Despite the availability of a tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) vaccine in the United States since 2005, the vaccine remains underutilized and perhaps misunderstood by many physicians. Pertussis continues to be a major public health problem, with adults being the primary source of infectious transmission to unprotected infants. Consequently, the Centers for Disease Control and Prevention’s Advisory Committee on Immunization Practices has expanded the indications for the Tdap vaccine. In addition, the vaccine can be safely administered regardless of the time since the patient’s last tetanus-diptheria booster. Widespread use of the Tdap vaccine—especially in healthcare workers, adolescents, and adults aged 19 to 64 years—should greatly reduce the incidence of Bordetella pertussis infection in the United States. The recent Food and Drug Administration approval of the Tdap vaccine for individuals aged 65 years or older should increase the use of this vaccine.

**Tdap Vaccine: Current Indications for Adolescent and Adult Patients in the United States**

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The combined diphtheria, tetanus toxoid, and acellular pertussis (DTaP) vaccines provide childhood immunization against pertussis, as well as diphtheria and tetanus. One of the DTaP vaccines is available in the United States for children aged 6 weeks to 6 years. There are currently 2 types of Tdap vaccines available in the United States—Adacel and Boostrix (GlaxoSmithKline Biologicals, Rixensart, Belgium). Because these Tdap vaccines contain lower amounts of diphtheria toxin and pertussis antigen compared to the DTaP vaccine, they should not be used for primary immunizations in children younger than 6 years. Both Tdap vaccine formulations contain similar amounts of tetanus toxoid, but they vary slightly in diphtheria toxoid concentrations and pertussis antigenic components (eg, filamentous hemagglutinin, fimbriae, pertactin).

**Clinical Manifestations**

Diphtheria (Corynebacterium diphtheria) remains rare in the United States. It occurs most commonly in children aged 15 years or younger. It manifests as either a localized or a generalized disease. Locally, it produces an acute respiratory infection accompanied by a gray membranous pharyngitis. Complications of diphtheria may include airway obstruction if the membrane descends into the larynx or bronchial tree. The last confirmed case of diphtheria in the United States occurred in 2003.

Tetanus, or “lock jaw” (Clostridium tetani), is associated with contaminated wounds and can be severe and life-threatening. It is characterized by rigidity and intermittent tonic spasms of voluntary muscles, mainly in the jaw and neck. Tetanus is rare in the United States, with only 233 cases reported to the CDC from 2001 to 2008. However, of 51 patients with tetanus associated with acute wound injuries, 49 (96%) cases occurred in individuals who had not received appropriate prophylaxis.

The risk of mortality from tetanus was 5 times higher in individuals aged 65 years or older than in younger individuals. Persons in the older age group, as well as those who have diabetes mellitus...
and those who use intravenous drugs, remain at higher risk for this rare but life-threatening condition.

Pertussis, or “whooping cough” (Bordetella pertussis), produces progressively worsening respiratory symptoms in affected children and adults. The first stage (ie, catarrhal stage) of pertussis lasts for 1 to 2 weeks, and symptoms during this phase resemble those of an upper respiratory illness, including runny nose, nasal congestion, sneezing, and occasional cough. A low-grade fever is present in some cases.

The second stage of pertussis (ie, paroxysmal stage) typically lasts from 1 to 6 weeks, though it can persist for a longer time in some cases. This stage is characterized by intense and prolonged bouts of coughing. The attacks tend to be more frequent at night, with an average of 15 attacks in a 24-hour period. Often a “whoop,” caused by the gasping patient inhaling between coughs, can be heard. Infants may seem to stop breathing and become cyanotic during the coughing spasms. Vomiting is also common during this stage. More than 50% of children younger than 1 year who get pertussis are hospitalized with complications, including pneumonia and seizures. These complications may lead to death.

Milder forms of pertussis occur in adults, but it is usually adults who transmit the infection to children. One study found that household members were responsible for 75% to 83% of pertussis transmissions to infants. In more than half of these cases, the infection source was a parent, and in 6% of the cases, the source was a grandparent. Adolescents and adults are susceptible to B pertussis infection as a result of waning pertussis antibody titers from childhood immunization. Loss of immunologic protection was the impetus behind ACIP’s extending and advancing vaccine coverage against B pertussis to adolescents and adults.

