Common Viral Infections in Older Adults
Mazen S. Bader, MD, MPH; David S. McKinsey, MD

ABSTRACT

PURPOSE: To review the clinical features of common viral infections in the elderly and discuss diagnostic approaches, treatment options, and prevention strategies for these infections.

EPIDEMIOLOGY: In patients ≥65 years of age the incidence rate of herpes zoster is 11.8 per 1000 person-years; of influenza-associated pulmonary and circulatory deaths, 0.983 per 1000 person-years; of respiratory syncytial virus infection, 15 per 1000 person-years in high-risk elderly patients and 9 per 1000 person-years in the healthy elderly. More than 90% of older adults are seropositive for herpes simplex virus and are at risk for reactivation herpes. Older adults account for ≥90% of deaths attributed to pneumonia and influenza.

REVIEW SUMMARY: Waning cell-mediated immunity in elderly patients is associated with higher incidence and greater severity of viral infections. Herpes zoster and herpes simplex occur due to reactivation of latent virus and are associated with painful vesicular skin lesions. Treatment with acyclovir, valacyclovir, or famciclovir shortens the duration of viral shedding and hastens resolution of lesions. Adjunctive use of prednisone in herpes zoster reduces the incidence of postherpetic neuralgia. Influenza and respiratory syncytial virus afflict a large population of elderly patients each winter and may be associated with life-threatening pneumonia. Oseltamivir and zanamivir are effective treatment options for influenza, and vaccination is indicated for all persons >65 years of age. There is no widely available antiviral treatment for respiratory syncytial virus; symptomatic treatment is indicated.

TYPE OF AVAILABLE EVIDENCE: Nationally recognized treatment guidelines, meta-analyses, unstructured reviews, prospective cohort studies, and clinical trials.

GRADE OF AVAILABLE EVIDENCE: Good.

CONCLUSION: Viral infections are more common in the elderly and may cause substantial morbidity and mortality. Newer antiviral medications are effective and offer increased ease of administration and less toxicity than do older drugs.

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Off-Label Product Discussion: The authors of this article do not include discussion of off-label/unapproved use of products.
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to polypharmacy. Finally, aging is associated with reduced clearance of many antiviral drugs because of declines in glomerular filtration rate, hepatic blood flow, and hepatic metabolism. This article focuses on the most common viral infections seen in elderly patients. Viral skin infections due to herpes zoster (HZ) and herpes simplex virus (HSV), and viral respiratory infections due to influenza and respiratory syncytial virus (RSV) are discussed.

**Herpes Zoster**

HZ is a neurocutaneous viral infection that generally involves the skin of a single dermatome. Although people of any age may be afflicted by HZ, it is primarily a disease of older adults. The incidence of HZ increases significantly among patients aged 50 to 60 years and continues to rise as age increases. The incidence rate of HZ in persons aged 55 to 64 years is 5.7 per 1000 person-years, whereas the rate in those 65 years of age is 11.8 per 1000 person-years. This higher incidence in the elderly is due to impairment of T-cell immunity to varicella-zoster virus (VZV) that occurs naturally with aging.

HZ results from reactivation of VZV virions that entered the cutaneous nerves during an earlier episode of childhood chickenpox. After acute varicella infection, VZV establishes a latent infection in sensory nerve ganglia, commonly involving the trigeminal, thoracic, and lumbar ganglia. Age and immunosuppressive drugs have been implicated in reactivating the virus, which subsequently travels back down the sensory nerve to infect the skin. Virus reactivation usually occurs once in a lifetime.

HZ has a spectrum of clinical manifestations, and infection may occur subclinically. HZ may first manifest with pain, skin lesions, or a combination of the 2. Pain, pruritis, or burning—generally localized to the dermatome—precedes the eruption by 4 to 5 days. Depending on the affected dermatome, pre-eruptive pain may be misdiagnosed as pleurisy, myocardial infarction, appendicitis, cholelithiasis, nephrolithiasis, or migraine headache. Constitutional symptoms of fever, headache, and malaise may precede the eruption by several days. The unilateral dermatomal rash begins with erythematous papules that then become vesicular. Typically, the vesicles become crusted within 7 to 10 days. In elderly and debilitated patients the eruption often is more extensive and inflammatory, occasionally resulting in hemorrhagic blisters, skin necrosis, secondary bacterial infection, or extensive scarring.

