<table>
<thead>
<tr>
<th>Program Name:</th>
<th>Immunization Competencies Education Program Module 8 - Administration of Immunizing Agents</th>
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</table>
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| **CCCEP:** | This continuing education lesson is designed primarily for community pharmacists and has been accredited by the Canadian Council on Continuing Education in Pharmacy (CCCEP) for 1 CEUs.  
**CCCEP File Number:** 1066-2010-092-I-P |
| **Course Expiration Date:** | June 15, 2013 |
| **Sponsor:** | This module is developed in collaboration with the Canadian Paediatric Society, the Public Health Agency of Canada and Health Canada. |
Competency: Prepares and administers immunization agents correctly.

Learning Objectives

Upon successful completion of this section the health professional will be able to perform the following:

1. Prepare a checklist for pre-immunization patient assessment, including precautions, contraindications, and indications for rescheduling.
2. Ensure the seven “Rights” of immunization: right drug, right client, right dose, right time, right route, right reason, and right documentation.
3. Demonstrate the steps involved in vaccine preparation, including reconstitution, if appropriate, administration, and disposal.
4. Name the resources that are used to guide the immunization administration process and decision making.
5. Develop a table listing the vaccine, age, dose, route, site, contraindications/precautions, and side effects for each vaccine used in the practice setting.
6. Demonstrate the age-appropriate injection sites and proper client positioning used for immunization.
7. Choose the correct needle length and gauge for the age and size of the client.
8. Describe actions taken to increase safety in immunization clinics related to the provider, the recipient, and the environment.
9. Demonstrate the appropriate technique for immunization.
10. Describe techniques to reduce the pain associated with immunization.

Test your Current Knowledge:
Based on your current knowledge, determine if the following statements are true or false.

1. Pre-immunization counselling serves to inform the patient of the procedure and ensures consent.
   a. True
   b. False
2. There are very few contraindications to vaccines.
   a. True
   b. False
3. Blood transfusions is a potential reason for deferral of immunizing with certain vaccines
   a. True
   b. False
4. If the patient has a severe gastrointestinal reaction to eggs, they should not be given the influenza vaccine
Immunizing your Patients

Appropriate vaccine administration is a key element to ensuring the optimal safety and efficacy of vaccines. Immunizing a patient is not as simple as drawing up a product and injecting it into the patient’s arm. Proper immunization involves the steps of pre-immunization counselling, vaccine preparation, vaccine injection and followed with a post-immunization procedure.

Pre-Immunization Counselling

Prior to immunization the immunizer should ensure the patient is informed of the procedure and provides consent. A systematic approach is exceptionally valuable to immunization counselling. This approach ensures the clinician is providing the key information to the patient in a way that they can become informed of the immunization procedures.

1. Eligibility for immunization

Each encounter with a healthcare provider is an opportunity to review immunization status and if indicated administer needed vaccines. Practitioners cannot miss an opportunity to protect the patient and the population against a vaccine-preventable disease.
The Rights of Your Patients:

When administering any biological product, consider the 7 “Rights” of Immunization:

1. Right product
2. Right client
3. Right dose
4. Right time
5. Right route
6. Right reason
7. Right documentation

2. Counsel the patient regarding the fact that immunization is not mandatory

Vaccination in Canada is a voluntary procedure. As patients have a right to refuse immunization, immunizers have a responsibility to provide patients with the information necessary to allow them to make the informed choice to immunize. Possible statements to utilize could include:

- “I believe in the importance of immunizing all of my patients. Vaccines are effective and safe.”
- “Based on our immunization schedule, your son is due for his first shot this week, would you like for us to administer it today?”
- “Mrs. Smith I see that your daughter is due for her next immunization shot, would you like us to take care of that today?”

3. Discuss the benefits of immunization

Immunizers are in a position of trust and are readily able to provide patients with an evidence-based discussion on the benefits of immunization. This could include scientific data or personal stories on the benefit of immunization. Possible statements to utilize could include:

- “Mrs. Thomas, your son is due for his chicken pox vaccine today. Although we all had this infection when we were kids this vaccine prevents your son from developing it. Many people are not worried about chicken pox, but the main reasons we immunize is because of related complications such as pneumonia, brain inflammation, scarring and even the flesh-eating disease.”
- “Mr. Singh your daughter is due for her second dose of the “1 in 5” vaccine. This immunization is crucial as it will protect her against 5 diseases at the time when she is most vulnerable and with booster will protect her into adulthood.”

4. Discuss the risk of not getting vaccinated

Immunizers need to be proficient in their knowledge of each of the vaccine-preventable disease, so they can provide appropriate information on the disease if asked. Possible statements to utilize could include:
• “Mr. Chen your daughter today is going to be immunized against Haemophilus influenza type B or Hib. This bacteria was the major cause of meningitis in young children your daughter’s age until the vaccine was available to provide protection. We encourage the vaccine as Hib is still in the community and this vaccine is highly effective.”
• “Mr. Jones your son is being immunized against a bacteria called Strep. Pneumonia. This bacteria used to be a major cause of pneumonia, ear infections, blood infections and even meningitis. I recommend that you give your son the vaccine to protect him from these major problems.”

5. Assess for true contraindications to immunization

There are very few contraindications to vaccines. Many clinicians and patients will forgo immunization due to mild illness. This is unfortunate as this is a missed opportunity to protect the patient and the population from a vaccine-preventable disease. Below are some screening questions you can ask your patients to determine if they have any contraindications to immunizations. Table 1 provides a quick overview of conditions that are contraindications to immunization. Table 2 provides conditions where immunization is not contraindicated.

1. Is the child (or are you) sick today?
   - There is no evidence that acute illness reduces vaccine efficacy or increases vaccine adverse events.
   - Mild illnesses (such as otitis media, upper respiratory infections, and diarrhea) are NOT contraindications to vaccination.
   - Do not withhold vaccination if a person is taking antibiotics.

