HOW TO VACCINATE

Modern Procedures and Best Practices for Vaccine Administration

For healthcare professionals

Immunize Immunisation Canada
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Introduction

Vaccines have helped prevent many infectious diseases that in the past caused great morbidity and mortality. However, for vaccines to be effective, they must be stored, handled, and administered appropriately and correctly.

Studies have shown that improper vaccine administration technique can result in suboptimal immunogenicity. Improper administration can also increase the risk for severe local adverse reactions. It's important that healthcare providers administering vaccines understand and follow current national professional standards and guidelines. This guide, created as a practical tool for training new employees or as a refresher for current healthcare providers, should be used as a complement to your institution's training process.

How vaccines work

Vaccines are oral, nasal, or injected preparations made up of dead or weakened infectious agents, such as bacteria and viruses. Vaccines work by stimulating the production of antibodies, resulting in immunity to that particular infection. Some vaccines induce prolonged or even lifelong immunity to certain infections and can be given just once. But others, such as pertussis or diphtheria, only induce temporary immunity and require repeat injections to maintain protection.

This resource will focus on injected vaccines administered via either the intramuscular or subcutaneous routes.

1. LEADUP TO VACCINATION

Layout and accomodations

The setup of the vaccination clinic is important to making patients comfortable and minimizing immunization stress-related responses.

- **Ideally, separate physical spaces for waiting, injection, and aftercare, with one-way flow-through.**
- **Provide seating for the patient and a support person. During injection, patients should be able to sit and lie down. Patients should have the ability to be vaccinated in private, out of the view of others.**
- **Minimize clutter and fear cues, like needles, equipment, and loud noises.**
- **Control the temperature to make people comfortable.**

Equipment

It's important to have all the necessary equipment or material on hand, including:

- **appropriately sized syringes**
- **a selection of needles**
- **alcohol swabs**
- **cotton balls**
- **a sharps container**
- **gloves**

In addition, it's important to have emergency medication, supplies and equipment on hand to assist with the management of anaphylaxis.

Screen patients for:

- **their current state of health,**
- **any potential contraindications,**
- **past adverse reactions to vaccine components.**

Note that children and adults can still be vaccinated if they have a current minor illness - such as an upper respiratory tract infection, diarrhea, or otitis media - with or without low-grade fever.

The *Canadian Immunization Guide* recommends that healthcare providers inquire about a patient's past history of **pre-syncopal or syncopal reactions**. This includes symptoms such as pallor, weakness, dizziness, light-headedness, or nausea. Syncope, or fainting, is more common in patients with needle fear.

To ensure **informed consent**, discuss the benefits and risks of the vaccine with your patient or their caregiver, using relevant health resources and language they can understand. Answer any questions and concerns they may have. Document consent appropriately.

Educational materials

Educational materials on vaccination procedure and fear management should be provided before the date of vaccination to improve the patient experience. Children are more frightened of vaccine injections and report more pain compared to adults. Child and parent/caregiver preparation ahead of time and on the day of vaccination can reduce their fear and pain.

Numerous strategies are available in the different letter categories of the CARD system that can help children and their parent/caregiver prepare for a vaccination appointment.

Healthcare workers can provide children and parents/caregivers with information ahead of time to allow them to plan coping strategies. That way, **children** can come prepared by:

- **wearing a short-sleeve shirt to facilitate access to the site of injection**
- **bringing a comfort item from home**
- **having a snack before or after injection.**

The Public Health Agency of Canada recommends the CARD (Comfort - Ask - Relax - Distract) framework, an evidence-based educational system, for vaccinating individuals. Each letter category includes evidence-based interventions that reduce immunization stress-related responses (ISRR), such as fear, pain, dizziness, and fainting. This improves the vaccination experience, which, in turn, increases confidence in vaccination and improves vaccine acceptability.

Learn more at https://immunize.ca/card.

2. PATIENT INTERACTION

Vaccinating children

Ask the child and their parent/caregiver if they have any concerns related to the vaccine and its administration, or about coping strategies, and answer questions they may have.

Offer options for coping in the different CARD letter categories. Options will vary depending on child age and preference. Some strategies may be administered by caregivers.

