
Aging and Infectious Disease

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The number of Americans over the age of 65 is expected to grow from 38 million to more than 80 million in the next 50 years. Armed with this knowledge, health care professionals will need to devote more of their focus on the care of the elderly. Health promotion and maintenance will become the main objectives in the care of aging adults and will encompass the following:

- Ensuring adequate nutrition and physical activity
- Eliminating physical and psychological stresses
- Teaching the proper use of prescription medications
- Providing an environment in all elder care settings that will reduce the risk of developing infectious disease

Currently, throughout the United States, more than 1.5 million people reside in nursing homes, and it is estimated that more than 1.5 million nosocomial infections are seen in this population each year.² This article focuses on the epidemiology of infectious disease, including risk factors, clinical features, and common infections, such as urinary tract infections (UTIs), respiratory tract infections (RTIs), and skin and soft tissue infections. It begins with a brief overview of the physiologic, biologic, and other changes that commonly occur with normal aging.

One must look at the normal physiologic changes that occur with aging to better understand why the elderly are more susceptible to infectious disease. With a better understanding of the aging process, programs can be implemented to decrease the risk of in-

fection in this population. The loss of certain body cells and the reduced metabolism in other cells are responsible for the aging process. These cellular changes result in a decline in a person's bodily composition and functions. Thus, a person's heart, lungs, kidneys, and other organs are less efficient at the age of 60 than they were at the age of 20.

Nutrition

Nutritional factors play a significant role in age-associated immune dysfunction. The reversal of underlying nutritional deficits is an inexpensive way to reduce morbidity and mortality in the elderly. As a person ages, their caloric needs lessen, but their protein, vitamin, and mineral needs remain the same. Factors that may affect the nutritional status of elderly adults include:¹

- Decreased renal function, causing greater susceptibility to dehydration and formation of renal calculi and an increase in the risk of UTIs
- Loss of calcium and nitrogen, mainly in nonambulatory individuals
- Decreased enzyme activity and gastric secretions
- Reduced pepsin and hydrochloric acid secretion, which tends to diminish the absorption of calcium and vitamins B1 and B2
- Decreased salivary flow and diminished sense of taste, which reduce a person's appetite and may lead to increased dental decay and gum infections
- Diminished intestinal motility and peristalsis, resulting in constipation
- Thinning of tooth enamel, resulting in brittle teeth
- Decreased biting force
- Diminished gag reflex, which can lead to aspiration pneumonia and poor nutrition
- Constipation, which may result in the overuse of laxatives, decreased digestion and absorption of food, and a weakened immune system
- Socioeconomic and psychologic factors (eg, loneliness and lack of money or transportation)

Skin

As a part of aging, a person's skin changes due to a loss of subcutaneous fat, dermal thinning, and a decrease in collagen and elastin. In

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addition, skin cell reproduction decreases by 50%.¹ This leads to a decrease in skin cell replacement, which may cause wounds to heal slower and make the elderly more susceptible to pressure ulcers and wound infections. In addition, the loss of elasticity causes “paper-thin skin,” increasing the risk of skin tears and infections.

Eyes

Along with normal age-related changes in visual acuity, the elasticity of the eyelids decreases, leading to “bagging” and wrinkles around the eyes. The quality of tears decreases so that they evaporate more rapidly, which can lead to an increased susceptibility for eye infections (eg, conjunctivitis). Dry eyes also may result from a decrease in the production of tears by the lacrimal glands.

Respiratory Tract

Changes with age that are observed in the respiratory tract include a decrease in pulmonary function caused by the degeneration or atrophy of the respiratory muscles. Aging causes the diffusing capacity of the lungs to decline, which decreases inspiratory and expiratory muscle strength. Degeneration of the lung tissue causes a decrease in the lungs’ recoil capability, which can result in emphysema. Furthermore, the closing of some airways produces poor ventilation, a decrease in oxygen saturation, and a reduction in respiratory fluids, which increase the risk of pulmonary infections and mucus plugs. These physiologic changes put elderly adults at greater risk of RTIs, such as pneumonia, chronic obstructive

pulmonary disease (COPD), tuberculosis (Tb), influenza, and adult respiratory distress syndrome.

In the elderly, a decrease in ciliary activity and a diminished cough reflex decrease the ability to clear mucus and foreign material from the airways. Accurate respiratory assessment can be a challenge because changes in the respiratory tract can lead to increased dead space in the lungs, which can mimic COPD. The signs of infection in the elderly also are often misleading, which may lead to delayed diagnosis and a more complicated course of illness.

Pneumonia—the leading cause of death due to infectious disease in the United States—is common in the elderly because weakened chest muscles decrease the ability to clear pulmonary secretions. Pneumonia can be classified in several ways. Based on microbiologic etiology, it may be considered to be viral, bacterial, fungal, protozoal, mycobacterial, mycoplasmal, or rickettsial in origin. Based on location, pneumonia may be classified as bronchopneumonia, lobular pneumonia, or lobar pneumonia. Pneumonia is also categorized as primary, secondary, or aspiration pneumonia.