2. Does the child have allergies to medications, food or any vaccine?
   - A history of anaphylactic reaction such as hives (urticaria), wheezing or difficulty breathing, or circulatory collapse or shock (not fainting) from a previous dose of vaccine or vaccine component is a contraindication for further doses, until further assessed by an allergist.
   - It may be more beneficial for clinicians to ask for allergies to specific components of the vaccine. For example checking for an egg allergy prior to immunizing with the influenza vaccine. This would warrant an assessment by an allergist if the egg allergy was severe.

3. Has the child had a serious reaction to a vaccine in the past?
   - A local reaction (redness or swelling at the site of injection) is NOT a contraindication to subsequent doses.

4. For live virus vaccines - Does your child have any problems with his or her immune system or have they taken prednisone or cancer drugs in the last 3 months?
   - Live-virus vaccines are usually contraindicated in immunocompromised patients.
   - Live-virus vaccines should be postponed until after chemotherapy or long-term, high-dose steroid therapy has ended.

5. For live virus vaccines - Has the child received a transfusion of blood or blood products in the past year?
Certain live virus vaccines may need to be deferred, depending on the type of blood product and the interval since the blood product was administered.3

<table>
<thead>
<tr>
<th>Issue of concern</th>
<th>Inactivated/subunit</th>
<th>Live</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allergy to vaccine component</td>
<td>Contraindication if the specific vaccine contains that particular component</td>
<td></td>
</tr>
<tr>
<td>Severely immunocompromised</td>
<td>Precaution</td>
<td>Contraindication</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>None</td>
<td>Contraindication</td>
</tr>
<tr>
<td>Recent administration of blood product containing antibodies</td>
<td>None</td>
<td>Precaution</td>
</tr>
<tr>
<td>Recent administration of live virus vaccine</td>
<td>None</td>
<td>Precaution</td>
</tr>
<tr>
<td>Severe bleeding disorder</td>
<td>Precaution</td>
<td>Precaution</td>
</tr>
</tbody>
</table>

### Table 2 – Conditions that are not Contraindications to Immunization

- **Premature birth**
  - Premature infants
    - Respond adequately to vaccines used in infancy.
    - Are not at significantly increased risk of adverse events.
  - Immunize on schedule, according to child’s chronological age.
  - **EXCEPTION:** Hepatitis B vaccine for infants weighing < 2000 g

- **Breast-feeding**
  - After immunization of either a mother or her infant, during breast-feeding there is:
    - No reduction in maternal or infant response to vaccines.
    - No increase in the risk of adverse events for either mother or breast-feeding infant, following immunization of either.

- **Pregnancy (inactivated vaccines)**
  - All inactivated vaccines are safe in pregnancy and should be administered if indicated.

- **Neurologic disorder**
  - No evidence of increased risk of any adverse event following immunization.
  - Such persons may be at increased risk of
<table>
<thead>
<tr>
<th>Complications from vaccine-preventable diseases such as influenza and should be immunized appropriately.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cancer (inactivated vaccines)</strong></td>
</tr>
<tr>
<td>• No increased incidence of adverse reactions to inactivated vaccines.</td>
</tr>
<tr>
<td>• No interference between treatment of cancer and inactivated vaccine.</td>
</tr>
<tr>
<td>• The immune response may be less than that of healthy adults and children, but any protection following immunization is important because of the increased risk of infection and associated complications.</td>
</tr>
<tr>
<td><strong>Minor acute illness (with or without fever of ≥ 39.5°C)</strong></td>
</tr>
<tr>
<td>• No interference with response to vaccine.</td>
</tr>
<tr>
<td>• No increase in risk of adverse event(s) following immunization.</td>
</tr>
<tr>
<td><strong>Antibiotic therapy</strong></td>
</tr>
<tr>
<td>• No effect on response to most inactivated or live vaccines used in Canada.</td>
</tr>
<tr>
<td><strong>Pregnant or immunosuppressed individuals living in household with vaccinee</strong></td>
</tr>
<tr>
<td>• No risk from any vaccine marketed in Canada to household contacts of vaccinees.</td>
</tr>
<tr>
<td>• Immunization of household contacts of immunosuppressed patients and neonates provides important protection against transmission of disease in the household. Vaccination opportunities in such persons should not be missed.</td>
</tr>
<tr>
<td><strong>Gastrointestinal intolerance to eggs</strong></td>
</tr>
<tr>
<td>• The inability to eat eggs for reasons other than allergy is not associated with an increase of adverse events to any vaccine.</td>
</tr>
<tr>
<td><strong>History of allergy that does not involve vaccine or component of vaccine</strong></td>
</tr>
<tr>
<td>• It is safe to immunize people with any of the following:</td>
</tr>
<tr>
<td>o non-specific allergies.</td>
</tr>
<tr>
<td>o environmental allergies.</td>
</tr>
<tr>
<td>o family histories of allergies.</td>
</tr>
<tr>
<td>o administration of allergy shots (desensitization therapy for allergy).</td>
</tr>
<tr>
<td>o allergies to commonly used antibiotics (exception is neomycin and/or polymyxin B).</td>
</tr>
<tr>
<td><strong>Concern regarding past adverse reaction</strong></td>
</tr>
<tr>
<td>• History of large local reaction following immunization.</td>
</tr>
</tbody>
</table>
| • A large local reaction to one vaccine is not associated with an increased risk of local
reactions to other vaccines.

- In other circumstances, repeating a dose of a vaccine that previously gave a large local reaction may result in another large local reaction. However, there is no increased risk of systemic adverse events.

<table>
<thead>
<tr>
<th>Febrile seizures</th>
<th>Childhood vaccines prevent serious diseases that pose a much greater risk to most children's health than seizures that might be associated with a febrile reaction after vaccination.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Family history of adverse reactions to vaccines</th>
<th>Adverse reactions to vaccines are not known to be inherited.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>EXCEPTION:</strong> a family history of an overwhelming infection or fatality after administration of a live vaccine may suggest inheritable severe immunodeficiency, which should be ruled out before administering live vaccines.</td>
</tr>
</tbody>
</table>

6. Discuss common adverse effects and any serious effects

Patients should be informed of common adverse effects. Most immunizers will discuss the common adverse effects such as local site reactions and mild fever. Adverse effects fall into three main categories. These include:

- **Local:**
  - The least severe and most frequent.
  - Pain, swelling, and redness at the site of injection.
  - May occur with up to 80% of vaccine doses, depending on the type of vaccine.
  - Most common with inactivated vaccines, particularly those containing an adjuvant.
  - Generally occur within a few hours of the injection and are usually mild and self-limited.

