Vaccine safety is a prime concern for the public, manufacturers, immunization providers, and recipients of vaccines. This chapter describes how vaccines licensed for use in the United States are monitored for safety, and presents general information about the provider's role in immunization safety. Further information about contraindications and precautions for individual vaccines, such as pregnancy and immunosuppression, and about potential adverse events associated with the vaccine is contained in the chapter on General Recommendations on Immunization, and in the chapters on specific vaccines.

Importance of Vaccine Safety

- Decreases in disease risks and increased attention on vaccine risks
- Public confidence in vaccine safety is critical
  - higher standard of safety is expected of vaccines
  - vaccinees generally healthy (vs. ill for drugs)
  - lower risk tolerance = need to search for rare reactions
  - vaccination universally recommended and mandated

The Importance of Vaccine Safety Programs

Vaccination is among the most significant public health success stories of all time. However, like any pharmaceutical product, no vaccine is completely safe or completely effective. While almost all known vaccine adverse events are minor and self-limited, some vaccines have been associated with very rare but serious health effects. The following key considerations underscore the need for an active and ongoing vaccine safety program.

Decreases in Disease Risks

Today, vaccine-preventable diseases are at or near record lows. Many people no longer see reminders of the severity and potential life-threatening complications of these diseases. Recent outbreaks of vaccine–preventable diseases show that even vaccinated people are at risk for disease if there is not adequate vaccine coverage in the population. Parents and providers in the United States may be more likely to know someone who has experienced an adverse event following immunization than they are to know someone who has experienced a vaccine-preventable disease. The success of vaccination has led to increased public attention on potential health risks associated with vaccines.

Disease	Pre-vaccine Era*	2006§	% decrease
Diphtheria	175,885	0	100
Measles	503,282	55	99.9
Mumps	152,209	6,584	95.7
Pertussis	147,271	15,632	89.4
Polio (paralytic)	16,316	0	100
Rubella	47,745	11	99.9
Congenital Rubella Syndrome	823	1	99.9
Tetanus	1,314	41	99.9
H. influenzae type b and unknown (<5 yrs)	20,000†	208	99.9
Total	1,064,854	22,532	97.9
Vaccine Adverse Events	N/A	15,484	N/A

*Baseline 20th century annual morbidity
§Source: MMWR 2007;56(33):851-64
†Estimated because no national reporting existed in the pre-vaccine era

Public Confidence

Maintaining public confidence in immunizations is critical for preventing a decline in vaccination rates that can result in outbreaks of disease. While the majority of parents understand the benefits of immunization and have their children vaccinated, some have concerns about the safety of vaccines. Public concerns about the safety of whole-cell pertussis vaccine in the 1980s resulted in decreased vaccine coverage and the return of epidemic disease in Japan, Sweden, United Kingdom, and several other countries. Around the same time in the United States, similar concerns led to increases both in the number of lawsuits against manufacturers and the price of vaccines, and to a decrease in the number of manufacturers willing to produce vaccines. This led to the National Childhood Vaccine Injury Act which is discussed in this chapter. Despite high national vaccination coverage rates, there are areas of low coverage that allow outbreaks of vaccine-preventable diseases to occur, many due to concerns about vaccine safety leading parents to refuse or delay their children's immunizations. For example, during 2008, more measles cases were reported than in any year since 1997. More than 90% of those infected had not been vaccinated, or their vaccination status was unknown. In California during January 1-June 30, 2010, 1,337 pertussis cases were reported to the California Department of Public Health, a 418% increase from the 258 cases reported during the same period in 2009. Providing accurate and timely vaccine safety information to healthcare providers, parents, and the general population has a positive effect on vaccine uptake and is a high priority for CDC. Close monitoring and timely assessment of suspected vaccine adverse events can distinguish true vaccine reactions from coincidental unrelated events and help to maintain public confidence in immunizations.

A higher standard of safety is generally expected of vaccines than of other medical interventions because in contrast to most pharmaceutical products, which are administered to ill persons for curative purposes, vaccines are generally given to healthy persons to prevent disease. Public tolerance of adverse reactions related to products given to healthy persons, especially healthy infants and children, is substantially lower than for reactions to products administered to persons who are already sick. This lower tolerance of risk for vaccines translates into a need to investigate the possible causes of very rare adverse events following vaccinations.

