

FUNDAMENTALS

Immunization Technique for Intramuscular (IM) Injections – Deltoid Muscle

2nd Revision: December 2021

Background

The correct technique for vaccine administration is a core competency for all immunizers.^{1, 2} Proper technique ensures optimal vaccine efficacy and safety, reduces the risk of injury, and decreases pain for the vaccine recipient.¹

Scope

This resource is intended for immunizers and focuses on vaccine administration technique for intramuscular (IM) vaccine injections in the deltoid muscle. This resource outlines evidence-based best practices for selecting the correct needle gauge and length, correct landmarking, proper injection technique, and co-administration of two or more vaccines. The clinical implications of non-standard vaccine practices are also reviewed. This document may be used in conjunction with – and does not replace – vaccine manufacturers' instructions as outlined in product monographs, professional standards of practice, and organizational policies and procedures.

Preparing for Vaccine Administration

Needle Selection

- To ensure that the vaccine is deposited within the proper tissue layer, an appropriate length and gauge of needle must be selected.² This practice will decrease the chance of local adverse events, and ensure optimal efficacy of the vaccine.²
- For all intramuscular injections, the needle should be long enough to reach the muscle mass and prevent the vaccine from seeping into subcutaneous tissue, but not so long as to involve underlying nerves, blood vessels, or bone.^{3,4}
- The immunizer should use clinical judgement when selecting the appropriate needle based on an assessment of the following: client's age, sex, weight, size of muscle mass and amount of adipose tissue of the client, recommended route of administration for the biological product, number of products to be administered, and volume and viscosity of the product being administered.^{1, 5-8}
- A needle gauge of 22-25 is recommended for IM injections, with a larger gauge (e.g., 22) required for more viscous or larger volume products¹, and evidence to suggest using a smaller gauge needle (23 or smaller) for those with bleeding disorders.⁹

The following tables have been adapted from the [Canadian Immunization Guide](#) and provide needle selection guidelines (i.e. gauge and length) for IM injections in the deltoid muscle.

The deltoid muscle is the preferred site for IM injection in adults and adolescents >12 years of age. While the anterolateral thigh or the deltoid can be used for children >12 months-12 years, the deltoid is often selected as the injection site in these age groups as temporary muscle pain post-vaccination in the anterolateral thigh muscle may affect ambulation. IM injections in the deltoid muscle are not recommended for children 12 months of age and younger.¹

Table 1: Needle selection guidelines for IM injections in the deltoid muscle using needle gauge 22-25 for children >12 months to 12 years of age.

Age of Vaccine Recipient	Needle Length
>12 months – 12 years of age	1.6 cm-2.5 cm (5/8 inch - 1 inch)

Table 2: Needle selection guidelines for IM injections in the deltoid muscle using needle gauge 22-25 for adolescents >12 years of age and adults.

