VACCINAREA LA ADULŢI

Vaccinations in adults

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ABSTRACT

Although immunization rates for children are at an all-time high, and young people rarely die from diseases that vaccines can prevent, that's not the case for adults. Many adults keep their immunity from certain childhood vaccinations. Nevertheless, it is difficult to know if a person is still protected without blood tests that can be expensive and aren't always reliable. What's more, many people don't remember what vaccines they were given at an early age and they don't have any records. In addition adults often skip recommended immunizations before traveling. Adults prioritize pediatric immunizations for their children and grandchildren; however, they often fail to protect themselves. To reverse this trend, better education is needed about the impact of adult diseases and the benefits of vaccination. To avoid the risk associated with vaccine-preventable diseases, health experts consider that revaccinations are safe.

Key words: vaccination, adult

INTRODUCTION

The most effective – and simplest – ways to protect our patients are to get them immunized against vaccine-preventable diseases. That includes getting the influenza vaccine every year. We can also do a better job ensuring that patients, not only children but also adults and seniors, receive their own recommended vaccinations. These simple but effective steps can go a long way towards protecting our patients from illness and even death.

Research shows that immunizing health care workers against influenza reduces both patient morbidity and mortality.

Besides getting vaccinated ourselves, we must also make sure our adult patients get the vaccinations they need. Generally speaking, we have a good system for immunizing children, but it is not the same situation when we speak about immunizing adults. Thousands of people suffer from illnesses that could have been prevented through recommended immunizations.

Many adults (incorrectly) think they don't need any immunization since they have already been immunized during their childhood. Nevertheless,

- some of them have never been immunized,
- the vaccinations received during their childhood do not protect them anymore (post vaccination immunity vanishes with time),
- getting older they became susceptible to number of diseases (ex influenza, pneumococcal disease etc)
- new vaccines are available.

As a matter of routine medical care, we should ask our adult patients about their vaccination history to make sure their immunizations are up to date. If our patients need vaccinations, we should either provide them or connect our patients with health care providers equipped to do so. As medical professionals in patient care, we have an *obligation* to educate our patients about the importance of vaccination and the safety and effectiveness of vaccines in preventing illness. Our patients are exposed to a lot of misinformation about vaccines,

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and we can help change that by giving patients the accurate, science-based information they need to make their decisions.

TETANUS-DIPHTHERIA

Although tetanus is rare in vaccinated populations, it has a high mortality rate. Because $^{1}/_{3}$ of cases occur unpredictably (after minor or unapparent injuries), universal tetanus vaccination remains necessary. The most widely used preparations combine tetanus toxoid with diphtheria toxoid (Td for adults, DT for children); a preparation with only tetanus toxoid (TT) is also available. Td contains a lower dose of diphtheria toxoid than DTaP and DT, used in children. Administration: Td boosters, 0.5 mL IM, are given q 10 yr after the Tdap booster that is given at age 11 to 12 yr. Boosters are needed to maintain immunity.

Td is preferred to TT for adults as part of wound management if the last dose of Td was received 5 or more years earlier.

Up-to-date vaccination against diphtheria is especially important for travelers who will be living or working with local populations in countries where diphtheria is endemic. Adolescents and adults who have never been vaccinated against diphtheria should receive a primary series of three doses of Td. The first two doses should be administered at least 4 weeks apart, and the third dose 6–12 months after the second dose.

DIPHTHERIA-TETANUS-PERTUSSIS

Preparations: Diphtheria (D) vaccines contain toxoids prepared from *Corynebacterium diphtheriae*. Tetanus (T) vaccines contain toxoids prepared from *Clostridium tetani*. Acellular (a) pertussis (P) vaccines contain semipurified or purified components of *Bordetella pertussis*. **DTaP** (also **DTPa**) is a combined vaccine against diphtheria, tetanus, and pertussis, in which the pertussis component is acellular. This is in contrast to whole-cell, inactivated DTP (DTwP). The acellular vaccine uses selected antigens of the pertussis pathogen to induce immunity. Because it uses fewer antigens than the whole cell vaccines, it is considered safer, but it is also more expensive. Most of the developed world has switched to DTaP, but developing countries continue to use DTP. Both DTP and DTaP appear to be equally efficacious in generating immunity.