Adding to public concern about vaccines is the fact that immunization is mandated by many state and local school entry requirements. Because of this widespread use, safety problems with vaccines can have a potential impact on large numbers of persons. The importance of ensuring the safety of a relatively universal human-directed "exposure"

like immunizations is the basis for strict regulatory control of vaccines in the United States by the Food and Drug Administration (FDA).

Sound Immunization Recommendations and Policy

Public health recommendations for vaccine programs and practices represent a dynamic balancing of risks and benefits. Vaccine safety monitoring is necessary to accurately weigh this balance and adjust vaccination policy. This was done in the United States with smallpox and oral polio vaccines as these diseases neared global eradication. Complications associated with each vaccine exceeded the risks of the diseases, leading to discontinuation of routine smallpox vaccination in the United States (prior to global eradication) and a shift to a safer inactivated polio vaccine. Sound immunization policies and recommendations affecting the health of the nation depend upon the ongoing monitoring of vaccines and continuous assessment of immunization benefits and risks.

Importance of Vaccine Safety

- Ongoing safety monitoring needed for the development of sound policies and recommendations

Adverse Events Following Immunization and Assessment of Causality

Adverse events following immunization can be classified by frequency (common, rare), extent (local, systemic), severity (hospitalization, disability, death), causality, and preventability (intrinsic to vaccine, faulty production, faulty administration). Adverse events following immunizations may be coincidental events or the vaccine may have increased the risk of the adverse event. Some adverse events following immunization may be due to the vaccine preparation itself and the individual response of the vaccinee, and would not have occurred without vaccination. Examples of such events are vaccine-associated paralytic poliomyelitis after oral polio vaccine, or vaccine-strain measles viral infection in an immunodeficient recipient. Other health events may be precipitated by an immunization, such as a vaccine-associated fever precipitating a febrile seizure. Vaccine administration errors may lead to adverse events as well, for example, when administration of a vaccine too high in an adult's arm causes deltoid bursitis. However, many adverse events following immunization are coincidental; they are temporally related to immunization, but occurring by chance without a causal relationship.

To assess causality of an adverse event following immunization, much information is generally needed. A good reference for causality determination is available at www.ncbi.nlm.nih.gov/pubmed/22507656. An adverse health event can be causally attributed to vaccine more readily if: 1) the health problem occurs during a plausible time period

following vaccination; 2) the adverse event corresponds to those previously associated with a particular vaccine; 3) the event conforms to a specific clinical syndrome whose association with vaccination has strong biologic plausibility (e.g., anaphylaxis) or occurs following the natural disease; 4) a laboratory result confirms the association (e.g., isolation of vaccine strain varicella virus from skin lesions of a patient with rash); 5) the event recurs on re-administration of the vaccine ("positive rechallenge"); 6) a controlled clinical trial or epidemiologic study shows greater risk of a specific adverse event among vaccinated vs. unvaccinated (control) groups; or 7) a finding linking an adverse event to vaccine has been confirmed by other studies.

Assessing and Monitoring Safety of Vaccines

Prelicensure

Prelicensure Vaccine Safety Studies

- Laboratory
- Animals
- Humans

Prelicensure Human Studies

- Phases I, II, III trials
- Common reactions are identified
- Vaccines are tested in thousands of persons before being licensed and allowed on the market

Vaccines, like other pharmaceutical products, undergo extensive safety and efficacy evaluations in the laboratory, in animals, and in sequentially phased human clinical trials prior to licensure. Phase I human clinical trials usually involve anywhere from 20 to 100 volunteers and focus on detecting serious side effects. Phase II trials generally enroll hundreds of volunteers. These trials might take a few months, or last up to three years. Phase II trials determine the best dose and number of doses for effectiveness and safety. Next, the vaccine moves into Phase III trials, which may last several years. A few hundred to several thousand volunteers may be involved. Some volunteers receive another already-licensed vaccine, allowing researchers to compare one vaccine with another for adverse health effects—anything from a sore arm to a serious reaction. If the vaccine is shown to be safe and effective in Phase III, the manufacturer applies for a license from the FDA. The FDA licenses the vaccine itself (the "product license") and licenses the manufacturing plant where the vaccine will be made (the "establishment license"). During the application, the FDA reviews the clinical trial results, product labeling, the manufacturing plant itself, and the manufacturing protocols.