**Indications for Tdap Vaccination**

According to the most recent ACIP guidelines, a single Tdap dose should be used for all adolescents aged 11 through 18 years who have completed the recommended childhood vaccination series for diphtheria, tetanus, and acellular pertussis. The ACIP also recommends that all adults aged 19 through 64 years receive a single Tdap dose. The vaccine may be administered regardless of the interval since the patient’s last tetanus or diphtheria toxoid-containing vaccine—an important change from previous recommendations. Current recommendations for Tdap vaccine administration are summarized in the Figure.

The ACIP further recommends a single dose of the Tdap vaccine for adults aged 65 years or older, emphasizing that these older adults should receive the vaccine if they have or anticipate having close contact with an infant younger than 12 months. This recommendation is based on data from 2274 adults in this age range who had received 1 of the 2 approved Tdap vaccines. In July 2011, the FDA formally approved use of the Boostrix Tdap formulation for adults aged 65 years or older. This approval should make it easier for physicians to follow through on the most recent CDC recommendations. Reimbursement for using the Tdap vaccine in these older patients is covered under Medicare Part D.

In February 2011, the ACIP recommended that all healthcare personnel, regardless of age or time since their last Tdap dose, receive a dose of the Tdap vaccine as soon as possible. However, because the Tdap vaccine is not licensed for multiple administrations, additional booster immunizations against tetanus and diphtheria should be administered according to previous CDC guidelines.

**Immunocompromised Adults**

The Tdap vaccine may be given to patients who are substantially immunocompromised (eg, patients receiving chemotherapy, radiation therapy, or long-term steroid medications). The vaccine may also be given to patients with HIV infection or inherited immune disorders. Immune responses to vaccines in these patients may not be as robust as in healthy individuals, though few data exist on this matter. For patients with HIV infection, it is generally recommended to withhold most vaccines until the CD4+ lymphocyte count is greater than 200 cells/mm3. Individuals in frequent, close contact with immunocompromised individuals should receive all age-appropriate vaccinations.

**Immunogenicity**

Several large clinical trials conducted in the United States found that immune responses to Tdap vaccines were noninferior to immune responses seen with traditional diphtheria toxoid vaccines. Protective serum concentrations of antipertussis and antitetanus antibodies were seen in 99.9% of adolescents randomly assigned to receive either Tdap or diphtheria toxoid vaccines.

In addition, a trial that included 2284 adults aged 19 to 64 years showed that serum concentrations of antipertussis antibodies approximately 1 month after Tdap administration were not inferior to serum concentrations known to have a protective effect in infants after the primary regimen of Tdap vaccination. More than 98% of the trial participants had protective antibody levels 1 month after Tdap administration.
Safety

Data from clinical trials and postmarketing surveillance studies suggest that the Tdap vaccine is safe across a wide range of ages. The frequency and severity of adverse events with the Tdap vaccine have been reported to be no greater in patients younger than 65 years than in patients older than 65 years. The data reported via the Vaccine Adverse Event Reporting System included 10,981 events related to Tdap vaccine use from September 2005 through September 2010, with 243 adverse events in adults aged 65 years or older. The most common adverse events were local reactions (eg, pain, redness, swelling) at the injection site. Such reactions have been noted to occur in 15% or more of patients. Less commonly reported adverse events included headache, fatigue, and gastrointestinal symptoms.

Contraindications

Reasons not to give the Tdap vaccine to eligible adults and adolescents are few. The vaccine is contraindicated for individuals with a history of serious allergic reaction (ie, anaphylaxis) after previous vaccination with any component of the vaccine. These individuals may be referred to an allergist to determine whether they are hypersensitive to any of the vaccine’s components. They can safely receive future immunizations.

The Tdap vaccine is also contraindicated in individuals with a “history of encephalopathy,” defined as coma or prolonged seizures not attributable to any identifiable cause within 7 days of administration of a vaccine containing pertussis antigen. These adults should receive the diphtheria toxoid vaccine rather than the Tdap vaccine. Progressive or unstable neurologic disorders (eg, acute encephalopathic conditions, cerebrovascular events) are not considered a contraindication to the Tdap vaccine, though they should prompt the physician to defer vaccination with any pertussis-containing vaccine until the patient’s condition is clinically stable.

Conclusion

On the basis of current ACIP recommendations, all adolescents and adults in the United States should receive 1 dose of the Tdap vaccine. The recommendations simplify use of this vaccine by removing the previous barrier of a time interval between administration of the Tdap vaccine and the patient’s last diphtheria toxoid vaccination. Ideally, these recommendations will provide a full range of protection against pertussis in patients of all age ranges. Hospitals and other ambulatory healthcare facilities should provide the Tdap vaccine for all of their healthcare professionals—including physicians—who need to be vigilant about their own immunization status.

References