Pertussis is an important cause of morbidity and mortality, and its incidence has been increasing in adolescents and adults over the past two decades. Waning immunity in adolescents and adults may be partially responsible. Adults can suffer significant illness from pertussis and its complications, such as pneumonia, rib fractures and syncope. Moreover, adults serve as a source of disease for infants, who are more vulnerable to severe complications and even death. The economic burden of pertussis is substantial, in terms of both medical and non medical costs. Fortunately, the burden of pertussis disease can now be safely and effectively reduced by vaccinating adults with tetanus-diphtheria-acellular pertussis (Tdap) vaccine. Because the incidence of pertussis is increasing, at least one booster before age 65 should be Tdap.

Adolescents 11–18 years of age should receive a single dose of Tdap instead of Td for booster immunization against tetanus Thereafter, routine booster doses of Td vaccine should be given at 10-year intervals. For added protection against pertussis, Tdap can substitute for any one dose in the 3-dose primary series.

For added protection against pertussis, adults 19–64 years of age should receive a single dose of Tdap (ADACEL®) to replace a single dose of Td for active booster immunization against tetanus, diphtheria and pertussis, if they received their last dose of Td 10 or more years earlier and have not previously received a dose of Tdap. Tdap is not licensed or recommended for adults 65 years of age or older; these persons should receive Td instead.

The U.S.'s Advisory Committee on Immunization Practices (ACIP) and Canada's National Advisory Committee on Immunization (NACI) both recommended adolescents and adults receive Tdap in place of their next Td booster (recommended to be given every 10 years). Tdap can be used as prophylaxis for tetanus wound management. Five years between doses of Td or doses of Td and Tdap is the current standard of care; frequent exposure to tetanus toxoid can cause local reactions. People who will be in contact with young infants are encouraged to get Tdap even if it has been less than 5 years since Td or TT to reduce the risk of infants being exposed to pertussis.

There are 2 preparations of the acellular vaccine:

- DTaP for children < 7 yr
- Tdap for adolescents and adults

Tdap contains lower doses of diphtheria and pertussis components (indicated by the lower case *d* and *p*). Administration: The vaccine is given as 5 primary and 1 booster IM injections during childhood as follows: the first 3 doses at 2-mo intervals, starting at age 2 mo; the 4th at age 12 to 15 mo; and the last before school entry at age 4 to 6 yr. A single booster of Tdap is given at age 11 or 12 yr.

Pertussis is not available as a single vaccine.

While pertussis was thought to have been eradicated entirely from the United States, in recent years the disease has made a comeback and resulted in fatalities. At the same time, many parents have declined to vaccinate their children against the disease for fear of side effects; however, most side effects of the vaccination are moderate and severe problems closely following DPT immunization happen very rarely.

Women who are pregnant or who have recently given birth should be given a one-time dose of Tdap to protect their newborn. If a woman is pregnant and received the last Td vaccination ≥10 years previously, administer Td during the second or third trimester. If the woman received the last Td vaccination <10 years previously, administer Tdap during the immediate postpartum period.

A dose of Tdap is recommended for postpartum women, close contacts of infants aged <12 months, and all health-care personnel with direct patient contact if they have not previously received Tdap. An interval as short as 2 years from the last Td vaccination is suggested; shorter intervals can be used. Td may be deferred during pregnancy and Tdap substituted in the immediate postpartum period, or Tdap can be administered instead of Td to a pregnant woman.

POLIO VACCINE

As long as poliovirus is circulating anywhere in the world it may easily be imported to polio-free regions. High vaccination coverage, including booster doses of IPV for persons traveling to polio endemic countries, and enhanced surveillance to detect imported cases early is necessary to avoid re-established circulation in other countries.

The first two cases of poliomyelitis in Europe since 1998 have been diagnosed in 2001 in Bulgaria, according to the World Health Organization (WHO) and Bulgarian officials. In September 2001, a boy from the village of Dashtafa in the south-eastern part of Georgia was admitted to hospital with symptoms of meningitis. In December, he was determined to be infected with poliovirus. Analysis showed that, as with the Bulgarian cases, the poliovirus originated from northern India.

There are two kinds of polio vaccine:

- Inactive Polio Vaccine- **IPV**, and
- A live, oral polio vaccine- **OPV**, which is drops that are swallowed.

