COMMUNITY-ACQUIRED PNEUMONIA IS A COMMON ILLNESS associated with significant morbidity and mortality, particularly for older adults and those with comorbid disease. An estimated 915,900 episodes of community-acquired pneumonia occur in adults aged 65 years or older each year in the United States and approximately 1 of every 20 persons aged 85 years and older will have a new occurrence yearly. Most of the hospitalizations and excess deaths due to community-acquired pneumonia occur in older adults, and most of the cost is for patients older than 65 years.

To better meet the health care needs of older patients and potentially alleviate the economic burden on the health care system, it is imperative to understand the epidemiology of pneumonia in this group of patients. In this issue of JAMA, Fry and colleagues examined the trends according to age groups in hospitalizations for pneumonia by comparing National Hospital Discharge Survey data from 1988-1990 and 2000-2002. They found that hospitalization rates have increased among US adults aged 65 to 84 years. Although the hospitalization rate among persons aged 85 years or older did not increase significantly from 1988-1990 to 2000-2002, the rate was approximately twice that of adults aged 65 to 84 years.

In addition, the authors report that the proportion of elderly patients with comorbid chronic diseases also has increased. Such comorbidities increase the severity of pneumonia and adversely influence the outcome of patients. Because this increase in pneumonia hospitalizations represents substantial morbidity and mortality and is associated with increased health care costs, it is appropriate to consider whether this trend can be reduced. The study by Fry et al does not provide a solution, but it does suggest the need to explore various strategies to address the trend. Currently the best approach is to reduce susceptibility to infection.
tion by immunization and smoking cessation, as well as reducing comorbidities to the extent possible (such as better control of diabetes, congestive heart failure, and chronic obstructive pulmonary disease), and reducing malnutrition and risks for aspiration.

Vaccination is the mainstay for prevention of community-acquired pneumonia.7 Pneumococcal polysaccharide and inactivated influenza vaccines are recommended for all older adults and for younger persons with medical conditions that place them at high risk for pneumonia and its complications.7 The new live, attenuated influenza vaccine is recommended for healthy persons (those without a comorbid illness that could place them at higher risk of pneumonia and who are not in contact with high-risk persons) aged 5 to 49 years.6 The efficacy of the pneumococcal polysaccharide vaccine has been documented for prevention of invasive infection (eg, bacteremia) among younger and older adults with certain chronic medical conditions.7 The vaccine reduces invasive pneumococcal disease among persons aged 65 years or older by a relative 44% to 75%. Efficacy decreases with advancing age and although one randomized clinical trial suggested some protection against pneumococcal pneumonia among high-risk elderly persons, other trials did not demonstrate efficacy against lower respiratory tract infection without bacteremia.12-13 The 7-valent pneumococcal conjugate vaccine is currently licensed only for use in children aged 2 to 59 months but has reduced disease in adults by lessening transmission from children.14

The effectiveness of influenza vaccines depends on host factors and on the degree of match between circulating viral strains and vaccine strains. Some recent reports suggest that vaccination has had a modest effect in reducing mortality or influenza-related complications in elderly persons.14 However, generalizing these studies to other populations is difficult because of variations in methods and measured outcomes (ie, all-cause mortality vs confirmed influenza infection vs influenza-like illness). Furthermore, a recent meta-analysis and review of controlled trials of community-dwelling elderly persons found that the inactivated vaccine is approximately 25% to 50% effective in reducing hospitalizations for pneumonia or influenza.15,16 In addition, economic studies of influenza vaccination of persons aged 65 years or older have shown overall societal cost savings.19

The effect of influenza vaccine seems to have additional benefits besides simply protecting against direct infection. A large observational study of adults aged 65 years or older showed that vaccination against influenza was associated with a relative reduction in the risk of hospitalization for cardiac disease (19% reduction), cerebrovascular disease (16%-23% reduction), and pneumonia or influenza (29%-32% reduction) and a relative reduction in the risk of death from all causes (48%-50% reduction).20

