Immunizations:
What nurses should know

Negative attitudes toward vaccines have existed since they were developed even though they're important for population health. Learn what you can do to educate parents, patients, and families.

By Amanda Perkins, MSN, RN

Immunization refusals from both parents and patients have increased in the last 10 years. This is alarming because following the CDC recommended immunization schedule can prevent approximately 322 million illnesses, 21 million hospitalizations, and 732,000 deaths. The World Health Organization (WHO) estimates that if all available vaccines were adopted so that 90% of all people were covered globally, 2 million deaths per year could be prevented in children under age 5. Immunizations are associated with healthier, longer lives, and are a cost-effective way to prevent debilitating illness, disability, and death. In fact, treating a child with measles costs 23 times more than the measles, mumps, and rubella (MMR) vaccine.

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Immunization preventable diseases

- Influenza
- Measles
- Meningococcal disease
- Pneumococcal disease
- Rabies
- Tetanus
- Typhoid fever

Immunizations are important because they protect against a variety of illnesses and greatly minimize the risks associated with immunization preventable diseases, such as paralysis, blindness, deafness, and infertility (see *Immunization preventable diseases*). Immunizations prevent 2 to 3 million childhood deaths per year worldwide, according to the WHO. Although globally more than 100 million children will be immunized before their first birthday, approximately 24 million will remain unvaccinated.

This article discusses how immunizations work, different types of immunizations, contraindications, safety, misconceptions, and your role in patient education.

How they work

Infections occur when bacteria or viruses enter a person's body, attack the body, and multiply within the body. The immune system has certain tools that can be used to fight infections, such as red blood cells that are necessary for carrying oxygen to the body's tissues and organs; white blood cells (WBCs), including macrophages, B lymphocytes, and T lymphocytes; and antibodies. Immunizations help our bodies build antibodies that mount a defense against certain illnesses.

Macrophages are WBCs that ingest, digest, and destroy foreign material within the body. These cells are also responsible for ingesting and digesting dead or dying cells. When macrophages act, they leave behind antigens—markers that sit on the cells' surface and identify them as self or foreign.

B lymphocytes are defensive WBCs responsible for creating antibodies—proteins that prevent the development of infection by destroying foreign organisms in the body. The antibodies that are created by B lymphocytes find antigens; when foreign material is detected, the antibodies attack it using antigens as a guide.

T lymphocytes are also defensive WBCs. Unlike B lymphocytes, the T lymphocytes attack infected cells. They're sometimes referred to as memory cells because they remain in the body and act quickly if they encounter the same germs at a different time.

All of these factors contribute to immunity—the body's ability to protect itself from disease. Types of immunity include natural, innate, and acquired. Because acquired immunity is the type that occurs with immunization, it's what we'll discuss in this article.

Acquired immunity can be passive or active, occurring through the administration of vaccines or immunoglobulins (antibodies). Passive immunity occurs when antibodies are obtained from a source outside of the body. Artificially acquired passive immunity occurs as the result of the administration of preformed antibodies. It's important to be aware that this type of immunity is only temporary. Active immunity, on the other hand, occurs when antibodies are actively produced by a person's body. This can happen after an infection, from which the body creates antibodies, or as the result of vaccination, which stimulates the production of antibodies and memory cells.

Immunizations assist in the development of immunity because they imitate an infection. Illness doesn't develop, but it causes the production of T lymphocytes and antibodies. Vaccine administration may cause mild symptoms, such as a

fever, due to the body working to build immunity. After immunity is achieved, T lymphocytes and B lymphocytes remain and will be able to fight the infection in the future. Because it can take a few weeks for the body to produce lymphocytes after an immunization, infection can occur if an individual becomes infected right before or after vaccine administration.

Different types

When developing immunizations, manufacturers must consider the specific germs, how the germs infect cells, and how the immune system responds to these germs. The types of immunizations that may be administered include live, attenuated vaccines; inactivated vaccines; toxoid vaccines; subunit vaccines; and conjugate vaccines.