Both vaccines give immunity to polio, but OPV is better at keeping the disease from spreading to other people. Both vaccines are highly effective against all three types of poliovirus (Type 1, 2 and 3). There are, however, significant differences in the way each vaccine works.

Oral Polio Vaccine (OPV)

The action of oral polio vaccine (OPV) is two-pronged: OPV produces antibodies in the blood ('humoral' or serum immunity) to all three types of poliovirus. In the event of infection, this will protect the individual against polio paralysis by preventing the spread of poliovirus to the nervous system. OPV also produces a local immune response in the lining ('mucous membrane') of the intestines - the primary site for poliovirus multiplication. The antibodies limit the multiplication of 'wild' (naturally occurring) virus inside the gut, preventing effective infection. This intestinal immune response to OPV is probably the main reason why mass campaigns with OPV can rapidly stop person-to-person transmission of wild poliovirus.

Inactivated Polio Vaccine (IPV)

Inactivated polio vaccine (IPV) needs to be injected and works by producing protective antibodies in the blood (serum immunity) – thus preventing the spread of poliovirus to the central nervous system. However, it induces only very low levels of immunity to polivirus locally, inside the gut. As a result, it provides individual protection against polio paralysis but, unlike OPV, cannot prevent the spread of wild polio virus.

Most adults do not need polio vaccine because they were already vaccinated as children. But three groups of adults are at higher risk and *should* consider polio vaccination:

1. People traveling to areas of the world where polio is common,
2. Laboratory workers who might handle polio virus, and
3. Health care workers treating patients who could have polio.

Because of polio eradication efforts, the number of countries where travelers are at risk for polio has decreased dramatically.

Adults in these three groups who **have never been vaccinated against polio** should get 3 doses of IPV:

- The first dose at any time,
- The second dose 1 to 2 months later,
- The third dose 6 to 12 months after the second.

Adults in these three groups who **have had 1 or 2 doses** of polio vaccine in the past should get the

remaining 1 or 2 doses. It doesn't matter how long it has been since the earlier dose(s). Adults in these three groups who **have had 3 or more doses** of polio vaccine (either IPV or OPV) in the past may get a booster dose of IPV.

Polio vaccination is also available for adults as a vaccine called DULTAVAX; it comes in the form of a suspension for injection. DULTAVAX is a combined vaccine indicated for adults, as a booster of a previous vaccination for the simultaneous prevention of diphtheria, tetanus and poliomyelitis. The vaccine may be administered as a booster of a previous vaccination to children aged 6 or older in exceptional cases.

Most of the world's population resides in areas considered free of WPV circulation, including the Western Hemisphere, the Western Pacific region (which encompasses China), and the European region.

Vaccination is recommended for all travelers to polio-endemic or epidemic areas, including countries with recent proven WPV circulation and neighboring countries. As of September 2008, these areas include some but not all countries in Africa, South Asia, Southeast Asia, and the Middle East.

The Eastern Mediterranean Region consist of 22 countries. Nineteen countries have been polio free for more than three years and Somalia has not had any cases since March 2007. The remaining two countries (Afghanistan and Pakistan) are still endemic and have not succeeded in interrupting indigenous circulation of the wild polio virus. Extensive efforts are underway to interrupt the wild virus circulation in these two remaining countries. The Region is always under the risk of importations. Sudan has suffered from these importations more than once, the last of which was in the south with the most recent case on 27 June 2009.

In 1988, the Regional Committee for the Eastern Mediterranean issued resolution EM/RC35/R.14 adopting the goal of poliomyelitis eradication. Since then, the implementation of eradication strategies has reduced the number of countries endemic for polio in the Eastern Mediterranean Region from 22 countries to only two (Afghanistan and Pakistan) since 2005. As well the epidemics that followed virus importation from Nigeria (2004–2007) affecting consecutively Sudan, Yemen and Somalia have come to an end, with the last case reported from Somalia in March 2007. In the two endemic countries the intensity of transmission decreased to historically low levels in 2007 as a result of enhanced eradication efforts.

