Immunization Strategies For Reducing Influenza’s Burden On Public Health

Based on an expert panel roundtable discussion held in Dallas, June 30, 2008

HIGHLIGHTS

• Introduction to Influenza

• Societal and Economic Consequences

• Challenges for Health Plans

• Prevention and Population Health Management

• Primary Care Perspectives

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SELF-STUDY CONTINUING EDUCATION ACTIVITY
Immunization Strategies for Reducing Influenza’s Burden on Public Health

Overview/needs assessment
Annual influenza epidemics generate a significant public health burden each year in the United States. Medical and public health professionals, government officials and agencies, and nongovernmental organizations have long called for increasing influenza vaccine usage in the United States and around the world. The reasons for doing so include reducing influenza-associated morbidity and mortality, reducing the economic burden of influenza, preparing for pandemic influenza, and fostering bioterrorism preparedness. This assessment examines the burden of annual influenza epidemics in the United States. Other areas discussed include prevention and management of influenza, access to care, and the idea of universal vaccinations.

Target audience
This program is targeted to medical directors, physicians, and pharmacists within managed care organizations.

Educational objectives
After reading this publication, participants will be able to:
- Discuss strategies used for influenza prevention, diagnosis, and management, especially in vulnerable populations.
- Assess burden of disease associated with influenza in all populations.
- Evaluate the economic impact of influenza on the health care system.
- Review Advisory Committee on Immunization Practices meeting discussions and notes.
- Discuss appropriateness and means for universal influenza vaccination.

Method of instruction
Participants should read the learning objectives and review the activity in its entirety. After reviewing this activity, submit a completed post-test and evaluation. Upon achieving a passing score of 70 percent or better on the post-test, a statement of credit will be awarded.

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Influenza is a prevalent disease with a large burden of morbidity and mortality (Couch 1986, Sullivan 1993, Simonson 1997). With annual outbreaks of epidemic or pandemic proportions and a relatively high death toll among vaccine-preventable diseases, control of influenza has become a major public health goal. Over the last 30 years, understanding of the molecular biology of the virus and the pathophysiology, natural history, and treatment of the illness has advanced enormously, yet there has not been much progress in reducing death from influenza. Advances in disease control, including the availability of new antiviral agents and both inactivated and live-attenuated vaccines, as well as improved understanding of how the disease spreads, hold promise that effective control of influenza might reduce its medical and economic impact within our lifetimes.

**The influenza virus**

Studies of the molecular biology of the influenza virus have revealed important insights into the genetics of influenza and how its evolution affects human infection during influenza epidemics and pandemics. Influenza virus is a spherical or ovoid body with a lipid bilayer en-
severe illness (CDC 2008a).

Three influenza pandemics have been studied in an effort to gain a better understanding of the genetic diversity of the virus: the 1918 Spanish influenza (H1N1); the 1957 Asian influenza (H2N2); and the 1968 Hong Kong influenza (H3N2). Both the 1957 and 1968 pandemics were caused by viruses that clearly resulted from genetic reassortment events of the prevailing strain. The 1957 pandemic was caused by a hybrid virus resulting from a dual infection with the avian H2N2 and human H1N1 influenza strains. The resultant species contained a hemagglutinin, a neuraminidase, and a gene for a polymerase protein from the avian virus and five genetic segments from the human virus (Figure 1). In the 1968 variant, the hemagglutinin and polymerase genes of this virus were further replaced with alternative avian genes to form H3N2. This viral form continues to be the major source of influenza infections in humans today.

Interestingly, however, Taubenberger (2005) found that the 1918 pandemic was caused not by a virus formed by reassortment, but by the mutation of a purely avian strain into an excessively virulent species that adapted to humans. Researchers worked with two preserved virus specimens from the 1918 pandemic — one, a soldier’s lung sample that had been stored at Walter Reed Medical Center, in Washington, and the other from an Eskimo who died in the pandemic and had been buried frozen in permafrost in Alaska — and were able to sequence the genes of the viral isolate. They found that all eight genes of the viral strain were derived from a duck virus that had adapted or mutated over time to permit human-to-human transmission. This finding may have alarming implications for the future. A current avian virus, H5N1 influenza A, is extremely pathogenic and is decimating the fowl population in at least eight Asian countries. The strain has been spreading to new avian and nonavian species. The virus has infected 379 humans, causing 239 deaths (WHO 2008). If it were to adapt for widespread human transmission, there is fear of a pandemic of unusually high morbidity and mortality.

**Influenza epidemics**

The “flu” is perhaps the most widely disseminated respiratory infection in the world. There are approximately

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**FIGURE 1**  Mechanism of genetic reassortment in influenza virus: origin of the 1957 and 1968 strains

Source: Belshe 2005
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10 million to 60 million cases of acute influenza each year in the United States, leading to as many as 25 million office visits, 200,000 hospitalizations, and 36,000 deaths (CDC 2008b, Couch 2000, U.S. Census Bureau 2008).

**Virus transmission.** Influenza is transmitted primarily via airborne respiratory secretions released in the event of a cough or a sneeze. It is believed that the virus settles in the host trachea and lungs and is absorbed into tissue by endocytosis. The virus replicates in the lower airway, with onset of cough and fever within 1 to 2 days of infection (Moser 1979). The highest mortality related to influenza occurs among elderly patients over age 65 and among patients with chronic conditions that are risk factors for influenza complications.

An aggressive effort to mitigate the disease with medication and vaccination has long existed in these high-risk populations. Today, however, it is becoming increasingly clear that children, in fact, bear the greater burden of infection. Although death rates are lower in this group, children experience the highest rates of sero-positive infection and are hospitalized for flu symptoms in much higher numbers than the elderly (CDC 2001a). One study estimated a rate of 1,000 children per 100,000 population versus 150 elderly per 100,000 population (Neuzil 2000).

Children also are responsible for most of the virus transmission throughout the community. Glezen (1997) followed patterns of influenza in 145 Houston-area families and reported an overall infection rate of 32.8 per 100 patient-years. The highest rate of 47.7 per 100 patient-years was observed in children aged 6 to 10 (Figure 2). Rates of infection decreased progressively in each advancing age group, and actual rates of infection were lowest among adults older than age 25.

Thus, what begins as a disease of children, acquired and circulated in the closed community of school, is now believed to pass on secondarily to adults, first within the home, then into the local environment (neighborhoods and regular contacts), and ultimately, reaching the greater community at large. Transmission from child to child in the school setting expands this infected universe by multiples (Elveback 1976).

**Patterns of epidemics.** The resultant disease epidemics take on fairly predictable patterns of progression. After a gradual increase in the proportion of patients with isolates of type A influenza, there is a rapid spike in infection prevalence, which usually lasts about 3 months. This spike is a bell curve that reflects the period of rapid spread and peaking of the epidemic, and the subsequent mounting of an immune response that mitigates the illness in the individual patient within 2 to 3 days (CDC 2008c). There is often a second surge of influenza infection caused by the B virus several weeks later due to lower and slower rates of transmission of influenza B, although in the 2007–2008 U.S. influenza season, A and B illnesses appeared to circulate simultaneously. Similarly, the peak month of illness generally falls in January or February, but has been reported as early as November and as late as April (CDC 2008c).

