Can vaccinations against influenza and pneumococcal pneumonia save lives and money?

**Summary**

Pneumonia and influenza are major causes of morbidity and mortality, especially among the elderly and younger persons with underlying chronic medical conditions. In 1998, 12,130 hospitalizations and 1,228 deaths of Connecticut residents were attributed to pneumonia and influenza. The economic cost of these diseases was $170.6 million in charges for inpatient hospital services alone. Safe and effective vaccines are readily available but underutilized. In 1999, only 63% of Connecticut’s elderly said they received a flu shot in the past year, and less than half said they had ever been vaccinated against pneumococcal pneumonia. Enhanced public health intervention and education by health care practitioners are needed to increase vaccination rates among the elderly and other high-risk groups.

**Introduction**

Influenza and pneumonia are highly contagious respiratory infections. Influenza is caused by constantly changing influenza viruses, whereas pneumonia may be caused by a host of microorganisms, including bacteria (notably *Streptococcus pneumoniae*, which causes pneumococcal pneumonia), viruses, mycoplasmas, protozoa, and chlamydia.

Although influenza usually does not cause pneumonia and most pneumonia is not due to influenza, pneumonia is a frequent complication of influenza, and most influenza fatalities result from secondary bacterial pneumonia (Kilbourne, 1994). The role of seasonal influenza epidemics in increasing flu and pneumonia deaths among the elderly is a key public health concern; consequently, disease monitoring systems often track influenza and pneumonia deaths combined. For example, a national year 2000 health objective targeted the reduction of epidemic-related pneumonia and influenza deaths among people 65 years of age and older.

Along with the elderly, those at higher risk for complications related to pneumonia and influenza include persons under age 65 with underlying chronic medical conditions (Table 1).

<table>
<thead>
<tr>
<th>TABLE 1. HIGH RISK GROUPS</th>
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<tbody>
<tr>
<td><strong>Influenza High-Risk Groups</strong></td>
</tr>
<tr>
<td>- All persons over age 65</td>
</tr>
<tr>
<td>- Residents of chronic care facilities</td>
</tr>
<tr>
<td>- Persons with chronic underlying conditions (see below)</td>
</tr>
<tr>
<td>- Children receiving long-term aspirin treatment</td>
</tr>
<tr>
<td>- Pregnant women beyond the first trimester of pregnancy (during the flu season)</td>
</tr>
<tr>
<td>- Organ transplant recipients</td>
</tr>
<tr>
<td>- Healthcare workers (who pose a transmission risk to others, including patients)</td>
</tr>
<tr>
<td><strong>Pneumococcal Pneumonia High-Risk Groups</strong></td>
</tr>
<tr>
<td>- Persons over age 65</td>
</tr>
<tr>
<td>- Persons age 2-64 years with chronic underlying conditions (see below)</td>
</tr>
<tr>
<td>- Alcoholics</td>
</tr>
<tr>
<td>- Persons with sickle cell disease</td>
</tr>
<tr>
<td>- Immunocompromised persons</td>
</tr>
<tr>
<td><strong>Pneumonia and Influenza: Chronic Underlying Conditions</strong></td>
</tr>
<tr>
<td>- Diabetes mellitus</td>
</tr>
<tr>
<td>- Chronic lung, liver, kidney, and heart diseases</td>
</tr>
<tr>
<td>- HIV infection</td>
</tr>
<tr>
<td>- Cancer</td>
</tr>
</tbody>
</table>

According to one study, more than 90% of patients over age 5 who were hospitalized for lower respiratory viral infections, including influenza, had underlying chronic conditions.3

**Deaths**

Although the death rate for pneumonia and influenza (P & I) has been declining during the past decade (Fig. 1), it remains the fifth leading cause of death in Connecticut.4

In 1998, 1,228 Connecticut residents (32.0 per 100,000 population5) died from P & I. Of the total deaths, 94%

![FIGURE 1 Age-Adjusted Death Rates Pneumonia and Influenza, Connecticut, 1989-98](chart.png)

Source: Connecticut Department of Public Health, Office of Policy, Planning, and Evaluation.3

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occurred among the elderly, and 98% had pneumonia listed as the underlying cause.\textsuperscript{6}

Death rates for P & I rise sharply after age 65, and for most ages, rates for males exceed those for females (Fig. 2). Overall, the death rate for males is more than 50% greater than that for females.\textsuperscript{5}

![FIGURE 2](image)