However, 2008 witnessed an increase in the number of polio cases reported from Pakistan and Afghanistan and the spread of the virus to areas in Pakistan that previously were free from polio, some for several years. During 2008, the Region continued to experience virus importations from infected countries in other regions. Northern Sudan received repeated importations of both types of wild poliovirus from Chad. None of these importations managed to establish circulation and no secondary cases were reported. However, south Sudan experienced an importation from Ethiopia that led to a large epidemic in 2008 that continued into 2009. The virus further spread from south Sudan to the rest of Sudan and into Kenya and Uganda.

TAJIKISTAN POLIOVIRUS OUTBREAK, MAY 2010

The recent outbreak of polio from a polio serotype 1 virus in Tajikistan does probably not change the current risk of polio importation, for the EU/ EEA countries as there is already much travel between the four large polio-endemic countries and the EU/EEA. However, the situation in Tajikistan is a reminder that importation of poliovirus to polio-free regions may happen at any time as long as polio virus is circulating in the world. In many European countries there may be population pockets with lower vaccination coverage, where introduction of poliovirus can lead to reestablishment of virus

TABLE 1. *Poliomyelitis in Eastern Mediterranean Region between 2005 and 2010*

Country	2005	2006	2007	2008	2009	2010	Last date of onset
Pakistan	28	40	32	117	89	24	07/06/2010
Afghanistan	9	31	17	31	38	10	23/05/2010
South Sudan	4			24*	40		27/06/2009
North Sudan	23		1*	2*	5*		15/03/2009
Somalia	185*	35	8				25/03/2007
Yemen	478*	1				36	02/02/2006
Total	727	107	58	174	172		

circulation. Earlier outbreaks, such as in the Netherlands in 1992, have shown that this may happen, even in countries with high general vaccination coverage (11).

As of 10 May 2010, 278 acute flaccid paralysis (AFP) cases have been reported, and 56 cases have been confirmed as wild poliovirus type 1 in Tajikistan. Genetic sequencing has determined that the origin of the poliovirus found in Tajikistan is most closely related to virus originating from Uttar Pradesh, India.

Two cases of poliomyelitis in two days was registered in Russia, soon after the Tajikistan outbreak. In both cases, the virus was imported.

HEPATITIS A

HAV infection may be asymptomatic, or its clinical manifestations may range in severity from a mild illness lasting 1–2 weeks to a severely disabling disease lasting several months.

Clinical manifestations of hepatitis A often include the abrupt onset of fever, malaise, anorexia, nausea, and abdominal discomfort, followed within a few days by jaundice.

The incubation period for hepatitis A averages 28 days (range: 15–50 days).

The likelihood of having symptoms with HAV infection is related to the infected person's age. In children <6 years of age, most (70%) infections are asymptomatic; if illness does occur, its duration is usually less than 2 months.

No chronic or long-term infection is associated with hepatitis A, but 10% of infected persons will have prolonged or relapsing symptoms over a 6- to 9-month period. The overall case-fatality rate among cases reported to CDC is 0.3%; however, the rate is 1.8% among adults >50 years of age.

All susceptible persons traveling to or working in countries that have high or intermediate hepatitis A endemicity should be vaccinated or receive IG before departure. Hepatitis A vaccine at the age-appropriate dose is preferred to IG. The first dose of hepatitis A vaccine should be administered as soon as travel to countries with high or intermediate endemicity is considered.