Strategies to reduce immunization stress-related responses (ISRR) on the day of vaccination

The words and actions of healthcare providers can influence how someone experiences vaccination. Some individuals may be prone to experiencing ISRR such as fear, pain, dizziness, and fainting. Some provider behaviours can promote coping, while others can increase distress.

- **Foster a calm environment and be positive. If you are calm and use your normal voice, others will feel that everything is OK.**
- **Provide information using neutral language. Do not use words that can be perceived as threatening. For example, say, "I am giving you the vaccine now" instead of "You are getting your shot now".**
- **Acknowledge concerns and provide balanced information. Do not minimize or dismiss people's concerns.**

Use age-appropriate coping strategies.

For **babies 12 months of age or younger**, breastfeeding before, during and after vaccination is the preferred intervention to reduce pain. If an infant is not breastfeeding, breastfeeding can be simulated by holding infants and administering sugar water with a pacifier. Infants should be held instead of left lying supine during vaccination.

Toddlers can be held by a parent/caregiver in a comfort position (such as sitting on a parent's lap in a bear-hug position with limbs gently secured) and offered a distraction.

Older patients can self-select preferred coping strategies from the CARD letter categories. Examples include:

- **picking a Comfort position**
- **Asking for information**
- **Relaxing by taking deep belly breaths, and**
- **using a Distraction**

It is important for providers to invite children and parents/caregivers to use their preferred coping strategies and support them in their choices. This promotes participation, increases agency, and improves satisfaction.

Preparing individuals with high levels of anxiety and fear

While speaking to the patient and preparing the vaccine, it's important not to be in a hurry, as patients are more distressed or anxious when they feel the process is being rushed and their concerns are not being addressed.

- **Recognize the efforts anxious patients are making. Help them to remember their vaccination in a positive way for the next time.**
- **Ask about past experiences and preferences for coping. Ensure coping strategies are available to support individuals, such as distraction items.**
- **Prepare the vaccine out of the sight of the patient, and keep needles and other fear-provoking equipment obscured from view.**
- **Answer questions using neutral language. Tailor the information to the patient's needs. Do not dismiss a patient's concerns.**
- **Ask patients how they are feeling both before and after the procedure. Ask how you can make the experience better.**

Syncope/Fainting

The *Canadian Immunization Guide* recommends that patients prone to syncope be advised to lie down during the vaccine administration or to use muscle tension to prevent it.

Muscle tension is an exercise that involves alternating between tensing and releasing large muscle groups, like the legs. This action increases blood pressure and prevents fainting. The exercise is continued until the procedure is over or the faint feeling is relieved.

3. PREPARING THE VACCINE

Verification

Vaccines can be supplied in single-dose vials, multi-dose vials and preloaded syringes.
It's important to ensure that the dose is appropriate for the patient's age. A lower-than-recommended dose for a particular vaccine can result in suboptimal vaccine potency. Conversely, exceeding the recommended dose may result in more tissue or systemic reactions.
In addition, before drawing up the vaccine, the healthcare worker should:

- **Perform thorough hand hygiene.**
- **Assure that the vaccine storage conditions are appropriate by checking the temperature monitor chart.**
- **Inspect the vaccine product to ensure that there are no irregularities such as damage or contamination. Check that the colour and appearance of the vaccine are correct.**
- **Check the vaccine identification label and expiry date on the vaccine package. If the expiry date indicates only the month and the year, the vaccine can be used until the end of the indicated month.**

Note that multi-dose vials should be labelled with the date of the first entry into the vial, and, unless specified by the manufacturer, should be discarded 30 days from the date of the first entry.