**Diagnosis trends**

The clinical diagnosis of influenza is moderately reliable in the event of a flu epidemic; in a community with widespread flu, the presence of cough and the acute onset of fever indicates influenza with 70 percent specificity (Hayden 2004). Without prevalent flu, however, it is much harder to diagnose influenza, because these common symptoms can suggest a wide range of alternative disorders.

Laboratory culture is the standard method used to establish the presence of influenza infection, but it is a time-consuming procedure. Polymerase chain reaction (PCR) tests are equivalent to, or better than, laboratory culture, offering greater sensitivity. PCR utilizes nasopharyngeal aspirate or nose/throat swab to detect influenza virus infection, acute respiratory infection, and lower respiratory infection.

**FIGURE 2** Age-specific annual influenza infection rates, Houston family study, 1976–1984

*Source: Glezen 1997*
viral RNA in as little as 15 minutes in the laboratory. In addition, rapid diagnostic tests are becoming more common and more reliable, allowing physicians to confirm the clinical diagnosis in the office setting. More than five rapid antigen-detection tests are available. Although modest in sensitivity (approximately 60 percent), these tests offer a rapid reading and, when positive, permit early initiation of antiviral therapy (CDC 2006). These tools are meeting with mixed reception among community physicians due to concerns about reliability and cost, but if nothing else, they will play a role in community influenza surveillance, particularly in less urban or academic settings.

Prevention trends
Over the years, many attempts have been made to suppress the spread of the influenza virus through such actions as isolating people, gargling with antiseptic, and wearing a mask. It was not until the development of influenza vaccine, however, that reliable protection against the spread of influenza could be achieved.

Today’s influenza vaccine is the most effective means to reduce the impact of influenza infection and virus-related illness. The vaccine is a trivalent compound; that is, it contains the three strains of viruses, including H1N1 and H3N2 type A and the type B influenza, commonly found in the United States. There are two types of vaccines: a trivalent inactivated vaccine (TIV) and a live-attenuated influenza vaccine (LAIV). The former is made from highly purified, egg-grown virus that is killed, and the hemagglutinin presented in the vaccine raises an immune response (Kilbourne 1987). This vaccine is delivered by intramuscular (IM) injection. The LAIV uses live but weakened egg-grown virus delivered via a nasal spray. Some inactivated viruses are approved for use in children as young as 6 months, whereas the LAIV is used starting at age 24 months through 49 years (Table). LAIV is not approved for children younger than 24 months of age due to adverse events, primarily wheezing, that may occur in a small percentage of patients. The most common adverse reactions found to occur with the use of LAIV are runny nose or nasal congestions in children and adults, fever of more than 100°F in children aged 2 to 6, and sore throat in adults (IIV 2008).

The efficacy of influenza vaccination is related to both age and immune competency, and depends on a match with the circulating virus of the season. If the vaccine does not contain strains that reflect the circulating viral population, it may not protect against onset of influenza. When appropriately matched and used in healthy children and adults under age 65 years, the vaccine has been reported to prevent disease onset in 70 to 90 percent of treated subjects (Palache 1997). The immune-senescent elderly, however, achieve lower post-vaccination antibody titers, and, as a result, realize only 30 to 40 percent protection against onset of influenza-related illness (Blumberg 1996, Dorrell 1997, Nichol 1998). Elderly persons in nursing homes or chronic-care facilities benefit from a 50 to 60 percent reduction in hospitalization or pneumonia and an 80 percent decrease in death (CDC 2001a, Patriarca 1985, Arden 1986). Current research is focused on improving vaccines for the elderly, either by increasing the amount of antigen or by adding an adjuvant compound that might stimulate the immune response to achieve better outcomes.

A recent study examined the relative efficacy of LAIV compared with TIV (Belshe 2007). In this head-to-head trial, approximately 8,000 children aged 6 months to 5 years were randomly assigned to vaccination with either IM injection of TIV, or to the cold-adapted trivalent LAIV (a refrigeration-stable formulation) nasal spray. Children who developed influenza-like symptoms were cultured to determine virus strain and titer.

Investigators observed a significant difference in the number of culture-confirmed cases of influenza that occurred in subjects receiving LAIV versus TIV (153 vs. 338 cases, respectively; P<.001). The reduced rate of infection associated with LAIV was consistent across age groups and for both antigenically well-matched influenza and virus variants (Figure 3, page 6). In addition, there was a 50.6 percent greater reduction in rates of symptomatic influenza (P<.001), a 45.9 percent greater reduction in lower respiratory infections (P=.046), and a 50.6 percent improvement in rates of acute otitis media associated with LAIV versus TIV (P=.003).

The broad coverage across multiple strains of influenza virus achieved with LAIV was confirmed in another study in which the antibody response to a Nanchang strain vaccine protected against multiple alternate viral strains, including the Sydney, Thessaloniki, Russian, and Johannesburg strains (Belshe 2000). LAIV provided better immune protection and a broader range of activity than TIV. This broad protection advantage should enable

### TABLE

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<th>Current indications and contraindications for live-attenuated influenza vaccine (LAIV) vs. trivalent inactivated vaccine (TIV)</th>
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<tbody>
<tr>
<td><strong>LAIV</strong></td>
<td><strong>TIV</strong></td>
<td></td>
</tr>
<tr>
<td>Indicated for ages 24 mo.–49 yr.</td>
<td>Indicated for age older than 6 mos.*</td>
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<tr>
<td>Contraindications: egg allergy, Guillain-Barré syndrome</td>
<td>Contraindications: egg allergy, Guillain-Barré syndrome</td>
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<tr>
<td>Not for recurrent wheezers</td>
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<tr>
<td>Not for pregnant women</td>
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*Different manufacturers have various ages indicated.
better outcomes with empiric therapy, and without the need to identify target virus, and to develop a vaccine aimed specifically at prevailing strains.

Antiviral drugs

Influenza-specific antiviral drugs are valuable adjuncts to vaccine in the management of influenza. Prophylactic or early (less than 48 hours after symptom initiation) treatment with these agents has been shown to reduce peak viral titers and limit the severity and duration of influenza-like illness. The agents available today target either the M2 ion channel of the viral envelope (amantadine or rimantadine) or the surface enzyme neuraminidase (oseltamivir or zanamivir).

Neuraminidase is an enzyme that breaks down sialic acid on the host cell surface. In the natural history of the influenza virus, the cleavage of sialic acid enables entry of virus into the host cell, as well as the release of replicated virus from infected cells back into the environment. Thus, the neuraminidase inhibitors work both to prevent spread of influenza by blocking release of viral replicates and to reduce severity of illness in the treated patients by blocking virus uptake.

