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Isabella Liu  
*Butler University*

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# Your Best Shot at Surviving the Flu Season

Isabella Liu

**Abstract:** Millions of individuals become ill from the influenza virus every year. As an existing public health issue, it is important for patients to understand that the best way to combat the influenza virus is through prevention. This article explores key aspects of the influenza vaccine and highlights its importance in the healthcare community.

The Centers for Disease Control and Prevention estimates that about 49 million individuals in the United States were ill with the influenza virus during the 2017-2018 influenza season.<sup>1</sup> Influenza viruses A and B are mostly responsible for causing seasonal influenza outbreaks.<sup>2</sup> In addition to seasonal illness, the influenza virus can often cause secondary complications, hospitalizations, and deaths. The first reliable documented record of an influenza-like disease dates back to the year 1510. In the centuries following, multiple influenza epidemics occurred, affecting many different continents.<sup>3</sup> An example of a widespread epidemic was the “Spanish” influenza pandemic of 1918. It was one of the deadliest outbreaks, affecting about one-third of the global population and caused an estimated 21 million deaths.<sup>4</sup> However, a breakthrough in the treatment of influenza occurred in 1938 when Jonas Salk and Thomas Francis developed the first influenza vaccine.<sup>3</sup> The influenza vaccine is still the best protection currently available against the influenza virus.

Seasonal outbreaks of the influenza virus cause millions of individuals to fall ill. This respiratory virus is extremely contagious and can infect the nose, throat, and lungs. Symptoms include coughing and disruption of the upper respiratory tract, fever, muscle aches, headaches, and fatigue.<sup>5</sup> Transmission of the influenza virus can be grouped into two categories: acquisition by large droplets and acquisition by smaller, aerosol particles. Both large droplets and small particles may be transmitted through contact with particles from affected individuals who cough or sneeze. Transmission by small aerosol particles tends to be longer reaching since these particles are lightweight and can travel longer distances, while acquisition of the illness by large droplets is limited to close interactions.<sup>6</sup>

Once infected by the influenza virus, the average incubation period is 2 days. Individuals with influenza are most contagious during the first 3 and 4 days of getting sick.<sup>5</sup> However, individuals with the influenza virus can spread it 24 hours before the onset of symptoms up to 5-7 days of having the illness. Most otherwise healthy individuals are symptomatic for 5-7 days.<sup>5</sup> In the case of special populations, such as children and/or immunocompromised individuals, symptoms can last longer than the typical time frame. Consequently, such individuals will continue to be contagious as the illness persists.<sup>5</sup> Ultimately, the influenza virus’s rapid transmission from person to person leads to widespread outbreaks during the influenza season.

The antigenic composition of the influenza virus plays a large role in the virus’s ability to infect humans and animals. There are four different types of influenza viruses, which include: A, B, C, and D.

Influenza viruses A and B are most likely to cause annual, seasonal outbreaks, with influenza virus A being most known for drastically morphing and causing pandemics. Additionally, influenza virus C is generally mild while influenza virus D is prominent in cattle.<sup>7</sup> Virus composition includes two main surface glycoproteins that are called hemagglutinin and neuraminidase. Changes in these glycoproteins are responsible for changes in annual influenza season outbreaks and can cause pandemics. The first type of change is called antigenic drift which occurs when there are small mutations in the surface glycoproteins. These small changes are the reason why different strains are responsible for each influenza season. The second type of change, which is called antigenic shift, is a major and abrupt change in the glycoproteins which results in pandemics. Antigenic shift most commonly occurs with influenza virus A. The most recent pandemic caused by antigenic shift in the United States was in 2009 with the H1N1 emergence.<sup>8</sup>

Today, the influenza vaccine is the best chance at preventing influenza contraction and lessening the severity of the illness if an individual does become infected.<sup>5</sup> Vaccines are generally administered via injection or nasal spray. The nasal spray contains the live attenuated version of the virus while the injection is inactivated. Both types cause an immune response to the disease, in which the body produces antibodies and develops immunity, making it less likely to contract influenza. Furthermore, if a vaccinated person does become ill, they already have antibodies from the vaccine exposure that allow the body to fight the disease more effectively.<sup>9</sup> It is important to note that the influenza season begins in the fall of one year and continues into the spring of the following year. The influenza vaccination should be received in the beginning of the influenza season for maximum effectiveness, since it takes around two weeks after administration for antibodies to develop.<sup>5</sup>

As discussed earlier, the influenza virus mutates at a quick rate. Therefore, new influenza vaccinations are created for every influenza season. New vaccinations are necessary to target new variations in the influenza virus. Experts create the influenza vaccine about six months prior to the start of the influenza season. They determine which strains the influenza vaccine should encompass based on global data from the previous influenza season. Trivalent and quadrivalent influenza vaccinations are offered. The trivalent vaccine is composed of two strains of virus A antigens and one strain of virus B antigens.