The thoracic and cervical regions are the most commonly affected areas, followed by the face. Zoster sine herpete refers to zoster in the absence of rash but with dermatomal pain. Herpes zoster ophthalmicus (HZO), which constitutes 10% to 15% of all HZ cases, typically presents with an erythematous, pustular rash within the distribution of the ophthalmic division of the trigeminal nerve. The rash may extend from the nose and eye to the skull vertex, but does not cross the midline. HZO usually is preceded by neuralgic pain, headaches, nausea, and vomiting. Involvement of the nasociliary nerve, manifested by vesicles on the side or tip of the nose (Hutchinson’s sign), occurs in about 30% of patients and correlates closely with serious ocular involvement, which occurs in approximately 50% of patients. Palsies of cranial nerves III or VI and central nervous system involvement occasionally are seen.

Postherpetic neuralgia (PHN), pain persisting 2 months or more after HZ, is the most debilitating complication of HZ. PHN is associated with scarring of the dorsal root ganglion, atrophy of the dorsal horn on the affected side, and injury of the peripheral nerves. Both the incidence and duration of PHN are directly related to increasing age. Fifty percent of patients with HZ who are ≥70 years continue to experience pain after 1 month. In patients aged 60 to 69 years, 40% have pain that lasts longer than 1 month; in patients aged 50 to 59 years, 23%; and in those ≤50 years, 5%. After 1 year of follow-up, 12% of those aged ≥70 years had persistent pain compared with fewer than 5% among other age groups. Pain often is severe, intractable, and exhausting. Some individuals may suffer hyperesthesia, which in the elderly can produce significant disability.

Less frequent complications of HZ in elderly patients include the following: ocular inflammation (anterior uveitis or keratitis), encephalitis, stroke due to granulomatous angiitis of the internal carotid artery, headache, nausea, and vomiting. Involvement of the nasociliary nerve, manifested by vesicles on the side or tip of the nose (Hutchinson’s sign), occurs in about 30% of patients and correlates closely with serious ocular involvement, which occurs in approximately 50% of patients. Palsies of cranial nerves III or VI and central nervous system involvement occasionally are seen.

Table 1. Treatment Options for Herpes Zoster in Older Patients

<table>
<thead>
<tr>
<th>Antiviral Agent</th>
<th>Dose</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acyclovir</td>
<td>800 mg po 5x/d for 7–10 d</td>
<td>Maintenance of adequate hydration and dose adjustment for renal failure is needed. Acyclovir has a significant beneficial impact on the severity, duration, and relative risk of PHN</td>
</tr>
<tr>
<td>Famciclovir</td>
<td>500 mg po tid for 7 d</td>
<td>Famciclovir has been shown to be as effective as acyclovir in reduction of acute pain and in prevention of PHN</td>
</tr>
<tr>
<td>Valacyclovir</td>
<td>1000 mg po tid for 7 d</td>
<td>Provides an improved benefit over acyclovir in reducing the severity and duration of PHN in patients &gt;50, with the same safety profile as acyclovir</td>
</tr>
</tbody>
</table>

Po = by mouth; tid = three times a day; d = day; PHN = postherpetic neuralgia.
Ramsey-Hunt syndrome (facial paresis, vertigo, hearing loss), and secondary bacterial infection of the rash. Treatment of HZ includes antiviral therapy and management of associated pain. Coexisting medical conditions and the risk of drug interactions must be considered when designing a treatment plan for an elderly patient. Antiviral agents used in the treatment of HZ are illustrated in Table 1. The benefits of antiviral treatment in reducing the extent and duration of pain have been primarily seen in patients older than 50 years of age. In order to be effective, antiviral therapy must be instituted within 72 hours of the onset of the rash. Treatment may be beneficial after 72 hours in the elderly patient who is at high risk of PHN, in patients with acute HZO, and in immunocompromised patients who have persisting or increasing vesicles reflecting ongoing viral replication. The doses of all antiviral agents should be adjusted for the level of renal function in elderly patients.