The neuraminidase inhibitors have been reported to be 70 to 90 percent effective at preventing onset of both A and B viral influenza, depending on the population studied (Cooper 2003). Prophylactic treatment is cumbersome, however, necessitating daily intake for the duration of an epidemic, generally about 6 to 10 weeks. These agents have proven valuable for reducing the duration and severity of influenza symptoms, lessening the burden of pneumonia and otitis media, and reducing hospitalizations of infected patients (Cooper 2003). The drug must be given within 48 hours of the onset of illness — during which time culture-confirmed diagnosis, prescription, and fulfillment must all be completed — or viral replication will have peaked and the drugs will no longer provide a beneficial effect (oseltamivir phosphate 2008). The ion channel blockers also prevent the virus from penetrating the host cell. As a result, the virus does not replicate. These drugs are generally about 50 percent effective at preventing and 70 percent to 90 percent effective at reducing the intensity of influenza A but not B infection (Couch 1997). A problem occurs, however, when any of the amino acids lining the M2 ion channel mutate, which renders the drug ineffective. Changes in the amino acids are quite common, occurring in about 1 of 1,000 viral particles (Belshe 1989). In this case, when a patient is treated with an ion channel blocker, the stable viruses are eliminated, but resistant, or altered, viruses survive. As they are shed and begin to spread, there is a wave of resistant influenza, which has become a widespread problem limiting the use of these drugs.

Conclusion

Although influenza is a common and generally benign disease that has at one time or another affected every American in some way, it can in fact be quite devastating. Morbidity from influenza is a major public health concern, and flu pandemics that result from genetic reassortment or viral mutations have caused

FIGURE 3 Study MI-CP111. Efficacy comparison by age: all strains
SOURCE: Belshe 2007
ATP=according to protocol, CDC-ILI=influenza-like illness as defined by the Centers for Disease Control and Prevention, LAIV=live-attenuated influenza vaccine, TIV=trivalent inactivated vaccine.
hundreds of thousands of deaths around the world. Fortunately, contemporary molecular biology and advanced genetic techniques allow for a better understanding of viral biology and the origins of influenza pandemics that may enable improved diagnosis and disease control.

The influenza vaccine has reduced the disease burden of flu, but has not significantly lowered the death rate. This is a result of the combined factors of underutilization of the vaccine and a revised understanding of disease spread. It is imperative that vaccination rates improve, particularly among the high-risk elderly population and health care workers. It also is clear that targeting children for universal vaccination can help to control spread of the virus and reduce morbidity and mortality in all age groups.

References
IVF (Influenza virus vaccine live, intranasal [FluMist]) [prescribing information]. Gaithersburg, Md: MedImmune; June 2008.

Disclosure: Robert Belshe, MD, has received grant/research support from Merck, has served as a consultant for MedImmune and Merck, and has served on the speaker’s bureau for sanofi-aventis, Merck, and MedImmune. He reports having been compensated for work related to the influenza virus vaccine live, intranasal (FluMist), the influenza virus vaccine suspension for intramuscular injection (Fluzone), and an investigational product from Merck.
Influenza is a disease with a significant impact on public health, affecting between 5 and 20 percent of the U.S. population each year. It occurs with substantially greater frequency and significantly more mortality than is observed with any other vaccine-preventable disease. For example, in comparison with pneumococcal disease (40,000 cases and 5,500 deaths), human papillomavirus (10,532 cases and 3,900 deaths), hepatitis B (6,741 cases and 685 deaths), and varicella (20,948 cases and 16 deaths), there are about 31 million cases of influenza in the United States, leading to approximately 36,000 excess deaths annually (Thompson 2003, Weycker 2005, CDC 2008, ACS 2004). Furthermore, this disproportionate incidence of influenza occurs in a relatively short time period — generally about 10 to 12 weeks — that reflects the seasonal profile of the epidemic.

Traditionally, the approach to vaccine control of influenza has been based on covering high-risk populations. Until recently, vaccination efforts primarily have focused on individuals 50 years of age or older, residents of chronic care facilities, children and adults with chronic conditions that place them at high risk for influenza complications, and, more recently, children younger than 5 years of age. Pregnant women and health care workers also are priority populations for influenza immunization. It is now clear, however, that this risk-based approach has not been successful in reducing overall morbidity and mortality from the disease, and the medical community is beginning to consider new strategies for influenza prevention.

**Disease burden**

Influenza is a major medical and economic burden in the United States. According to a systematic evaluation of influenza outcomes from 2001 to 2003, about 31 million outpatient visits each year are related to flu symptoms, accounting for about 3.1 million hospitalized days (Molinari 2007). Influenza is the number one vaccine-preventable cause of death among both adults and children, leading to an estimated 610,660 life-years lost (Molinari 2007).

Direct medical costs due to influenza, adjusted to 2003 prices, average $10.4 billion, and projected lost earnings as a result of illness and loss of life account for $16.3 billion (Molinari 2007). The total annual economic burden from influenza across all age groups (using projected statistical life values) is $87.1 billion. When associated with health outcome, 83 percent of the total cost of influenza is attributable to death, 7 percent to hospitalizations, and 8 percent to outpatient care. These results emphasize that the impact of influenza in the United States remains high, with an exorbitant cost related to lost productivity and disease-related death rather than from hospitalization. In addition, the loss of productivity and the time away from work hinders national economic growth. Thus, more focused and effective prevention strategies would not only improve quality of life for individual Americans affected by influenza, but also would positively affect the country’s economy.

**Changing recommendations for vaccination**

The failure of a risk-based vaccination strategy to improve morbidity and mortality from influenza has in recent years led a number of monitoring agencies to recon-
Consider strategic guidelines for immunization. The Advisory Committee on Immunization Practice (ACIP) traditionally had called for annual immunization against influenza among adults aged 50 and older; residents of chronic care facilities; children and adults with chronic health conditions, such as chronic pulmonary disease, renal dysfunction, or immunosuppression from HIV; pregnant women; and children aged 6 months to 18 years who receive long-term aspirin therapy (ACIP 2006, Bridges 2003). However, due to high rates of influenza-related medical care for children, along with their role in the spread of influenza to susceptible household contacts and the community, ACIP recently voted to expand immunization recommendations to include universal vaccination for all children aged 6 months through 18 years (Table). The committee also advised that inadequate vaccination for children younger than age 9—i.e., only one dose in their first vaccination year—should be corrected by giving two doses 4 weeks apart in the subsequent year. Another key point was the recommendation to vaccinate household members and out-of-home care providers of all children who are at high risk, and of all healthy children younger than 5 years of age.

**Current vaccination statistics**

Vaccination is the most effective method for preventing influenza and reducing the burden of flu complications. Achieving national goals for immunization as established by the ACIP, however, has been a challenge (ACIP 2006, Committee on Infectious Diseases 2008). As shown in Figure 1 (page 10), immunization guidelines have been well adopted by adults older than 65, who achieved an immunization rate of 65 to 70 percent in 2004. In addition, the elderly with comorbid conditions reached a rate as high as 75 percent. Meeting the goals for other populations, however, has been less successful (Lu 2008). Influenza vaccination coverage in 2004 was only 50.5 percent for adults aged 50 to 64, and 27.2 percent for those aged 18 to 49.