**FIGURE 2**

Age-Specific Death Rates

Pneumonia and Influenza

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-54</td>
<td>750</td>
<td>1200</td>
</tr>
<tr>
<td>55-59</td>
<td>1200</td>
<td>1800</td>
</tr>
<tr>
<td>60-64</td>
<td>1800</td>
<td>2400</td>
</tr>
<tr>
<td>65-69</td>
<td>2400</td>
<td>3000</td>
</tr>
<tr>
<td>70-74</td>
<td>3000</td>
<td>3600</td>
</tr>
<tr>
<td>75-79</td>
<td>3600</td>
<td>4200</td>
</tr>
<tr>
<td>80-84</td>
<td>4200</td>
<td>4800</td>
</tr>
<tr>
<td>85+</td>
<td>4800</td>
<td>5400</td>
</tr>
</tbody>
</table>

Source: Connecticut Department of Public Health, Office of Policy, Planning, and Evaluation.\textsuperscript{5}

**Hospitalizations**

Pneumonia and influenza constitute the fifth leading cause of hospitalization for Connecticut residents of both sexes.\textsuperscript{3} In 1998, there were 12,130 hospitalizations for P & I, or 370 per 100,000 population. Of these, 87% were for bacterial (including pneumococcal) pneumonia, 12% were for viral pneumonia, and 1% were for influenza. Pneumococcal pneumonia accounts for an estimated 9-55% of all cases of adult pneumonia that require hospitalization.\textsuperscript{7}

Hospitalizations for P & I decreased annually from 1995 to 1997,\textsuperscript{8} then rose in 1998 (Fig. 3). Most hospitalizations occurred during the flu season, or January-March of each year.

Although they represent only 14% of Connecticut’s population, the elderly accounted for 67% of P & I hospitalizations in 1998, and their rate of hospitalization was 16 times greater than that of persons under age 65. Even so, more than 3,000 hospital admissions for pneumonia and influenza were people under age 65.\textsuperscript{8}

The elderly remained hospitalized longer than did younger persons (7.9 vs. 4.4 days average) for influenza, probably due to their having more underlying chronic health problems and a slower immune response. Some of the most common conditions diagnosed in persons hospitalized with pneumonia were hypertension, congestive heart failure, chronic obstructive bronchitis and other lung diseases, coronary atherosclerosis, and diabetes.\textsuperscript{6}

In the U.S. in 1997, white, non-Hispanics 65+ years of age reported the highest percentages of vaccination (67.2% flu, 47.3% pneumococcal), whereas elderly non-Hispanic blacks reported the lowest percentages (50.2% flu, 29.7% pneumococcal).\textsuperscript{10} Comparable figures for Connecticut residents were too small to be reliable.

Vaccination coverage was lower among adults with diabetes, who are considered at high-risk for influenza complications. In 1997, 49% of Connecticut adults with diabetes said they received a flu shot in the last year, while only 34% said they ever had a pneumococcal vaccine.\textsuperscript{11}

![FIGURE 3](image)

**FIGURE 3**

Hospitalizations

Pneumonia and Influenza

- 1994: 11,800 hospitalizations
- 1995: 12,000 hospitalizations
- 1996: 11,800 hospitalizations
- 1997: 12,000 hospitalizations
- 1998: 12,200 hospitalizations

Source: Connecticut Office of Health Care Access, Hospital Discharge Abstract and Billing Data Base.\textsuperscript{8} Oct.-Dec. 1999 data not available.

**Disease Prevention**

**Vaccination Coverage**

One dose of pneumococcal vaccine and a yearly flu shot are recommended for adults 65+ years of age and for selected groups under age 65 who are at risk for the diseases or their complications (see Table 1). Both influenza and pneumococcal vaccinations have been available at no charge to Medicare beneficiaries since 1993.

Among Connecticut’s elderly, self-reported influenza vaccination coverage increased from 38% in 1990 to 65% in 1999, and self-reported pneumococcal immunization rose from 14% in 1993 (the first year this information was available in Connecticut) to 49% in 1999 (Fig. 4). The influenza vaccination coverage exceeded that national year 2000 objective of 60%.\textsuperscript{9}

Adult vaccinations are especially important in long-term care facilities, where infectious diseases can spread rapidly. In 1998, 70% of Connecticut nursing homes met the national year 2000 objective of 80% for influenza vaccinations, whereas only 31% reached the 80% target for pneumococcal vaccinations. Influenza vaccination coverage was higher at facilities where annual consent by residents was not required, and pneumococcal coverage was greatest where vaccine was offered to all newly admitted residents who had not been vaccinated before.\textsuperscript{12}

**Vaccination Effectiveness**

Influenza vaccination decreases pneumonia and influenza infections.
among the elderly by 50% or more and dramatically reduces P & I hospitalizations and deaths. In Connecticut, substantial improvements in vaccination rates for persons 65+ years of age may have contributed to the decline in the P & I death rate between 1989 and 1998 (see Figs. 1 and 4).

High levels of vaccine protection from influenza and its complications have been reported among high-risk persons in nursing homes. Even healthy adults under age 65 benefit from influenza vaccination, in terms of fewer upper respiratory illnesses and physician visits, and less work absenteeism. Similar results have been reported for hospital-based healthcare professionals.