- **Systemic:**
  - More generalized reactions and can include fever, malaise, myalgias (muscle pain), headache, loss of appetite.
  - These symptoms are common and nonspecific; they may occur in vaccinated persons because of the vaccine or may be caused by something unrelated to the vaccine, like a concurrent viral infection, stress, or excessive alcohol consumption.
  - Live attenuated vaccines can cause symptoms such as fever or a rash. These represent symptoms produced from viral replication and are similar to a mild form of the natural disease. Systemic adverse reactions following live vaccines are usually mild, and occur 7–21 days after the vaccine was given.
• Anaphylaxis\textsuperscript{3}
  o A very rare severe allergic reaction.
  o May be caused by the vaccine antigen itself or some other component of the vaccine, such as cell culture material, stabilizer, preservative, or antibiotic used to inhibit bacterial growth.
  o Occur in approximately 2 cases for every million doses of vaccines given.
  o The risk of an allergic reaction can be minimized by good screening prior to vaccination.
  o All providers who administer vaccines must have an emergency protocol and supplies to treat anaphylaxis.

7. Confirm understanding of the information and provide an opportunity for questions

Immunizers should assess the level of understanding by watching for non-verbal cues, assessing questions asked and clarifying reasons for silence or refusal to engage in discussion.\textsuperscript{2}

Many patient issues with immunization can be addressed by providing the patient the opportunity to ask questions and answering them appropriately.

8. Confirm Consent

The last step is to confirm the consent of immunization. Possible statements to use include:
- “Do you have any more questions before I prepare the immunizations?”
- “If there are no further questions, we are ready to proceed?”
- “Based on the information we discussed, can I give the immunization?”

Vaccine Preparation

Once it has been determined the patient requires the vaccine and has consented to immunization it becomes time to prepare for immunization. This involves several steps.

Step 1: Vaccine Inspection

Immunizers should at this point take the appropriate vaccine from the vaccine storage unit and follow the inspection checklist:
- a. Check the name of the vaccine to ensure it matches the type required by the patient.
- b. Check the expiration date. Even if the product has expired one day earlier, it is inappropriate to inject to a patient.\textsuperscript{1}
- c. Check the appearance of the vial for any irregularities (e.g. particulate matter, damage to the vial).
- d. If using a previously opened multi-dose vials check the date the vial was first punctured (as this should be recorded on the label). Multi-dose vials should be used within 30 days of opening unless the manufacturer specifies a shorter period.\textsuperscript{1}
- e. Mix the vaccine with a careful swirling motion until a uniform suspension is achieved.

Step 2: Adding the Diluent
Many of the commonly used vaccines are sent as lyophilized (freeze dried) powders. When a vaccine requires reconstitution, these powders must be mixed with a liquid called the diluent immediately prior to immunization.\textsuperscript{4} Diluents vary in their volume. The volume of the diluent depends if the product is a single use or multiuse vial.\textsuperscript{4} Diluents also vary in their ingredients.\textsuperscript{4} Some contain only sterile water for injection, but other contain a variety of ingredients that help to dissolve the powder into a liquid, stabilize the vaccine and/or maintain sterility of the vaccine.\textsuperscript{4} Table 3 lists the instructions for reconstituting with a diluent.

Once a vaccine is reconstituted their shelf life is limited and they must be stored under appropriate temperature and light conditions.\textsuperscript{4} The life of each reconstituted vaccine varies from product to product. Consult the product package insert (product monograph) for the most up-to-date information about expiration dates and times following reconstitution.\textsuperscript{4}

Clinical Tip:

Diluents are specifically designed for a particular vaccine to allow for optimal immune response.

Vaccine diluents are NOT interchangeable (unless specified from the manufacturer).

Table 3 – Instructions for Reconstitution Lyophilized Vaccines with Diluent\textsuperscript{4}

Refer to the package insert for instructions on a specific vaccine.

In general follow the following steps:

1. Reconstitute vaccine immediately prior to use.
2. Do not allow vaccines to sit out and warm up during the reconstitution process. Limit the time live virus vaccines are exposed to light.
3. Check the diluent label to be sure that the vial contains:
   - The correct diluent provided by the manufacturer for that specific vaccine.
   - The correct volume of diluent for reconstitution so that the proper number of doses per vaccine vial is obtained.
4. Check the labels on both the diluent vial and the lyophilized (freeze-dried) vaccine vial to make sure they have not expired. Do not administer expired vaccine. Do not use expired diluent.
5. Remove the protective caps from the diluent and lyophilized vaccine vials and wipe the stoppers with an alcohol swab.
6. Select a disposable syringe and a needle of the proper length for the vaccine and route of administration. (discussed further under vaccine administration).
   - For single-dose reconstituted vials, the needle used for drawing up the diluent is the same needle you will use for vaccine administration. There is no need to change the needle. Only change the needle if it has been damaged or...
contaminated during the reconstitution and drawing up process.

- For multidose reconstituted vials, use one needle and syringe to reconstitute the vaccine. Use a separate needle and syringe for each dose of reconstituted vaccine administered.

7. Insert the needle into the diluent vial and withdraw the entire contents.
8. Inject all the diluent into the lyophilized vaccine vial and agitate or rotate the vial to ensure thorough mixing (follow the specific instruction given in the vaccine package inserts).
9. Observe the reconstituted vaccine for color and appearance and verify that the appearance matches the description in the package insert. If the lyophilized vaccine cannot be resuspended or if the reconstituted vaccine does not look as it should (e.g., discoloration, extraneous particulate matter), mark the vial as “DO NOT USE” and return it to proper storage conditions. Contact the local public health units to provide further guidance. Get another diluent vial and another lyophilized vaccine vial and begin the reconstitution process again.
10. For multidose vials, record the date and time of reconstitution on the vaccine vial. For single-dose vials, record the date and time of reconstitution on the vaccine vial if it is not administered immediately after reconstitution.
11. For single-dose vials, withdraw the entire contents of the reconstituted vaccine into the syringe. For multidose vials, withdraw the appropriate volume of vaccine into the syringe. Recheck the vial contents and the expiration date.

