

# Guidelines for the Evaluation and Treatment of Pneumonia



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## KEYWORDS

- Pneumonia • Ventilator-associated • Community-acquired • Pediatric
- Antibiotic resistance • Microbial pathogens

## KEY POINTS

- Pneumonia is a common respiratory infection and warrants careful consideration of antibiotic initiation and choice, along with knowledge of local antibiotic resistance patterns.
- Community-acquired pneumonia afflicts all age groups and although not always bacterial in origin, is clinically versatile, depending on its cause.
- Nonresolving pneumonia may be because of less common pathogens, or feature other conditions, and requires more detailed investigation.
- Pediatric pneumonia is also common, and first-line treatment is still amoxicillin, followed closely by cephalosporins or macrolides.
- Other categories of pneumonia, including mechanically induced (ventilator) or travel/geriatric pneumonia, benefit from astute clinical acumen, proper history and physical examination, and knowledge of microbial causes.

## INTRODUCTION

Pneumonia is a leading cause of hospitalization among both adults and children in the United States, accounting for more than 800,000 hospitalizations and more than 400,000 emergency department visits in 2014.<sup>1,2</sup> It is among the most expensive conditions treated in US hospitals with national aggregate costs of \$9.5 billion in 2013.<sup>3</sup>

A causal pathogen is often not identified. A 2015 prospective, multi-center study by the Centers for Disease Control and Prevention identified a responsible pathogen in only 38% of cases of community-acquired pneumonia (CAP) in adults requiring hospitalization.<sup>4</sup> CAP is an infection of the lung parenchyma that is acquired outside of

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hospitals or extended-care facilities.<sup>5</sup> Viral pathogens were identified in 27% of cases and bacterial pathogens in 14% of cases.<sup>5</sup> In adults of all ages, human rhinovirus and influenza were the most frequently identified viruses.<sup>5</sup> *Streptococcus pneumoniae* is the most common causal bacterium. *Staphylococcus aureus* and *Enterobacteriaceae* were significantly more common among patients requiring intensive care unit (ICU) level care.<sup>4</sup> Other bacteria identified in CAP include *Mycoplasma pneumoniae*, *Chlamydophila pneumoniae*, and *Haemophilus influenzae*.<sup>5</sup> Less common bacterial causes include *Mycobacterium tuberculosis*, *Legionella* sp, and *Pseudomonas aeruginosa*. These and other bacteria may be considered more likely in patients with certain risk factors (Table 1).<sup>6</sup>

## DIAGNOSIS

A diagnosis of pneumonia should be considered in patients presenting with acute onset fever or chills and cough. The cough may be described as productive. Additional symptoms frequently seen include fatigue, anorexia, and pleuritic chest pain. Important components of a history include recent travel, history of underlying lung disease,

Table 1 Risk factors and infectious causes in community-acquired pneumonia	
Risk Factor	Infectious
Agricultural animals	<i>Coxiella burnetii</i> (Q fever)
AIDS	<i>Aspergillus</i> and <i>Cryptococcus</i> species, <i>Histoplasma capsulatum</i> , <i>Haemophilus influenzae</i> , <i>Nocardia</i> species, nontuberculous mycobacteria, <i>Pneumocystis jiroveci</i>
Alcoholism (aspiration)	Anaerobic oral flora, <i>Klebsiella pneumoniae</i> , <i>Mycobacterium tuberculosis</i> , <i>Streptococcus pneumoniae</i>
Avian fecal matter	<i>H. capsulatum</i>
Chronic obstructive pulmonary disease	<i>Chlamydophila pneumoniae</i> , <i>H. influenzae</i> , <i>Legionella</i> species, <i>Moraxella catarrhalis</i> , <i>Pseudomonas aeruginosa</i> or other gram-negative rods, <i>S. pneumoniae</i>
HIV infection	<i>H. influenzae</i> , <i>M. tuberculosis</i> , <i>S. pneumoniae</i>
Hotel or cruise ship travel (recent)	<i>Legionella</i> species
Influenza	<i>H. influenzae</i> , influenza and other respiratory viruses, <i>S. pneumoniae</i> , <i>Staphylococcus aureus</i> (including MRSA)
Intravenous drug use	Anaerobes, <i>M. tuberculosis</i> , <i>S. aureus</i> (including MRSA), <i>S. pneumoniae</i>
Pulmonary abscess	Anaerobic oral flora, <i>M. tuberculosis</i> , nontuberculous mycobacteria, <i>S. aureus</i> (including MRSA)
Travel (national/international)	<i>Blastomyces dermatitidis</i> , <i>Coccidioides</i> species, <i>Hantavirus</i> species Middle East respiratory syndrome, Avian influenza, inter alia

**Abbreviations:** AIDS, acquired immunodeficiency syndrome; HIV, human immunodeficiency virus; MRSA, methicillin-resistant staphylococcus aureus.

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