Valacyclovir and famciclovir are approved by the Food and Drug Administration (FDA) for the treatment of HZ in elderly patients and are preferred to acyclovir because of their improved pharmacokinetics and simpler dosing regimens. The recommended dose of valacyclovir for HZ is 1 g 3 times daily; the dose of famciclovir is 500 mg 3 times daily. There have been no head-to-head comparisons of valacyclovir with famciclovir to determine whether one drug is superior to the other. There is no role for topical antiviral agents in the treatment of HZ. In relatively healthy persons aged ≥50 years who have localized HZ, combined acyclovir and prednisone therapy can improve quality of life by accelerating time to cessation of acute neuritis, return to uninterrupted sleep, resumption of usual daily activities, and cessation of analgesic therapy. However, corticosteroid therapy does not reduce the incidence of PHN at 6 months. The recommended regimen for prednisone is 30 mg twice daily for the first 7 days, 15 mg twice daily for days 8 through 14, and 7.5 mg twice daily for days 15 through 21. Although the use of prednisone in combination with either valacyclovir or famciclovir has not been studied in controlled clinical trials, given the superiority of these 2 drugs to acyclovir it has been common practice to use prednisone together with either medication.

Several options are available for the management of pain in the eruptive stage of HZ and for PHN, as shown in Table 2. Clinical trials have demonstrated that pain relief with opioids, tricyclic antidepressants, and gabapentin reduces the severity and duration of PHN. Attenuation or elimination of pain may be accomplished with an initial therapy of topical lidocaine-prilocaine cream or 5% lidocaine gel. Narcotics also may be used, as long as the risks of sedation and dependence are recognized. If analgesia is ineffective, a tricyclic antidepressant drug should be prescribed. Nortriptyline and desipramine are associated with less postural hypotension and fewer anticholinergic effects than is amitriptyline and hence are preferred in older patients. Nortriptyline should be started at a low dose (10 mg) at bedtime and may be increased weekly until the pain subsides or side effects become unacceptable. At least 4 weeks of therapy is required, and treatment should be continued for 3 to 6 months for adequate pain control.

Patients should be advised that there may be a delay of several weeks in achieving the maximal benefit from antidepressant therapy, and should be counseled on possible adverse reactions to tricyclics such as confusion, urinary retention, postural hypotension, constipation, and arrhythmias. A soluble fiber laxative can be started with the tricyclic agent to prevent constipation. Exposure to tricyclic antidepressants is associated with a significant increase in the risk for falls and hip fractures, particularly in nursing home patients.

### Table 2. Treatment Options for Postherpetic Neuralgia in Older Patients

<table>
<thead>
<tr>
<th>Therapy</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Topical Lidocaine</td>
<td></td>
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<tr>
<td>Lidocaine patch</td>
<td>One or more patches are applied and left over the affected area for 12 hours/day</td>
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<tr>
<td></td>
<td>It may take up to 2 weeks to determine the effectiveness of this therapy</td>
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<tr>
<td>EMLA cream</td>
<td>Combination of 2.5% lidocaine and 2.5% prilocaine cream. Should be applied over the affected area under an occlusive dressing once a day</td>
</tr>
<tr>
<td>Opiates</td>
<td>Opiates such as morphine sulfate and oxycodone hydrochloride can be used. Common adverse effects are constipation, sedation, and nausea</td>
</tr>
<tr>
<td>Tricyclic Antidepressants</td>
<td>Nortriptyline and desipramine are preferred alternatives to amitriptyline in elderly patients because they cause less sedation, cognitive impairment, orthostatic hypotension, and constipation</td>
</tr>
<tr>
<td>Gabapentin</td>
<td>Should be started at 300 mg once a day and titrated as necessary over a 4-week period up to maximum daily dose of 3600 mg or until intolerable adverse effects occur. Adverse effects such as somnolence, dizziness, and ataxia can limit the use of gabapentin in elderly patients with falls, gait disturbance, and cognitive impairment</td>
</tr>
<tr>
<td>Intrathecal Methylprednisolone</td>
<td>Indicated in patients with intractable PHN &gt;1 year who failed to respond to all standard therapy</td>
</tr>
<tr>
<td>Nonpharmacologic Therapy</td>
<td>Transcutaneous electrical nerve stimulation, hypnosis, biofeedback complementary to traditional medical treatment of PHN</td>
</tr>
</tbody>
</table>