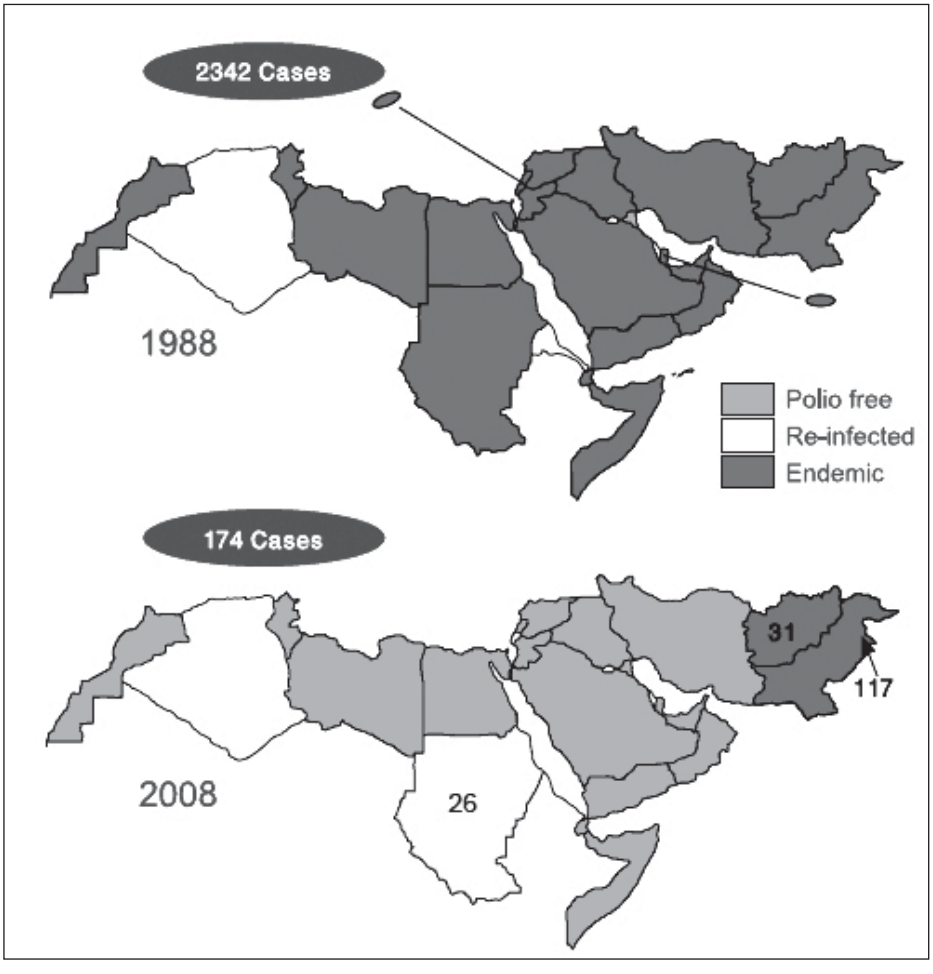

FIGURE 1. *Status of poliomyelitis endemicity in countries of the Eastern Mediterranean Region in 1988 and 2008*

In addition we should propose this vaccination to persons with any of the following indications and any person seeking protection from hepatitis A virus (HAV) infection.

- *Behavioral:* Men who have sex with men and persons who use injection drugs.
- *Occupational:* Persons working with HAV-infected primates or with HAV in a research laboratory setting.
- *Medical:* Persons with chronic liver disease and persons who receive clotting factor concentrates.

Unvaccinated persons who anticipate close personal contact (e.g., household contact or regular babysitting) with an international adoptee from a country of high or intermediate endemicity during the first 60 days after arrival of the adoptee in the United States should consider vaccination. The first dose of the 2-dose hepatitis A vaccine series should be administered as soon as adoption is planned, ideally ≥2 weeks before the arrival of the adoptee.

Single-antigen vaccine formulations should be administered in a 2-dose schedule at 0 and 6--12 months (Havrix). If the combined hepatitis A and hepatitis B vaccine (Twinrix) is used, administer 3 doses at 0, 1, and 6 months; alternatively, a 4-dose schedule, administered on days 0, 7, and 21--30 followed by a booster dose at month 12 may be used.

Although vaccination of an immune traveler is not contraindicated and does not increase the risk for adverse effects, screening for total anti-HAV before travel can be useful in some circumstances to determine susceptibility and eliminate unnecessary vaccination or IG prophylaxis of immune travelers. Such serologic screening for susceptibility might be indicated for adult travelers who are >40 years of age and those born in areas of the world with intermediate or high endemicity who are likely to have had prior HAV infection, if the cost of screening (laboratory and office visit) is less than the cost of vaccination or IG prophylaxis and if testing will not delay vaccination and interfere with timely receipt of vac

HEPATITIS B

Vaccinate persons with any of the following indications and any person seeking protection from hepatitis B virus (HBV) infection.

Behavioral: Sexually active persons who are not in a long-term, mutually monogamous relationship (e.g., persons with more than one sex partner during the previous 6 months); persons seeking evaluation or treatment for a sexually transmitted disease (STD); current or recent injection-drug users; and men who have sex with men.

Occupational: Health-care personnel and public-safety workers who are exposed to blood or other potentially infectious body fluids.