Fundamental to preventing safety problems is the assurance that any vaccines for public use are made using Good Manufacturing Practices and undergo lot testing for purity and potency. Manufacturers must submit samples of each vaccine lot and results of their own tests for potency and purity to the FDA before releasing them for public use. FDA licensure occurs after a vaccine has met rigorous standards of efficacy and safety, and when its potential benefits in preventing disease clearly outweigh any risks. Phase III trials may be powered sufficiently to identify certain potential adverse reactions prior to licensure. For example, in the pentavalent rotavirus vaccine trials, 70,000 infants received

either vaccine or placebo, so this permitted evaluation of safety with respect to intussusception. However, while rates of common vaccine reactions, such as injection-site reactions and fever, can be estimated before licensure, the comparatively small number of patients enrolled in these trials generally limits detection of rare side effects or side effects that may occur many months after the vaccine is given. Even the largest prelicensure trials (more than 10,000 persons) are inadequate to assess the vaccine's potential to induce rare side effects. Therefore, it is essential to continue to monitor vaccine-associated adverse events once the vaccine has been licensed and recommended for public use.

National Childhood Vaccine Injury Act (NCVIA) of 1986
During the mid-1970s, there were vaccine safety-related lawsuits filed on behalf of those presumably injured by the whole-cell pertussis component of diphtheria-tetanus-pertussis (DTP) vaccine. Legal decisions were reached and damages awarded despite the lack of scientific evidence to support vaccine injury claims. As a result of vaccine manufacturers being held liable, prices soared and many manufacturers halted vaccine production. A vaccine shortage resulted, and public health officials became concerned about the return of epidemic disease. To respond to these concerns, Congress passed the National Childhood Vaccine Injury Act (NCVIA) in 1986. Among the requirements of the NCVIA were the establishment of the Vaccine Adverse Event Reporting System (VAERS) to collect reports of vaccine adverse events, and the National Vaccine Injury Compensation Program to compensate individuals who experience certain health events following immunization. Postlicensure vaccine safety monitoring is now a multifaceted activity which helps address these concerns as well.

Postlicensure Vaccine Safety Monitoring

Postlicensure evaluation of vaccine safety is critical because rare reactions, delayed reactions, or reactions among subpopulations may not be detected before vaccines are licensed. Several monitoring systems are used in the US to detect and study adverse events that occur after immunizations. In addition to Phase IV trials required of manufacturers, the CDC and FDA use two main systems to monitor the safety of vaccines in use: VAERS and the Vaccine Safety Datalink (VSD). The objectives of postlicensure surveillance are to:

- identify rare adverse reactions after immunization not detected during prelicensure studies;
- monitor increases in known adverse health events after immunization;

Postlicensure Vaccine Safety Systems

- Vaccine Adverse Event Reporting System (VAERS)
- Vaccine Safety Datalink (VSD)

Postlicensure Surveillance

- Identify rare reactions
- Monitor increases in known adverse health events
- Identify risk factors for reactions
- Identify vaccine lots with unusual rates or types of event
- Identify signals

Vaccine Adverse Event Reporting System (VAERS)

- National spontaneous surveillance system
- Jointly administered by CDC and FDA
- Receives about 30,000 reports per year
- Detects
  - new or rare events
  - increases in rates of known side effects
  - patient risk factors
- Additional studies required to confirm VAERS signals
- Not all reports of adverse events are causally related to vaccine

- identify risk factors or preexisting conditions that may be associated with a higher incidence of adverse reactions;
- identify whether there are particular vaccine lots with unusually high rates or certain types of events; and
- identify "signals," possible adverse reactions that may warrant further study to establish the association of an adverse event with vaccination, or affect current immunization recommendations.

The Vaccine Adverse Event Reporting System (VAERS)

The National Childhood Vaccine Injury Act (NCVIA) of 1986 mandated that healthcare providers who administer vaccines and vaccine manufacturers report adverse health events following vaccinations. This act led to the creation of the Vaccine Adverse Event Reporting System (VAERS) in 1990. VAERS is a national spontaneous surveillance system, jointly administered by CDC and FDA, which accepts reports of adverse events after US-licensed vaccinations from health professionals, vaccine manufacturers, and the public. Reports are submitted via the Internet, mail, and fax. All reports are coded using the Medical Dictionary for Regulatory Activities (MedDRA) (http://www.meddramsso.com/) and entered into the VAERS database. VAERS receives about 30,000 US reports per year. Though this may seem like a large number, it is relatively small considering that millions of doses of vaccines are given to adults and children in the US each year.