Vaccines that require no reconstitution

Once the patient is ready to receive the vaccine, the syringe can be filled as follows:

- **Uncap the vaccine vial. Clean the rubber stopper with an alcohol swab and let dry.**
- **Pull back the plunger to fill the syringe with the required amount of vaccine.**
- **Remove the needle guard and place it where it will not be contaminated.**
- **Holding the vial upright, insert the needle directly into the centre of the rubber stopper.**
- **Do not inject air into a multi-dose vial prior to withdrawing vaccine. Injecting air may produce a "spritz" of vaccine that is lost each time the air is injected, resulting in a decrease in vaccine contained in the vial over time.**
- **Invert the vial and draw up the vaccine, while keeping the bevel of the needle within the solution to avoid drawing air. For a single-dose vial, withdraw the entire vial contents. For a multi-dose vial, withdraw the desired amount of vaccine.**
- **Remove the needle from the vial and gently expel air bubbles from the syringe by tapping on the side of the syringe while pushing the plunger. Make sure you do not expel any of the vaccine.**
- **When possible, give the vaccine immediately after drawing it up into the syringe.**

Hygiene and infection prevention

If you administer vaccines:

- Take appropriate precautions to minimize the spread of disease to or from patients.
- You should also have evidence of immunity or be immunized against measles, mumps, rubella, varicella, hepatitis B, influenza, diphtheria, tetanus and pertussis.

Perform hand hygiene:

- before vaccine preparation
- between vaccine recipients
- whenever your hands are soiled

Gloves are not required when administering vaccines unless you have open hand lesions or anticipate contact with potentially infectious body fluids.

- **Syringes and empty vials should be discarded into a biohazard container.**
- **Preloading syringes with vaccine is discouraged because of uncertainty of vaccine stability in syringes, risk of contamination, increased potential for vaccine administration errors, and vaccine wastage if not given.**

Reconstituted Vaccines

Depending on the vaccine preparation, the healthcare provider may need to reconstitute the vaccine with a supplied diluent. Here are some guidelines for proper vaccine reconstitution:

- **Ensure that you use ONLY the diluent supplied by the manufacturer.**
- **Verify the expiry date on both the vaccine and the diluent.**
- **Remove the cap from the vaccine vial. Clean the rubber stopper with an alcohol wipe and allow to it to dry.**
- **Draw up the diluent into your syringe and inject it into the vaccine vial. CAUTION: Injecting the diluent too rapidly or shaking the ampoule may cause frothing, which can affect the dilution and thus the potency of the vaccine.**
- **If the freeze-dried powder does not instantly dissolve in the diluent, gently rotate the ampoule until it dissolves.**
- **Whenever the solution and container permit, inspect the vaccine visually for particle matter and discoloration. If problems are noted, the vaccine should not be given.**

Fill the syringe as directed in the previous section on drawing up vaccines. Note that it's not necessary to change the needle after reconstitution of the vaccine, unless the needle has become bent or contaminated. Once reconstituted, the vaccine must be administered within the timelines provided by the manufacturer or it must be discarded.

4. VACCINE ADMINISTRATION: CHOICES

Injectable vaccines are administered via the intramuscular (IM) or deep-subcutaneous (SC) routes. Healthcare providers should be familiar with, and comfortable with, these two routes of administration. Vaccines are also available for intradermal injection, oral administration and via intranasal spray. This guide will review the IM and SC routes only.

Recommended routes of injection

For complete vaccine administration information, providers should refer to the package insert and the current *Canadian Immunization Guide* or the National Advisory Committee on Immunization statement.

Choosing the site of injection

Once the provider has determined which route a particular vaccine requires, the next steps are:

1. **to choose the site of injection, and**
2. **to choose the appropriate needle size.**

These decisions are made depending on the age of the patient to be vaccinated.

The recommended sites for IM injection are the vastus lateralis muscle of the anterolateral thigh, or the deltoid muscle of the upper arm, depending on the age and the degree of muscle development.

- For **children less than 1 year old**, the recommended site for IM injection is the anterolateral aspect of the thigh. Most clinicians agree that once an infant is walking, the deltoid muscle is preferable. **Never use the gluteal muscle for IM vaccination, as it's highly unlikely that the vaccine will reach the muscle, and there's a risk for damage to underlying structures such as the sciatic nerve. In addition, some vaccines may have reduced immunogenicity when given in the gluteal muscle.**
- Vaccines containing adjuvants are to be administered via IM injection. If inadvertently injected subcutaneously or intradermally, increased inflammation, induration or granuloma formation may occur.
- For **older children and adults**, the deltoid muscle is the preferred site for an IM injection.