Medical: Persons with end-stage renal disease, including patients receiving hemodialysis; persons with HIV infection; and persons with chronic liver disease.

Other: Household contacts and sex partners of persons with chronic HBV infection; clients and staff members of institutions for persons with developmental disabilities; and international travelers to countries with high or intermediate prevalence of chronic HBV infection (a list of countries is available at http://wwwn.cdc.gov/travel/contentdiseases.aspx).

Hepatitis B vaccination is recommended for all adults in the following settings: STD treatment facilities; HIV testing and treatment facilities; facilities providing drug-abuse treatment and prevention services; health-care settings targeting services to injection-drug users or men who have sex with men; correctional facilities; end-stage renal disease programs and facilities for chronic hemodialysis patients; and institutions and nonresidential day-care facilities for persons with developmental disabilities.

Persons not previously vaccinated should receive (or complete) a 3-dose series of hepatitis B vaccine. The second dose should be administered 1 month after the first dose; the third dose should be administered at least 2 months after the second dose (and at least 4 months after the first dose). If the combined hepatitis A and hepatitis B vaccine (Twinrix) is used, administer 3 doses at 0, 1, and 6 months; alternatively, a 4-dose schedule, administered on days 0, 7, and 21--30 followed by a booster dose at month 12 may be used.

Adult patients receiving hemodialysis or with other immunocompromising conditions should receive 1 dose of 40 μg/mL administered on a 3-dose schedule or 2 doses of 20 μg/mL (Engerix-B) administered simultaneously on a 4-dose schedule at 0, 1, 2, and 6 months.

INFLUENZA

The influenza vaccine should be given for persons aged ≥50 years and any younger persons who would like to decrease their risk for influenza, as well as for persons aged 19 through 49 years with any of the following indications.

- Medical:

- chronic disorders of the cardiovascular or pulmonary systems, including asthma;
- chronic metabolic diseases (including diabetes mellitus);
- renal or hepatic dysfunction,
- hemoglobinopathies, or immunocompromising conditions (including immunocompromising conditions caused by medications or HIV);
- cognitive, neurologic, or neuromuscular disorders;
- pregnancy during the influenza season.

No data exist on the risk for severe or complicated influenza disease among persons with asplenia; however, influenza is a risk factor for secondary bacterial infections that can cause severe disease among persons with asplenia.

- *Occupational:* All health-care personnel, including those employed by long-term care and assisted-living facilities, and caregivers of children aged <5 years.
- *Other:* Residents of nursing homes and other long-term care and assisted-living facilities; persons likely to transmit influenza to persons at high risk (e.g., in-home household contacts and caregivers of children aged <5 years, persons aged ≥50 years, and persons of all ages with high-risk conditions).

PNEUMOCOCCAL INFECTION (PNEUMOCOCCAL POLYSACCHARIDE VACCINATION) (PPSV)

Vaccination is recommended for all persons with the following indications:

- Medical:
  - chronic lung disease (including asthma);
  - chronic cardiovascular diseases;
  - diabetes mellitus;
  - chronic liver diseases, cirrhosis;
  - chronic alcoholism;
  - functional or anatomic asplenia (e.g., sickle cell disease or splenectomy (if elective spletnectomy is planned, vaccinate at least 2 weeks before surgery));
  - immunocompromising conditions (including chronic renal failure or nephrotic syndrome);
  - cochlear implants and cerebrospinal fluid leaks.
  - HIV diagnosis
- *Other:* Residents of nursing homes or long-term care facilities and persons who smoke cigarettes. Routine use of PPSV is not recommended for persons aged <65 years unless they have underlying medical conditions that are PPSV indications. However, public health authorities may consider recommending PPSV for persons aged 50 through 64 years who are living in areas where the risk for invasive pneumococcal disease is increased.

One-time revaccination after 5 years is recommended for persons with chronic renal failure or nephrotic syndrome; functional or anatomic asplenia (e.g., sickle cell disease or splenectomy); and for persons with immunocompromising conditions. For persons aged ≥65 years, one-time revaccination is recommended if they were vaccinated ≥5 years previously and were aged <65 years at the time of primary vaccination.