**Step 3: Drawing up Biological Products in Vial Presentation**

Proper procedure must be followed when drawing up vaccines in a vial to ensure aseptic technique is met. The following is a checklist for drawing up a biological product from a vial:

1. Wash hands or cleanse with a sanitizer.
2. Remove the plastic cap covering the vial.
3. Cleanse the surface of the rubber stopper using a cotton pad/swab moistened with 70% isopropyl alcohol. Allow to air dry.
4. Gently swirl the vial immediately before removing each dose to ensure that the contents are fully dispersed.
5. For a product in a “ready to go” liquid presentation, draw into the syringe a volume of air equal to the quantity of biological product to be removed.
6. For lyophilized or freeze-dried products having to be reconstituted, the diluent acts as the air in the syringe so there is no need to draw air into the diluent syringe.
7. Hold/place the vial right side up and insert the needle through the centre of the rubber stopper.
8. Slowly inject the air or diluent from the syringe.
9. If the biological product was reconstituted, gently swirl the vial to ensure the contents are fully dispersed.
10. Hold the vial upside down and withdraw the required quantity of biological product into the syringe.
11. Remove the needle from the vial and expel the air bubble(s).
12. It is not necessary to change needles between drawing up the biological product into the syringe and immunizing the client. Change the needle only if it is damaged, or becomes contaminated.
13. If it is the first entry into a multi-dose vial, record the date (include day, month and year) on the label of the vial.
14. Immediately return multi-dose vials to the refrigerator/biological cooler. Ensure that the date opened and the expiry date are clearly marked on the vial.

Step 4: Drawing up Biological Products in Ampoule Presentation

The use of an ampoule requires a slightly different approach than drawing up from a vial. Several steps for drawing from an ampoule include:
1. Gently swirl the ampoule immediately before removing the contents to ensure that the contents are fully dispersed.
2. Tap the ampoule lightly to ensure that the contents are in the lower part of the ampoule.
3. Using a swab moistened with isopropyl alcohol, wipe the neck area of the ampoule prior to opening to prevent bacterial contamination of ampoule contents.
4. Break the neck of the ampoule using the alcohol swab, a clean cotton ball /gauze. If you cut yourself in breaking the ampoule, discard the ampoule, since the product may be contaminated. Wash your hands and cover the cut before continuing.
5. Withdraw the contents of the ampoule using a sterile syringe and 25-gauge needle. It is not necessary to change needles between drawing up the biological product into the syringe and administering it to the client.
6. Discard the ampoule into a hard sided, labelled sharps container.
7. Expel the air bubble(s) from the syringe.
8. Filter needles are not indicated for the routine administration of biological products from ampoules.

Step 5: Preloading Vaccines

A vaccine should ideally be withdrawn from the vial by the vaccine provider administering the vaccine. Pre-loading syringes with vaccine is discouraged because of:
- The uncertainty of vaccine stability in syringes.
- Risk of contamination.
- Increased potential for vaccine administration errors.
- Increased risk of vaccine wastage.

Injecting the Vaccine

Like preparing the vaccine there are several steps to ensuring the vaccine is administered appropriately.

Step 1: Selecting the Right Syringe and Needles

A separate, sterile syringe should be used for each injection, and different vaccines should not be mixed in the same syringe unless specified by the manufacturer as part of the reconstitution and administration procedure. Depending on the dosage, a 3 mL or 1 mL syringe should be selected.
The Canadian Immunization Guide provides some recommendations on the needle size to select when administering vaccines. The needle size and gauge is based on the route of administration, individual’s age, size of the muscle mass and the viscosity of the vaccine. The needle should be inserted as far as possible into the muscle. The Guide’s recommendations are as followed:

- **For subcutaneous (SC) injections**, a 25 gauge, 1.6 cm (5/8”) needle is recommended.
- **For intramuscular (IM) injections**, a 22-25 gauge needle that is long enough to reach muscle is recommended:
  - 2.2 cm (7/8”) to 2.5 cm (1”) for infants, toddlers and older children.
  - 2.5 cm (1”) to 3.8 cm (1½”) for adolescents and adults.

* A lower gauge needle (e.g., 22 gauge) may be required when administering viscous or larger volume products such as immune globulin.

### Selecting the Site for Administration

The Canadian Immunization Guide has recommendations for immunization sites based on the age and the type of vaccine. Table 4 has some tips provided by the BC Centre of Disease Control for administering SC and IM injections. Table 5 (at the end of this module) has specific recommendations for the individual vaccines on the Canadian market. There recommendations are as follows:

Vaccines and other biologic products are injected via SC or IM routes.

- **SC injections**: SC injections are usually given at a 45° angle into subcutaneous tissue of the upper triceps area of the arm.
- **IM injections**:
  - IM injections are administered at a 90° angle into:
    - The vastus lateralis muscle (anterolateral thigh) in infants < 1 year of age.
    - Have the parent/caregiver hold the infant in a "cuddle" or semi-recumbent position on their lap.
    - The deltoid muscle of anyone ≥ 1 year of age (unless the muscle mass is not adequate). This site is used for IM injections only.
    - Have the child sit sideways on the lap of the parent/caregiver. The injection arm should be held close to the infant's body while the other arm is tucked behind the parent's/caregiver's back.
    - Have the older client sit with their elbow bent and their forearm resting on the arm of a chair and internally rotated.
    - Appropriate site selection is important to avoid inadvertent injection into a blood vessel or injury to a nerve.

