



# Etiology of Community-acquired Pneumonia in Adults: A Systematic Review

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## Background

The etiology of community-acquired pneumonia (CAP) has evolved since the beginning of the antibiotic era. Recent guidelines encourage immediate empiric antibiotic treatment once a diagnosis of CAP is made. Concerns about treatment recommendations, on the one hand, and antibiotic stewardship, on the other, motivated this review of the medical literature on the etiology of CAP.

## Methods

We reviewed English-language literature using PRISMA guidelines. Data were stratified according to the microbiologic studies that were done.

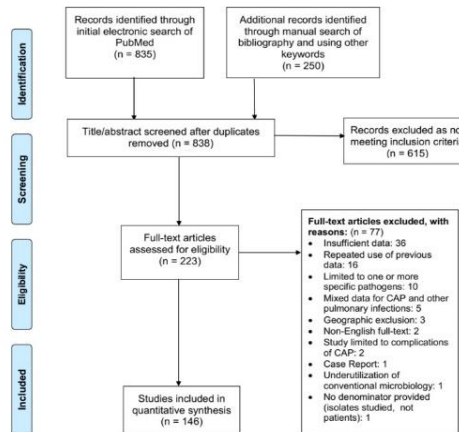


Fig.1. Flowchart of systematic literature review and study selection

## Results

146 articles with 82,674 CAP pts met criteria for inclusion; 77.3% were inpatients, 20.0% were in- or outpatients, and 2.7% were outpatients. Pneumococcus was the most common cause of CAP without regard to which microbiological techniques were used (12-50% of all cases). The proportion due to this organism declined with time, much more strikingly in the US than in Europe. Haemophilus influenzae was the second most common cause (7-16% of cases), followed by Staphylococcus aureus and Enterobacteriaceae each in 4-10%.

Table1. Characteristics of studies reporting the etiology of community acquired pneumonia (CAP)

Table with 7 columns: Nature of the microbiologic studies, Bacteriology only, Bacteria & 'atypicals'\*, Bacteria, 'atypicals' & viruses, Modern Studies: Bacteria and: PCR for 'atypicals', PCR for viruses, PCR for 'atypicals' and viruses. Rows include Number of studies, Publication years, Study setting, Number of CAP patients, Antibiotic exposure prior to microbiologic testing, and Number of patients with no etiology determined.

\*'Atypicals' is a term used loosely in publications to refer to Mycoplasma, Chlamydia, Legionella and/or Coxiella

Table2. Frequency of causative pathogens in CAP, stratified based on microbiologic techniques\*

Table with 6 columns: Studies were designed to recognize: Bacteria only, Bacteria & 'atypicals'\*, Bacteria, 'atypicals' & viruses, Modern Studies: Bacteria and: PCR for 'atypicals', PCR for viruses, PCR for 'atypicals' & viruses. Rows list various pathogens like Streptococcus pneumoniae, Haemophilus influenzae, etc.

\* Results for each organism are reported as percentage of all patients for whom an etiology was determined. † 'Atypicals' is a term used loosely in publications to refer to Mycoplasma, Chlamydia, Legionella and/or Coxiella. ‡ 'Other bacteria' were listed as 'other' in original publications or <0.2% in every column. †† --, not studied.

## Conclusion

- 1. Our results justify current guidelines for initial empiric antibiotic treatment of all pts with CAP.
2. With pneumococcus and Haemophilus continuing to predominate, efforts at antibiotic stewardship might be enhanced by greater attention to routine use of sputum Gram stain and culture.
3. Because viral/bacterial coinfection is relatively common, the identification of a virus by PCR does not, by itself, permit the non-use of an antibiotic.

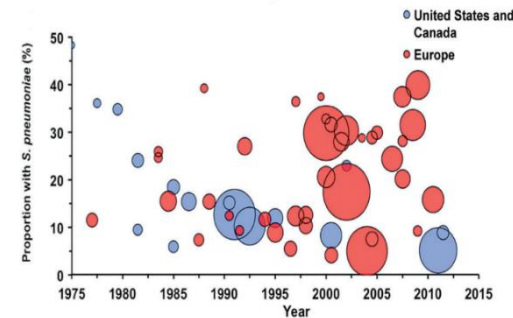


Fig.2. The proportion of S. pneumoniae as the cause of CAP in the US and Canada vs. all other geographic regions

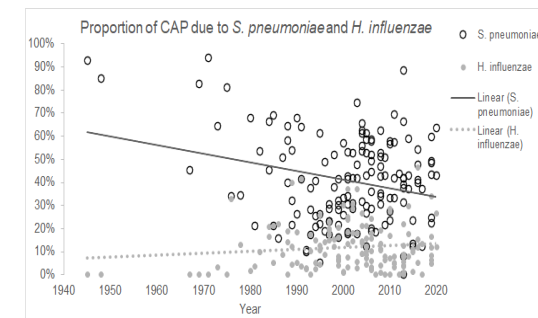


Fig.3. Trends of identification of S. pneumoniae and H. influenzae as the etiology of CAP