The U.S. Centers for Disease Control and Prevention’s (CDC) Healthy People 2010 initiative also has rather rigorous influenza vaccination objectives (CDC 2005). With recommendations for 90 percent vaccination among noninstitutionalized adults older than age 65, 90 percent vaccination of institutionalized adults, and 60 percent vaccination for other risk groups by the year 2010, a mid-course review determined that these goals are not being met. Immunization rates for adults over age 65 reached 69.3 percent, but none of the other age and risk categories had achieved rates above 50 percent at the time of the review. This is reflected in the rates for adults aged 50 to 64 with comorbidity (48.4 percent), adults aged 50 to 64 without comorbidities (32.2 percent), adults aged 18 to 49 with or without high-risk conditions (30.5 percent and 18.3 percent, respectively), and children aged 6 months to 23 months (20.6 percent fully vaccinated) (CDC 2007a, 2007b, 2007c).

In addition, there are two demographic groups for whom suboptimal coverage has far-reaching implications. Vaccination among pregnant women in 2004 was only 14.4 percent (Figure 1, page 10), despite the fact that this population is more likely to develop serious medical complications and require hospitalization for flu symptoms than age-matched, nonpregnant peers (Lu 2008). Furthermore, vaccinating a pregnant woman has the potential to also protect the newborn infant via the transfer of maternal antibodies through the placenta to the developing fetus so that the child is born with a degree of protective immunity (Zaman 2008). Although concerns about the safety of immunization to both mother and child might play a role in the inadequate uptake in this population, there is no documented evidence of harm to the pregnant mother or fetus associated with influenza vaccine (Munoz 2005, Heinonen 1973). Similarly, although there has been a trend toward improved immunization rates among health care workers, maximum

**TABLE**

**Recommendations for influenza vaccination**

<table>
<thead>
<tr>
<th>Advisory Committee on Immunization Practices</th>
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<tr>
<td>• Adults aged 50 or older, residents of chronic care facilities, children and adults with chronic conditions, pregnant women, and children 6 months to 18 years who are on aspirin therapy should be immunized against influenza.</td>
</tr>
<tr>
<td>• Immunization providers should begin efforts to offer influenza vaccination to all children aged 6 months through 18 years in the 2008–2009 influenza season, if feasible.</td>
</tr>
<tr>
<td>• Annual vaccination for all children aged 6 months through 18 years should begin in the 2009–2010 influenza season.</td>
</tr>
<tr>
<td>• Children aged 6 months to 18 years who have not been vaccinated previously or who were vaccinated for the first time during the previous season and received only one dose should receive two doses of vaccine.</td>
</tr>
<tr>
<td>• The first dose should be as soon as is feasible after vaccine becomes available, so that both doses can be administered before the onset of influenza activity.</td>
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**Healthy People 2010**

| • 90 percent vaccination rate for noninstitutionalized persons ≥65 years of age |
| • 90 percent vaccination rate for institutionalized adults |
| • 60 percent vaccination for other risk groups |

Sources: ACIP 2006, ACIP 2008, CDC 2005
coverage achieved in 2004 was 43.2 percent (Lu 2008). A failure to meet vaccination goals in this group has the potential to increase influenza-related risk to patients and — particularly among the elderly and seriously ill — to increase influenza-related death as well. If caretakers are going to be true advocates for vaccination, it is incumbent on them to serve as role models by being vaccinated themselves.

One might expect to see a reduction in the number of deaths in the older-than-65 age group, given their relatively high rate of vaccination, but this is not the case. Among all-cause deaths between 1990 and 2000, the total number of cases remained unabated, with about 90 percent of influenza deaths occurring in the elderly population (Thompson 2003, Thompson 2004). This may be due in part to senescence of the immune system and the resultant failure of the vaccine to provide optimal protection. On the other hand, low vaccination rates in the index group, which, as described below, is generally made up of school-aged children, may lead to poor disease control and rapid viral transmission throughout the community, affecting the frail elderly indirectly.

**Influenza virus transmission**

Children appear to play an important role in dissemination of the influenza virus, particularly during the early phase of a flu epidemic when the index events first enter the community (Figure 2). According to Glezen (1982), school-age children represent a disproportionate number of influenza cases in the early period of a flu epidemic, with a subsequent age shift in the population presenting for medical care. It was reported that children 5 to 19 years of age represent more than 50 percent of cases seen in the early phase but only 35 percent during the later phase of the outbreak. In contrast, the incidence of positive influenza cultures among adults aged 20 to 44 rose from 20.7 percent in the early phase to 28.9 percent in the late phase and from 7.3 to 11.4 percent among adults aged 45 or older in this same time frame (Glezen 1982).

This has led some scientists to question the validity of the high-risk approach to influenza vaccination. School and daycare settings are recognized incubators for viral spread due to children’s susceptibility to influenza infection, high student density, poor understanding of hygiene, and exposure to common items shared by large groups of classmates. Infected children then transport the virus home to siblings, parents, and caretakers, and ultimately, to other contacts in the community. If children are key transmitters of disease early in an epidemic, does focusing on immunization of the elderly and chronically ill population achieve the goal of deterring spread of the disease? It might be more rational to prevent outbreaks among school-age children to break the cycle of progressive spread among susceptible individuals in the community.

In fact, the advantage of vaccinating children for improved control of influenza morbidity and mortality was suggested as long ago as 1970. Investigators attempted to change the course of the 1968 pandemic outbreak caused by influenza A/Hong Kong (H3N2) in Tecumseh, Mich.,
by initiating a school-based effort aimed at universal immunization of schoolchildren with an inactivated virus vaccine (Monto 1970). The course of the pandemic outbreak was then compared with that seen in neighboring Adrian, Mich., as well as in Flint and Lansing, Mich., where widespread immunization was not carried out. The investigators achieved an overall rate of vaccination of 85.8 percent among students enrolled in Tecumseh schools, which was completed approximately 2 weeks before the influenza virus was first isolated in the district. On follow-up, the investigators observed a 26.7 percent overall effectiveness rate in deterring respiratory illness during the pandemic. The reduction in respiratory illness was reported in all age groups over the course of the 10-week pandemic (Figure 3), indicating that protection was not limited to the schoolchildren immunized, but also extended to adult members of the community as well.

Similar benefits during pandemic and epidemic influenza were ascribed to widespread immunization in several other investigations. An Australian study reported limited spread of H3N2 influenza in a small community where individuals with chronic medical conditions, elderly adults, and children between 1 and 3 years of age were assigned to vaccination (Warburton 1972). In Japan, a country that was an early proponent of widespread vaccination of schoolchildren to control epidemic or seasonal influenza, administration of an inactivated influenza virus vaccine to 80 percent of schoolchildren who were 7 to 15 years of age was found to prevent between 37,000 and 49,000 excess deaths annually (Reichert 2001). A mass vaccination campaign among Russian schoolchildren (aged 3 to 17 years) in two communities near Moscow led to a statistically significant (P<.01) 3.4-fold reduction in cases of influenza-like illness among more than 82,000 noninstitutionalized adults older than age 60 when compared with results in the approximately 76,000 elderly subjects in two control communities (Ghendon 2006). Vaccination with a trivalent live attenuated influenza vaccine (LAIV-T) among 15 percent of children aged 1.5 to 18 enrolled in a central Texas program reduced the rate of medically attended influenza-related illnesses by 8 to 18 percent in adults aged 35 or older (Piedra 2005, Piedra 2007a).