Healthcare providers are required to report certain adverse health events following specific vaccinations to VAERS (see http://vaers.hhs.gov/resources/VAERS_Table_of_Reportable_Events_Following_Vaccination.pdf) and are encouraged to report any clinically significant adverse event after vaccination even if the reporter is not certain that the incident is vaccine-related. Vaccine manufacturers are required to report all adverse health events that come to their attention (http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=600.80). In 2012, US VAERS reports were received from healthcare providers (41%), manufacturers (29%), unknown or other reporters (17 %), and patients or parents (14%).

VAERS collects information about the patient, the vaccination(s) given, the adverse event, and the person reporting the event. Serious adverse event reports as defined in the Federal Register are those involving reported hospitalization or prolongation of hospitalization (if vaccine is given in hospital), death, life threatening illness, or permanent disability. Attempts are made to obtain additional medical information for all reports classified as serious. For these

reports, letters to obtain information about recovery status are also sent to the reporters. All patient-identifying information submitted to VAERS, directly or as part of follow-up activities, is protected by strict confidentiality requirements.

Despite limitations inherent to spontaneous reporting systems, VAERS has been able to fulfill its primary purpose of detecting new or rare vaccine adverse events, increases in rates of known side effects, and patient risk factors for particular types of adverse events. Additional studies are required to confirm possible safety signals detected by VAERS because not all reported adverse events are causally related to vaccine. See the section in this chapter titled "Reporting Adverse Events Following Immunization to VAERS" for information on submitting reports. In addition, VAERS often provides early safety data after a vaccine is licensed or during a public health emergency.

VAERS data with personal identifiers removed are available at http://vaers.hhs.gov/index or at http://wonder.cdc.gov/vaers.html.

Vaccine Safety Datalink (VSD)

In 1990, CDC established the Vaccine Safety Datalink to address gaps in the scientific knowledge of rare and serious adverse events following immunizations. This project involves partnerships with large health plans to monitor vaccine safety. A complete list of VSD partners can be found at http://www.cdc.gov/vaccinesafety/Activities/VSD.html. Each participating organization utilizes its electronic health records and immunization registries to contribute to a large linked database. Available information includes data on vaccination (vaccine type, date of vaccination, concurrent vaccinations), health conditions, medical encounters (outpatient visits, inpatient visits, urgent care visits), birth data, and census data.

The VSD allows for planned immunization safety studies, as well as timely investigations of hypotheses that arise from review of medical literature, reports to VAERS, changes in immunization schedules, or the introduction of new vaccines. The Rapid Cycle Analyses (RCA) conducted by the VSD enable CDC and its co-investigators to monitor adverse events following vaccination in near real time, so the public can be informed quickly of possible risks. VSD data come from participating health plans that serve more than 9 million people annually, representing nearly 3% of the United States population, and records for more than 150 million vaccinations, enabling the VSD to study possible rare adverse events after immunization. Data files used in VSD studies remain at each participating site; specific data

Vaccine Safety Datalink (VSD)

- Involves partnerships with large health plans
- Links vaccination and health records
- Allows for planned immunization safety studies
- Allows for investigations of hypotheses that arise from review of medical literature, reports to VAERS, changes in immunization schedules, or the introduction of new vaccines

are pulled together for each analysis and do not contain personal identifiers. Further information about VSD is available at http://www.cdc.gov/vaccinesafety/Activities/VSD.html.

Clinical Immunization Safety Assessment (CISA) Project

Clinical Immunization Safety Assessment (CISA) Project

- Improve understanding of vaccine safety issues at individual level
- Review individual cases
- Develop strategies to assess individuals
- Conduct studies to identify risk factors