### Table 4 – Proper Subcutaneous and Intramuscular Injection Procedure

<table>
<thead>
<tr>
<th>Subcutaneous (SC) Injections</th>
<th>Important Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use correct length and size of needle.</td>
<td>Pinching skin elevates SC tissue and</td>
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</tbody>
</table>

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**Intramuscular (IM) Injections**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Important Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grasp a skin fold of fatty tissue at site with thumb and forefinger. Measure skin fold from top to bottom; be sure needle is approximately one half this length. Clean the site with a cotton pad/swab/ball moistened with 70% isopropyl alcohol.</td>
<td>ensures that needle will be injected into SC tissue. Allow the skin to air dry prior to injection to avoid a burning sensation on insertion of the needle.</td>
</tr>
<tr>
<td>Insert the needle quickly and firmly, with the bevel facing upwards, at a constant angle of 45°. For an obese client, use a longer needle and inject at a 90° angle to reach SC tissue.</td>
<td>Quick, firm insertion minimizes discomfort.</td>
</tr>
<tr>
<td>Release the skin.</td>
<td>Injecting into compressed tissue irritates nerve fibres.</td>
</tr>
<tr>
<td>Rapidly inject the biological product.</td>
<td>Rapid injection reduces pain.</td>
</tr>
<tr>
<td>Remove the needle in one swift motion, immediately applying pressure to the injection site with a dry cotton pad/swab/ball. Do not massage the injection site.</td>
<td>Minimizes discomfort during needle withdrawal. Alcohol on a cotton pad/swab can irritate non-intact skin. Massage can damage underlying tissue.</td>
</tr>
</tbody>
</table>

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• Continue to apply pressure for 30 seconds.
• Do not massage injection site.

Step 2: Multiple Injections

There are no contraindications to giving multiple vaccines at the same clinic visit, and all opportunities to immunize should be utilized. Giving multiple injections at one visit helps to ensure that children are up to date with the vaccines required for their age. The Canadian Immunization Guide provides some tips for the administration of multiple injections:

- Vaccines prepared in separate syringes should be labelled in order to identify which vaccine each syringe contains. The site of administration of each vaccine should be recorded.
- Separate limbs should be used if two IM injections are required. If more than two injections are required, two injections may be administered into the same muscle separated by at least 2.5 cm (1").
- Vaccines that are known to cause more stinging and/or pain should be given last.

Step 3: Techniques to help with the immunization

The British Columbia Centre of Disease Control (BC CDC) and the Canadian Immunization Guide have some practical tips to make the process of immunization as successful as possible.

Communicating the Immunization Process to the Child

The BC CDC has some tips when talking to the child and parent during an immunization appointment. These include:

- Ask about the child’s previous experiences with needles. Individual responses to stress are influenced by temperament, environment and past experience.
- Acknowledge the child’s feelings. Give permission to cry.
- Do not give false reassurance (i.e., “it won’t hurt”). Honest reassurance is “it may hurt a bit, but I think you can handle it.”
- Do not tolerate threats, shaming, or manipulation from the child’s parent/guardian or caregiver. When a parent threatens a child, the most helpful response is to offer empathy to the parent, state a neutral fact or principle and offer hope (e.g., “This must be frustrating for you. Immunizations are never emergencies. I think we can work out something we can all live with”).
- Discourage the use of bribes, and encourage effort – no matter how small.
- Remain firm as you manage the process. At the same time, show respect for the child.

Prepping the Child for the immunization

The BC CDC has some tips on prepping the child for the vaccine administration. These steps include:

- If a parent presents with more than one child, immunize the most anxious one first (usually the eldest), even if the parent thinks otherwise. The needle is the focus of the
child’s fear and watching while someone else is immunized may increase fear and anxiety.

• Provide privacy and prepare the immunization ahead, if possible, always out of sight of the child. If the child asks to see the needle, explain you will show it after the procedure.

• Describe what you plan to do, thereby displaying respect for a child’s right to know, confidence in their ability to manage, and interest in addressing concerns. The child may wonder how long the needle will be in their arm or how quickly it will go in. Threatened loss of control is a factor in needle fear.

• Consider the use of practice dolls with children under 6. Offer to immunize a stuffed toy or doll, and invite the child to hold the “patient”. Use a syringe without a needle and go through all the steps, explaining each one as you proceed.

• Provide limited, realistic choices and let the child decide (e.g., “Would you like to use your right or left arm?” “Would you prefer to sit or stand?”). Offering realistic choices creates a setting where the child can maintain some personal control and contributes to an atmosphere of mutual respect. Supportive, secure positioning can be achieved with a child (depending upon age) either standing or sitting.

The parent or guardian should hold a child with specific instructions on restraint positioning. Failed restraint can result in inaccurate dose, inappropriate depth of injection or injury to the individual being immunized and/or vaccine provider.¹

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Practical tip:

Techniques to decrease anxiety in adolescents and adults are important to minimize the risk of fainting.

They include:

- Ensuring that the temperature in the room is comfortable.
- Avoiding long line-ups in mass immunization clinics.
- Administering the vaccine while the person is seated.

Patients who appear very anxious should be observed while seated until anxiety has resolved after the immunization.

---

Calming, Distracting and Managing the Pain

Distraction techniques are effective in decreasing pain response in infants, toddlers, and children during and following immunization. Regardless of the type of distraction, the more the child is involved in the distraction, the lower their pain.²

Work with the parent to use distraction techniques such as reading, music, use of pinwheels or soap bubbles, and instructing children to “blow the pain away.” Some children find books, video games or movies are good distractions.¹ Slow, deep breathing has a physiologic calming effect and can, at minimum, limit anxiety escalation.²

One systematic review found that the following were effective at reducing pain and distress from childhood immunizations:⁵

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• Breathing exercises
• Child-directed distraction
• Nurse-led distraction
• Combined cognitive-behavioural interventions

Consider the following techniques to minimize child and parent distress following immunization:\(^2\)
  • Suggest swaddling, cuddling and rocking the infant to the parents.
  • Suggest parents try breastfeeding, bottle-feeding, or using a pacifier.

