formulation of each season's vaccine. The health records of children for whom immunizations have been missed or postponed should be flagged to remind health care professionals to resume the child's immunization regimen at the next available opportunity. Minimum age and interval recommendations should be followed for administration of all doses. A computer-based tool is available for downloading and can be used to determine which vaccines a child 6 years or younger needs according to the childhood immunization schedule, including timing of missed or skipped vaccines **(www.vacscheduler.org).**

Unknown or Uncertain Immunization Status

Many children, adolescents, and young adults do not have adequate documentation of their immunizations. Parent or guardian recollection of a child's immunization history may not be accurate. Only written, dated records should be accepted as evidence of immunization. In general, when in doubt, a person with unknown or uncertain immunization status should be considered disease susceptible, and recommended immunizations should be initiated without delay on a schedule commensurate with the person's current age. Serologic testing is an alternative to vaccination for certain antigens (eg, measles, rubella, hepatitis A, and tetanus). No evidence suggests that administration of vaccines to already immune recipients is harmful. In general, initiation of revaccination with an age-appropriate schedule of pertussis, diphtheria, and tetanus toxoid-containing vaccine is appropriate, with performance of serologic testing for specific IgG antibody needed only if a severe local reaction occurs.[1]

Vaccine Dose

Reducing or exceeding a recommended dose volume is never recommended. Reducing or dividing doses of DTaP or any other vaccine, including vaccines given to preterm or low birth weight infants, can result in inadequate immune response. A previous immunization with a dose that was less than the standard dose or one administered by a nonstandard route should not be counted as valid, and the person should be reimmunized as recommended for age.

Active Immunization of People Who Recently Received Immune Globulin and Other Blood Products

Live-virus vaccines may have diminished immunogenicity when given within 2 weeks before or up to 11 months following receipt of IG (either standard or hyperimmune globulins following intramuscular, intravenous, or subcutaneous administration). In particular, IG administration inhibits the response to measles vaccine for up to 11 months. Inhibition of immune response to rubella vaccine also has been demonstrated, but the effect on response to mumps or varicella vaccines is not known. The appropriate interval between IG administration and measles immunization varies with the dose of IG and the specific product. Suggested intervals are provided in Table 1.10 but may be shortened if exposure to measles is likely (see Measles, p 535). Because of potential interference with the immune response, varicella, mumps, or rubella vaccine administration should be delayed as recommended for measles vaccine (see Table 1.10). If IG must be given within 14 days

[1]Centers for Disease Control and Prevention. General recommendations on immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep.* 2011;60(RR-02):1-64

Table 1.10. Suggested Intervals Between Immune Globulin Administration and Measles Immunization (MMR or MMRV)

Indications or Product	Route	Dose		Interval, mo[a]
		U or mL	mg IgG/kg	
RSV prophylaxis (palivizumab monoclonal antibody)[b]	IM	...	15 (monoclonal)	None
Tetanus prophylaxis (as TIG)	IM	250 U	10	3
Hepatitis A prophylaxis (as IG)				
Contact prophylaxis	IM	0.02 mL/kg	3.3	3
International travel	IM	0.06 mL/kg	10	3
Hepatitis B prophylaxis (as HBIG)	IM	0.06 mL/kg	10	3
Rabies prophylaxis (as RIG)	IM	20 IU/kg	22	4
Varicella prophylaxis (as VariZIG)	IM	125 U/10 kg (maximum 625 U)	20–40	5
Measles prophylaxis (as IG)				
Standard	IM	0.25 mL/kg	40	5
Immunocompromised host	IM	0.50 mL/kg	80	6
Botulinum Immune Globulin Intravenous (Human [as BabyBIG])	IV	1.5 mL/kg	75	6
Blood transfusion				
Washed RBCs	IV	10 mL/kg	Negligible	0
RBCs, adenine-saline added	IV	10 mL/kg	10	3
Packed RBCs	IV	10 mL/kg	20–60	5
Whole blood	IV	10 mL/kg	80–100	6
Plasma or platelet products	IV	10 mL/kg	160	7
Replacement (or therapy) of immune deficiencies (as IGIV)	IV	...	300–400	8
Therapy for ITP (as IGIV)	IV	...	400	8
Varicella prophylaxis (as IGIV)	IV		400	8
Therapy for ITP (as IGIV)	IV	...	1000	10
Therapy for ITP or Kawasaki disease (as IGIV)	IV	...	1600–2000	11