The findings in all of these studies helped to establish the concept of “herd” immunity, or indirect protection, in a community as a result of effective immunization of preschool and school-age children — a large index group. The concept of herd protection has been documented, and aggressive immunization of preschool and school-aged children appears to be an effective way to slow the progression of viral illness in the community (Monto 1970, Reichert 2001, Piedra 2005, Piedra 2007a). Our data show that reaching 15 to 25 percent of children in the community can yield up to an 18 percent reduction in influenza-like illness cases in adults over age 35 (Piedra 2005). A more recent study indicated that administering LAIV-T to children age 5 to 18 during the 2003–2004 influenza outbreak reduced the rate of influenza-positive cultures by 37.3 percent and pneumonia and influenza events by 50 percent, even though the outbreak arrived early, was intense, and was caused by a drifted variant (Piedra 2007a). Indirect protection against medically attended acute respiratory illness among adults aged 35 to 44 and children aged 5 to 11 who were not vaccinated was also observed.

Results of a community-based universal child immunization program

In 1998, a National Institutes of Health-sponsored clinical trial for widespread vaccination of children was initiated in central Texas as a means to cover as large a base as possible with influenza protection. The trial was initiated by the Baylor College of Medicine, in Houston, in collaboration with the Scott & White Clinic, in Temple, Texas, one of the nation’s largest health care systems. Children were vaccinated with LAIV-T, administered by nasal spray, or the inactivated influenza vaccine (IIV-T), administered by intramuscular injection in schools in several towns in central Texas. Healthy children in the intervention cities received LAIV-T, whereas children with an at-risk condition received IIV-T. Age-eligible children in the comparison cities were not offered an influenza vaccine through the trial. Over the years, the

![Weekly mean rates of respiratory illness (%)](https://example.com/figure3.png)
school-based influenza vaccination program has been the most successful of our programs in vaccinating all children in the intervention communities. This vaccination program required buy-in from many stakeholders, including independent school districts, the Bell County (Texas) Health Department, and regional medical education institutions: Baylor College of Medicine; Scott & White Clinic; and University of Mary Hardin–Baylor School of Nursing, in Belton, Texas.

Building community awareness regarding the burden of influenza and the benefit of vaccination continues to be a major emphasis of our program in the intervention cities. Community education is accomplished through press releases, newspaper articles and ads, informational posters and pamphlets given to schools and clinics, and school-based educational events. The education and vaccination campaigns are conducted in the intervention cities, which include Academy, Belton, Holland, Rogers, Salado, Temple, and Troy, all based in central Texas. The school-based influenza vaccination program complements the community physicians’ efforts against influenza. In the comparison cities, including Bryan, College Station, and Waco, all of which also are in central Texas, the education and prevention of influenza are conducted by the community physicians.

For the school-based influenza vaccination program, it is crucial that schools are well aligned with the program, as time is needed for scheduling the vaccination date, delivering the consent packets through the schools, having the packets returned to the school with the signed consent and assent forms, sending reminders of the vaccination dates, and conducting in-school vaccination. The consent packets are delivered in elementary schools to children in the classroom or by mail to the homes of children in the middle and high schools. The signed consent forms are returned to the school in time for vaccination.

For this program, the vaccination process is best conducted during the months of September, October, and November, and completed just prior to Thanksgiving. Such outcomes as school absenteeism and health care utilization for influenza-related illnesses are examined. Demonstrating a beneficial impact on schools, families,
and the community makes a strong argument for sustaining the school-based influenza vaccination program.

Outcomes were examined in a nonrandomized, open-label, community influenza vaccination trial in children. Influenza vaccination coverage was about 2.5- to 3-fold higher in school-aged children in the intervention communities compared with the comparison communities (Figure 4). In 2003–2005, children 5–11 and 12–17 years of age who received care at the Scott & White Clinic had greater vaccination coverage, approximately 60 and 40 percent, respectively, than most other age groups, other than adults older than age 65 who received care at the clinic.

As a result of the higher coverage of school-aged children, the relative risk (RR) of medically attended influenza-related illnesses fell in the intervention cities compared with the comparison cities (Piedra 2006). During the epidemic of the 2004–2005 flu season, adult subjects in the intervention communities experienced a substantial RR reduction for acute respiratory illnesses in comparison with control peers. The RR ratio reverted back to pre-epidemic values after the influenza season, supporting the concept of herd protection during the active flu season.

During the subsequent epidemic (2005–2006), the investigators achieved approximately 30 percent coverage of children aged 5 to 18 in the intervention communities and observed direct and indirect protection against influenza — including the ability to prevent the second influenza wave, which was dominated by influenza B (Piedra 2007b). In the vaccination year 2005–2006, coverage in the 5–18-year age range who received care at the Scott & White Clinic was approximately 2.5- to 3-fold greater in the intervention cities than in the comparison cities. The school-based influenza vaccination program, which was initiated for 2007–2008 and limited primarily to elementary schools, reached 5,144 elementary-grade students, 887 school staff members, and 996 additional school-age children through the outreach and clinic-based vaccination efforts (Gagliani 2008).

For the 2008–2009 influenza season, there are plans to expand the school-based vaccination program to include all of the middle and high schools in the intervention cities, reaching more children and school staff members, and offering parent and student participation in focus groups. It will be valuable to see how an increase in vaccination coverage relates to morbidity and mortality from influenza in the intervention communities. The success of the program to date suggests that universal vaccination of children may be an important means to help control seasonal influenza and should be considered in any pandemic preparedness plan.

**Barriers to universal vaccination**

The clinical benefit of influenza vaccination of school children has now been documented in the United States, Italy, Japan, and Russia. A number of barriers must be addressed, however, if universal vaccination is to be achieved. Among the most important barriers are patient factors, including safety or side-effect concerns that might deter patient use, a misunderstanding that generally can be reversed with education.

Another common barrier is that some people have time limitations that prevent them from reaching vaccination sites, or are concerned about reimbursement from insurers, or are unable to pay. These situations suggest the need for providing easier access to vaccination sites, influenza vaccine coverage (LAIV-T and IIV-T) by third-party payers, and umbrella policies for the uninsured, respectively. Yet another common, but less often considered, barrier is the lack of physician recommendation. Without a prompt from their health care provider, many people will not seek vaccination as a standard of care.

There also are vaccine availability factors that can interfere with widespread immunization, including an inadequate supply, distribution problems, or product recalls. Perhaps the most important challenge, however, lies with the medical provider: if the physician or nurse does not take every opportunity to encourage patients to receive a flu vaccine, widespread coverage will not be accomplished.

**Conclusion**

Influenza is a disease of substantial morbidity and mortality and has been the focus of aggressive prevention efforts for many years. Vaccination has proven to be the best means to control viral spread and to reduce the burden of the disease. However, older vaccination guidelines, which focused on treating people at high risk for complications, prompted neither a significant reduction in influenza incidence nor a substantial improvement in disease mortality. As a result, national guidelines have changed to promote universal vaccination of children age 6 months through 18 years. Vaccination of school-aged children not only provides direct benefit to the children, but also offers indirect benefit to their families and the community, because children are the major transmitters of influenza to other susceptible family and community members.