Pharmacologic agents such as EMLA (eutectic mixture of local anesthesia, consisting of 2.5% lidocaine and 2.5% prilocaine), Ametop\(^1\) gel (4% amethocaine) and vapocoolants (e.g., Fluorimethane) have been used to reduce pain.\(^1\) Studies have demonstrated that EMLA does not affect the immunologic response to MMR, DTaP-IPV-Hib (Pentacel\(^1\)), hepatitis B (Recombivax\(^1\)) or Bacille Calmette-Guérin (BCG) vaccinations.\(^1\) EMLA needs to be applied at the immunization site approximately 60 minutes before the injection. Ametop\(^1\) gel produces anesthesia within 30 to 40 minutes and has been shown not to interfere with the immunologic response to MMR vaccine. Vapocoolants are effective immediately after application.\(^1\)

**Monitoring After Immunization**

After vaccination, vaccine recipients should be counselled on common side effects and the reporting and management of these reactions.\(^1\) Vaccine providers should identify and observe individuals who are particularly anxious about receiving the vaccine. Individuals with presyncopal symptoms such as pallor or sweating should sit or lie down until symptoms resolve. A study using the American Vaccine Adverse Reporting System found that 63% of syncopal (fainting) events occurred within 5 minutes of vaccination, and 89% occurred within 15 minutes.\(^1\) It is therefore prudent to keep the person in the clinic for 15 minutes after vaccination. This will also facilitate the management of the rare anaphylactic event. The treatment of adverse effects is discussed in Module 9.

**Protecting Yourself and your Patient**

Standard infection control practices should be implemented by immunization providers. These recommendations include:\(^1\)
  • Gloves are not required when administering biological products unless the vaccinator has open hand lesions or will come into contact with potentially infectious body fluids.
  • Wash hands well between vaccine recipients. Alcohol-based hand sanitizers are an alternative to hand washing with soap and water.
  • To prevent accidental needle stick injury, do not recap standard needles.
  • When safety needles are used, engage safety mechanism immediately following administration of the biological product.
  • Immediately discard needle and attached syringe in hard sided, labelled sharps container. Place sharps container so as to avoid reaching or having to reach in front of the client. Caution should also be taken so that the sharps container cannot be reached by children in the clinic setting.
  • Do not empty used needles and syringes from one sharps container to another.
  • Report percutaneous (needle stick) injuries immediately to supervisor for consideration of possible post-exposure immunoprophylaxis.
• All immunization providers should have completed a full series of hepatitis B vaccine.

**Key Learning Points**

1. Preimmunization counselling is crucial for the patient to understand the procedure including the risks and benefits as well as providing informed consent.
2. Assessment of contraindications for immunization can be done by asking only a few questions:
   - Is the child (or are you) sick today?
   - Does the child have allergies to medications, food or any vaccine?
   - Has the child had a serious reaction to a vaccine in the past?
   - For Live Vaccines:
     - Does your child have any problems with his or her immune system or have they taken prednisone or any cancer drugs in the last 3 months?
     - Has the child received a transfusion of blood or blood products in the past year?
3. There are very few contraindications to immunization.
4. Although vaccines can cause adverse effects most are mild and self-limiting such as injection site reactions.
5. Vaccine preparation may involve the use of a diluent to add to lyophilized powders. These diluents:
   - Are NOT interchangeable (unless specifically recommended by the manufacturer).
   - Have varying volumes.
   - Can vary in their ingredients.
   - May help to stabilize the vaccine or to maintain sterility.
6. Proper syringe selection is important for appropriate SC and IM administration. The general recommendations are:
   - For subcutaneous (SC) injections, a 25 gauge, 1.6 cm (5/8") needle.
   - For intramuscular injections (IM) a 22-25 gauge needle that is long enough to reach the muscle:
     - 2.2 cm (7/8") to 2.5 cm (1") for infants, toddlers and older children.
     - 2.5 cm (1") to 3.8 cm (1½") for adolescents and adult.
7. Immunization procedures can be improved with some communication and some practical tips.
8. There are several methods to reduce pain and discomfort from immunization.
9. Patients should remain for observation for 15 minutes after immunization.
10. Standard infection control and routine precautions can minimize risks to the immunizer and the patient.
Discussion Forum:
1. This module presented some examples of counselling statements you can use with your patients on immunizations. Are there any counselling lines that you have found work well in your clinical practice that you can share with your colleagues?
2. Many clinicians feel uncomfortable administering a vaccine to a patient with a “perceived” contraindication (e.g. mild infection, pregnancy). What do you feel can be done to improve correct this situation?
3. Parent and child stress can be a problem when administering a vaccine. Are there any tips that you can share from your clinical practice that have helped make immunization easier for the child and parent?
4. This module presented the steps of vaccine administration. Are there any tips you can share from your clinical practice that you found were very effective in improving your delivery of immunizations to your patients.

Post Test
Mrs. McCann is in for an immunization for her 2 month old daughter Sara. This is the first set of immunizations and although she is a strong supporter of the immunization program, she is still nervous about her daughter getting an injection. Today Sara is due for her first immunization with the “1 in 6” vaccine. (Infanrix hexa®).
1. When discussing the benefits of the injection with Mrs. McCann which of the following statements is the MOST appropriate to include?
   a. This vaccine protects against a large number of conditions but we have to give extra immunizations as the body can only handle so many immunizations at a single time
   b. I like this vaccine as this one shot will protect your daughter against 6 conditions and it minimizes the number of needles given to our children
   c. This is the first immunization and she will need 2 more, one at 6 months and one at 18 months
   d. This vaccine protects against quite a few diseases but it has a slightly higher risk of adverse effects compared to giving each immunization alone
2. Which of the following vaccine-preventable diseases are NOT included in the “1 in 6” vaccine series?
   a. Diphtheria
   b. Polio
   c. Hepatitis A
   d. Haemophilus influenza type b
3. Which would be the best site for administering this vaccine to Sara?
   a. Subcutaneously in the deltoid region
   b. Subcutaneously in the thigh region
   c. Intramuscularly in the deltoid region
   d. Intramuscularly in the thigh region