Subcutaneous vaccines are injected into the fat tissue below the dermis but above the muscle. While there are many possible sites for subcutaneous injection, the usual sites selected for vaccine administration are the upper thigh and the outer triceps of the arm.

Choosing the needle size

The needle is 22-25 gauge for an IM injection, and 25 gauge with a length of 5/8 inch for SC injections.

It's important for the needle to be long enough to reach the muscle, and this of course depends on the size of the patient being vaccinated. Needle selection should be based on the route of administration, the individual's age, the size of muscle mass, and viscosity of the vaccine.

- **For infants, the needle length should be between 7/8 and 1 inch.**
- **For toddlers and older children, the needle length should also be between 7/8 and 1 inch.**
- **For adolescents and adults, the needle length should be 1 to 1½ inches.**

Patient positioning and comfort

It is important to maintain patient comfort during vaccination to minimize the risk of injection administration errors. In general, **infants should be held by a parent or caregiver**, and **older children and adults should be sitting upright rather than lying supine**.

Ensure that the site of vaccine administration is accessible and that the limb being vaccinated is stable. Age, activity level, and the level of anxiety or fear of the patient and/or caregiver influence the position selected. For **young children**, offer positions that support and contain the limbs (for example, a bear hug for a toddler, with the parent's arms over the child's arms).

In general, the following patient positioning instructions apply to both IM and SC injections:

- **The patient should be in a comfortable position.**
- **Ensure the vaccine site is easily accessible.**
- **Fully expose the appropriate area, and avoid tight clothing above the injection site.**
- **Expose the upper arm fully.**
- **The muscle should be relaxed, so encourage the patient to either:**
    1. let the arm hang by the side, or
    2. rest the arm on their lap or hip.

Babies and children:

Babies and infants should be held on their parent's or caregiver's knee during vaccination instead of being left lying supine.

The parent or caregiver should gently, yet firmly, hold the child during the procedure. Physical closeness can help comfort the child.

If the injection is given in the deltoid, the parents should keep the free arm tucked behind them, with the child cuddled into their body.

Older children may sit on their own, but the parent or caregiver may still be required to help hold the arm still.

5. VACCINE ADMINISTRATION: INJECTION

Administration of an intramuscular vaccine

1. **Following injection site selection, prepare the area with an alcohol wipe, using a circular motion, starting from the centre outward. Allow the area to dry.**
2. **With your free hand, hold the skin firmly, but not bunched, between your thumb and forefinger, isolating the muscle.**
3. **Insert the needle fully at a 90-degree angle and inject the vaccine into the muscle.**
4. **Withdraw the needle and apply light pressure to the injection site for several seconds with a dry cotton ball or gauze, especially if bleeding occurs. Do not rub the area, as studies suggest that rubbing can decrease vaccine absorption.**
5. **If using a retractable safety-engineered needle, you'll need to apply slight pressure to the plunger to ensure the needle retracts.**

Some vaccine providers prefer to pull back on the plunger to determine whether the needle has entered a blood vessel. **This practice is called aspiration, and is not recommended**.

- **There are no studies that have found it necessary to aspirate prior to IM injection of vaccines.**
- **Aspiration can cause unnecessary trauma and pain in patients.**
- **Some syringes provided for immunization may not allow aspiration before giving the vaccine.**

Administration of a subcutaneous vaccine

With the patient properly positioned, subcutaneous injections are administered as follows:

1. **After appropriate site selection, prepare the area with an alcohol wipe, using a circular motion, starting from the centre outward. Allow the area to dry.**
2. **Bunch or pinch up the skin and fat between the thumb and forefinger, to lift the fat tissue away from the underlying muscle.**
3. **Insert the needle at a 45-degree angle, and then slowly inject the vaccine into the tissue.**
4. **Withdraw the needle and apply light pressure to the injection site for several seconds using a dry cotton ball or gauze. Do not rub or massage the site post injection.**

Co-administration of multiple injections

Today, with the increasing number of childhood vaccines, it's not uncommon that babies and children may require multiple vaccines in the same clinic visit, administered sequentially at separate sites. There are no contraindications for giving multiple vaccines, and all opportunities for vaccination should be explored. Of current relevance, the COVID-19 vaccine can be co-administered in adults with other vaccines, for example, the influenza vaccination.