The CDC supports the Clinical Immunization Safety Assessment (CISA) Project to improve the understanding of adverse events following immunization (AEFI) at the individual-patient level. The CISA Project's goals are to: (1) serve as a vaccine safety resource for consultation on clinical vaccine safety issues, including individual case reviews, and assist with immunization decision-making; (2) assist CDC in developing strategies to assess individuals who may be at increased risk for AEFI; and (3) conduct studies to identify risk factors and preventive strategies for AEFI, particularly in special populations. CISA experts provide advice that has led to a broader understanding of vaccine safety issues and informs clinical or public health practices. A healthcare provider who needs expert opinion on a vaccine safety question about a specific patient can contact CDC at CISAeval@cdc.gov to request a CISA evaluation. Individual case evaluations may lead to development of protocols or guidelines for healthcare providers to help them make the right assessments and manage similar situations. CISA has also contributed to Advisory Committee on Immunization Practices (ACIP) recommendations. Established in 2001, the CISA Project currently consists of seven academic centers of excellence with vaccine safety expertise working in partnership with CDC. A list of these centers, and additional information about the CISA Project, can be found at http://www.cdc.gov/vaccinesafety/Activities/cisa.html.

Vaccine Injury Compensation

Vaccine Injury Compensation Program (VICP)

- Established by National Childhood Vaccine Injury Act (1986)
- "No fault" program
- Covers all routinely recommended childhood vaccines
- Vaccine Injury Table

A main impact of the National Childhood Vaccine Injury Act (NCVIA) of 1986 was the initiation of the National Vaccine Injury Compensation Program (VICP). This program, administered by the Health Resources and Services Administration (HRSA), compensates individuals who experience certain health events following immunization on a "no fault" basis. "No fault" means that persons filing claims are not required to prove negligence on the part of either the healthcare provider or manufacturer to receive compensation. The program covers all routinely recommended childhood vaccines, although adults who receive a covered vaccine may also file a claim. Claims may be based on a Vaccine Injury Table (available at http://www.hrsa.gov/vaccinecompensation/vaccinetable.html), which lists conditions associated with each vaccine and provides a rebuttable presumption of causation, or by proving by preponderant evidence that the vaccine caused an injury not on the Table.

This Table was developed initially by Congress and has been modified by the Secretary of the Department of Health and Human Services (DHHS) to better reflect current science regarding which serious adverse events are reasonably certain to be caused by vaccines. The Table was created to provide swift compensation to those possibly injured by vaccines. As more information becomes available from research on vaccine side effects, the Table will continue to be amended.

VICP has provided compensation to individuals injured by rare vaccine-related adverse events and provided liability protection for vaccine manufacturers and administrators. Further information about the VICP is available at http://www.hrsa.gov/vaccinecompensation/vaccinetable.html.

During the 2009 H1N1 influenza pandemic, the government implemented a new compensation program called Countermeasures Injury Compensation Program (CICP). This program provides compensation for certain individuals who are seriously injured by countermeasures as specified in a declaration by the Secretary of DHHS. Both security (bioterrorism) and pandemic countermeasures are covered. The CICP currently covers serious adverse events caused by pandemic influenza vaccines, including the 2009 monovalent H1N1 influenza vaccine that was widely distributed in the 2009 influenza season and any pandemic influenza vaccines in clinical trials such as H5, H7, H9, etc. The CICP also currently covers serious adverse events caused by anthrax, smallpox, and botulism vaccines, including those used by the Department of Defense. Covered countermeasures within the CICP are not limited to vaccines and may include certain medications or devices used to diagnose, prevent, or treat the covered condition (currently pandemic influenza, smallpox, anthrax, botulism, and acute radiation syndrome). People have one year from receipt of the countermeasure to file with the CICP. More information can be found at http://www.hrsa.gov/countermeasurescomp.

The Immunization Provider's Role

Even though federal regulations require vaccines to undergo years of testing before they can be licensed, and vaccines are monitored continually for safety and effectiveness, immunization providers still play a key role in helping to ensure the safety and efficacy of vaccines. They do this through proper vaccine storage and administration, timing and spacing of vaccine doses, observation of contraindications and precautions, management of vaccine adverse reactions, reporting of adverse events following immunization to VAERS, and educating patients and parents about vaccine benefits and risks. Each of these steps is described

The Provider's Role

- Immunization providers can help to ensure the safety and efficacy of vaccines through proper:
  - vaccine storage and administration
  - timing and spacing of vaccine doses
  - observation of contraindications and precautions
  - management of adverse reactions
  - reporting to VAERS
  - benefit and risk communication

only briefly here. Further information is available elsewhere in this book or in resource materials from CDC or other organizations.