Similarly, the quadrivalent vaccine is composed of two strains of virus A antigens but also contains two strains of virus B antigens.<sup>2</sup> After experts predict the more common strains for the upcoming season, the World Health Organization releases information annually on their website regarding the current vaccines, including the specific strains.

It is important to understand the indications and possible exceptions to the influenza vaccination. Individuals including children older than 6 months, healthy adults, the elderly, and those immunocompromised should receive the influenza vaccine every year.<sup>2</sup> Children up to age 8 who have not previously received the influenza vaccine need 2 doses, given 4 weeks apart. Children who have previously received the influenza vaccine can receive one, single dose.<sup>2</sup> It is important to note that children and individuals 65 years and older are most susceptible to contracting influenza. Those who are 65 years and older have the largest disease burden, with an estimated 70% to 85% of deaths and 50% to 70% of hospitalizations due to influenza. There are two types of inactivated vaccine injections specifically approved for this population, the High Dose Flu Vaccine and Adjuvanted Flu Vaccine. Both invoke a greater immune response compared to the other influenza vaccines. The High Dose Flu Vaccine contains four times the antigen of a single dose while the Adjuvanted Flu Vaccine contains an additive that creates a stronger immune response. Aluminum salts or oil in water emulsions are the ingredients often added to the Adjuvanted Flu Vaccine.<sup>10</sup>

In regard to expecting mothers, the Centers for Disease Control and Prevention emphasizes that it is safe for pregnant women to get the influenza vaccine. Not only will the vaccine protect the mother, but the mother will pass on the antibodies created by her immune system to the baby. As far as immunocompromised individuals, the Advisory Committee on Immunization Practices (ACIP) recognizes that the immunogenicity of influenza is lower in this patient population. However, the vaccine will still significantly protect immunocompromised individuals against the virus. It is recommended that they receive the inactivated injection, not the attenuated live nasal vaccine.<sup>2</sup> Other people who should avoid the nasal spray vaccine include caregivers of or those in close contact with immunocompromised individuals, pregnant women, children less than 2 years old, children 2-17 years old who are also taking aspirin, children 2-4 years old with asthma, or adults 50 years and older.<sup>5</sup> These individuals should receive the inactivated injection instead. Individuals with egg allergies can receive the vaccine as well. Those with a history of a severe allergic reaction to eggs with symptoms other than hives should receive the vaccine in an inpatient or outpatient medical setting, under the supervision of a licensed medical professional who can take further action if necessary. However, if the individual previously had an allergic reaction to the influenza vaccine, future egg-based vaccines are contraindicated.<sup>11</sup> Cell-based flu vaccines are available as an alternative because it is not created with eggs.<sup>11</sup>

Overall, the influenza vaccine has proven to lessen the influenza burden of the world's population. According to the World Health Organization, annual influenza epidemics affect 3 to 5 million people globally.<sup>13</sup> The Centers for Disease Control and Prevention measures the effect of influenza on the U.S. population by looking

at cases of influenza-related medical visits, hospitalizations, and deaths. In the 2017-2018 influenza season, the U.S. had an estimated 49 million people who were symptomatic, 23 million people who scheduled a medical visit, 960,000 people who were hospitalized, and 79,000 people who died from the influenza virus.<sup>1</sup> Due to the widespread impact of the influenza virus, it is important for individuals to receive the influenza vaccination annually. Not only does the vaccine decrease a person's odds of becoming ill with influenza, but it also helps decrease the severity of the disease. This may be crucial in highly susceptible populations such as children, immunocompromised individuals, and the elderly. Ultimately, it is the responsibility of all healthcare providers to educate patients on the severity of the seasonal influenza and to advocate for individuals to get their influenza vaccine.

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