Vaccine Administration

Appropriate vaccine administration is critical to vaccine effectiveness. The recommended site, route and dosage for each vaccine is based on clinical trials, practical experience and theoretical considerations. The following information provides general guidelines for administration of vaccines for those who administer vaccines, as well as those in training, education and supervisory positions. This information should be used in conjunction with professional standards for medication administration, vaccine manufacturers' product guidelines, Centers for Disease Control and Prevention's (CDC) Advisory Committee on Immunization Practices (ACIP) General Recommendations on Immunization, the American Academy of Pediatrics' (AAP) Report of the Committee on Infectious Diseases Red Book and state/agency-related policies and procedures. An education plan that includes competency-based training on vaccine administration should be considered for all persons who administer vaccines to children and/or adults (refer to "Skills Checklist for Pediatric Immunization" – page G13).

Preparation

- **Patient Preparation** - Patients should be prepared for vaccination with consideration for their age and stage of development. Parents/guardians and patients should be encouraged to take an active role before, during and after the administration of vaccines (refer to "Be there for your child during shots" – page G15). Parents/guardians who elect not to directly participate during vaccine administration can wait in a nearby area.

  - **Screening** - All patients should be screened for contraindications and precautions for each scheduled vaccine. Many state immunization programs and other organizations have developed and make available standardized screening tools. Basic screening questions can be found in Chapter 2. Sample screening forms for children and adults are included in Appendix A

  - **Vaccine Safety & Risk Communication** - Parents/guardians and patients are exposed through the media to information about vaccines, some of which is inaccurate or misleading. Health-care providers should be prepared to discuss the benefits and risks of vaccines using Vaccine Information Statements (VIS) and other reliable resources. Establishing an open dialogue provides a safe, trust-building environment in which individuals can freely evaluate information, discuss vaccine concerns and make informed decisions regarding immunization (refer to Chapter 17 and Appendix F).

  - **Atraumatic Care** - Vaccine safety issues and the need for multiple injections have increased the concerns and anxiety associated with immunizations. Health-care providers need to display confidence and establish an environment that promotes a sense of security and trust for the patient and family, utilizing a variety of techniques to minimize the stress and discomfort associated with receiving injections. This is particularly important when administering vaccines to children.

    - **Positioning & Comforting Restraint** - The health-care provider must accommodate for the patient's comfort, safety, age, activity level, and the site of administration when considering patient positioning and restraint. For a child, the parent/guardian should be encouraged to hold the child during administration. If the parent is uncomfortable, another person may assist or the patient may be positioned safely on an examination table (refer to "Comforting Restraint for Immunizations" – page G17).

- **Pain Control** - Pain is a subjective phenomenon influenced by multiple factors, including an individual's age, anxiety level, previous health-care experiences, and culture. Consideration for these factors is important as the provider develops a planned approach to management of injection pain (see page G15).

  ✓ **Topical Anesthetics** or a vapocoolant spray may be prescribed pre-vaccination to decrease pain at the injection site. These products should be used only for the ages recommended and as directed by the product manufacturer.

  ✓ **Analgesic Agents** - A non-aspirin-containing pain reliever may be considered to decrease discomfort and fever following vaccination. These products should be used only in age-appropriate doses (refer to "After the shots. . ." in Appendix A).

  ✓ **Diversionary Techniques** - Age-appropriate non-pharmacologic techniques may provide distraction from pain associated with injections. Diversion can be accomplished through a variety of techniques, some of which are outlined on pages G15-16.

  ✓ **Dual Administrators** - Some providers favor the technique of two individuals simultaneously administering vaccines at separate sites. The premise is that this procedure may decrease anxiety from anticipation of the next injection(s). The effectiveness of this procedure in decreasing pain or stress associated with vaccine injections has not been widely evaluated.

- **Infection Control** - Health-care providers should follow Standard Precautions to minimize the risks of spreading disease during vaccine administration.

  - **Handwashing** - The single, most effective disease prevention activity is good handwashing. Hands should be washed thoroughly with soap and water or cleansed with an alcohol-based waterless antiseptic between patients, before vaccine preparation or any time hands become soiled, e.g. diapering, cleaning excreta, etc.

  - **Gloving** - Gloves are not mandatory for vaccine administration unless there is potential for exposure to blood or body fluids or the provider has open lesions on the hands. It is important to remember that gloves cannot prevent needle stick injuries.