It seems clear that high vaccination coverage of preschool and school-aged children can reduce the morbidity and mortality related to influenza outbreak in the community. In my experience, the vaccination of children and staff members through a school-based initiative that is supported by the community, including the medical establishment, offers an option for rapid and efficient control of influenza outbreaks. A universal vaccination program may help to reduce the morbidity of seasonal influenza and protect against reduced productivity and loss of life.
References


Disclosure: Pedro A. Piedra, MD, has received consulting fees from Merck, MedImmune, Novartis, Roche, and sanofi pasteur, has performed contracted research for MedImmune, Novartis, and sanofi pasteur, and serves on the speaker’s bureau for MedImmune. He reports no real or apparent conflicts of interest with respect to proprietary products mentioned in this article.
Business is decreasing for HMOs as Medicare and Medicaid increase their coverage. With the advent of health reimbursement accounts, health savings accounts (HSAs), and flexible spending accounts (FSAs), the focus turns to reimbursement, and more flexibility exists as to how and where members can receive their care — whether in a physician's office or convenient care clinics, also known as “minute clinics.” Operating mainly out of grocery stores and chain pharmacies, these clinics provide basic medical services, including vaccinations, on a walk-in basis. Their presence is growing. A recent study conducted by the Deloitte Center for Health Solutions (2008) found that more than 1 in 3 consumers are receptive to the idea of using minute clinics, and 1 in 6 already has visited one.

Vaccinations often are considered loss leaders in physician offices and pharmacies. In the case of the former, the influenza vaccination has typically been a part of a general health update. With pharmacies, the hope exists that a patient will buy other items during the time spent in there for an influenza vaccination.

When offered by employers, vaccination programs may be initiated with the goal of improving employee productivity. Most people understand the connection between illness and lost productivity, but not everyone understands how much lost productivity in the workplace is attributed to single parents and women, who are vulnerable to absenteeism due to their caregiving roles. Health care workers and the so-called sandwich generation — the middle-aged parents who also care for elderly parents — are two additional groups that need protection from the influenza virus. Although it is clear that influenza vaccination is an important part of a wellness program, these programs have a poor track record when it comes to return on investment (ROI). So when it comes to influenza vaccination, the question is, as always, “Who pays?”

Minute clinics and primary care

Pediatricians once administered vaccines for protection against childhood diseases separately to children, and charged an administration fee with each injection. Now, five different vaccines are combined into one injection, so whereas in the past a physician would receive $20 for the administration, that physician now makes $4. It might not seem like much money is at stake, but physicians need the income stream. The more influenza vaccinations are given outside the physician's office, such as those provided at minute clinics, the more income physicians lose. Primary care is shrinking, because the money is just not there, even with subsidization.

Health plans understand that the market will drive minute clinics, which will take business away from primary care providers. MCOs have not fully embraced this alternative, because they need the providers. If and when MCOs do embrace minute clinics, these clinics will fall under the urgent care rubric, and minute clinic care will be billed through HSAs and FSAs. At least one reason exists to support these clinics — they provide a less costly alternative to an emergency room visit.

Balancing both the interests of patients and physicians is a challenge. On one hand, the proliferation of minute clinics, through their visibility and accessibility, would probably increase vaccination rates. On the other hand, it is vital for physicians to determine how to keep their practices relevant and to effectively communicate to their patients that they remain central to their medi-
cal care, especially when complex health care issues are involved.

Although it does not endorse the spread of minute clinics, the American Academy of Family Physicians (AAFP) has published a list of desired attributes for them (Box). The AAFP’s attributes include the use of electronic health record (EHR) systems. A recent survey concluded that only 12.4 percent of physicians used comprehensive EHR systems in 2006 (Hing 2007). Minute clinics, on the other hand, tend to be more up to date when it comes to using computers to digitize medical information.

**Strategies for increasing influenza vaccination rates**

In the past, UnitedHealth Group has aggressively encouraged influenza vaccinations for high-risk populations, as part of a disease management program for people with such conditions as asthma and chronic obstructive pulmonary disease. But in light of the high rate of hospitalization due to influenza in the population younger than 6 months, more needs to be done for this age group as well. Informing pregnant women — especially high-risk pregnant women — about the importance of influenza vaccinations in the neonatal age group through healthy pregnancy programs could be a way to increase vaccination in the neonatal age group. Such an initiative would appear to have a good ROI.

When considering adult immunization, the best approach for health plans may be to partner with employers rather than to transfer accountability to the individual member. Many employers are self-insured and have a stake in immunizing employees so that they are productive at work or not have to leave work to tend to ill family members. Plans also should continue to include reminders about influenza vaccination in the literature that is sent out to members. But, ultimately, even if plans cover the influenza vaccine, it is the members who decide for themselves whether to receive it.

**Navigating the cost of immunization**

Although access to the influenza vaccine is certainly important, a health plan has to look at the cost of influenza vaccination to an organization. Plans often are presented with the cost-offset model and are asked to pay up front in the hope that money will be saved in the future, typically through the prevention of future hospitalizations. Unlike other kinds of vaccinations that need to be administered several times, the influenza vaccine is annual. Manufacturers of new vaccine products, such as the live-attenuated influenza virus vaccine, must be able to show that their product is worth its cost because of a higher effectiveness rate and faster administration. Otherwise, health plans will question spending money on a vaccination that the public may perceive as unpredictable in its effectiveness.

Although it may be unrealistic to expect one health plan to take on universal influenza immunization, a state association of health plans could organize individual plans to work collaboratively with each other or with community foundations to get everyone vaccinated. Each plan could be encouraged to contribute to a collective pot, adding in what it already pays to cover vaccinations. If there were data that show that the cost of vaccination was less than the cost of lost productivity resulting from the influenza virus, then jointly-funded programs could be particularly effective. However, the government — be it city, state, or federal — is in a better position than health plans to implement a universal vaccination program, because there are many people in the United States who are uninsured. Perhaps governments could create a specific immunization tax. Schools also are important to universal vaccination and creating herd immunity, as they capture the entire population of children, regardless of whether they are insured or uninsured or legal or illegal residents of the United States.

Flu vaccination will remain part of our commitment to vaccination, immunization, and preventive care. The key is to determine how best to invest our resources to significantly increase the compliance rate.

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**Desired attributes of retail health clinics**

**Scope of service** — Retail clinics must have a well-defined and limited scope of clinical services.

**Evidence-based medicine** — Clinical services and treatment must be evidence-based and quality-improvement oriented.

**Team-based approach** — The clinic should have a formal connection with physician practices in the local community, preferably with family physicians, to provide continuity of care. Other health professionals, such as nurse practitioners, should only operate in accordance with state and local regulations, as part of a team-based approach to health care and under responsible supervision of a practicing, licensed physician.

**Referrals** — The clinic must have a referral system to physician practices or to other entities appropriate to the patient’s symptoms beyond the clinic’s scope of work. The clinic should encourage all patients to have a “medical home.”

**Electronic health records (EHRs)** — The clinic should include an EHR system sufficient to gather and communicate the patient’s information with the family physician’s office, preferably one that is compatible with the Continuity of Care Record supported by AAFP and others.

Source: AAFP 2008
Influenza Prevention and Population Health Management

Alyce Kuhn, RN, RRT, MSHA
Matria Healthcare, Dallas

SUMMARY

Modifiable health risk factors can be improved through effective health promotion and disease management efforts, such as vaccinations. Employers must understand that employee illness is related to not only medical and pharmaceutical costs, but to productivity costs as well.

