Pediatric Community-Acquired Pneumonia in the United States

Changing Epidemiology, Diagnostic and Therapeutic Challenges, and Areas for Future Research

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KEYWORDS

• Community-acquired pneumonia • Pediatric • Epidemiology

KEY POINTS

- Pediatric community-acquired pneumonia (CAP) continues to cause significant morbidity and remains one of the most common serious infections of childhood.
- Routine childhood vaccination against *Streptococcus pneumoniae* has greatly reduced invasive disease rates caused by this pathogen.
- Although molecular diagnostics have helped highlight the important role that respiratory viruses play in pediatric CAP, bacterial diagnostics remain suboptimal.
- Biomarkers and molecular host responses to infection are current areas of intense study that may facilitate a deeper understanding of pneumonia etiology and disease outcomes.

INTRODUCTION

Pneumonia is an infection of the lower airways (distal bronchi and alveoli) caused by both viruses and bacteria. Community-acquired pneumonia (CAP) specifically refers to clinical signs and symptoms of pneumonia acquired outside a hospital setting.[1] It is one of the most common serious infections in childhood, accounting for more than 900,000 deaths among children younger than 5 years of age in 2015.[2] Although

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the rate of mortality due to CAP is much lower in the developed world compared with the developing world, CAP continues to account for a significant proportion of health care visits and hospitalizations in high-income countries. This review focuses on pediatric CAP in the United States and other industrialized nations, specifically highlighting the changing epidemiology of CAP, diagnostic and therapeutic challenges, and areas for further research.

EPIDEMIOLOGY

In the United States, CAP accounts for approximately 2 million outpatient visits annually[3] and is among the most common causes for hospitalization, with approximately 124,000 pediatric hospitalizations annually (annual incidence of 15.7–22.5 hospitalizations per 100,000 children).[4–6] The highest rate of health care utilization occurs in children younger than 2 years of age and decreases with increasing age in the pediatric population.[4]

DIAGNOSIS

Children with pneumonia most often present with fever, tachypnea, and other signs of respiratory distress (**Table 1**). Signs and symptoms may include tachypnea, cough, dyspnea, retractions, grunting, hypoxemia, abdominal pain, or lethargy, and physical examination findings of decreased breath sounds, crackles, rales, or wheezing on auscultation of lung fields. Many of these findings overlap with other acute lower respiratory tract diseases (eg, asthma and viral bronchiolitis), and identifying children with pneumonia based only on clinical signs and symptoms is sometimes difficult. As a result, chest radiographs are commonly used to confirm the diagnosis. Even when a chest radiograph reveals an infiltrate, however, it is sometimes difficult to differentiate between consolidation representing pneumonia and atelectasis commonly seen in children with asthma or bronchiolitis. As a result, variation in chest radiograph interpretation is common and may contribute to antibiotic overuse.[7,8] For this reason, the guideline developed by the Pediatric Infectious Diseases Society (PIDS) and Infectious Diseases Society of America (IDSA) discourages use of chest radiographs in children with suspected uncomplicated pneumonia in an outpatient setting.[7] Chest

Table 1
Manifestations of community-acquired pneumonia requiring hospitalization among those enrolled in the Centers for Disease Control Etiology of Pneumonia in the Community study

Characteristic	Frequency in Children with Radiographic Evidence of Pneumonia (N = 2358) no. (%)
Symptom	
Cough	2230 (95)
Abnormal temperature	2155 (91)
Anorexia	1766 (75)
Dyspnea	1657 (70)
Chest indrawing	1278 (55)
Radiographic finding	
Consolidation	1376 (58)
Alveolar or interstitial infiltrate	1195 (51)
Pleural effusion	314 (13)

Adapted from Jain S, Williams DJ, Arnold SR, et al. Community-acquired pneumonia requiring hospitalization among U.S. children. NEJM 2015;372(9):839. Table 1; with permission.