  - **Needle Stick Injuries** should be reported immediately to the site supervisor with appropriate care and follow-up given as directed by state/local guidelines.

  - **Equipment Disposal** - *Used needles should not be detached from syringes, recapped or cut before disposal. All used syringe/needle devices should be placed in puncture proof containers to prevent accidental needle sticks and reuse.* Empty or expired vaccine vials are considered medical waste and should be disposed of according to state regulations.

- **Vaccine Preparation** - Proper vaccine handling and preparation is critical in maintaining the integrity of the vaccine during transfer from the manufacturer's vial to the syringe and ultimately to the patient.

- **Equipment Selection**

  - **Syringe Selection** - A separate needle and syringe should be used for each injection. A parenteral vaccine may be delivered in either a 1 mL. or 3 mL. syringe as long as the prescribed dosage is delivered. Syringe devices and sharps with engineered sharps injury protection (SESIP) are available, recommended by OSHA and required in many states to reduce the incidence of needle stick injuries and potential disease transmission. Personnel should be involved in product evaluation and selection. Prior to use in the clinical area, staff should receive training with the device.

  - **Needle Selection** - Vaccine must reach the desired tissue site for optimal immune response. Therefore, needle selection should be based upon the prescribed route, size of the individual, and viscosity of the vaccine (See Subcutaneous & Intramuscular Injections below). Typically vaccines are not highly viscous, and therefore, a fine gauge needle can be used (22-25 gauge).

  - **Needle-free Injection** - A new generation of needle-free vaccine delivery devices has been developed in an effort to decrease the risks of needle stick injuries to health-care workers and to prevent improper reuse of syringes and needles. For more information on needle-free injection technology consult the CDC website, www.cdc.gov/nip/dev/jetinject.htm.

- **Inspecting Vaccine** - Each vaccine vial should be carefully inspected for damage or contamination prior to use. The expiration date printed on the vial or box should be checked. Vaccine can be used through the last day of the month indicated by the expiration date. Vaccine past its expiration date should never be used.

- **Reconstitution** - Some vaccines are prepared in a lyophilized form that requires reconstitution, which should be done according to manufacturer guidelines. Diluent solutions vary; only the specific diluent supplied for the vaccine should be used. Once the vaccine vial is uncapped, clean the rubber stopper of the vial with an alcohol wipe and allow to dry. Inject the entire content of the diluent vial into the vial of lyophilized vaccine and agitate to ensure thorough mixing. Once reconstituted, the vaccine must be administered within the time guidelines provided by the manufacturer or discarded. Changing the needle after reconstitution of the vaccine is not necessary unless the needle has become contaminated or bent. Continue with steps for filling the syringe.

- **Filling the Syringe** -

  - For vaccines that do not require reconstitution, uncap the vaccine vial, clean the rubber stopper of the vial with an alcohol wipe and allow to dry.

  - If possible, tighten the needle on the syringe.

  - Pull back on the plunger to fill the syringe with an amount of air equal to the amount of vaccine to be withdrawn.

  - Remove the needle guard and place the guard where it will not become contaminated.

  - With the vial upright, insert the needle directly into the center of the rubber stopper.

- Inject the air into the vial, keeping the bevel of the needle above the level of the vaccine to avoid producing air bubbles in the vaccine. The injected air will create positive pressure in the vial and allow removal of the vaccine without creating a vacuum.

- Invert the vial and withdraw the vaccine keeping the bevel of the needle within the solution to avoid drawing air into the syringe. For single dose vials, withdraw the entire vial contents. For multidose vials, withdraw the desired vaccine dose.

- Remove the vial and expel any air bubbles or excess air from the syringe by gently tapping the side of the syringe and advancing the plunger. Do not expel any of the vaccine.

- Recap the needle. Since the needle has not been injected into the patient, recapping at this point is allowable.

- **Prefilling Syringes** - The National Immunization Program strongly discourages filling syringes in advance because of the increased risks for administration errors. Once in the syringe, it is difficult to tell which vaccine is which. Other problems associated with this practice are vaccine wastage, and possible bacterial growth in vaccines that do not contain a preservative. Furthermore, medication administration guidelines state that individuals should draw up and prepare any medications they will administer. An alternative to the practice of prefilling syringes is to use filled syringes supplied by the vaccine manufacturer. Syringes other than those filled by the manufacturer are designed for immediate administration, not for vaccine storage.

