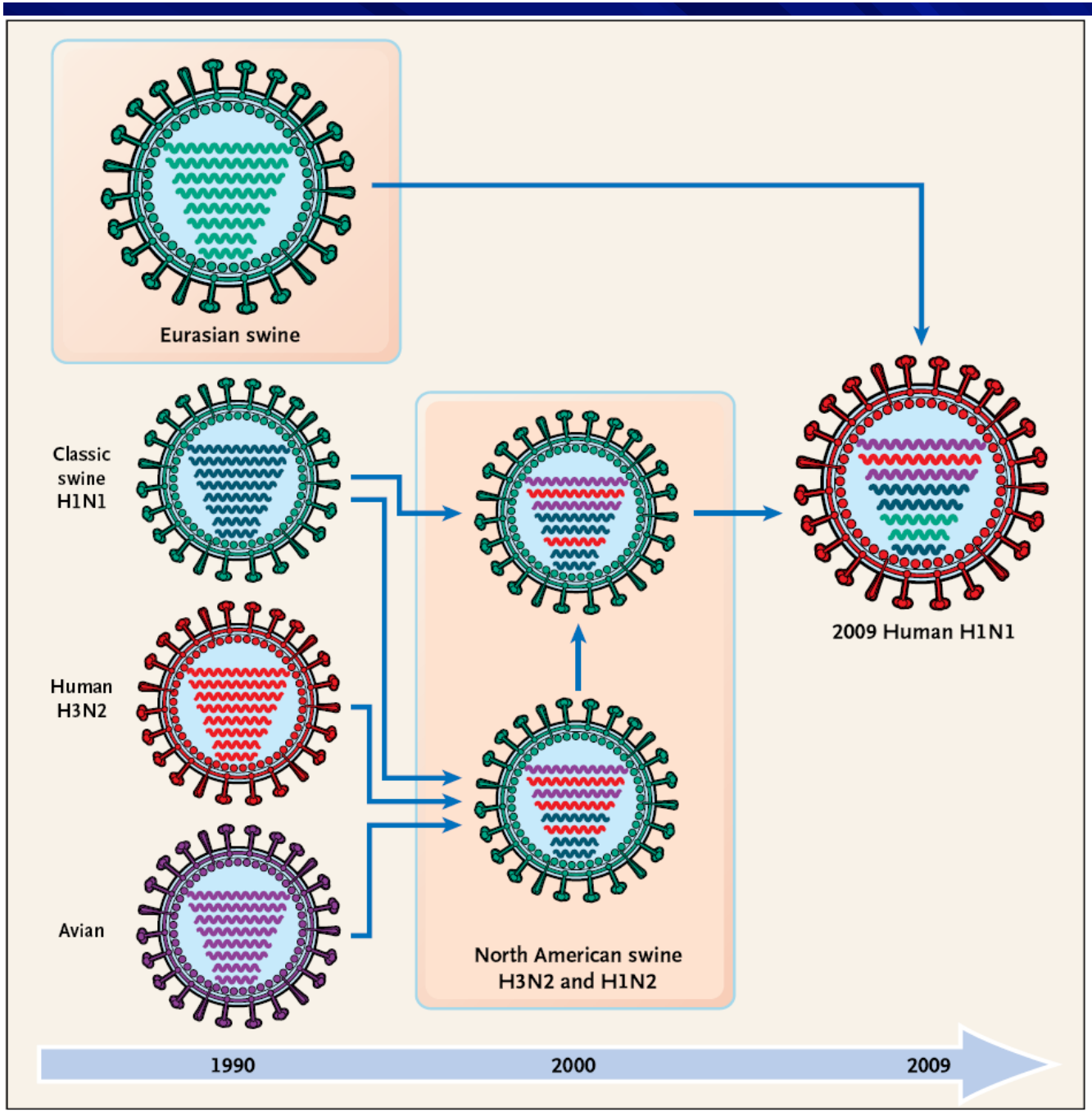


Figure 1. History of Reassortment Events in the Evolution of the 2009 Influenza A (H1N1) Virus.

- The 8 segments shown within each virus code for proteins of the influenza A virus
- The segments of the human 2009 influenza A (H1N1) virus have coexisted in swine influenza A virus strains for more than 10 years.

Downloaded from www.nejm.org on June 9, 2009 .

- Seasonal Flu
  - 36,000 deaths/year in the US
  - 90% people > 65yrs old
- N1H1
  - Most people confirmed are between 5-24 yrs old
- Higher risk groups
  - Age > 65 or < 5yrs
  - Pregnant women
  - Chronic medical conditions (asthma and diabetes

Symptoms of novel influenza A(H1N1)?

- Similar to regular human seasonal influenza symptoms:
  - Fever
  - Respiratory symptoms such as cough or runny nose
  - Sore throat
  - Possibly other symptoms such as
    - Body aches (particularly muscle pain)
    - Headache
    - Chills
    - Fatigue
    - Vomiting or diarrhoea (not typical for influenza but reported by some of the recent cases of novel influenza)
- In some cases, severe complications could occur even in normally healthy persons who become infected with the virus.

Treatment of novel influenza virus A(H1N1)

- Most swine influenza viruses have been susceptible to antiviral medications
  - Neuraminidase inhibitors (oseltamivir and zanamivir)
  - Older antiviral drugs (amantadanes).
- The novel influenza virus is susceptible to neuraminidase inhibitors but resistant to amantadanes.