Although vaccines may not be as immunogenic in older patients,7,10 clinicians should adhere to recommendations to vaccinate all eligible elderly individuals with both vaccines. The 2 vaccines appear to work additively. *Streptococcus pneumoniae* is the most common cause of bacterial pneumonia after a respiratory virus infection and recent data suggest that the use of pneumococcal vaccine reduces the burden of viral pneumonia that may be caused by viruses other than influenza.21 In one study in Sweden, the use of either pneumococcal or influenza vaccine alone did not significantly reduce the occurrence of influenza or invasive pneumococcal pneumonia, but the combination of the 2 vaccines was associated with a significant decrease in hospital admissions for influenza or pneumonia.22

While influenza and pneumococcal polysaccharide vaccines are recommended for individuals aged 65 years or older and those with comorbidities, many individuals have not received them. A 2003 US survey indicated that among individuals aged 65 years or older, coverage was only 69.9% for influenza and 64.2% for pneumococcal vaccine.23 Studies of vaccine delivery strategies indicate that the use of standing orders is the best way to improve vaccination coverage in office, hospital, or long-term care settings.24 Hospitalization of at-risk patients represents an underserved opportunity to assess vaccination status and provide recommended immunization.25 Influenza and pneumococcal vaccines can be given at the same time in different arms. The vaccines should be provided either during hospitalization or at a follow-up office visit.

As Fry et al point out, new strategies for preventive vaccines are necessary. The development of more potent vaccines could potentially further reduce complications in elderly persons. It will be important to determine whether new recommendations for influenza vaccination of children will have a similar effect of reducing the disease burden in older adults as it has with the use of the conjugate pneumococcal vaccine for invasive pneumococcal disease. One study in Japan showed that mortality in elderly individuals significantly decreased as more schoolchildren were vaccinated for influenza.26 In addition, the role of vaccines for other respiratory viruses (eg, respiratory syncytial virus, parainfluenza, adenovirus, metapneumovirus) needs to be explored.

Chemoprophylaxis can be used as an adjunct to vaccination for prevention and control of influenza. Chemoprophylaxis may be useful for those who have household exposure to influenza, who live or work in institutions with an influenza outbreak, or who are at high risk for influenza complications in the setting of a community outbreak.8 Chemoprophylaxis also may be useful for persons with contraindications to influenza vaccine or as an adjunct to vaccination for those who may not respond well to influenza vaccine (eg, persons with human immunodeficiency virus).8 Amantadine and rimantadine have indications approved by the Food and Drug Administration for treatment and chemoprophylaxis of influenza A infection. However, some clinicians may prefer to use oseltamivir be-
cause it is indicated for prevention and treatment of both influenza A and B.8

In addition to immunization, another consideration to potentially lessen the burden of community-acquired pneumonia in older adults may be directed at reducing the impact of comorbid conditions. Risk factors associated with community-acquired pneumonia in elderly patients include chronic obstructive pulmonary disease, chronic heart failure, diabetes, malnutrition, and swallowing disorders, which increase the risk of aspiration.2,3,27-30 In addition to predisposing to community-acquired pneumonia, these conditions significantly worsen the outcome of pneumonia among older adults.27 While the effect of comorbid conditions on pneumonia is well established, whether optimally controlling these conditions will reduce the burden of pneumonia in elderly persons is unclear. Will interventions such as more intensive treatment of diabetes, chronic obstructive pulmonary disease, and congestive heart failure; supplementing nutritional deficiencies; or evaluation of risk factors for aspiration reduce the predisposition or severity of pneumonia? Previous studies have shown that hyperglycemia at the time of hospital admission adversely affects patients with a wide variety of clinical illnesses, including community-acquired pneumonia.31 However, no prospectively controlled trials have assessed the effect of more rigorous control of blood glucose levels, or other comorbidities, on the incidence and outcome of pneumonia.