  However, if you have a reason to reconstitute more than one dose of vaccine, perhaps for a large influenza clinic, you should only prefill a few syringes at a time, which you can administer while someone else is prefilling a few syringes they will administer. Any syringes left at the end of the clinic day *should be discarded*.

  Under NO CIRCUMSTANCES should MMR or varicella vaccine ever be reconstituted and drawn prior to the immediate need for the vaccines. These live virus vaccines are unstable and begin to deteriorate as soon as they are reconstituted with diluent.

- **Labeling** - Once vaccines are drawn up, filled syringes should be identifiable in terms of the vaccine or antigen(s) in the syringe(s). There are a variety of methods for identifying or labeling syringes (e.g., keep syringes with the appropriate vaccine vials, place the syringes in a labeled partitioned tray, or use color coded labels or preprinted labels). Some providers may choose to include the lot number and date of filling on the identification.

Administration

- **Route** - Administering a vaccine by the recommended route is imperative. Delivering the vaccine into the appropriate tissue promotes optimal vaccine efficacy and diminishes the risk of severe local adverse reactions.

Administering Vaccines: Dose, Route, Site, and Needle Size

Vaccines	Dose	Route	Site	Needle Size
Diphtheria, Tetanus, Pertussis (DTaP, DT, Td)	0.5 mL	IM	**Vastus lateralis:** for infants (& toddlers lacking adequate deltoid mass); **Deltoid:** for toddlers, children & adults	22–25g, 1–2"
***Haemophilus influenzae* type b (Hib)**	0.5 mL	IM	**Vastus lateralis:** for infants (& toddlers lacking adequate deltoid mass); **Deltoid:** for toddlers & children	22–25g, 1–2"
Hepatitis A (HepA)	≤18 yrs.: 0.5 mL ≥19 yrs.: 1.0 mL	IM	**Vastus lateralis:** for infants (& toddlers lacking adequate deltoid mass); **Deltoid:** for toddlers, children & adults	22–25g, 1–2"
Hepatitis B (HepB)	≤19 yrs.: 0.5 mL* ≥20 yrs.: 1.0 mL	IM	**Vastus lateralis:** for infants (& toddlers lacking adequate deltoid mass); **Deltoid:** for toddlers, children & adults	22–25g, 1–2"
Influenza, live attenuated (LAIV)	0.5 mL	Intranasal spray	Administer 0.25 mL dose into each nostril while patient is in an upright position	NA
Influenza, trivalent inactivated (TIV)	6-35 mos: 0.25 mL ≥3 yrs.: 0.5 mL	IM	**Vastus lateralis:** for infants (& toddlers lacking adequate deltoid mass); **Deltoid:** for toddlers, children & adults	22–25g, 1–2"
Measles, mumps, rubella (MMR)	0.5 mL	SC	**Anterolateral fat of thigh:** for young children **Posterolateral fat of upper arm:** for children & adults	23–25g, 5/8"
Meningococcal (Men)	0.5 mL	SC	**Anterolateral fat of thigh:** for young children **Posterolateral fat of upper arm:** for children & adults	23–25g, 5/8"
Pneumococcal conjugate (PCV)	0.5 mL	IM	**Vastus lateralis:** for infants (& toddlers lacking adequate deltoid mass); **Deltoid:** for toddlers & children	22–25g, 1–2"
Pneumococcal polysaccharide (PPV)	0.5 mL	IM	**Deltoid**	22–25g, 1–2"
		SC	**Anterolateral fat of thigh:** for young children **Posterolateral fat of upper arm:** for children & adults	23–25g, 5/8"
Polio, inactivated (IPV)	0.5 mL	IM	**Vastus lateralis:** for infants (& toddlers lacking adequate deltoid mass); **Deltoid:** for toddlers, children & adults	22–25g, 1-2"
		SC	**Anterolateral fat of thigh:** for infants & young children **Posterolateral fat of upper arm:** for children & adults	23–25g, 5/8"
Varicella (Var)	0.5 mL	SC	**Anterolateral fat of thigh:** for young children **Posterolateral fat of upper arm:** for children & adults	23–25g, 5/8"