PHN = postherpetic neuralgia.
If only partial relief is achieved with a tricyclic agent, an anticonvulsant drug such as phenytoin or valproic acid can be added. Intrathecal methylprednisolone is indicated in patients with intractable PHN of >1-year duration who fail to respond to all standard therapy. Nonpharmacologic, noninvasive, and nontraditional therapies, such as transcutaneous electrical nerve stimulation, hypnosis, biofeedback, and other cognitive and behavioral techniques, complement traditional medical treatment for PHN.

Herpes Simplex Virus

The spectrum of mucocutaneous disease caused by HSV includes primary and recurrent gingivostomatitis, herpes labialis, genital HSV infections, and keratoconjunctivitis. In the elderly, HSV lesions typically are seen at the vermillion border of the lip; stomal lesions are rare. In those elderly patients with impaired cognition, recurrent herpes labialis carries the risk of autoinoculation of the eyes or genital area. Elderly patients with severe oral disease may develop pharyngitis and bronchitis. Herpetic tracheobronchitis can occur in elderly patients in intensive care units who have been intubated and are receiving systemic corticosteroid therapy.

Virus isolation in culture remains the definitive diagnostic method for HSV infections. Cytopathic effect usually develops within 24 to 48 hours after inoculation of specimens, such as swabs or scrapings from sites that contain infectious virus (eg, skin vesicles, throat, nasopharynx, and conjunctiva). The Tzanck smear can be used for rapid diagnosis, although this test is less sensitive and specific than viral culture. Rapid immunofluorescence tests are accurate but are not readily available in many community hospitals. Antivirals used for the treatment of HSV infections in the elderly include acyclovir, famciclovir, and valacyclovir. There are no substantial differences in efficacy among these 3 medications. Acyclovir should be given in a dosage of 200 mg 5 times daily. The other 2 medications offer more convenient dosing regimens but are more expensive than acyclovir. The recommended dose of valacyclovir is 1000 mg twice a day for primary infections and 500 mg twice a day for recurrent herpetic infections. Famciclovir is administered at a dose of 250 mg twice daily. Ganciclovir has in vitro activity against HSV but is far more expensive and toxic than are acyclovir, famciclovir, and valacyclovir and thus is not routinely recommended for treatment of herpetic infections. Rarely, acyclovir-resistant HSV may be seen in severely immunosuppressed patients. These infections often respond to treatment with foscarnet.

Influenza

Influenza is a significant cause of morbidity and mortality among elderly persons living in the community or in long-term care facilities and has a significant negative impact on the functional capacity of frail elderly individuals.

Elderly and debilitated patients with influenza may present with fever, confusion, anorexia, and functional decline manifested by frequent falls and greater dependency in activities of daily living. Elderly patients also may develop complications of influenza such as bacterial pneumonia or exacerbation of underlying chronic obstructive pulmonary disease (COPD) or congestive heart failure. Pneumonia is the most important complication of influenza. Postinfluenza pneumonia may be either viral or bacterial in nature, but the latter occurs more frequently. Primary influenza pneumonia begins about 1 to 4 days after the onset of initial influenza symptoms. Patients present with a preceding influenza syndrome, followed by increasing cough, tachypnea, and dyspnea. The disease progresses rapidly over 1 to 4 days to cause severe respiratory failure. Secondary bacterial pneumonia typically begins 3 to 5 days after the onset of influenza and can be caused by *Streptococcus pneumoniae*, *Staphylococcus aureus*, or *Haemophilus influenzae*. Reappearance of fever, increased respiratory symptoms, or cough productive of purulent sputum suggest the possibility of a superimposed bacterial infection.