MMR indicates measles-mumps-rubella; MMRV, measles-mumps-rubella-varicella; RSV, respiratory syncytial virus; IM, intramuscular; TIG, Tetanus Immune Globulin; IG, Immune Globulin; HBIG, Hepatitis B Immune Globulin; RIG, Rabies Immune Globulin; VariZIG, Varicella-Zoster Immune Globulin; IV, intravenous; RBCs, Red Blood Cells; IGIV, Immune Globulin Intravenous; ITP, immune (formerly termed "idiopathic") thrombocytopenic purpura.

[a]These intervals should provide sufficient time for decreases in passive antibodies in all children to allow for an adequate response to measles vaccine. Physicians should not assume that children are protected fully against measles during these intervals. Additional doses of IG or measles vaccine may be indicated after exposure to measles (see text).

[b]RSV monoclonal antibody (palivizumab) does not interfere with the immune response to vaccines.

after administration of measles- or varicella-containing vaccines, these vaccines should be administered again after the interval specified in Table 1.10. One exception to this rule is when serologic testing at an appropriate interval after IG administration documents seroconversion.

Administration of IG preparations does not interfere with antibody responses to yellow fever, oral poliovirus (OPV), or oral rotavirus vaccines and is not expected to affect response to live-attenuated influenza vaccine. Hence, these live vaccines can be administered simultaneously with or at any time before or after administration of IG.

In contrast to the effect on some live-virus vaccines, administration of an IG preparation does not significantly inhibit the immune responses to inactivated vaccines or toxoids. Concurrent administration of recommended doses of Hepatitis B Immune Globulin (HBIG), Tetanus Immune Globulin, or Rabies Immune Globulin (RIG) and standard doses of the corresponding inactivated vaccine or toxoid for postexposure prophylaxis provides immediate protection and long-term immunity and does not impair the efficacy of the vaccine. Vaccines should be administered at a separate anatomic site from that of intramuscularly administered IG. For additional information, see chapters on specific diseases in Section 3.

Respiratory syncytial virus monoclonal antibody (palivizumab) does not interfere with the response to any vaccines.

Testing for *Mycobacterium tuberculosis* Infection

Testing for *Mycobacterium tuberculosis* infection at any age is not a prerequisite for administering live-virus vaccines. A tuberculin skin test (TST) or interferon-gamma release assay (IGRA [see Tuberculosis, p 804]) can be performed at the same visit during which any vaccines are administered, but the testing should not be performed for at least 6 weeks after the administration of measles-containing vaccine (including MMR and MMRV) or smallpox vaccine, because the vaccine temporarily could suppress tuberculin sensitivity for at least 4 to 6 weeks. The effect of live-virus varicella, mumps, rubella, yellow fever, and live-attenuated influenza vaccines on the TST or IGRA result is not known. Infection with wild varicella-zoster virus suppresses TST response, and although the effect of live-virus vaccines on IGRA results has not yet been studied, in theory it could be similar to the effect on the TST. In the absence of data, the same spacing recommendation for TST and IGRA should be applied to these live-virus vaccines as is described for measles, which means waiting at least 6 weeks after administration of vaccine before testing, if the test is not performed at the same time as vaccination (see Tuberculosis portion of Medical Evaluation for Infectious Diseases for Internationally Adopted, Refugee, and Immigrant Children, p 198, and Tuberculosis, p 804). However, if a child is being evaluated for tuberculosis disease, tests for tuberculosis infection should be performed regardless of time after vaccination; a positive test result is valid. Inactivated vaccines, polysaccharide vaccines, and recombinant or subunit vaccines and toxoids do not interfere with clinical interpretation of the TST or IGRA.

Record Keeping and Immunization Information Systems

The National Vaccine Advisory Committee in 1993 recommended a set of standards to improve immunization practices for health care professionals serving children, and revised the standards in 2002. More recently, the ACIP has reviewed and updated these standards