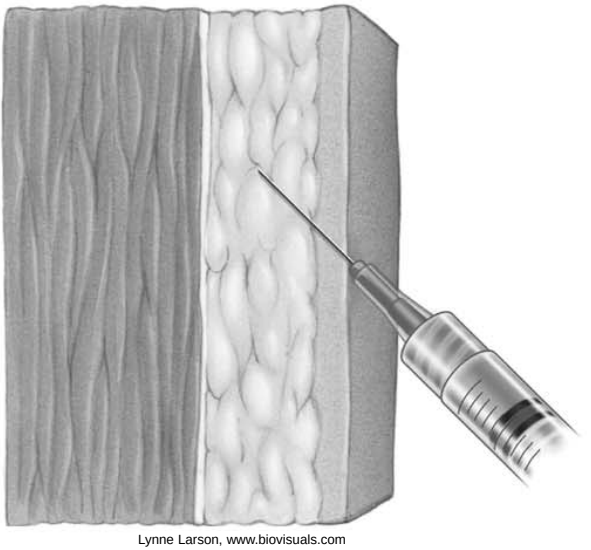
*Persons 11 through 15 years of age may be given Recombivax HB® (Merck) 1.0 mL (adult formulation) on a 2–dose schedule.

Combination Vaccines

DTaP+HepB+IPV (Pediarix™) **DTaP+Hib (Trihibit™)** **Hib+HepB (Comvax™)**	0.5 mL	IM	**Vastus lateralis:** for infants (& toddlers lacking adequate deltoid mass); **Deltoid:** for toddlers & children	22–25g, 1–2"
HepA+HepB (Twinrix®)	≥18 yrs.: 1.0 mL	IM	**Deltoid**	22–25g, 1–2"

Please note: Always refer to the package insert included with each biologic for complete vaccine administration information. The Advisory Committee on Immunization Practices (ACIP) statement for the particular vaccine should be reviewed as well.

- **Subcutaneous** (SC) injections are administered into the fatty tissue found below the dermis and above muscle tissue.



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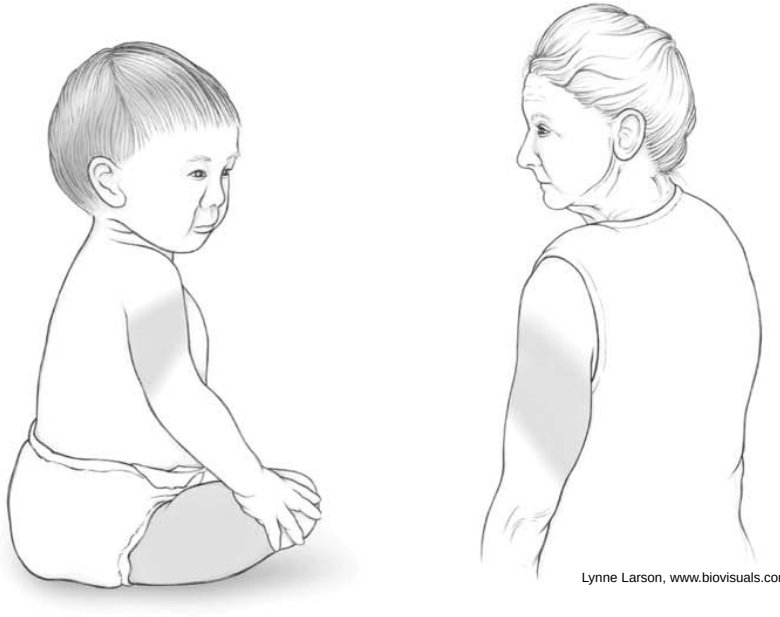
- **Site** - SC tissue can be found all over the body. The usual SC sites for vaccine administration are the thigh and the upper outer triceps of the arm. If necessary, the upper outer triceps area can be used to administer SC injections to infants.



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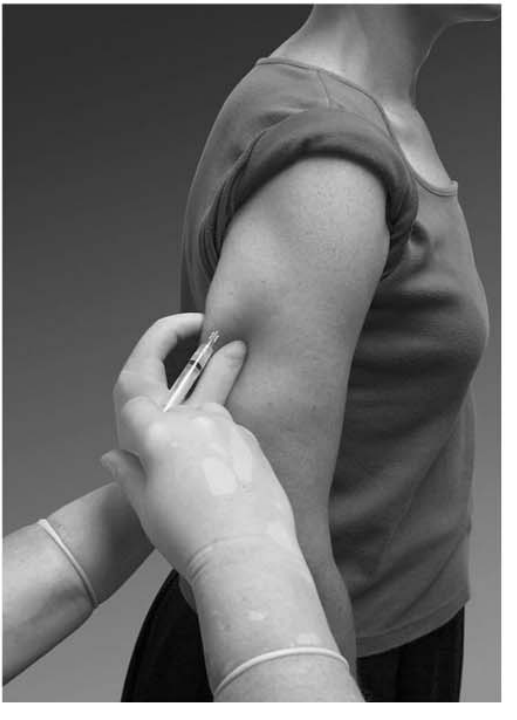
- **Needle Gauge & Length** - 5/8-inch, 23- to 25-gauge needle