RUBELLA

Rubella component: 1 dose of MMR vaccine is recommended for women who do not have documentation of rubella vaccination, or who lack laboratory evidence of immunity. For women of childbearing age, regardless of birth year, rubella immunity should be determined, and women should be counseled regarding congenital rubella syndrome. Women who do not have evidence of immunity should receive MMR vaccine upon completion or termination of pregnancy and before discharge from the health-care facility.

For unvaccinated health-care personnel who lack laboratory evidence of measles, mumps, and/or rubella immunity or laboratory confirmation of disease, health-care facilities should consider vaccinating personnel with 2 doses of MMR vaccine at the appropriate interval (for measles and mumps) and 1 dose of MMR vaccine (for rubella), respectively.

All adults without evidence of immunity to varicella should receive 2 doses of single-antigen varicella vaccine if not previously vaccinated or the second dose if they have received only 1 dose, unless they have a medical contraindication. Special consideration should be given to those who 1) have close contact with persons at high risk for severe disease (e.g., health-care personnel and family contacts of persons with immunocompromising conditions) or 2) are at high risk for exposure or transmission (e.g., teachers; child-care employees; residents and staff members of institutional settings, including correctional institutions; college students; military personnel; adolescents and adults living in households with children; nonpregnant women of childbearing age; and international travelers).

VARICELLA

Evidence of immunity to varicella in adults includes any of the following: 1) documentation of 2 doses of varicella vaccine at least 4 weeks apart; 2) history of varicella based on diagnosis or verification of varicella by a health-care provider (for a patient reporting a history of or having an atypical case, a mild case, or both, health-care providers should seek either an epidemiologic link with a typical varicella case or to a laboratory-confirmed case or evidence of laboratory confirmation, if it was performed at the time of acute disease); 3) history of herpes zoster based on diagnosis or verification of herpes zoster by a health-care provider; or 4) laboratory evidence of immunity or laboratory confirmation of disease.

Pregnant women should be assessed for evidence of varicella immunity. Women who do not have evidence of immunity should receive the first dose of varicella vaccine upon completion or termination of pregnancy and before discharge from the health-care facility. The second dose should be administered 4--8 weeks after the first dose.

MENINGOCOCCAL VACCINATION

Neisseria meningitidis is found worldwide. At any time, 5%–10% of the population may be carriers of *N. meningitidis*. Invasive disease is much rarer, occurring at a rate of 0.5–10 cases per 100,000 population in nonepidemic areas and up to 1,000 cases per 100,000 population in epidemic regions.

The incidence of meningococcal disease is highest in the "meningitis belt" of sub-Saharan Africa. The incidence of meningococcal disease is several times higher in the meningitis belt, with periodic epidemics during the dry season (December–June). During nonepidemic periods the rate of meningococcal disease is roughly 5–10 cases per 100,000 population per year. During epidemics the rate can be as high as 1,000 cases per 100,000 population.

Serogroup A predominates in the meningitis belt, although serogroups C, X, and W-135 are also found. Young children have the highest risk for meningococcal disease.

Meningococcal vaccine should be administered to persons with the following indications:

- *Medical:* Adults with anatomic or functional asplenia, or persistent complement component deficiencies.
- *Other:*
  - first-year college students living in dormitories;
  - microbiologists routinely exposed to isolates of *Neisseria meningitidis;*
  - military recruits;
  - persons who travel to or live in countries in which meningococcal disease is hyperendemic or epidemic (e.g., the "meningitis belt" of sub-Saharan Africa during the dry season (December through June)), particularly if their contact with local populations will be prolonged. Vaccination is required by the government of Saudi Arabia for all travelers to Mecca during the annual Hajj.

Meningococcal conjugate vaccine (MCV4) is preferred for adults with any of the preceding indications who are aged ≤55 years; meningococcal polysaccharide vaccine (MPSV4) is preferred for adults aged ≥56 years. Revaccination with MCV4 after 5 years is recommended for adults previously vaccinated with MCV4 or MPSV4 who remain at increased risk for infection (e.g., adults with anatomic or functional asplenia). Persons whose only risk factor is living in on-campus housing are not recommended to receive an additional dose.

IMMUNOCOMPROMISING CONDITIONS

Inactivated vaccines generally are acceptable (e.g., pneumococcal, meningococcal, influenza (inactivated influenza vaccine)) and live vaccines generally are avoided in persons with immune deficiencies or immunocompromising conditions.