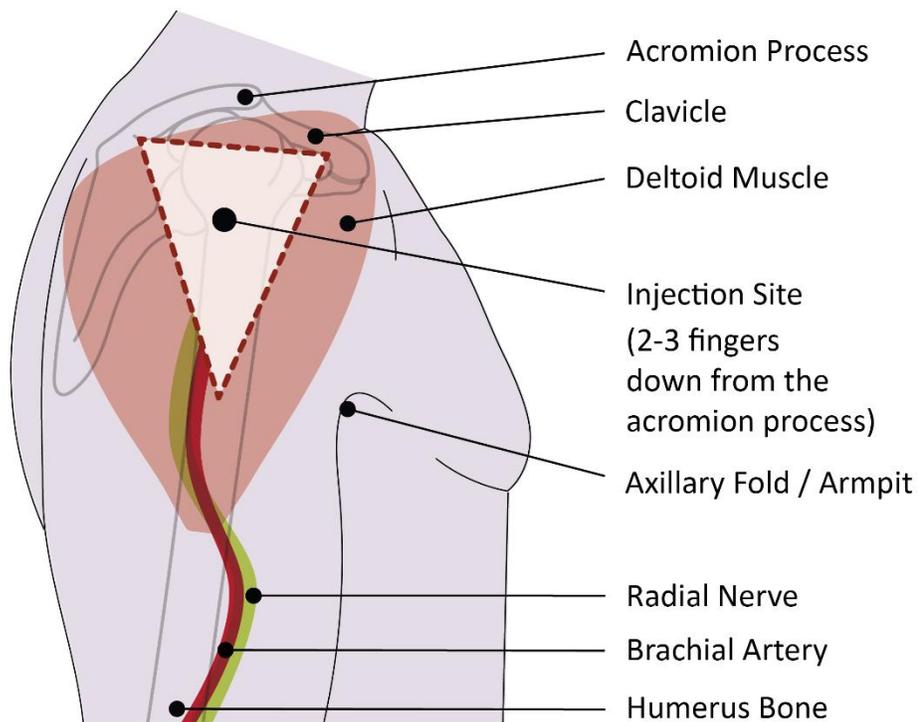
Weight of Vaccine Recipient	Needle Length
For those weighing less than 130 lbs (60kg)	1.6 cm – 2.5 cm (5/8 inch– 1 inch)
Males weighing 130-260 lbs (60-118 kg) Females weighing 130-200 lbs (60-90kg)	2.5 cm (1 inch)
Males weighing more than 260 lbs (118kg) Females weighing more than 200 lbs (90kg)	3.8 cm (1½ inch)

Landmarking

- To locate the deltoid muscle, the whole arm must be properly exposed. The correct place to insert the needle is the central and thickest portion of the deltoid muscle.⁴
- A general guideline to find the upper border of the injection site is to lay two or three fingers across the deltoid muscle below the acromion process (see Figure 1).¹⁰
- Anatomical landmarks may also be used to determine the injection site, known as the axillary triangle method.³ First, palpate the acromion process, the bony point at the end of the shoulder. Draw the base of the triangle at the lower edge of the acromion process and the peak of the triangle at the crease of the axillary fold/armpit. The injection site will be in the centre of this triangle. (See Figure 1).¹¹

- Do not inject in a site where there is bruising, scarring, inflammation, masses, edema, or other tenderness as this could interfere with the absorption of the product; an immunization may be provided in an area that is tattooed.^{1,5}
- Although the deltoid muscle is the preferred site for many vaccinations and populations, some individual circumstances (e.g. minimal muscle mass) may necessitate injection in an alternate site. In these instances, the vaccine can be given in the anterolateral thigh (vastus lateralis muscle).^{1,5-8}
- Active immunizing agents, including COVID-19 vaccines, should not be administered in the buttock (gluteal) muscle as an alternative site to the deltoid muscle.¹

