



Community-acquired pneumonia in children: guidelines for treatment

[CONCISE REVIEWS OF PEDIATRIC INFECTIOUS DISEASES]

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This brief review focuses on management of pediatric patients older than 3 months who have community-acquired pneumonia without empyema and who are otherwise normal and without anatomic or immunologic abnormalities. The subject of pleural empyema was discussed recently in these pages by Campbell and Nataro.¹

In children with serious acute infectious diseases for which there is specific antimicrobial therapy, such as meningitis, urinary tract infections and osteomyelitis, obtaining a fluid or tissue specimen for microbiologic analysis is easy and routine. Such is not the situation in acute pneumonia. We rarely do biopsy or needle aspiration of lung tissue and only a small fraction of children with pneumonia have bacteremia or pleural empyema. Bacterial cultures of the nasopharynx or throat correlate poorly with cultures of lung tissue and are as likely to confound as to clarify the etiology. Certain clinical and radiographic signs point one toward viral, bacterial or mycoplasmal etiology, but there is so much overlap that they have little value when dealing with one sick child.

The physician faces two decisions: antibiotics versus no antibiotics and, if the former course is elected, broad-spectrum versus narrow spectrum antibiotics. The seemingly easy way out of this dilemma would be to give broad-spectrum antibiotics to every child with pneumonia. This course of action is wasteful and exposes the majority who have viral infections to the real risk of superinfection with resistant bacteria and adverse effects of the drug. In addition, the bacterial ecology of our society has suffered from past decades of over-prescribing antibiotics to patients with respiratory infections resulting in resistant bacteria such as the current problem with resistant *Streptococcus pneumoniae*.

Besides doing cultures for bacteria and viruses, several investigators in recent years have used antigen detection methods and antibody studies to define probable etiologic agents in children with community-acquired pneumonia.²⁻⁴ However, their best efforts leave 30-40% of cases unexplained. In August 1999 the Food and Drug Administration approved a rapid immunochromatographic test (NOW®; Binax, Inc., Portland, OR) for pneumococcal antigen in urine which has good sensitivity and specificity for diagnosis of pneumococcal disease in adults. It has not been tested in children. The high proportion of normal children colonized with pneumococci may compromise the specificity of the test.

In a remarkable study published in 1971, Mimica and colleagues⁵ in Chile performed

needle aspiration of the lung for bacterial culture in 530 infants and children with acute pneumonia and found positive culture results in 235 (44%). The presumption that the remainder were caused by viruses or mycoplasma is confounded by the fact that 370 of the children had received antibiotics before the lung aspiration was done, so growth of susceptible bacteria could have been inhibited. The prior antibiotics might also explain the large number of isolations of *Staphylococcus aureus* they found, since it is known from past experience and studies that broad spectrum antibiotics, such as tetracycline and chloramphenicol which their patients had taken, cause rapid changes in respiratory microflora and frequent overgrowth of staphylococci.

The status of *Chlamydia pneumoniae* as a lower respiratory pathogen is unsettled. Serologic studies prove that the majority of children develop antibodies to this organism during the school years of ages 5 to 15, but the clinical illness correlates are far from clear. This epidemiology mimics that of *Mycoplasma pneumoniae*. Because both microorganisms are susceptible in vitro to macrolides, it has been tempting to conclude that school-aged children with possible *Mycoplasma* or *Chlamydia* illness should be treated with a macrolide. Tempering this common recommendation is knowledge that, although erythromycin and tetracycline had a modest beneficial effect in controlled studies of *M. pneumoniae* disease in adults, this has not been shown in children and controlled studies of erythromycin for *C. pneumoniae* disease have not been done in adults or children.

From the recent studies of community-acquired pneumonia 2-4 and from experience we can make several generalizations about microbial etiology: respiratory viruses are most common overall; among bacteria, pneumococci are most common; *Haemophilus influenzae* type b used to be as common as pneumococci in infants but it has virtually disappeared in immunized populations; *Mycoplasma* and *Chlamydia* infections are equally common in school-aged children and may cause half or more of the cases (keeping in mind the above-expressed reservation about *Chlamydia* and pneumonia); group A streptococci and *Staphylococcus aureus* are uncommon but, when they occur, cause severe disease; other bacteria, rickettsia and parasites are rare.