HAEMOPHILUS INFLUENZAE TYPE B (HIB) VACCINE

Hib vaccine generally is not recommended for persons aged ≥5 years. No efficacy data are available on which to base a recommendation concerning use of Hib vaccine for older children and adults. However, studies suggest good immunogenicity in patients who have sickle cell disease, leukemia, or HIV infection or who have had a splenectomy. Administering 1 dose of Hib vaccine to these high-risk persons who have not previously received Hib vaccine is not contraindicated.

HUMAN PAPILLOMAVIRUS (HPV) VACCINATION

HPV vaccination is recommended at age 11 or 12 years with catch-up vaccination at ages 13 through 26 years.

Ideally, vaccine should be administered before potential exposure to HPV through sexual activity;

however, females who are sexually active should still be vaccinated consistent with age-based recommendations. Sexually active females who have not been infected with any of the four HPV vaccine types (types 6, 11, 16, 18, all of which HPV4 prevents) or any of the two HPV vaccine types (types 16 and 18, both of which HPV2 prevents) receive the full benefit of the vaccination. Vaccination is less beneficial for females who have already been infected with one or more of the HPV vaccine types. HPV4 or HPV2 can be administered to persons with a history of genital warts, abnormal Papanicolaou test, or positive HPV DNA test, because these conditions are not evidence of prior infection with all vaccine HPV types.

HPV4 may be administered to males aged 9 through 26 years to reduce their likelihood of acquiring genital warts. HPV4 would be most effective when administered before exposure to HPV through sexual contact.

A complete series for either HPV4 or HPV2 consists of 3 doses. The second dose should be administered 1-2 months after the first dose; the third dose should be administered 6 months after the first dose.

VACCINATION OF INTERNATIONAL TRAVELER

Routine Vaccine-Preventable Diseases

- Diphtheria
- Human Papillomavirus (HPV)
- Influenza (Seasonal, Avian, and Pandemic)
- Measles
- Mumps
- Pertussis
- Pneumococcal Disease (*Streptococcus pneumoniae*)
- Poliomyelitis
- Rubella
- Tetanus
- Varicella (Chickenpox)

Travel-Related Vaccine-Preventable Diseases

- Hepatitis A
- Hepatitis B
- Typhoid fever
- Yellow fever
- Japanese encephalitis
- Meningococcal disease
- Rabies
- Tick borne encephalitis

Summarizing the vaccinations according to the age in adults:

Young adults and teenagers

- Vaccinate against rubella and HPV – very important in young women and teenagers
- Check for previous vaccination/infection measles, mumps, rubella and varicella; vaccinate all adults without evidence of immunity
- Check for previous vaccination/infection for hepatitis A and B; vaccinate all adults without evidence of immunity
- On selected cases:
  - Vaccinate against meningococcal infection
  - Vaccinate against influenza
  - Vaccinate against pneumococcal invasive disease (Pneumococcal polysaccharide vaccination) (PPSV)
  - Vaccinate against rabies

Adults

- Booster/vaccination against diphtheria, tetanus, acellular pertussis, and poliomyelitis dT (dTaP) every 10 years
- Vaccinate against pertussis -adults in contact with children under 1 year
- Vaccinate against influenza (if predisposing conditions)
- Vaccinate against hepatitis A and/or B vaccinate (all adults without evidence of immunity)
- On selected cases:
  - Vaccinate against meningococcal infection
  - Vaccinate against *H.influenzae*
  - Vaccinate against pneumococcal invasive disease (Pneumococcal polysaccharide vaccination) (PPSV)
  - Vaccinate against rabies

Elderly

- Vaccinate against influenza
- Vaccinate against pneumococcal invasive disease (Pneumococcal polysaccharide vaccination) (PPSV)
- Booster dT/dTaP or against poliomyelitis, if required (traveller in endemic area)
- Vaccinate against Herpes zoster (age 60yrs and older)

Vaccines contraindicated in pregnant women

- Measles
- Mumps
- Rubella
- Varicella
- Yellow fever
- Oral Poliomyelitis

CONCLUSION

Increased education is needed to help ensure adults understand the importance of vaccination and know which vaccines they should receive.

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