Figure 1: Landmarking for Intramuscular Injections in the Deltoid Muscle



Best Practices for Vaccine Administration

Table 3: Best practices for IM Injections in the deltoid muscle

Best Practice	Rationale/Evidence
<ul style="list-style-type: none"> The client should be sitting in a relaxed manner with arm fully exposed.⁶ Encourage the client to keep their forearm and hand in a relaxed position on upper thigh. For children younger than 3 years of age strategies such as holding during vaccine injections or holding and rocking/patting after vaccine injection may be used.¹ Sitting upright is recommended for all individuals 3 years and older.¹ 	<ul style="list-style-type: none"> Sitting up and relaxing the arm muscle reduces pain associated with vaccination.¹ If the arm is not fully exposed (e.g., shirt is pulled down) this may interfere with correct landmarking.⁶ Proper positioning can reduce pain and anxiety.¹² This assists with keeping still the limbs to be vaccinated; Restraining children should be avoided this can increase fear.¹²
<ul style="list-style-type: none"> The “flattening” technique, stretching the skin between the non-dominant thumb and forefinger, at time of administration is most often recommended.¹ The “bunching” technique, pinching or squeezing of the deltoid between the non-dominant thumb and forefinger, is only recommended if the client’s muscle mass is small.³ 	<ul style="list-style-type: none"> This helps to ensure that the vaccine reaches the muscle mass.^{1,3} The needle length(s) recommended in the Canadian Immunization Guide (see Table 1 and 2 above) are based on the flattening technique (stretching the skin) beforehand.¹ Child, adolescent and geriatric populations tend to have smaller muscle mass, therefore “bunching” may be recommended to ensure the vaccine reaches the deltoid muscle.³
<ul style="list-style-type: none"> Insert the needle rapidly at a 90° angle (See Figure 2).⁸ 	<ul style="list-style-type: none"> Injecting at a 90° angle ensures the vaccine product to be deposited into the muscle and not the fascia or subcutaneous tissues.¹³ If injected at an angle other than 90°, the needle will be at increased risk of hitting the posterior humeral circumflex artery or axillary nerve.¹³
<ul style="list-style-type: none"> Inject the vaccine quickly and do not aspirate.^{3, 5, 8, 14,15} 	<ul style="list-style-type: none"> Fast injections are recommended when administering vaccines because of the potential for a reduction in pain, feasibility and practicality.¹⁴ Aspiration is not recommended. There are no large blood vessels near the intended deltoid injection site.^{3,5,8}

Best Practice	Rationale/Evidence
<ul style="list-style-type: none"> Depress the plunger fully ensuring the entire dose is administered.⁵ 	<ul style="list-style-type: none"> Aspiration may increase the time it takes to immunize and be more painful for the client.^{5,8} A full dose is required for the intended immune response.⁵
<ul style="list-style-type: none"> Remove the needle immediately in one swift motion.⁵ 	<ul style="list-style-type: none"> This will minimize discomfort to the client.^{5,7}
<ul style="list-style-type: none"> Apply pressure to the injection site for 30 seconds.⁵ 	<ul style="list-style-type: none"> Applying pressure to the site of injection for 30 seconds helps decrease bruising and bleeding.⁶ Pressure may need to be applied for 5-10 minutes to stop bleeding if the client has a bleeding disorder.⁵
<ul style="list-style-type: none"> Do not massage the injection site.⁶ 	<ul style="list-style-type: none"> Massaging the site can damage underlying tissue.⁶