- **Technique**

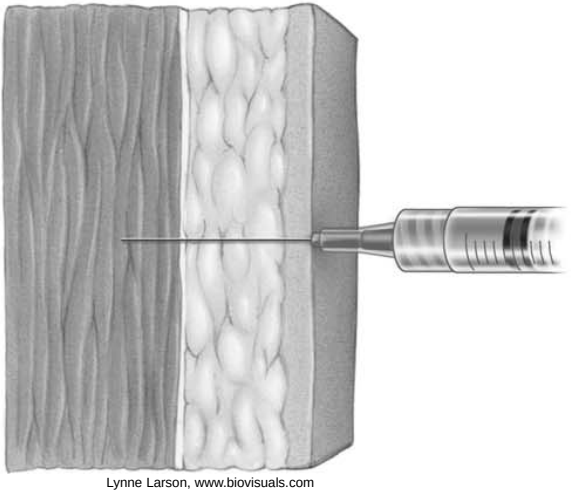
  ✓ Following appropriate site assessment/selection, prep the injection site with an alcohol wipe. Using a circular motion, wipe from the center out and allow to dry.

  ✓ To avoid reaching the muscle, the fatty tissue is pinched up, the needle is inserted at a 45 degree angle and the vaccine is injected into the tissue.

  ✓ Withdraw the needle and apply light pressure to the injection site for several seconds with a dry cotton ball/gauze.



- **Intramuscular** (IM) injections are administered into muscle tissue below the dermis and SC tissue.



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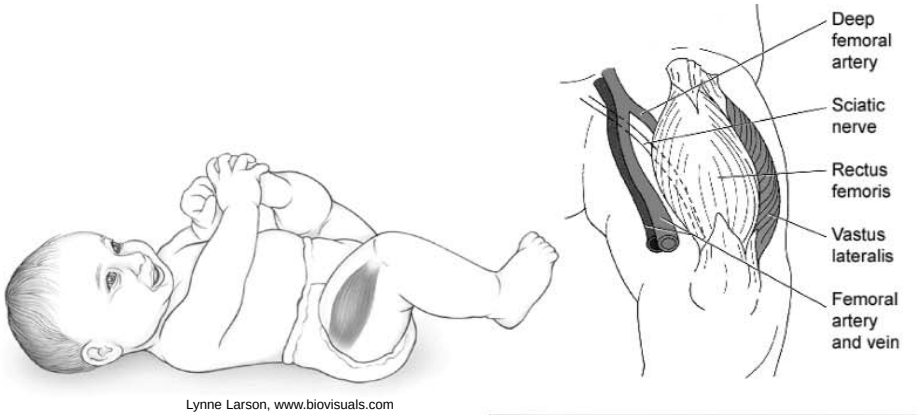
- **Site -** Although there are several IM injection sites on the body, the recommended IM sites for vaccine administration are the vastus lateralis muscle (anterolateral thigh) and the deltoid muscle (upper arm). The site depends on the age of the individual and the degree of muscle development.