Vaccine Storage and Administration

To achieve the best possible results from vaccines, immunization providers should carefully follow the recommendations found in each vaccine's package insert for storage, handling, and administration. Other steps to help ensure vaccine safety include: 1) inspecting vaccines upon delivery and monitoring refrigerator and freezer temperatures to ensure maintenance of the cold chain; 2) rotating vaccine stock so the oldest vaccines are used first; 3) never administering a vaccine later than the expiration date; 4) administering vaccines within the prescribed time periods following reconstitution; 5) waiting to draw vaccines into syringes until immediately prior to administration; 6) never mixing vaccines in the same syringe unless they are specifically approved for mixing by the FDA; and 7) recording vaccine and administration information, including lot numbers and injection sites, in the patient's record. If errors in vaccine storage and administration occur, corrective action should be taken immediately to prevent them from happening again and public health authorities should be notified. More information on vaccine storage and handling is available in the "Vaccine Storage and Handling" chapter and CDC's "Vaccine Storage and Handling Toolkit", available on the CDC Vaccines and Immunizations website at http://www.cdc.gov/vaccines/recs/storage/toolkit/.

Timing and Spacing

Timing and spacing of vaccine doses are two of the most important issues in the appropriate use of vaccines. To ensure optimal results from each immunization, providers should follow the recommended immunization schedules for children, adolescents, and adults. Decreasing the timing intervals between doses of the same vaccine may interfere with the vaccine's antibody response. For more specific information on timing and spacing of vaccines, see Chapter 2, "General Recommendations on Immunization." A table showing recommended minimum ages and intervals between vaccine doses is contained in Appendix A.

Providers should also remember the following:

- Administering all needed vaccines during the same visit is important because it increases the likelihood that children will be fully immunized as recommended. Studies have shown that vaccines are as effective when administered simultaneously as they are individually and carry no greater risk for adverse reactions.

- Some vaccines, such as pediatric diphtheria and tetanus, may cause local reactions when given too frequently. Good recordkeeping, maintaining careful patient histories, and adherence to recommended schedules can decrease the chances that patients receive extra doses of vaccines.

Contraindications and Precautions

Certain vaccines should not be given, or should be given only under controlled circumstances, to certain patients. A contraindication is a condition that increases the likelihood of a serious adverse reaction to a vaccine for a recipient with that condition. In general, a vaccine should not be administered when a contraindication is present. A precaution is a condition that might increase the likelihood or severity of an adverse reaction in a recipient, or compromise the ability of the vaccine to produce immunity. Vaccination is generally deferred when a precaution is present. Situations may arise when the benefits of vaccination outweigh the risk of a side effect, and the provider may decide to vaccinate the patient. Many contraindications and precautions are temporary and the vaccine may be given at a later time. More information about contraindications can be found in the Advisory Committee on Immunization Practices (ACIP) statements for individual vaccines. Recommendations for immunizing persons who are immunocompromised can be found in Appendix A. Information on allergic reactions to vaccines can be found in the American Academy of Pediatrics *Red Book*.

Screening for contraindications and precautions is important for preventing serious adverse outcomes after vaccination. Every provider who administers vaccines should screen every patient before giving a vaccine dose. Sample screening questionnaires can be found in Chapter 2, "General Recommendations on Immunization." Many conditions are often inappropriately regarded as contraindications to vaccination. In most cases, the following are not considered contraindications:

- Minor acute illness (e.g., diarrhea and minor upper respiratory tract illnesses, including otitis media) with or without low-grade fever
- Mild to moderate local reactions and/or low-grade or moderate fever following a prior dose of the vaccine
- Current antimicrobial therapy
- Recent exposure to infectious disease
- Convalescent phase of illness
- Pregnant or immunosuppressed person in the household

Contraindication

A condition that increases the likelihood of a serious adverse reaction to a vaccine for a recipient with that condition

Precaution

A condition in a recipient that might:

- Increase the chance or severity of an adverse reaction, or
- Compromise the ability of the vaccine to produce immunity

Invalid Contraindications to Vaccination

- Minor acute illness
- Mild/moderate local reaction or fever following a prior dose
- Antimicrobial therapy
- Disease exposure or convalescence
- Pregnancy or immunosuppression in the household
- Preterm birth
- Breastfeeding
- Allergies to products not in vaccine

- Preterm birth
- Breastfeeding
- Allergies to products not in vaccine

Managing Adverse Reactions after Immunization

Providers should use their best clinical judgment regarding specific management of adverse events after immunization. Allergic reactions to vaccines are estimated to occur after vaccination of children and adolescents at a rate of one for every 1.5 million doses of vaccine. All providers who administer vaccines should have procedures in place and be prepared for emergency care of a person who experiences an anaphylactic reaction. Epinephrine and equipment for maintaining an airway should be available for immediate use. All vaccine providers should be familiar with the office emergency plan and should be certified in cardiopulmonary resuscitation.