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4. When discussing the most common side effects of “1 in 6” vaccine which of the following is important to list?
   a. Fever > 40° C
   b. Redness and pain at the injection site
   c. Increase in appetite
   d. All of the above

5. Which of the following would be the most appropriate needle tip to use for the 1 in 6” vaccine injection for Sara?
   a. 22 gauge, 3.8 cm (1.5 inch)
   b. 25 gauge, 1.6 cm (5/8 inch)
   c. 25 gauge, 2.5 cm (1 inch)
   d. 20 gauge, 2.5 cm (1 inch)

6. Which of the following recommendations would NOT be appropriate to recommend to Mrs. McCann to reduce immunization pain?
   a. Blowing bubbles to distract
   b. Administer acetaminophen just prior to the immunization
   c. Breastfeeding Sara at the time of injection
   d. Cuddling and rocking the infant

7. Approximately how long should you keep Sara in the immunization clinic after the immunization?
   a. 1 minute
   b. 5 minutes
   c. 15 minutes
   d. 40 minutes

---

**Table 5 – Common Public Funded Vaccines used in Canada**

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Age</th>
<th>Dose</th>
<th>Route</th>
<th>Site</th>
<th>Contraindications/Precautions</th>
<th>Adverse Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pediacel*®</td>
<td>2,4,6,12 months</td>
<td>Immunization series is 4 doses of 0.5 ml</td>
<td>IM</td>
<td>&lt; 1 year old - anterolateral thigh</td>
<td>History of anaphylactic reaction to a previous dose of DPT, DTaP, IPV or Hib-containing vaccine.</td>
<td>Local: Redness, tenderness, swelling. Systemic: Irritability, crying, fever &gt; 38.3°C, drowsiness, decreased activity and appetite, vomiting, diarrhea.</td>
</tr>
<tr>
<td>DTaP-IPV-Hib</td>
<td></td>
<td></td>
<td></td>
<td>&gt; 1 year old - Deltoid</td>
<td>Children age 7 years and older.</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>History of Guillain-Barré syndrome (GBS) within 8 weeks of receipt of a tetanus-containing vaccine.</td>
<td></td>
</tr>
<tr>
<td>Quadracel*®</td>
<td>School entry booster</td>
<td>0.5 ml</td>
<td>IM</td>
<td>Deltoid muscle as child is &gt; 1 year of age</td>
<td>Same as Pediacel*®</td>
<td>Local: Redness, tenderness, swelling, pain. Systemic: fever &gt; 38.3°C, anorexia, vomiting, irritability, drowsiness, listlessness, fretfulness, persistent or unusual crying.</td>
</tr>
<tr>
<td>DTaP-IPV</td>
<td>Aged 4-6 years</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Vaccine</td>
<td>Age</td>
<td>Dose</td>
<td>Route</td>
<td>Local</td>
<td>Systemic</td>
<td></td>
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<tr>
<td>Infanrix Hexa DTap-HB-IPV-Hib</td>
<td>2,4,6 months</td>
<td>Immunization is series of 3 doses of 0.5 ml</td>
<td>IM</td>
<td>&lt; 1 year old - anterolateral thigh</td>
<td>History of anaphylactic reaction to a previous dose of DPT, DTaP, IPV HB or Hib-containing vaccine. Children age 7 years and older. History of Guillain-Barré syndrome (GBS) within 8 weeks of receipt of a tetanus-containing vaccine.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Booster at 18 months would be Pediacel&lt;sup&gt;®&lt;/sup&gt;</td>
<td></td>
<td>&gt; 1 year old - Deltoid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adacel&lt;sup&gt;®&lt;/sup&gt; DTap</td>
<td>Booster dose: 14-16 years or grade 9</td>
<td>0.5 ml</td>
<td>IM</td>
<td>Deltoid</td>
<td>History of anaphylactic reaction to a previous dose of any tetanus, diphtheria, or pertussis-containing vaccine. History of Guillain-Barré syndrome (GBS) occurring within 8 weeks of receipt of a tetanus-containing vaccine.</td>
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<tr>
<td>Engerix&lt;sup&gt;®&lt;/sup&gt; HB</td>
<td>Infancy 3 doses</td>
<td>Infancy 3 doses of 0.5 ml (10 µg)</td>
<td>IM</td>
<td>&lt; 1 year old - anterolateral thigh</td>
<td>History of anaphylaxis to any HB vaccine.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preteen 2 doses of 1 ml (20 µg)</td>
<td></td>
<td>&gt; 1 year old - Deltoid</td>
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<tr>
<td>Recombivax&lt;sup&gt;®&lt;/sup&gt; HB Twinrix&lt;sup&gt;®&lt;/sup&gt; HAB</td>
<td>Infancy 3 doses Preteen/teen - 2 doses</td>
<td>Infancy 3 doses of 0.5 ml (5 µg)</td>
<td>IM</td>
<td>&lt; 1 year old - anterolateral thigh</td>
<td>History of anaphylaxis to any HB vaccine or latex.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Preteen 2 doses of 1 ml (10 µg)</td>
<td></td>
<td>&gt; 1 year old - Deltoid</td>
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<tr>
<td>MMR II&lt;sup&gt;®&lt;/sup&gt; or Priorix&lt;sup&gt;®&lt;/sup&gt; MMR Priorix-Tetra&lt;sup&gt;®&lt;/sup&gt; MMRV</td>
<td>Infancy 2 doses</td>
<td>1 dose at 12 months 0.5 ml</td>
<td>SC Outer aspect of upper arm.</td>
<td></td>
<td>Anaphylaxis to any MMR vaccine. Consult specialist before administering live vaccine to any immunocompromised patient. Pregnancy. Should be give on the same day or delayed until 4 weeks after administering another live vaccine. Do TB skin test the same day as MMR immunization or delay TB test ≥ 6 weeks.</td>
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<tr>
<td></td>
<td></td>
<td>1 dose at 18 months or 4 to 6 years 0.5 ml</td>
<td></td>
<td></td>