Figure 2: Needle Entry for Intramuscular Injections

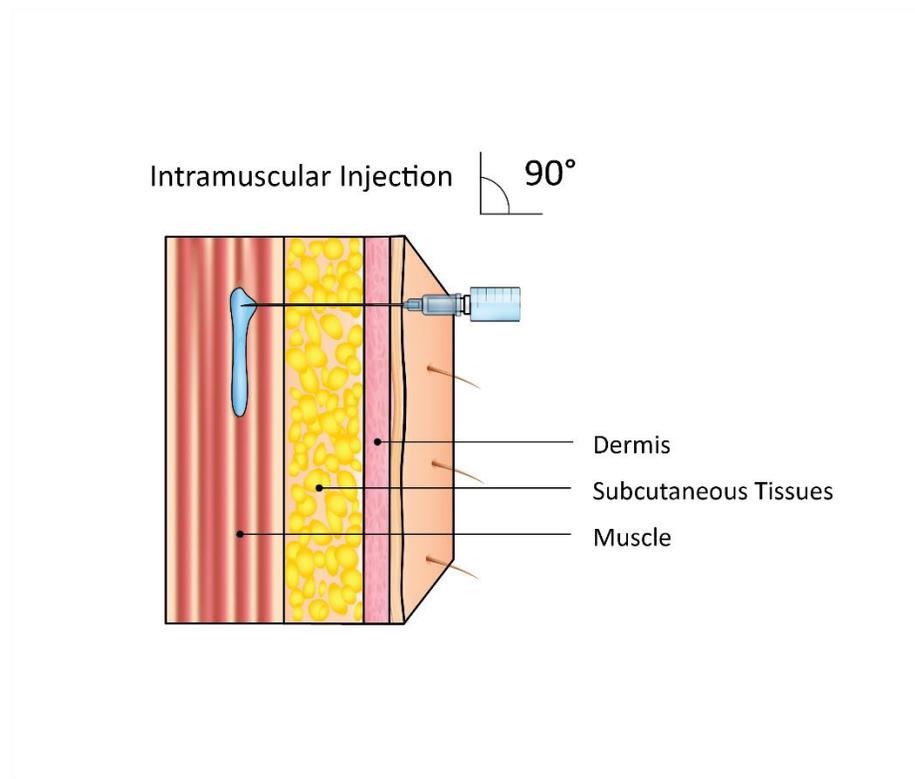


Table 4: Best practices for vaccine co-administration

Best Practice	Rationale/Evidence
<ul style="list-style-type: none"> Most routine vaccines can be safely and effectively administered at the same visit.¹⁶ Vaccine providers should check the National Advisory Committee on Immunization (NACI): Statements and Publications for specific guidance for co-administration of specific vaccines. 	<ul style="list-style-type: none"> In general, all vaccine doses for which a person is eligible should be administered at a single visit to increase the probability that the individual will be fully immunized.¹⁷
<ul style="list-style-type: none"> If multiple injections are required, whenever possible, different limbs should be used.¹ For most adolescent and adults the deltoid muscle can be used for multiple injections.² 	<ul style="list-style-type: none"> If a local reaction occurs, the associated vaccine can be identified if different limbs were used.¹ If multiple injections in the same limb are required, the injection sites should be separated by at least 2.5cm (1 inch) so that any local reaction can be differentiated.^{1,7} In individuals where there is insufficient deltoid mass, the anterolateral thigh muscle can be used. Separate injection equipment should always be used.¹
<ul style="list-style-type: none"> Administer vaccines that are known to be more painful when injected last (e.g., MMR, HPV).^{1,15} 	<ul style="list-style-type: none"> Pain can increase with each injection¹, injecting the most painful vaccine last when multiple injections are needed may decrease the pain associated with the injections.^{1,12}

Implications for Non-standard Vaccine Practice

Non-standard or incorrect vaccine practice can result in sub-optimal vaccine efficacy and safety and may lead to injury and/or increased pain for the client.¹

Incorrect Needle Size

- If the needle used is too short, the vaccine may be inadvertently injected into the subcutaneous tissue.^{5,10} This may lead to more severe local reactions such as the development of nodules or cellulitis and compromised immunogenicity.^{5,10}
- If the needle is too long, it may strike the bone and the vaccine may not be fully absorbed into the muscle, again leading to a reduced immune response.³

Incorrect Landmarking

- Incorrect landmarking may lead to shoulder injury related to vaccine administration (SIRVA).^{10, 18} SIRVA occurs when an IM injection intended for the deltoid muscle has been administered too high (i.e. in the shoulder joint), which initiates an inflammatory process, causing damage to the bursae, tendons, and ligaments.¹⁰ Typically, symptoms begin within 48 hours after vaccine administration and do not improve with over-the-counter analgesic medications. The client will experience persistent shoulder pain and may present with a limited range of motion.¹⁰
- Injections that occur below the deltoid muscle can puncture the radial nerve and those that are too far to the side of the deltoid muscle can cause injury to the axillary nerve. Both of these landmarking errors may result in paralysis or neuropathy that does not always resolve.¹⁰

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Summary of Revisions

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This document is current to December 01, 2021. New material in this revision is highlighted in the table below.

Section	Revision	Implementation Date
1	Increased the scope of this document	December 1, 2021
2	Table 1 condensed	December 1, 2021
3	Additional information provided to correctly landmark in both pediatric and adult populations	December 1, 2021
4	Image updated to align with additional information regarding landmarking	December 1, 2021
5	Information revised to align with updated information about landmarking	December 1, 2021
6	Information updated to include best practice for pediatric population and vaccine administration	December 1, 2021
7	Addition of section: Best practice for vaccine co-administration	December 1, 2021
8	Referenced updated to reflect additional information	December 1, 2021

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