It is difficult to clinically diagnose influenza infection with confidence in elderly patients due to its frequently atypical clinical presentation in this population. Furthermore, many other respiratory viruses such as parainfluenza, RSV, and adenovirus cause similar symptoms and signs. Early knowledge about the activity of influenza in the community through contact with public health officials or local virology laboratories is very helpful in aiding in the diagnosis of influenza. The use of rapid diagnostic testing that detects virus antigens in respiratory secretions can facilitate decisions regarding treatment of influenza with antiviral drugs. Several commercial diagnostic kits are available. Enzyme immunoassays (EIAs) generally perform more consistently, with sensitivities of about 60% to 90%. EIAs of nasopharyngeal aspirates and washes have higher yields than those of nasopharyngeal swabs; throat swabs and gargles are relatively insensitive. Pelleting cells from combined nasopharyngeal and throat swabs are the optimal method for antigen detection in older adults. Viral culture remains the gold standard for diagnosing influenza. Identification of the virus in a cell culture requires 2 to 5 days.

Yearly administration of inactivated influenza virus vaccine is the most important measure for the control of influenza. Influenza vaccination in elderly patients has been shown to decrease hospitalization rates and to reduce mortality. Although the vaccination rate in the elderly, approximately 70%, is higher than that of
other groups for whom influenza vaccine is recommended, further improvements in vaccine coverage levels are needed, chiefly among elderly black and Hispanic individuals. The proposed goal for the vaccination rate in the elderly is 90% by 2010. The Advisory Committee on Immunization Practices (ACIP) of the Centers for Disease Control and Prevention recommends influenza vaccination for all adults ≥50 years as well as for all residents of long-term care facilities. ACIP recommends that vaccine providers focus their vaccination efforts in October primarily on persons aged >50 years. Yearly during October and November vaccination should be routinely provided to all residents of chronic-care facilities. Persons aged >50 years who are hospitalized at any time during September through March should be offered and strongly encouraged to receive influenza vaccine before being discharged. Vaccination also is recommended for individuals who can transmit influenza to elderly patients, such as healthcare personnel, employees of long-term care facilities, and providers of home care to people at high risk. Vaccination of healthcare workers has been associated with fewer deaths among nursing home patients. However, a National Health Interview Survey reported vaccination coverage of only 38% among healthcare workers in 2002.

### Indications for Prophylaxis of Influenza With Antiviral Agents in Older Patients
- Older persons for whom vaccination is contraindicated because of hypersensitivity reaction
- Older persons who were recently vaccinated (2 weeks) prior to an outbreak of influenza in their community
- Older persons who received influenza vaccine that has a poor antigenic match to the epidemic virus
- All residents of long-term care facilities during an outbreak regardless of vaccination status

Although influenza vaccine is only 40% to 60% effective in elderly patients, an effective immune response can be mounted within 10 to 14 days of vaccination. Prevaccination titers as well as number of previous vaccinations have been identified as factors that influence postvaccination titers. Vaccination in multiple previous years confers greater reduction in mortality than does first-time immunization.

The primary goal of influenza vaccination is to prevent the serious consequences of influenza, not to prevent influenza epidemics. Older adults account for >90% of deaths attributed to pneumonia and influenza. Studies in a US community have shown that influenza vaccination consistently decreased hospitalizations for respiratory disease, congestive heart failure, and death from any cause in elderly people. Vaccination of elderly persons in long-term care facilities is associated with decreased risk of pneumonia and death. Economic studies of influenza vaccination in persons >65 years of age conducted in the United States have reported overall societal cost savings associated with use. Individuals aged >50 years should not be vaccinated with live attenuated inhaled vaccine because it is not an FDA indication.