Matria Healthcare began as a maternity high-risk program, but through the years it has purchased other companies to add to its array of services. We now offer services that run “from cradle to grave,” and include oncology services, diabetes programs, and a wellness program.

We believe that a large proportion of diseases and disorders are preventable. Our main goal is to examine modifiable health risk factors that can be improved through effective health promotion and disease management and prevention, such as vaccinations, and we then provide the outcome to the employer. Focusing on the context of prevention, we have utilized previous research to help formulate our productivity and health-screening tools (Edington 2001, Kessler 2003). Work conducted by Edington and Kessler has been instrumental in helping us to determine which of our programs’ participants exhibit characteristics that place them at high risk for disease, such as those individuals who are overweight, or smoke, or have unhealthy diets.

For those program participants who are chronically ill,

we implement disease management programs, which include programs for managing asthma, diabetes, and chronic obstructive pulmonary disease. Nurses work with participants to make sure they adhere to guidelines, and teach them what to focus on and what questions to ask in a typical 7- to 10-minute visit at the physician’s office.

Twelve percent of our participants are considered high-risk or chronically ill and are in need of telephone coaching regarding proper health habits. We communicate with these members by way of telephone, e-mail, and text messaging to ensure that information pertaining to the importance of vaccination is received. Of these high-risk members, approximately 89 percent have reported receiving vaccination against influenza.

One hundred percent participation in vaccination programs has been unattainable, as some people are uncertain about the safety of the vaccine.

Encouraging influenza vaccination

After finishing their health assessment, participants receive a personal health report, along with ongoing e-mails and other communications regarding preventive measures that can be taken. We have a system of clinical alerts, utilizing automated phone calls based on voice recognition technology, that remind patients to get their vaccinations. These care-alert calls address different health issues, depending on the season of the year; for example, we ask people in the fall if they have had their influenza vaccination. Our system bases its screening recommendations on personal information like gender, age, and geographical location. In the future, we aim to emphasize in our messages the importance of vaccinations for all age groups, especially for school-aged children.

After trying different means of communicating the importance of preventive health measures, we have found

FACULTY PRESENTATION

Influenza Prevention and Population Health Management

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References

Disclosures: Michael A. Kaufman, MD, and Allan J. Kogan, MD, report no real or apparent conflicts of interest with respect to companies, organizations, or proprietary products mentioned in this article.
that letters do not work: postcards are better. Shorter messages are more effective, and telling people to do something (“You need to get your flu vaccine”) is more effective than taking an educational approach.

**Employers and employee wellness**

Past efforts have shown that people need incentives to adhere to wellness programs. We use a point system to reward participants for getting screenings, like mammograms, and for taking preventive measures, like getting the influenza vaccine. Some companies have the means to use financial incentives, but some use other strategies. For example, a cultural example may be set when corporate executives send messages, provide information, and create challenges for employees. We have found that one of the 10 best things companies can do to increase participation in wellness programs is to lead by example. Leaders should “walk the walk and not just talk the talk.” This approach can even be more successful in increasing participation than financial incentives.

Employers understand that the overall cost of an employee illness is not limited to medical and pharmaceutical costs — a health-related productivity cost exists as well. Companies have moved beyond just wanting a return on their investment (ROI) in wellness, and are now more concerned with the value of their investment. We have worked with a variety of companies to assist in the implementation of an influenza vaccination program that utilizes on-site clinics. By spending the money up front, they are looking toward establishing an increased vaccination rate and, in turn, a healthier and more productive employee population. Those employees who want information about vaccine safety or about how new products compare with older ones can call a 24-hour nurse line or read provided literature.

We work with employers to show them the association between health risks and absenteeism. Tailored analyses based on specific employee populations show the cost of employee illness to companies. Six months after we launch our program, we do another analysis, after which we provide quarterly outcomes. When it comes to risks due to conditions like influenza, it can take time for results to appear; positive outcomes may not be immediately visible.

We have found that people initially buy our services based on faith, but they renew their contracts based on the value of the services that we provide. We believe that well-designed and well-implemented health promotion and disease prevention programs can be cost-effective to health plans and beneficial to program members. Reductions in health costs, improvements in productivity, and a positive ROI are valuable outcomes for all involved parties.

**References**


**Disclosure**: Alyce Kuhn, RN, RRT, MSHA, reports no real or apparent conflicts of interest with respect to companies, organizations, or proprietary products mentioned in this article.

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**In the Trenches: Primary Care Perspectives On Implementation, Prevention, and Treatment**

**RICHARD L. COLLINS, MD**

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**SUMMARY**

A yearly influenza clinic with convenient hours and location is an efficient way to ensure that primary care patients receive their influenza vaccination. Physicians should also receive the influenza vaccine themselves, to lead by example and to help dispel some of the myths that surround its administration.

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I am an internist for a large private practice group in Buffalo, N.Y. Our group is made up of approximately 120 physicians who cover almost 300,000 lives. We take influenza vaccination seriously, and our group aims for 100 percent immunization of our targeted population. The physicians in our group meet regularly to discuss strategies to improve vaccination rates, retinal examinations for patients with diabetes, colonoscopies, and other important preventive procedures.

Richard L. Collins, MD, is an internist with the Buffalo Medical Group, and is a clinical assistant professor of medicine at Buffalo General Hospital.
I have a personal interest in the influenza vaccine, as a few years ago my daughter had the flu. When I took her to her pediatrician, he asked me if I had received the flu shot. When I replied that I had not, he told me, “You likely have yourself to thank, as both a health care worker and father, for not getting vaccinated. Your not getting vaccinated placed her at increased risk.” From that point on, I vowed to get the flu shot every year. Before that time, my patients often would ask me, “Do you get the flu shot?” If I shrugged, indicating a negative response, they typically would not get the shot either. In retrospect, I can see that this was not the best way to impress upon the patients the importance of the flu vaccine. I need to lead by example.

**How we encourage and administer influenza vaccinations**

Each year, on July 1, we begin to alert our patients to the fact that the flu vaccine will be available to them on Oct. 1. We have three large offices in Western New York, and we put out signs that say “Flu shots will be available here.” In the fall, our flu vaccine clinics are open 3 days a week, from 5 pm until 9 pm, and on weekends at each of our three locations downtown and in the suburbs. We try to make it as easy and convenient as possible for each patient to receive the flu vaccine. We stress ease of access. As long as someone is a member of our practice, that patient can walk in the door and receive a vaccination. We also use our Web site to disseminate information.

We have found that what really brings people into our clinics is the word “shortage.” In the past, when the media has reported a shortage of influenza vaccine, the number of visits increased markedly, and the lines at our clinics downtown were out the door. In general, we aim for a 15-minute process, from the time a patient walks in the door to the time that patient walks out the door.

As a rule, we softly discourage patients from getting the influenza vaccine during their routine care. However, if a patient has congestive heart failure and diabetes, for example, and requests the vaccination, we will administer it on the spot. Approximately 80 percent of our patients who receive the vaccine come to our flu vaccine clinics. Across the country, 60 percent of our patients over age 65 are vaccinated; the number drops to 34 percent in the group of patients between the ages of 50 and 65. Unfortunately, only 34 percent of health care workers receive the vaccine. Clearly, this number must be improved.

