Sepsis and Other Infectious Disease Emergencies in the Elderly

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KEYWORDS

• Infections • Sepsis • Pneumonia • Urinary tract infection • Meningitis
• Skin and soft tissue infection • Elderly

KEY POINTS

- Infectious diseases are responsible for significant morbidity and mortality among elders.
- Immunosenescence, declining physical barriers to pathogens, and mounting medical co-morbidities increase an elder's vulnerability to a wide range of infections.
- Atypical clinical presentations of infection are common in the elderly.
- Timely recognition and appropriate empirical antimicrobial therapy for infectious disease can increase survival and optimize clinical outcomes.

INTRODUCTION

The world is aging. The number of individuals aged 60 years and older is expected to increase globally from 841 million in 2013 to more than 2 billion by 2050.[1] In the United States, persons aged 65 years and older are anticipated to double in number from 43.1 million in 2012 to 83.7 million by 2050.[2] Fueled by a generation of baby boomers born between 1946 and 1964, more than a fifth of the US population will surpass 65 years of age by 2030. From 2009 to 2010, elders accounted for more than 19 million visits made to US emergency department (ED) visits, representing 15% of all ED visits

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nationally.[3] More than a third of these visits warranted hospital admission for further care. As new advances in medicine and improved access to health care continue to extend the envelope of life expectancy worldwide, emergency physicians must be well versed in the timely, comprehensive, and compassionate care of our elders.

Infectious diseases account for widespread morbidity and mortality among the elderly. In 2012 alone, infectious diseases accounted for 13.5% (3.1 million) of all visits made by elders to US EDs.[4] Hospitalization rates for infectious diseases in this segment of our population have steadily risen over the past 2 decades.[5,6] Although respiratory tract infections, primarily pneumonia, account for most of these admissions, hospitalization rates for sepsis and urinary tract infections (UTIs) have dramatically increased since 2000, particularly in those aged 85 years and older.[7] From 1998 to 2004, infectious diseases accounted for almost 14% of all hospitalizations of older adults in the United States, with total charges in excess of $261 billion.[8] Not surprisingly, pneumonia and sepsis accounted for almost 60% of those charges. In a large retrospective study of 323 acute-care hospitals in California from 2009 to 2011, infection-related readmissions comprised more than a quarter of 30-day all-cause readmissions.[9] Although mortality from heart disease, malignancy, chronic pulmonary disease, and cerebrovascular disease far outpaces mortality from infectious diseases in persons aged 65 years and older, pneumonia, influenza, and sepsis remain significant causes of death among elders in the United States.[10]

The spectrum of infectious diseases in the elderly is wide ranging. This review examines the unique risk factors that render the elderly vulnerable to infection and focuses on the diagnosis and emergent management of severe sepsis and septic shock, pneumonia, urinary tract infections, central nervous system infections, and skin and soft tissue infections.

AGING AND INFECTION

The aging immune system creates a natural state of immunosuppression in the elderly, predisposing to infection. Immunosenescence is characterized prominently by a decline in adaptive immunity. Although circulating memory T cells increase over time in response to continued antigenic stimulation, the pool of naïve T cells is depleted through age-related thymic involution, compromising the primary T-cell response to new antigens.[11,12] Loss of T-cell receptor repertoire diversity and intrinsic age-related naïve T-cell defects further impair the effectiveness of this cell-mediated immune response. As the pool of antigen-experienced memory B cells expands with age displacing naïve B cells necessary for new antibody formation, humoral immunity is likewise blunted. Reduced B-cell repertoire diversity, devolution of critical T-cell interactions needed for B-cell activation and differentiation, and decreased antibody affinity dampen the humoral response to infection and vaccines alike.[12] Immunosenescence is also marked by the dysregulation of innate immunity.[13,14] Polymorphonuclear neutrophils exhibit reduced chemotaxis, phagocytosis, and intracellular killing of pathogens, due in part to reduced toll-like receptor expression and activation. Similarly, age-associated decreases in macrophage, natural killer, and dendritic cell function are apparent. Impaired immune responses to new pathogens may also arise from basal activation of the innate immune system with increasing age, evidenced by increased levels of proinflammatory cytokines (eg, interleukin 6, tumor necrosis factor-α), clotting factors, and acute phase reactants (eg, C-reactive protein). Attributed to chronic viral infections (eg, cytomegalovirus) and cellular damage as well as age-related hormonal and metabolic changes, such dysregulated inflammatory responses may likewise contribute to the development of noninfectious diseases,