Live, attenuated vaccines are administered to prevent infection with viruses. These vaccines contain a living virus that's been weakened, hindering its ability to cause disease. Live, attenuated vaccines are effective because they're the closest thing to a natural infection. Examples include the MMR vaccine and the varicella (chicken pox) vaccine.

Inactivated vaccines are also used to fight viruses. The virus is inactivated or killed during the process of making the vaccine. With these types of vaccines, multiple doses are often needed to produce immunity. An example is the polio vaccine.

Toxoid vaccines are administered to prevent diseases caused by bacteria that produce toxins within the body. When these vaccines are manufactured, the toxins are weakened, leading to toxoids that allow the body to mount an immune response without causing an illness. An example is the diphtheria and tetanus portion of the diphtheria, tetanus, and pertussis (DTaP) vaccine.

Subunit vaccines contain parts of a virus or bacteria. These vaccines typically produce fewer adverse reactions because

did you know?

History of immunizations

Before immunizations, inoculations were used in much the same way, with the goal of preventing disease. With inoculation, a disease such as smallpox was deliberately given to people, causing a mild form of the disease, followed by immunity. There's evidence that inoculations were in use for smallpox as early as 1000 C.E.

In 1777, George Washington ordered the mass inoculation of members of the army against smallpox. At that time, Europe was known for infecting individuals with a less deadly form of smallpox with good outcomes. In 1796, Edward Jenner used cowpox material to create immunity to smallpox. Immunization has since led to the eradication of smallpox.

In 1885, Louis Pasteur developed the rabies vaccine. From 1885 through the 1930s, there was a rapid increase in the development of immunizations.

In the early 19th century, infectious diseases were the leading cause of death. In the early 20th century, 100 out of 1,000 U.S. children died before age 1. As a result of immunizations, infectious diseases have dropped to the eighth leading cause of death and the number of children living to see their first birthday has increased, with only 7 out of 1,000 children dying before age 1 as the result of an infectious disease.

In the early 1970s, immunizations for approximately 70 diseases were in use, primarily for individuals considered to be high risk, such as travelers and those in the military. In the mid-1980s, evidence demonstrated that immunization programs could protect millions from disease and death in a relatively short period of time. In the 1990s, there was a drive for universal childhood immunizations; global coverage reached approximately 80%. The 1990s also gave rise to the VAERS.

In 2015, there were 592 cases of measles and 4 separate outbreaks of mumps on college campuses in the United States. Of those infected with these immunization preventable diseases, most weren't vaccinated. At this time, the United States has immunization laws requiring vaccination before a child enters school. However, 19 states allow exemptions for personal beliefs.

they aren't made up of entire viruses or bacteria. The pertussis component of the DTaP vaccine is an example of a subunit vaccine.

Conjugate vaccines are used to guard against bacteria that have antigens with an outer coating of polysaccharides. These polysaccharides disguise the antigen, making it harder for the immune system to recognize. Conjugate vaccines connect the polysaccharides to recognizable antigens, helping the immune system mount a response. An example is the *Haemophilus influenzae* type B, or Hib, vaccine.

Research is underway for a variety of immunizations, including malaria, tuberculosis, and AIDS. Research is also ongoing for needleless vaccines, such as aerosol formulations, adhesive skin patches, sublingual delivery, and oral pills.

Who shouldn't be immunized?

Before administering immunizations, you should understand that each one has its own cautions and/or recommendations. In general, immunizations should be avoided if a patient is allergic to any of the vaccine components. For example, many influenza vaccines contain egg so should be avoided in individuals with an egg allergy. Most vaccines are contraindicated in individuals with moderate-to-severe illness. These individuals are often good candidates for vaccines once the illness has passed. Lastly, any patient who's experienced a serious adverse event after vaccine administration may not be an appropriate candidate.