<td>Local: Tenderness, redness, swelling, induration, wheal and flare reaction, urticaria. Systemic: Moderate fever, rash, malaise, headache, and nausea, myalgia, and paraesthesia; thrombocytopenia; encephalitis. Acute transient arthritis or arthralgia is uncommon in children, but frequency and severity increases with age. 25% of post-pubertal females may experience arthralgia, and 10% may have arthritis-like signs and symptoms.</td>
<td></td>
</tr>
<tr>
<td>Vaccine</td>
<td>Schedule</td>
<td>Injection Site</td>
<td>Adverse Reactions</td>
<td></td>
<td></td>
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<td>-------------------------</td>
<td>--------------------------------------------------------------------------</td>
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<td>-----------------------------------------------------------------------------------</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
| Varivax III *           | Infancy 1 dose, 12 months to 12 years once dose 0.5 ml ≥ 13 years two doses 0.5 ml 4 weeks apart. | SC             | • Anaphylaxis to any varicella vaccine.  
• Consult specialist before administering live vaccine to any in immunocompromised patient.  
• Pregnancy.  
• Should be given on the same day or delayed until 4 weeks after administering another live vaccine. | Injection site reactions, non-injection site rash and low grade fever. |
| Menjugate MCC           | Infancy (4 doses) > 12 months 1 dose AND Preteen (1 dose) 0.5 ml at 2,4,6 and 12 months of age OR 1 dose at 12 months < 1 year old – anterolateral thigh > 1 year old – Deltoid | IM             | • History of anaphylactic reaction to a previous dose of any meningococcal vaccine. | All: Redness, swelling and pain at injection site.  
In adolescents and adults: headache, myalgia, and fever.  
In younger children: irritability, crying, change in appetite, diarrhea, and fever. |
| Meningitec MCC Neis Vac-C | Infancy 3 doses > 12 months 1 dose AND Preteen (1 dose) 0.5 ml at 2,4 and 12 months of age OR 1 dose, 0.5 ml at 12 months of age < 1 year old – anterolateral thigh > 1 year old – Deltoid | IM             | • History of anaphylactic reaction to a previous dose of any meningococcal vaccine. | All: Redness, swelling and pain at injection site; headache, fever.  
Infants and toddlers: crying, irritability, drowsiness, somnolence/impaired sleeping.  
Infants: vomiting/nausea/diarrhea/loss of appetite. |
| Menactra MCC (A,C,Y,W-135) | 1 dose Used at any time pre-teen 0.5 ml | Deltoid        | • Known history of Guillain-Barré syndrome (GBS).  
• History of anaphylactic reaction to a previous dose of any meningococcal or diphtheria vaccine or to latex (latex is not in pre-filled syringe). | Local pain, redness, swelling, headache, malaise, chills, fever. |
<p>| Prevnar Pneu-C-7 Synflorix | 4 doses 3 2,4,6, 12-15 months 0.5 ml &lt; 1 year old – anterolateral | IM             | • History of anaphylactic reaction to a previous dose of any pneumococcal | Redness, swelling, tenderness at injection site, fever, irritability, drowsiness, restless sleep, decreased appetite, vomiting, diarrhea. |</p>
<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Ages</th>
<th>Doses</th>
<th>Site</th>
<th>Notes</th>
<th>Adverse Reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pneu-C-10</strong></td>
<td>2,4,12-15 months</td>
<td>0.5 ml</td>
<td>al thigh</td>
<td>&gt; 1 year old – Deltoid</td>
<td></td>
</tr>
<tr>
<td><strong>Fluviral Vaxigrip Inf</strong></td>
<td>6 months - 8 years</td>
<td>2 doses</td>
<td>IM</td>
<td>&lt; 1 year old – anterolateral thigh</td>
<td>History of an anaphylactic reaction to a previous dose of any influenza vaccine.</td>
</tr>
<tr>
<td></td>
<td>3-8 years</td>
<td>0.5 ml</td>
<td>Deltoid</td>
<td>&gt; 1 year old – Deltoid</td>
<td>History of an anaphylactic reaction to eggs.</td>
</tr>
<tr>
<td></td>
<td>≥ 9 years</td>
<td>1 dose</td>
<td></td>
<td></td>
<td>History of Guillain-Barré syndrome (GBS) within 8 weeks of receipt of a previous dose of influenza vaccine.</td>
</tr>
<tr>
<td></td>
<td>≥ 9 years</td>
<td>0.5 ml</td>
<td></td>
<td></td>
<td>Infants less than 6 months of age.</td>
</tr>
<tr>
<td><strong>Gardasil HPV</strong></td>
<td>9-26 years</td>
<td>3 doses</td>
<td>IM</td>
<td>Deltoid</td>
<td>History of anaphylactic reaction to previous dose of HPV vaccine.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 ml</td>
<td>Deltoid</td>
<td></td>
<td>Pregnancy (although no causal adverse outcomes have been reported).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>at day 0, 60 and day 180</td>
<td></td>
<td></td>
<td>Local: mild to moderate pain, redness, swelling.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Systemic:</td>
<td>Headache.</td>
</tr>
</tbody>
</table>

**Legend:**

- **DTaP:** Diphtheria, Tetanus, Acellular Pertussis
- **HB:** Hepatitis B
- **Hib:** Haemophilus Influenzae Tybe b
- **HPV:** Human Papillomavirus
- **Inf:** Influenza
- **IPV:** Inactivated Polio
- **Men C:** Meningococcal C Conjugate
- **M (A,C,Y,W-135):** Quadrivalent Meningococcal Conjugate (serogroups A, C, Y, W-135)
- **MMR:** Measles, Mumps, Rubella
- **MMRV:** Measles, Mumps, Rubella, Varicella
- **Pneu-C-7:** Pneumococcal conjugate 7 valent
- **Pneu-C-10:** Pneumococcal conjugate 10 valent
- **Var:** Varicella
- **Zostavax- herpes zoster**
- **Synagis- RSV**

- **SC:** Subcutaneous
- **IM:** Intramuscular
References