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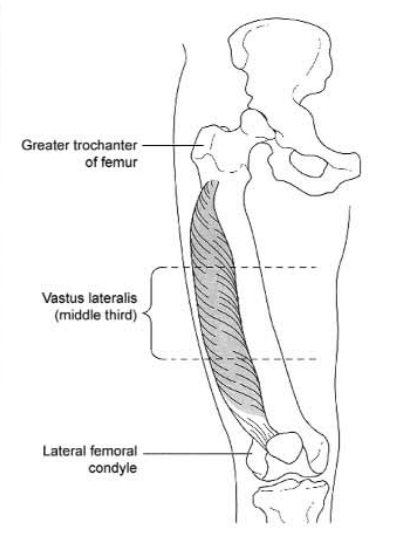
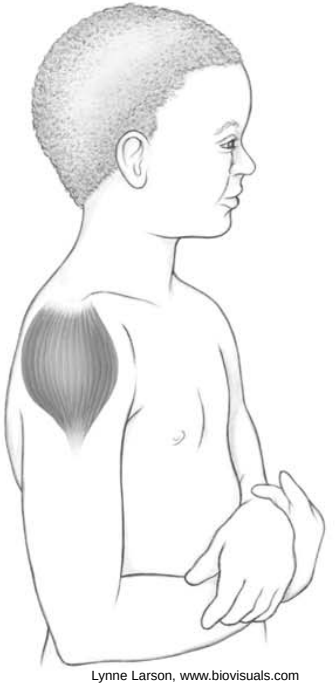
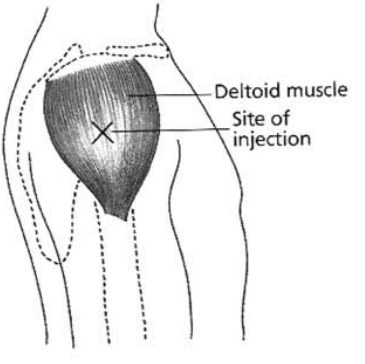
The vastus lateralis muscle of the upper thigh used for intramuscular injections.



The vastus lateralis site of the right thigh, used for an intramuscular injection.

The deltoid muscle site is most commonly used in older children and adults. The deltoid muscle can be used in toddlers if the muscle mass is adequate. The buttock should never be used to administer vaccines.





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- **Needle Gauge** - 22- to 25-gauge needle

  - **Needle Length** - The needle length must be adequate to reach the muscle and is based on the size of the individual. Following are the typical lengths for various ages.

    Infant - 7/8- to 1-inch

    Toddler & older children - 7/8- to 1 1/4-inch

    Adults - 1- to 1 ½-inch

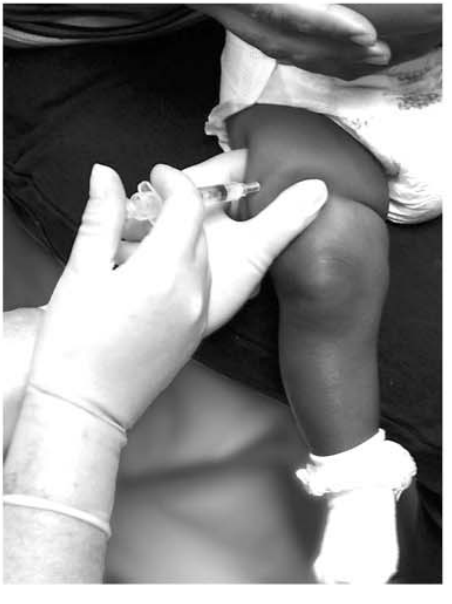
  - **Technique** -

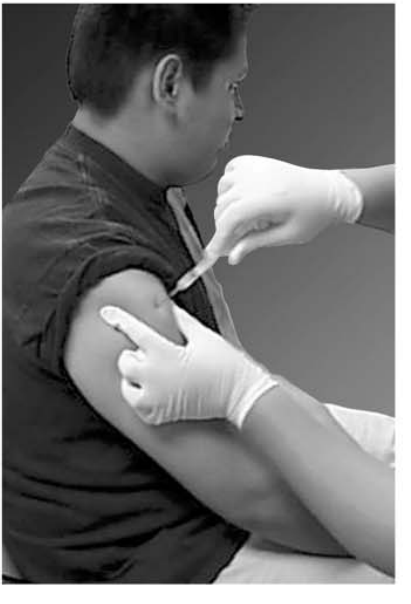
    ✓ Following appropriate site assessment/selection, prep the injection site with an alcohol wipe. Using a circular motion, wipe from the center out and allow to dry.

    ✓ To avoid injection into SC tissue, the skin of the selected vaccine administration site can be spread taut between the thumb and forefinger, isolating the muscle. Another technique, acceptable mostly for pediatric and geriatric patients, is to grasp the tissue and "bunch up" the muscle.

    ✓ Insert the needle fully into the muscle at a 90 degree angle and inject the vaccine into the tissue.

    ✓ Withdraw the needle and apply light pressure to the injection site for several seconds with a dry cotton ball/gauze.