Immunization contraindications

cheat sheet

- If allergic to any components of the vaccine
- Pregnancy or actively trying to become pregnant
- Breastfeeding
- Compromised immune system
- Current illness or recent illness
- Previous serious adverse event
- History of Guillain-Barré syndrome

Live, attenuated vaccines shouldn't be administered to those with weakened immune systems, especially children. Before administering live, attenuated vaccines, ensure that your patient has an intact and well-functioning immune system. Additionally, live, attenuated vaccines may not be appropriate during pregnancy because they can create risks for the developing fetus. Individuals who've ever been diagnosed with Guillain-Barré syndrome may need to avoid certain vaccines, such as the influenza vaccine, because these vaccines have been shown to increase the risk of developing Guillain-Barré syndrome.

Are they safe?

Immunizations are tested and monitored for safety. It can take up to 10 years for an immunization to move from a concept to a licensed vaccine. The licensing process holds immunizations to very high safety standards. Testing and evaluation must occur before the FDA licenses and the CDC recommends an immunization. Throughout this process, the FDA provides supervision. Before the licensing of an immunization, clinical trials are conducted, initially in small groups, then with thousands of volunteers. Testing determines the safe dose and how the immune system reacts. All safety issues must be addressed before an immunization is licensed.

Once an immunization is licensed, safety monitoring is an ongoing process that continues for as long as the immunization is in use. After a vaccine is manufactured, it's lot tested to ensure sterility, purity, and potency. The FDA reviews the results of lot tests and inspects manufacturing facilities. The influenza vaccine requires yearly testing and manufacturing facility inspection; all other vaccine manufacturing facilities are inspected every 2 years.

A variety of organizations play a role in monitoring and evaluating the safety

of immunizations. The Vaccine Safety Datalink is a collaboration between the CDC and U.S. healthcare organizations that uses medical record databases to track immunization safety. The FDA Postlicensure Rapid Immunization Safety Monitoring System, or PRISM, uses health insurance company databases to monitor and evaluate safety issues associated with immunizations. The Clinical Immunizations Safety Assessment Project is a collaboration between the CDC and medical research center immunization safety experts that conducts clinical vaccine safety research and evaluates complex cases associated with vaccine adverse reactions. Additional research and testing is conducted nationally by government organizations such as the National Institutes of Health.

The CDC and FDA Vaccine Adverse Event Reporting System (VAERS) is open to anyone who suspects an adverse event occurrence as the result of a vaccine, including healthcare personnel, patients, and parents. This early warning system is used to detect safety problems with vaccines administered in the United States. In addition, the National Childhood Vaccine Injury Act requires that healthcare workers report serious vaccine adverse events.

Examples of serious adverse events include hospitalization, prolonged hospitalization, disability, birth defects, and death. It's always best practice to report even if you're unsure if the patient's signs and symptoms are vaccine related. Patient consent isn't required when reporting to the VAERS. Once a report is submitted, you may be contacted for additional information such as the patient's medical record. Adverse events associated with vaccines rarely occur and, as a result, the benefits of immunizations greatly outweigh the associated risks.

Misconceptions

Fear of many diseases has declined, in part, due to the effectiveness of immunizations. This can be both a positive and a negative. It's positive that the rate of these diseases has declined. It's negative because an increasing number of people are choosing alternative vaccine schedules (any immunization schedule that doesn't follow the CDC recommended schedule). At this time, 1 out of 10 parents reports using an alternative vaccine schedule. Additionally, 1% to 2% of American parents refuse immunizations, whereas 11% to 19% are hesitant or chose to delay immunizations.

The following are reasons provided for following alternative vaccine schedules: concerns about adverse reactions; pain with administration; lack of vaccine schedule awareness; poor communication by healthcare providers; and distrust of the government, the healthcare system, or those advocating for immunizations. Additional fears cited by parents/patients include concern that vaccines will lead to autism, diabetes, arthritis, and autoimmune diseases.