When assessing a child with community-acquired pneumonia, I find it useful to attempt categorization according to several factors.

The Age Factor

Adenoviruses and parainfluenza type 3 are common in infancy. Respiratory syncytial virus sometimes causes pneumonia in young infants, but it more typically causes bronchiolitis. Among bacteria, *Staphylococcus aureus* is most likely to occur in the first 6 months of life. *S. pneumoniae* and *H. influenzae* type b are equally common between 6 months and 2 years of age in unimmunized populations. During school age years, the incidence of pneumonia drops sharply but the proportion of cases possibly attributable to *M. pneumoniae* and *C. pneumoniae* is high.

The Epidemiology Factor

Respiratory syncytial virus infection is seasonal in the late fall and winter months and influenza virus infections occur in epidemics during these periods as well. The day care setting is conducive to sharing of respiratory viruses. There are no firm data about day care centers

and pneumococcal infection but almost surely strains are shared freely. Epidemiologic links to hospitals or to recently hospitalized individuals used to be an important risk factor for methicillin-resistant *Staphylococcus aureus* infection, but MRSA strains are widespread in most communities nowadays.

The Radiographic Feature

An interstitial radiographic picture is characteristic of viral infection, lobar consolidation is the hallmark of pneumococcal disease and bronchopneumonia patterns can be caused by any microbe. The problem with these generalizations is that there are many exceptions.

The Vaccine Factor

Immunization with protein conjugated *H. influenzae* type b vaccine virtually eliminates that etiologic possibility. The conjugated pneumococcal vaccines currently undergoing field trials appear to decrease the likelihood of pneumococcal pneumonia, but they will not eliminate it because not all antigenic types are included in the vaccine.

The Severity of Illness Factor

This is a non-factor in trying to discriminate among categories of infectious agents and, in my opinion, should not influence one's thinking.

After assessing the patient and pondering the above factors, the physician must make decisions about diagnostic tests that may be indicated, about the need for hospitalization and about the need for antimicrobial therapy. Probably the hardest decision is the one to withhold antibiotic treatment. This is the best course of action when the patient has findings increasing the likelihood of viral infection (pharyngitis, rhinitis, or similar illness in family members), has no respiratory distress and is alert and active. Pneumonia developing after several days of non-specific respiratory illness increases the likelihood of bacterial superinfection of viral disease and probably warrants antibiotic treatment.

For many years ambulatory infants and young children with suspected bacterial pneumonia have been treated orally with amoxicillin, amoxicillin-clavulanate or a cephalosporin. The thinking has been that the targeted pathogens are the same as those causing acute otitis media so it makes sense to use the same rationale in selecting an antibiotic regimen for both conditions. These options and the impact of relatively resistant pneumococci were discussed in depth by a group of experts assembled by the Centers for Disease Control.⁶ For acute otitis media amoxicillin, in a larger dosage (80–90 mg/kg daily) than previously recommended, was suggested as primary therapy. Amoxicillin-clavulanate, cefuroxime axetil or, alternatively, ceftriaxone given intramuscularly were recommended as backup agents.

For patients requiring hospitalization, a parenteral cephalosporin such as cefuroxime or cefazolin is adequate unless staphylococcal infection is suspected, in which case vancomycin is indicated since many community-acquired staphylococci are methicillin resistant. Many community-acquired *S. aureus* isolates remain susceptible to clindamycin. (Most such patients have empyema that is beyond the scope of this article; see the article by Campbell and Nataro.¹)

Chumpa et al 7 of Boston's Children Hospital reviewed their experience with pneumococcal bacteremia and found that the bacteremic children with pneumonia who were given a parenteral antibiotic at the initial clinic visit were less likely than those given an oral antibiotic to require subsequent hospitalization (0% versus 24%, $p=0.03$). This should not be an endorsement for routine use of parenteral antibiotics since those treated with oral antibiotics fared quite well.

References

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