- **Aspiration** - Aspiration is the process of pulling back on the plunger of the syringe prior to injection to ensure that the medication is not injected into a blood vessel. Although this practice is advocated by some experts, there is no research data documented to support the need for this procedure. If blood appears following aspiration, the needle should be withdrawn, a new site selected and the entire administration process restarted.

- **Multiple Vaccinations** - When administering multiple vaccines, NEVER mix vaccines in the same syringe unless approved for mixing by the Food and Drug Administration (FDA). If more than one vaccine must be administered in the same limb, the injection sites should be separated by 1-2 inches so that any local reactions can be differentiated. Vaccine doses range from 0.5 mL. to 1 mL. The recommended maximum volume of medication for an IM site, varies among references and depends on the muscle mass of the individual. However, administering two IM vaccines into the same muscle would not exceed any suggested volume ranges for either the vastus lateralis or the deltoid muscle in any age group. The option to also administer a SC vaccine into the same limb, if necessary, is acceptable since a different tissue site is involved.

- **Nonstandard Administration** - Deviation from the recommended route, site and dosage of vaccine is strongly discouraged and can result in inadequate protection. In situations where nonstandard administration has occurred, refer to the ACIP General Recommendation on Immunization, MMWR 2002; 51 (RR-2), for specific guidance.

Special Situations

- **Bleeding Disorders** - Individuals with a bleeding disorder or who are receiving anticoagulation therapy may develop hematomas in IM injection sites. Prior to administration of IM vaccines the patient or family should be instructed about the risk of hematoma formation from the injection. Additionally, a physician familiar with the patient's bleeding disorder or therapy should be consulted regarding the safety of administration by this route. If the patient periodically receives hemophilia replacement factor or other similar therapy, IM vaccine administration should ideally be scheduled shortly after replacement therapy. A 23-gauge or finer needle should be used and firm pressure applied to the site for at least two minutes. The site should not be rubbed or massaged.

- **Latex Allergy** - Administration of a vaccine supplied in a vial or syringe that contains natural rubber (refer to product information) should not be administered to an individual with a history of a severe (anaphylactic) allergy to latex, unless the benefit of vaccination clearly outweighs the risk of an allergic reaction. These situations are rare. Medical consultation and direction should be sought regarding vaccination. A local or contact sensitivity to latex is not a contraindication to vaccination.

- **Limited Sites** - Sometimes vaccination sites may be limited in an individual because of amputation, injury, orthopedic device or cast, etc. It may be necessary to consult the patient's primary health-care provider to develop an individualized immunization schedule.

- **Syncopal or vasovagal response** ("fainting") may occur during vaccine administration, especially with adolescents and adults. Because individuals may fall and sustain injury as a result, the provider may consider having the patient sit during injection(s). A syncopal or vasovagal response is not an allergic reaction, however, the provider should observe and administer supportive care until the patient is recovered.

- **Anaphylaxis** (a life-threatening acute allergic reaction) - Each facility that administers vaccines should have a protocol, procedures and equipment to provide initial care for suspected anaphylaxis. Facility staff should be prepared to recognize and respond appropriately to this type of emergency situation. All staff should maintain current CPR certification. Emergency protocols, procedures and equipment/supplies should be reviewed periodically. For detailed information on medical management, refer to the ACIP General Recommendations on Immunization and AAP Red Book. Although both fainting and allergic reactions are rare, some experts suggest observing patients for 15-20 minutes following vaccine administration.

Documentation - All vaccine administration should be fully documented in the patient's permanent medical record to include:

1. Date of administration
2. Name or common abbreviation of vaccine
3. Vaccine lot number
4. Vaccine manufacturer
5. Administration site
6. Vaccine Information Statement (VIS) edition date (found either in the lower left or lower right corner of the VIS).
7. Name and address of vaccine administrator (This should be the address where the record is kept. If immunizations are given in a shopping mall, for example, the address would be the clinic where the permanent record will reside).

Facilities that administer vaccines are encouraged to participate in state/local vaccine registries. The patient or parent should be provided with an immunization record that includes the vaccines administered with dates of administration.

The California Department of Health Services' Immunization Branch has developed a complete package of resources on vaccine administration, including a training video, posters and a skills checklist. Ordering information is available on the Immunization Action Coalition (IAC) website, http://www.immunize.org/iztech/index.htm.