Antiviral drugs for influenza are an adjunct to influenza vaccine for controlling and preventing influenza. However, these agents are not a substitute for vaccination. Four licensed influenza antiviral agents are available in the United States: amantadine, rimantadine, zanamivir, and oseltamivir (Table 3). The latter 2 medications have activity against both influenza A and B, whereas amantadine and rimantadine are active only against influenza A. Evidence for the efficacy of the 4 antiviral drugs principally is based on studies of patients with uncomplicated influenza. These antiviral drugs usually are effective when begun within 48 hours of first symptom onset. Zanamivir and oseltamivir are of comparable efficacy. Data are limited and inconclusive concerning the effectiveness of antiviral drugs for treatment of persons at high risk for serious complications of influenza. Decisions regarding the choice of antiviral medication for influenza must take into consideration the potential side effects of the medications. Zanamivir should not be used in patients who have obstructive airways disease. Accordingly, oseltamivir is considered first-line treatment by many authorities.

Using antiviral drugs for treatment and prophylaxis of influenza is a key component of influenza outbreak control in institutions. When such outbreaks occur in institutions, chemoprophylaxis should be administered to all residents, regardless of whether they received influenza vaccinations the previous fall, and should continue for a minimum of 2 weeks. If surveillance indicates that new cases continue to occur, chemoprophylaxis should be continued until approximately 1 week after the end of the outbreak. Chemoprophylaxis also can be offered to unvaccinated staff members who provide care to persons at high risk. Prophylaxis should be considered for all employees, regardless of their vaccination status, if the outbreak is caused by a variant strain of influenza that is not well matched to the vaccine strain.

### Respiratory Syncytial Virus
RSV is an enveloped ribonucleic acid virus and belongs to the *Paramyxoviridae* family, genus pneumovirus. RSV is a recently recognized cause of lower
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respiratory tract infection in elderly patients, especially in long-term care facilities and adult daycare centers.\(^\text{25}\) It is among the 3 most common viral pathogens detected during the winter months in hospitalized adults with community-acquired pneumonia.\(^\text{26}\)

The annual incidence of RSV infection in the elderly is twice that of influenza.\(^\text{27}\) It is estimated that RSV infection occurs in 5% to 10% of patients in long-term care facilities per year; 10% to 20% of these infections result in pneumonia and 2% to 5% of RSV infections in death.\(^\text{25}\) RSV is transmitted via the spread of large droplets and by direct contact with secretions or fomites. The clinical manifestations of RSV infection in the elderly are quite variable, ranging from mild upper respiratory symptoms to severe respiratory distress. RSV infection typically presents with nasal congestion and discharge and nonproductive cough. Fever is experienced by approximately half of infected persons. Signs of lower respiratory tract involvement such as rales or wheezing are common and help differentiate RSV from influenza. RSV infection can cause exacerbation of congestive heart failure or COPD. Chest radiographs generally demonstrate bilateral interstitial or alveolar infiltrates. However, lobar consolidation has been reported in a third of hospitalized adult patients with community-acquired RSV pneumonia.\(^\text{26}\)

The currently available methods of diagnosing RSV infection in adults are viral culture, antigen detection on nasopharyngeal wash by immunofluorescence or enzyme-linked immunosorbent assay (ELISA); RNA detection by reverse transcription polymerase chain reaction; and antibody assay using ELISA to detect RSV-specific IgM acutely or by a 4-fold increase in RSV-specific IgG titers between acute- and convalescent-phase sera. It should be noted that viral culture and antigen detection are less sensitive than in younger individuals. Concomitant administration of antihistamines or anticholinergic drugs can increase the incidence of adverse CNS reactions.