When giving multiple injections:

- **A separate syringe should be used for each injection.**
- **It's important to note that different vaccines should not be mixed in the same syringe, unless specified by the manufacturer as part of the reconstitution and administration procedure. It is also important to ensure that the vaccine administered can be given with other vaccines. This depends on the vaccine, and in some cases the age of the patient.**
- **When necessary, two vaccines can be given in the same limb at a single visit.**
  - For **infants up to 12 months**, the thigh muscle is the preferred site for two simultaneous injections because of its bigger muscle mass.
  - The distance between the two injections should be about 1 to 2 inches.
- **Vaccines that are known to cause more stinging or pain should be given last.**
- **When choosing to give injections at multiple sites in infants, administering them simultaneously by two different providers may reduce the anticipation of, and anxiety about, the next injection. For older children and adults, ask about their preferences for simultaneous injections.**

After injection - local or topical pain relief techniques:

After injection has occurred, pain may need to be managed through active techniques.

Pressure at the site of injection for 10 seconds may reduce pain. Ice isn't recommended, as it provides only a few seconds of pain control. For details, consult your local institution policies

6. POST-INJECTION PROCEDURES

Needlestick injury prevention

With injected vaccines, there is a risk of transmission of bloodborne or body fluid-borne pathogens. Using proper sterile and aseptic techniques minimizes the risk of cross-infection during the immunization process.

The following steps can help prevent needlestick injury:

- **Use safety-engineered needles.**
- **Immediately after vaccine administration, dispose of all needles and syringes in a proper, clearly identified and puncture-resistant sharps container.**
- **Never attempt to push contents down into a full sharps container.**
- **Make sure that the sharps container is not accessible to children in the room.**
- **Ensure appropriate disposal of used vials.**
- **Discard as appropriate all used swabs or gauzes which may have been contaminated with blood.**

Healthcare providers should report any needlestick injury to their supervisor or occupational health and safety person, and follow their facility's needlestick injury protocols.

Preparedness/management of adverse or allergic reactions

Every facility administering vaccines should have a protocol and equipment in place to provide immediate care for an anaphylactic reaction. These protocols, as well as equipment and supplies, should be reviewed regularly. Staff members must be able to recognize and respond appropriately to such an emergency situation, and should maintain their current CPR certification. Fortunately, anaphylaxis is very rare, but the *Canadian Immunization Guide* suggests observing patients for 15-30 minutes following vaccine administration. Each healthcare provider should use their professional judgement to determine if a longer wait period is necessary.

Counselling and patient follow-up

Patients and parents should be given clear and simple instructions on how to manage any possible side effects, and to report any significant adverse events. Attention should be given to pain control as necessary, depending on the individual situation. It's recommended to use an empathetic, comforting and relaxed tone in answering any specific questions the patient or parent may have.

Documentation

Any and all vaccine administration should be fully documented in the patient's medical record. The following information is necessary:

- **date of vaccine administration**
- **name of vaccine**
- **vaccine lot number and expiry date**
- **vaccine manufacturer**
- **administration site**
- **any pertinent comments, remarks, side effects, or observations**
- **name and agency of the vaccine administrator**

The patient or parent should be given an immunization record which includes the vaccines administered, the dates of administration, and the name and title of the person administering the vaccine. Individuals should be instructed to keep the record in a safe place and to bring it to immunization visits. Parents should also be instructed to maintain these records on behalf of their children and pass them on to their children at the appropriate time, such as when they are leaving home. And finally, be sure to remind the patient or parent to report all immunizations to their local health unit.

7. CONCLUSION

Proper vaccine administration technique assures optimal potency and the reduction of local side effects. It's important for all healthcare personnel administering vaccines to be familiar with the appropriate preparatory, vaccine injection, and follow-up procedures for both children and adults.

In addition, healthcare providers are encouraged to make the vaccine administration session as positive as possible. A positive experience will help ensure follow-up and acceptance of future vaccinations, and of course will enhance the relationship between the healthcare provider and patient.

This program is intended to complement your facility's existing immunization technique training process. The contents of this program are based on the general recommendations of the *Canadian Immunization Guide*.

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