Reporting Adverse Events Following Immunization to VAERS

Healthcare providers are required by the National Childhood Vaccine Injury Act of 1986 to report certain adverse events to VAERS and are encouraged to report any adverse event even if they are not sure a vaccine was the cause. A table listing reportable events is available at http://vaers.hhs.gov/reportable.htm. Reporting can be done in one of three ways:

1. Online through a secure website: https://vaers.hhs.gov/esub/step1.
2. If a reporter is unable to report by Internet, they may fax a completed VAERS form* to 877-721-0366.
3. Mail a completed VAERS form* to:

   VAERS
   P.O. Box 1100
   Rockville, MD 20849-1100

*A one-page VAERS form can be downloaded from http://vaers.hhs.gov/resources/vaers_form.pdf or can be requested by telephone at 800-822-7967 or by fax at 877-721-0366.

When providers report suspected vaccine reactions to VAERS, they provide valuable information that is needed for the ongoing evaluation of vaccine safety. CDC and FDA use VAERS information to ensure the safest strategies of vaccine use and to further reduce the rare risks associated with vaccines.

Benefit and Risk Communication

Parents, guardians, legal representatives, and adolescent and adult patients should be informed of the benefits and risks of vaccines in understandable language. Opportunity for questions should be provided before each vaccination. Discussion of the benefits and risks of vaccination is sound medical practice and is required by law.

The National Childhood Vaccine Injury Act requires that vaccine information materials be developed for each vaccine covered by the Act. These materials, known as "Vaccine Information Statements" (VISs), must be provided by all public and private vaccination providers before each dose of vaccine. Copies of VISs are available from state health authorities responsible for immunization, or they can be obtained from CDC's website at http://www.cdc.gov/vaccines/pubs/vis/default.htm or from the Immunization Action Coalition at http://www.immunize.org. Translations of VISs into languages other than English are available from certain state immunization programs and from the Immunization Action Coalition website. Further information about VISs and their use is contained in Appendix C.

Healthcare providers should anticipate questions that parents or patients may have regarding the need for or safety of vaccination. Some individuals may refuse certain vaccines, or even reject all vaccinations. Some might have religious or personal objections to vaccinations. Having a basic understanding of how patients view vaccine risk and developing effective approaches to dealing with vaccine safety concerns when they arise are imperative for vaccination providers. Healthcare providers can accomplish this by assessing patients' specific concerns and information needs, providing them with accurate information, and referring them to credible sources for more information. CDC's website contains extensive and up-to-date information on vaccines and tools for discussing vaccines with patients (see http://www.cdc.gov/vaccines/hcp/patient-ed/conversations/index.html for provider resources).

When a parent or patient initiates discussion regarding a vaccine concern, the healthcare provider should discuss the specific concern and provide factual information, using language that is appropriate. Effective, empathetic vaccine risk communication is essential in responding to misinformation and concerns. The Vaccine Information Statements provide an outline for discussing vaccine benefits and risk. Other vaccine safety informational resources are available at http://www.cdc.gov/vaccinesafety/.

For patients who question or refuse vaccination, identifying common ground and discussing measures for deferring vaccinations is a more effective public health strategy for

Benefit and Risk Communication

- Opportunities for questions should be provided before each vaccination
- Vaccine Information Statements (VISs)
  - must be provided before each dose of vaccine
  - public and private providers
  - available in multiple languages

providers than excluding these patients from their practice. Healthcare providers can reinforce key points regarding each vaccine, including safety, and emphasize risks encountered by unimmunized children. Parents should be informed about state laws pertaining to school or child care entry, which might require that unimmunized children stay home from school during outbreaks. Documentation of these discussions in the patient's record, including the refusal to receive certain vaccines (i.e., informed refusal), might reduce any potential liability if a vaccine-preventable disease occurs in the unimmunized patient.

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