**Common misconceptions**

Our nursing staff is trained to answer the same question it receives over and over: “Am I going to get sick as a result of receiving the flu vaccine?” We distribute a handout from the Centers for Disease Control and Prevention that explains that the influenza vaccine does not make people sick and explains the local reaction to the injection.

I decided to ask the question to people around me: “Why don’t you get the flu shot?” My wife responded, “Because I’m going to get sick.” This is the most common reason people give for not getting vaccinated—the fear of being ill. Also, many people avoid the influenza vaccine thinking it is a “guessing game vaccine,” an idea that could be due in part to the media’s coverage of instances in which influenza strains differed from what had been anticipated. There also is concern about the vaccine containing a live-attenuated virus—the fear, again, is that a vaccine containing live virus could make one sick with the flu.

I asked my sister-in-law the same question, and she said, “I get the flu shot, but I don’t have time for the kids. If the kids get sick, I’ll take care of the kids.” A neighbor responded to the question in a similar fashion. Her answer was, “I’m a minimalist. I don’t want to get flu shots, I don’t want to get anything that is unnecessary.” Parents do not seem to be aware that children should receive influenza vaccinations; there is an idea that it is not necessary. But we have had some tragic pediatric deaths in our community in the last few years due to influenza. There may be ways that the mainstream media could more effectively get the message across to stay-at-home mothers that the influenza vaccination is necessary both for them and for their healthy children.

The analogy I like to use in the face of these misconceptions is that of the “scouting report” in football. This advance report gives a team a preview of what’s coming, how to play against it, and what tricks are going to be used. The influenza vaccine is a scouting report that gives your body a preview of what’s coming this winter.

As an internist and father, I think that giving and receiving the flu vaccine are two important goals for each fall season. I try to stress the importance of the flu vaccine on a daily basis at home and in the office between Oct. 1 and Jan. 1 every year. I think every health care professional should do the same.

**Disclosure:** Richard L. Collins, MD, reports no real or apparent conflicts of interest with respect to companies, organizations, or proprietary products mentioned in this article.
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CE Credit for Physicians/Pharmacists

I certify that I have completed this educational activity and post-test and claim (please check one):
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EXAMINATION: Place an X through the box of the letter that represents the best answer to each question on page 21. There is only ONE correct answer per question. Place all answers on this form.

A. B. C. D.
1. ☐ ☐ ☐ ☐
2. ☐ ☐ ☐ ☐
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PROGRAM EVALUATION
So that we may assess the value of this self-study program, we ask that you please fill out this evaluation form.

Have the objectives for the activity been met?
1. Discuss strategies used for influenza prevention, diagnosis, and management, especially in vulnerable populations.
   ☐ Yes ☐ No

2. Assess burden of disease associated with influenza in all populations.
   ☐ Yes ☐ No

3. Evaluate the economic impact of influenza on the health care system.
   ☐ Yes ☐ No

4. Review Advisory Committee on Immunization Practices meeting discussions and notes.
   ☐ Yes ☐ No

5. Discuss appropriateness and means for universal influenza vaccination.
   ☐ Yes ☐ No

Was this publication fair, balanced, and free of commercial bias?
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If no, please explain: ________________________________

Please use the following scale to answer the next four questions:

Strongly Agree ................................5
Agree ........................................4
Neutral ......................................3
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Strongly Disagree .....................1

Did this educational activity meet my needs, contribute to my personal effectiveness, and improve my ability to:

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☐ 5 ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ N/A

Manage my medical practice?
☐ 5 ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ N/A

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Effectiveness of this method of presentation:

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What other topics would you like to see addressed?

Comments: ________________________________

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CONTINUING EDUCATION POST-TEST
Immunization Strategies for Reducing Influenza’s Burden on Public Health

Please tear out the assessment/evaluation form on page 20. On the answer sheet, place an X through the box of the letter corresponding to the correct response for each question. There is only ONE correct answer to each question.

1. The antigenic components of the influenza virus are:
   a. M2 ions.
   b. Hemagglutinin and neuraminidase.
   c. Viral RNA.
   d. None of the above.

2. Antigenic drift is:
   a. A change in the antigenic profile of a virus due to point mutations.
   b. The onset of an influenza epidemic.
   c. The accumulation of virus in an individual due to viral replication.
   d. A mutation of M2 ion channel amino acids.

3. True or false: Inactivated virus vaccine has proven more efficient than live-attenuated vaccine at protecting against multiple strains of influenza virus.
   a. True.
   b. False.

4. Influenza outbreaks are responsible annually for:
   a. A total economic burden of $87.1 billion.
   b. 31 million outpatient visits.
   c. 3.1 million hospitalization days.
   d. All of the above.

5. Proper vaccination of young children requires:
   a. Three doses, 8 weeks apart.
   b. Two doses, 4 weeks apart.
   c. Two doses, 8 weeks apart.
   d. Two doses, 1 year apart.

6. A community-based vaccine access program in several Texas communities increased vaccine coverage by _____ compared with control communities:
   a. 20 percent
   b. 50 percent
   c. 2.5 to 3 times
   d. 5 times

7. One of the 10 best things employers can do to improve employee wellness is to:
   a. Improve cafeteria food.
   b. Have company executives lead by example.
   c. Fire overweight employees.
   d. Give away movie tickets as incentives.

8. Which kind of message is best for encouraging people to get an influenza vaccination?
   a. One that is short.
   b. One that is detailed.

9. The cost of employee illness consists of:
   a. 66 percent personal health costs and 33 percent productivity costs.
   b. 66 percent productivity costs and 33 percent personal health costs.
   c. 99 percent productivity costs and 1 percent personal health costs.
   d. 50 percent personal health costs and 50 percent productivity costs.

10. A good reason for medical plans to support the proliferation of minute clinics is that these clinics:
    a. Cost less to visit than going to a physician’s office.
    b. Provide an alternative to a physician’s office.
    c. Provide an alternative to an emergency room visit.
    d. Provide better care than a physician’s office would.

11. Which of the following is an American Academy of Family Physicians Desired Attribute of Retail Health Clinics?
    a. Electronic Health Record systems.
    b. Hours until midnight.
    c. Noncompetition with physicians.
    d. Location at the workplace.

12. Schools are important to universal vaccination because they capture:
    a. Uninsured children.
    b. Children who are illegal residents.
    c. Both A and B.

13. Informing pregnant women about the need to vaccinate newborns against influenza is important because:
    a. Newborns are frequently hospitalized with influenza.
    b. Pregnant women are at high risk for contracting influenza.
    c. Newborns spread influenza to family members.
    d. Newborns have a high mortality rate due to influenza.

14. The difference between the influenza vaccine and other vaccines is that it:
    a. Must be administered yearly.
    b. Is relatively ineffective.
    c. Costs less.
    d. Must be administered more than once.

15. The most commonly voiced misconception about the influenza vaccination is that:
    a. It varies in effectiveness from year to year.
    b. It is not covered by health plans.
    c. It is too expensive.
    d. It makes people sick.