The currently available methods of diagnosing RSV infection in adults are viral culture, antigen detection on nasopharyngeal wash by immunofluorescence or enzyme-linked immunosorbent assay (ELISA); RNA detection by reverse transcription polymerase chain reaction; and antibody assay using ELISA to detect RSV-specific IgM acutely or by a 4-fold increase in RSV-specific IgG titers between acute- and convalescent-phase sera. Therefore, more than 1 diagnostic test should be used for laboratory diagnosis of RSV infection in older adults.\(^\text{25}\)

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**Table 3. Treatment Options for Influenza in Older Patients**

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Drug</th>
<th>Dosage</th>
<th>Comments</th>
</tr>
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<tbody>
<tr>
<td>Ion channel blockers</td>
<td>Amantadine</td>
<td>100 mg/d</td>
<td>Can be used for both prophylaxis and treatment of influenza A. Dosage adjustment is required in patients with creatinine clearance &lt;50 mL/min. Amantadine or rimantadine should be discontinued as soon as clinically warranted (typically after 3-5 days of treatment or within 24-48 hours after the disappearance of signs and symptoms) to reduce the emergence of antiviral drug-resistant viruses. Central nervous system (CNS)-related adverse effects such as light-headedness, jitteriness, insomnia, and seizures are common in elderly patients. Concomitant administration of antihistamines or anticholinergic drugs can increase the incidence of adverse CNS reactions.</td>
</tr>
<tr>
<td></td>
<td>Rimantadine</td>
<td>100 mg/d</td>
<td>Can be used for both prophylaxis and treatment of influenza A. Dosage adjustment is required in patients with creatinine clearance &lt;10-20 mL/min and severe hepatic dysfunction. Preferred in elderly patients because of less frequent CNS side effects. Nausea and vomiting can be alleviated by taking the drug with food.</td>
</tr>
<tr>
<td>Neuraminidase inhibitors</td>
<td>Zanamivir</td>
<td>2 inhalations of 5 mg ea bid for 5 d</td>
<td>Approved for treatment of both influenza A and B. Adjustment of dosage in renal failure is not necessary. Avoid in patients with asthma or COPD. The most common adverse events reported were diarrhea, nausea, sinusitis, nasal signs and symptoms, bronchitis, cough, headache, dizziness, and ear, nose, and throat infections.</td>
</tr>
<tr>
<td></td>
<td>Oseltamivir</td>
<td>75 mg bid for 5 d</td>
<td>Approved for both prophylaxis and treatment of influenza A and B. 75 mg/day is the dosage for prophylaxis. For patients with creatinine clearance of 10-30 mL/min, a reduction of the treatment dosage of up to 75 mg once daily and in prophylaxis dosage of up to 75 mg every other day is recommended. Nausea and vomiting might be less severe if it is taken with food.</td>
</tr>
</tbody>
</table>

\(d = \text{day}; \ bid = \text{twice a day}; \ COPD = \text{chronic obstructive pulmonary disease.}\)
Treatment of RSV infection in the elderly is primarily supportive with administration of fluids, oxygen, and bronchodilators. Antibiotics may be used in selected RSV-infected adults with underlying cardiopulmonary disease who have bacterial pathogens isolated from sputum. Currently, aerosolized ribavirin is the only approved agent for treatment of RSV infection. There is no evidence of ribavirin efficacy in the treatment of RSV infection in the elderly and ribavirin is seldom used in this patient population. However, ribavirin therapy might be considered as a treatment option in elderly adults with severe disease.25

CONCLUSION
Viral infections are associated with a significant morbidity and mortality in older adults. The future of decreasing associated morbidity and mortality will be through primary prevention by vaccination. For example, in a randomized, double-blind, placebo-controlled trial an investigational live attenuated Oka/Merck VZV vaccine reduced the incidence of HZ by 51.3% and PHN by 66.5% in adults 60 years of age and older.29 Furthermore, based on limited data, intranasal live influenza vaccine was found to be effective and safe in older adults,30 and trials with larger sample sizes are under way (direct communication, Medimmune Vaccines, Inc, Gaithersburgh, Maryland, August 1, 2005).

REFERENCES