The benefits of pneumococcal vaccination against invasive pneumococcal diseases, in which bacteria spread to the bloodstream (bacteremia) or central nervous system (meningitis), are well known, but its ability to prevent localized pneumococcal diseases like pneumonia without bacteremia has not been demonstrated conclusively. It was shown recently that pneumococcal vaccination prevents pneumonia in healthy infants and reduces pneumonia hospitalizations and deaths among elderly persons with chronic lung disease.

Economics

Disease Costs

In the United States, the economic cost of influenza epidemics exceeds $12 billion annually. More than one-third of this figure represents inpatient medical expenses for persons hospitalized with pneumonia. In Connecticut in 1998, charges for inpatient services for pneumonia and influenza totaled $170.6 million; the average charges per hospitalization were $14,074 for pneumonia and $13,310 for influenza. Nearly 70% of these charges were for persons 65 years of age and over.

One third of elderly and other high-risk persons do not receive flu shots each year, and more than half have never received pneumococcal vaccinations, largely because doctors don’t recommend them.

Economic Benefits of Vaccination

Influenza and pneumococcal vaccinations are among the few health care interventions that are both cost-effective and cost-saving.

The estimated cost of an influenza vaccination (in 2000 dollars) is $10, which includes the cost of the vaccine and vaccine administration, and the total cost of pneumococcal vaccination (1983 dollars) is $14.65. Total direct savings (medical, insurance, etc.) and indirect savings (increased productivity) from influenza vaccination of healthy adults were estimated at $46.85 per person. Flu shots given to children in clinics produced net savings of $35 per child.

Vaccination of older adults living independently in the community saved about $30 to $60 in hospitalization costs per $1 spent on vaccination, and direct savings averaged $117 a year per person. The cost-effectiveness of flu shots also has been shown for the elderly living in nursing homes.

For the 23 million elderly Americans unvaccinated against pneumococcal disease in 1993, vaccination would have saved an estimated $194 million in hospital expenses for bacteremia alone. Use of the pneumococcal vaccine to reduce pneumonia hospitalizations could produce net cost savings over 2 years of $294 per elderly person vaccinated. It recently was estimated that pneumococcal pneumonia vaccination of 575,000 active-duty U.S. Navy and Marine Corps personnel would decrease costs by $9.88 per person.

Conclusion

Despite the demonstrated safety and effectiveness of influenza and pneumococcal vaccines, one third of elderly and other high-risk persons do not receive flu shots each year, and more than half have never received pneumococcal vaccine.

Why aren’t more people vaccinated? According to a recent survey of Medicare beneficiaries, the main reasons for not receiving a flu shot were lack of knowledge that it was needed, not thinking of or missing it, and misconceptions that it would cause or not prevent the flu. The main reasons for not receiving pneumococcal vaccination were lack of knowledge that it was needed and lack of recommendations from physicians.

Reasons for vaccine underutilization among minority groups include poorer access to health care services (related to low socioeconomic status), lack of incentives to primary care providers when reimbursement for vaccine services is low, and cultural factors such as language barriers and undocumented immigrant status. Failure to develop national policy to improve vaccination of high-risk populations has been attributed to emphasis on disease treatment rather than disease prevention, and a lack of appreciation among health care workers for the magnitude of illness and death due to pneumonia and influenza. Such lack of recognition often results in under-emphasis by providers on immunizations.

Inconclusive medical literature about the effectiveness of the pneumococcal vaccine in the elderly and chronically ill also may contribute to the failure of health care providers to utilize the vaccine. Finally, low levels of pneumococcal vaccination may be due in part to inadequate levels of Medicare reimbursement for vaccine delivery.

Adult immunizations receive much less public attention than childhood vaccines, partly because no statute requires them and partly because their value is misunderstood.
Physicians and other health care providers must first recognize that pneumonia and influenza are important diseases and that vaccines are safe and effective; then they must consistently offer the vaccines to their patients. Increased public education about vaccine-preventable diseases and the benefits of vaccination also is needed, especially programs targeting adults who do not have regular contact with traditional health care settings.

Notes

a Death rates age-adjusted to year 2000 U.S. standard million population.
b The terms charges and costs are not synonymous for hospital inpatient services, as insurers negotiate discounted hospital charges. Although actual costs generally are lower than charges, charges is a convenient measure of the relative magnitude of hospital services and resources utilized.

References

This is the third in a series of briefs issued by the Connecticut Department Public Health and spotlighting key health issues that affect Connecticut residents.

For more information, contact the Office of Policy, Planning, and Evaluation, Connecticut Department of Public Health, P.O. Box 340308, Hartford, CT 06134-0308, or visit our web site at http://www.state.ct.us/dph.


* Complete text is available on the Internet.