- Primary pneumonia is caused by the direct inhalation or aspiration of bacterial or viral pathogens
- Secondary pneumonia typically occurs as a result of lung damage from inhalation of a noxious chemical, superinfection, or the spread of bacteria from a distant area
- Aspiration pneumonia is caused by the inhalation of foreign matter, such as vomit or food, into the bronchi

Immune System

The decline in immune function begins at sexual maturity and continues with age. The risk of the development of autoimmune diseases increases because of the body’s inability to differentiate between self and nonself. As the body ages, the immune system begins to lose its ability to recognize and attack mutant cells, which presumably accounts for the increased risk of cancer among the elderly. The decrease in antibody response makes older adults more susceptible to infections. In addition, the active blood-forming bone marrow is replaced by fatty bone marrow, which causes a decrease in the production of erythrocytes.

Annual influenza vaccination may fail to provide its intended protection for the elderly for several reasons:

- An aged immune system
- A decrease in the immune system’s ability to form antibodies
- The immune system is unable to maintain antibodies from year to year
- The virus that causes influenza mutates every flu season

Because of advanced age and underlying disease, not all healthy elderly and only about half of long-term care (LTC) residents³ develop “protective” vaccine-induced antibody titers compared with 70% to 90% of young healthy adults.^{4,5} Latent diseases, such as Tb and shingles (varicella zoster), may be reactivated because of the immune system’s inability to suppress the responsible virus any longer.

It also must be noted that as the population ages, individuals with HIV/AIDS are living longer and may become residents in elder care settings. Currently in the United States, between 11% and 15% of AIDS cases occur in people over the age of 50. The number of these cases is expected to increase as people of all ages with HIV/AIDS survive longer due to triple-combination drug therapy and other treatment advances. Between 1991 and 1996, AIDS cases in the over-50 population rose more than twice as fast as those among younger adults. The rate of HIV infection (not AIDS) in seniors is especially difficult to determine because older people are not routinely tested for HIV. In addition, the symptoms of HIV in the elderly are often similar to those associated with aging (ie, fatigue, weight loss, dementia, skin rashes, and swollen lymph nodes).

Renal System

As people age, the renal system changes in several ways. Bladder muscles become weaker and bladder capacity decreases, resulting in incomplete bladder emptying and chronic urine retention, both of which may predispose a person to

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the development of bladder infection.

If an adult lives to be 90 years old, renal function and renal blood flow can decrease by as much as 50% and 53%, respectively.¹ Because management of a neurogenic bladder involves Foley catheter insertions, the risk of bladder infection may increase. Additionally, as a person ages, there is an increase in residual urine, frequency, and nocturia.

Urinary tract infections are

known to cause incontinence in the elderly. The prevalence of UTIs is very high in LTC residents. Elderly individuals frequently believe that incontinence is a natural part of aging and thus do not seek medical advice. At least 50% of women with an asymptomatic UTI have bacteria localized to the kidneys.^{6,7}

Lastly, with age comes an increase in the pH of vaginal secretions and a change in vaginal flora, making the vaginal area more alkaline and increasing the risk of vaginal infections. Vaginal dryness from estrogen deficiency may cause vaginitis in women, whereas an enlargement of the prostate gland may lead to UTIs in men.

Conclusion

Malnutrition, poor skin integrity, diminished gag reflex, and incomplete bladder emptying all contribute to infectious disease in the elderly. With the emergence of

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Impact to You

Because of the normal physiologic changes that occur with aging, the elderly are more susceptible to infectious diseases.

What You Need to Know

The diagnosis of infection in Medicare patients is sometimes difficult, and requires careful assessment. Atypical presentations may include hypothermia, chest pain, or acute change in mental status. While these may be more typical of other conditions, infections should not be overlooked from the list of potential diagnoses.

What You Need to Do

Timely diagnosis and treatment is critical to assure optimum outcomes from infections in Medicare patients. Be aware of the physiologic changes that occur with aging with regard to all of the major bodily systems, as well as steps needed to maintain good health. Promote healthy aging with your Medicare patients through proper nutrition, rest, immunizations, frequent hand washing, and appropriate medical care.

drug-resistant organisms, such as methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococcus* (VRE), physicians must consider limiting the use of antibiotics and carefully evaluating the type of antibiotic that is used to treat a specific infection.

Infection prevention must become a priority not only for health care providers, but also for the elderly themselves. Elderly adults must take responsibility in maintaining their health at all times. This can be done through:

- Proper nutrition
- Plenty of rest
- Up-to-date immunizations (eg, pneumococcal vaccination and annual influenza vaccinations)
- Frequent hand washing by elderly individuals and their health

Urinary tract infections are known to cause incontinence in the elderly.

care providers

- Appropriate medical care, including limited antibiotic use, to decrease the risk of infectious disease and the development of multiple drug-resistant infections.

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