Many fears associated with immunizations arose as the result of a study published by a physician in 1998 that purported to identify a link between vaccination and autism. Although this study created resistance to vaccinations, also called the "anti-vax" movement or "anti-vaxxers," it was later determined that the

consider this

You're the infection control nurse within your organization. You find that compliance rates for immunizations, specifically the influenza vaccine, are quite low among your facility's employees. Upper management has asked you to address this issue. You send out a questionnaire and round on the nursing units within the hospital. You find the most common reasons for nurse refusal of the vaccine are reports that it makes them sick, doubts that the vaccination is effective, perceived immunity, and lack of time to get the vaccine. What would you do? How should you proceed?

on the web

Vaccine schedule:
www.cdc.gov/vaccines/schedules/easy-to-read/child-easyread.html

Vaccine storage and handling:
www.cdc.gov/vaccines/hcp/admin/storage/index.html

Vaccines licensed for use in the United States:
www.fda.gov/BiologicsBloodVaccines/Vaccines/ApprovedProducts/ucm093833.htm

VAERS table of reportable events following vaccination:
https://vaers.hhs.gov/docs/VAERS_Table_of_Reportable_Events_Following_Vaccination.pdf

lead author fabricated information so that he could gain financially. This physician subsequently lost his license as a result of his unethical behavior. Although the information presented in the study was found to be false and there's extensive literature that shows no link between autism and immunizations, the fear that it created remains.

Why nurses refuse

Some healthcare providers, including nurses, are vaccine hesitant or resistant. A recent study showed that the U.S. vaccination rate for influenza among healthcare workers was 36%. This is important to address because immunization preventable diseases in healthcare workers can lead to transmission of disease to vulnerable populations.

The rationales provided by nurses who don't want to receive immunizations include fear of adverse events; doubt regarding efficacy; organizational issues; feeling that they don't belong to a high-risk group; self-perception of being immune; and believing that certain illnesses, such as influenza, aren't serious diseases. Resistance to vaccination among nurses may also be due to the need for autonomy. Many nurses report that they prefer to make the decision to be vaccinated versus being told to be vaccinated. For those working in leadership roles, it may be beneficial to avoid mandating vaccines because this may lead to decreased compliance.

Noncompliance among nurses can be addressed in a variety of different ways. It's always important to provide information on vaccine effectiveness, adverse reactions, and patient benefits. Research has shown that administering immunizations in the workplace can increase compliance. Educational offerings about vaccination can be provided in person, via social media, and/or through a web-based platform by staff development specialists or infection control nurses.

Your role as educator

When it comes to immunization awareness and acceptance, education that's based on scientific data is essential to dissipate patient fears. Teach parents and/or patients about immunization preventable diseases, the current vaccines available, vaccine scheduling, and known common and adverse reactions. Consistency in the message about immunizations goes a long way in building trust.

When providing education about the importance of immunizations to parents and/or patients, it's important to understand their fears and concerns. Factors influencing the decision to immunize include information/knowledge about immunizations; past personal experiences; past experiences of family and/or friends; perception of immunization importance; perception of risks and social pressure/responsibility; and religious or moral convictions. It's necessary to take all of these factors into consideration. Identify and address issues that cause mistrust and work to increase trust. It's also important to remember that education and communication aren't only necessary for patients and their families, but they may also be needed for healthcare workers who may have reservations about immunizations themselves.

A healthy start

As nurses, you're entrusted with the care and safety of your patients. One way to ensure that you keep your patients healthy is through immunizations. ■

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Amanda Perkins is an Assistant Professor of Nursing at Vermont Tech in Randolph, Vt., and a *Nursing made Incredibly Easy!* Editorial Board Member.

The author and planners have disclosed no potential conflicts of interest, financial or otherwise.

DOI-10.1097/01.NME.0000534111.98635.e4

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