Because aspiration of microorganisms in oropharyngeal secretions is a major cause of pneumonia in elderly persons and swallowing disorders are the major risk factor for aspiration, clinical assessment of oropharyngeal hygiene and swallowing problems may be beneficial.20 Evaluation for swallowing disorders, which are common after cerebral infarction, may be performed by observation of oral movement and swallowing of various foods. Potential approaches to reduce aspiration in such patients include dietary modification and compensatory swallowing techniques,29 although we are unaware of any controlled studies that have shown a reduction in associated pneumonia. Furthermore, because poor oral/dental hygiene is associated with increased bacterial colonization of oral secretions and of dental plaque,32 attempts to improve dental hygiene may reduce the infectious consequences of aspiration. The relatively easy act of daily teeth brushing may help to prevent pneumonia, but carefully conducted studies are needed. In addition to potentially reducing dental plaque, one study showed that the simple procedure of daily brushing stimulates sensory nerves that improved the swallowing reflex in elderly patients in nursing homes.33

Until carefully controlled studies of these interventions have been conducted, definitive recommendations are not possible. Such studies should assess multiple outcomes rather than pneumonia alone because a single disease-oriented study or guideline may not recognize potentially undesirable consequences of the intervention for coexisting conditions.24,32 Randomized clinical trials need to be designed to account for the variable effect of multiple comorbidities. However, because pneumonia is one of the most common reasons for hospitalization and is associated with significant morbidity and mortality, it is vital to conduct such studies.

One intervention for comorbid illness for which no further study is needed is smoking cessation. In one study, nearly one third of pneumonia episodes in senior adult smokers and 4% of pneumonia events population-wide could be attributed to smoking.4 Smoking is also associated with a substantial risk of pneumococcal bacteremia; one study showed that smoking was the strongest risk factor for invasive pneumococcal disease in immunocompetent nonelderly adults.30 Counseling patients to quit smoking and providing them with materials to assist with smoking cessation are essential.37,38 In summary, numerous risk factors and underlying conditions affect the susceptibility to and prognosis of pneumonia in elderly individuals.

Clinicians can intervene to modify some of the associated risk factors for pneumonia in older adults. Administration of preventive vaccines, counseling about smoking cessation, stabilization of underlying conditions, and promotion of appropriate nutrition may help to reduce the risk of community-acquired pneumonia and thereby promote longer and healthier lives for older adults.

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REFERENCES


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Vaccine Safety—Achieving the Proper Balance

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Influenza is an acute respiratory disease that causes illness in individuals of all ages. Influenza causes repeated infections throughout life, is highly communicable, and is responsible for annual epidemics of varying severity. While influenza leads to a self-limited respiratory disease in the majority of individuals, it is deadly in others. Influenza is the leading cause of vaccine-preventable hospitalizations and deaths in both children and adults in the United States.1,2 The seriousness of influenza in young children, older children, and in persons of all ages with certain underlying medical conditions is the reason these individuals and their close contacts are targeted for influenza vaccination each year.1

Although hospitalization and death rates among healthy older children and adults are low, a substantial number of such persons miss work or school, visit a health care professional, or receive antibiotics for influenza-associated illnesses. In most years, 10% to 30% of healthy unvaccinated school-aged children and 5% to 15% of healthy unvaccinated young and adult adults experience symptomatic influenza illness.3 Population-based studies of healthy children aged 5 to 15 years estimate that 5% to 7% of such children have an outpatient visit related to influenza, and 6% receive an antibiotic prescription.3,4 Morbidity appears to be similar in healthy adults. While over 70 million healthy persons younger than 50 years are contacts of persons in high-risk groups and are recommended for annual vaccination to reduce influenza transmission to vulnerable contacts, only 18% of such persons receive influenza vaccine.5

The live, attenuated influenza vaccine (LAIV), licensed in 2003, represents a new approach to influenza vaccination and is licensed for healthy individuals 5 to 49 years of age.2 Potential advantages of LAIV over the trivalent inactivated influenza vaccine, or “flu shot,” include its intranasal route of administration and induction of both mucosal and systemic immunity.6,7

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See also p 2720.