

# Bacterial Pneumonia in Older Adults

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## KEYWORDS

- Pneumonia • Older adults • Long-term care facility • Multidrug-resistant organisms
- Empiric treatment

## KEY POINTS

- The incidence of pneumonia increases with age, and is particularly high in patients who reside in long-term care facilities (LTCFs).
- Despite diagnostic and therapeutic advances, mortality rates for pneumonia in the elderly are high and have not decreased in the last decade.
- Atypical symptoms such as confusion, general clinical deterioration, new onset of recurrent falls, and exacerbation of underlying illness should trigger clinical suspicion and evaluation for pneumonia.
- Decisions regarding the site of care for older adults with pneumonia should take into account scoring systems of pneumonia severity, patient wishes regarding intensity of care, supportive environment, and clinical judgment.
- Empiric treatment of pneumonia should be based on clinical assessment of illness severity and risk factors for multidrug-resistant organisms, which are more common in older adults and LTCF residents.

## OVERVIEW AND EPIDEMIOLOGY

Pneumonia is a serious infection that occurs when a pathogen's virulence overcomes a person's host defenses. Aging is associated with general deterioration of organ function in a way that dictates not only an individual's risk of developing pneumonia, but also clinical manifestations and outcomes. In addition to increased complexity of clinical presentation and more rapid progression of disease, older patients are at higher risk to have pneumonia owing to resistant organisms including Gram-negative bacilli, and therefore empiric as well as definitive treatment can be challenging. The incidence of pneumonia increases with age, as does the impact of pneumonia on morbidity and mortality.

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In the 19th century, before the antimicrobial era, pneumonia was described by Sir William Osler as a fatal disease in older adults. Mortality rates are still high, particularly in elderly patients. Pneumonia, together with influenza, is the eighth leading cause of death in the United States and accounts for 2.3% of all death cases in patients older than 65 years.<sup>1</sup>

Risk factors for pneumonia among older adults include underlying comorbid conditions, such as cardiovascular and lung disease, diabetes mellitus, and malignancy, all of which are more prevalent in advanced age. Male gender and smoking have been identified as independent risk factors for community-acquired pneumonia (CAP) in older adults,<sup>2–4</sup> as has reduced functional capacity, and residence in an institution (long-term care facility [LTCF] or nursing home).<sup>5–7</sup>

Polypharmacy is a common finding in older patients, and several drugs are associated with higher risk of pneumonia, including antipsychotic and anticholinergic drugs, both used to treat symptoms that are more common in elderly patients. These drugs are used to treat dementia symptoms, urinary incontinence, depression, pain, and insomnia.<sup>8</sup> Some of the anticholinergic side effects include sedation and altered mental status, which increase the risk of pneumonia, and can also be symptoms of pneumonia.<sup>9</sup> In addition, inhaled corticosteroids have been associated with recurrent pneumonia.<sup>10</sup>

The burden of pneumonia on health care resources is enormous owing to both hospitalization costs and long-term outcomes, particularly in elderly patients.<sup>11</sup> With the anticipated growth of the population of older adults, the burden of pneumonia, both community acquired and health care associated, is anticipated to increase.<sup>11,12</sup>

## **PATHOGENESIS: WHAT MAKES ELDERLY PATIENTS PRONE TO DEVELOPING PNEUMONIA?**

In general, regardless of age, pneumonia occurs when an organism's ability to penetrate and infect the lung parenchyma overcomes the host's defense mechanisms.<sup>6</sup> Several factors common in the elderly contribute to breaches in their defense systems, making elderly patients not only more vulnerable to infection, but also more vulnerable to severe infection associated with prolonged recovery and poor outcomes.

Structural and functional changes across the respiratory system lead to reduced host defenses. These factors include (1) impaired function of mucociliary clearance, an important defense mechanism against pathogen entrance to the upper airways and respiratory tree. Slower and less efficient clearance of secretions by the mucociliary system in the elderly has been shown to correlate with pneumonia.<sup>13</sup> (2) Chest wall mobility and compliance decrease with aging owing to costovertebral joint alteration, rib cartilage calcification, loss of muscle strength, and changes in the shape of rib cage such as kyphosis or scoliosis. (3) Lung compliance is reduced owing to changes in lung parenchyma, which affect the lung's elastic recoil.<sup>6</sup> These alterations in the chest wall and lung compliance lead to increased air trapping, reduced ability to clear secretions, and an increase in the workload of respiratory muscles. In older age, a further increase in the work of breathing, as occurs in cases of pneumonia and particularly in the presence of underlying diseases such as cardiovascular and lung diseases, compromise functionality during infection and may lead to respiratory failure.<sup>14</sup>

Neurologic changes predisposing older adults to "silent aspiration" include reduced ability to cough owing to gag reflex dysfunction as well as changes in mental status.<sup>15</sup> In one study, oropharyngeal dysphagia was strongly associated with CAP in the elderly (occurring in 91% of patients with CAP; odds ratio, 16.3; 95% CI, 4.6–58.2).<sup>16</sup> In addition, pneumonia has been estimated to occur in about 10% to 30% of patients after a

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