Intramuscular injection, ambulatory care

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Introduction

Intramuscular (IM) injections deposit medication deep into muscle tissue. This route of administration provides rapid systemic action and absorption of relatively large doses (up to 5 mL in appropriate sites).[1][2] Guidelines recommend IM injections for patients who can't take medication orally, when IV administration is inappropriate or inaccessible, and for medications that are altered by digestive juices. Because muscle tissue has few sensory nerves, IM injection of irritating medications is less painful than other types of injections.

◆ ***Clinical alert:*** Some states don't permit medical assistants to administer medications or place restrictions on what medications medical assistants may administer.[3][4] Be sure to understand and comply with your state's laws and scope of practice, as well as your facility's guidelines, regarding medication administration. Additional training may be required.[4] ◆

Careful selection is necessary when choosing a site for an IM injection. Selection must take into account the patient's general physical status and the purpose of the injection.[5] IM injections are contraindicated if the site is inflamed, edematous, or irritated or has moles, birthmarks, scar tissue, or other lesions.[1] IM injections may also be contraindicated after thrombolytic therapy, during an acute myocardial infarction (MI), and in patients with impaired coagulation mechanisms, occlusive peripheral vascular disease, edema, or shock because these conditions impair peripheral absorption. IM injection requires sterile no-touch technique to maintain the integrity of muscle tissue.[6][7]

The Z-track technique is the preferred method for administering an IM injection. By leaving a zigzag path that seals the needle track, this technique prevents drug leakage into the subcutaneous tissue, helps to seal the drug in the muscle, and minimizes irritation.[1][2][7][8][9]

Equipment

- Alcohol pads
- Gauze pads
- Patient's medication administration record
- Prescribed medication
- Single-use sterile syringe and needle of appropriate size and gauge (a self-sheathing needle is recommended)
- Optional: adhesive bandage, filter needle, gloves, other personal protective equipment

The prescribed medication must be sterile. The needle may be packaged separately or already attached to the syringe. (See *Selecting the appropriate syringe and needle*.)

EQUIPMENT

SELECTING THE APPROPRIATE SYRINGE AND NEEDLE

For an IM injection, several factors help determine the size of the syringe and the gauge and length of the needle, including the amount and viscosity of the medication, the injection site, and the patient's weight and amount of adipose tissue. Needles for IM injections are longer than subcutaneous needles *because they must reach deep into the muscle.*

The volume of medication typically administered IM is 1 to 4 mL, so a 3- or 5-mL syringe is usually appropriate. You can determine the appropriate gauge of the needle according to the medication you're administering. You should administer biologic agents and medications in aqueous solutions with a 20G to 25G needle; for medications in oil-based solutions, use an 18G to 25G needle.

Needle length depends on the injection site, the patient's size, and the amount of subcutaneous fat covering the muscle. For injection into the deltoid muscle, patients with obesity may require a longer needle (1½" [3.8 cm] or longer), and thin or emaciated patients (those who weigh less than 130 lb [60 kg]) may require a shorter needle (⅝" [1.6 cm]).[10][11] Choose the needle size and injection site on an individual basis, taking into consideration muscle size, thickness of adipose tissue at the injection site, volume of the material you're administering, injection technique, and the depth below the muscle surface that you're injecting the material.[7][10][11] The following guidelines can help in your choice:

- vastus lateralis—1" to 1½" (2.5 to 3.8 cm)[11][12]
- deltoid—⅝" to 1½" (1.6 to 3.8 cm)[11][12]
- ventrogluteal—½" to 1½" (1.3 to 3.8 cm).

Preparation of Equipment

Inspect all equipment and supplies. If a product is expired, is defective, or has compromised integrity, remove it from patient use, label it as expired or defective, and report the expiration or defect as directed by your facility. Choose equipment appropriate to the prescribed medication and injection site, and make sure it works properly. The needle should be straight, smooth, and free from burrs.[7][10] Be sure to prepare injections in a clean, designated area where the risk of contamination by blood or body fluids is low.

Implementation

- Avoid distractions and interruptions when preparing and administering medication *to prevent medication errors.*[13][14]
- Review the practitioner's order.[15][16][17]
- Gather and prepare the necessary equipment and supplies.
- If appropriate to your role, reconcile the patient's medications when the practitioner orders a new medication *to reduce the risk of medication errors, including omissions, duplications, dosing errors, and drug interactions, as appropriate.*[18]
- Perform hand hygiene.[19][20][21][22][23]

◆ ***Clinical alert:*** If your facility's hazardous drug list contains the drug that you're about to administer, put on personal protective equipment as directed.[24] ◆

- Compare the medication label to the order in the patient's medical record.[15] [16] [17]
- Review the patient's medical record for an allergy or contraindication to the prescribed medication. If an allergy or contraindication exists, don't administer the medication and notify the practitioner.[15] [16] [17]
- Check the expiration date on the medication. If the medication is expired, return it to the medication room and obtain new medication.[15] [16] [17]
- Visually inspect the solution for particles, discoloration, or other loss of integrity. Don't administer the medication if its integrity is compromised.[15] [16] [17] Remember that the presence of drug particles is normal for some drugs (such as suspensions). If in doubt, check with the pharmacist and consult the manufacturer's instructions.
- Discuss any unresolved concerns about the medication with the patient's practitioner.[15] [17]
- Calculate the dose carefully.[3]
- Perform hand hygiene.[19] [20] [21] [22] [23]
- If necessary, read the medication label again as you draw up the medication for injection. Use a filter needle if you are drawing up medication from an ampule. (See *Drawing up medication for injection*.)

DRAWING UP MEDICATION FOR INJECTION

The technique for drawing up the medication varies according to the type of container that houses the medication. Prepare the medication in a clean, dry work space that's free of clutter and contamination.[25] Follow sterile no-touch technique during preparation *to prevent the transfer of microorganisms to the patient.*[25]

For a single-dose ampule: Disinfect the neck of the ampule with an alcohol pad before breaking it.[25] Wrap an alcohol pad around the ampule's neck or insert the ampule's head into an ampule breaker. Snap off the top, directing the force away from your body. Attach a filter needle to the syringe and withdraw the medication, keeping the needle's bevel tip below the level of the solution.[26] Tap the syringe *to clear air from it.* Cover the needle with the needle sheath.

Before discarding the ampule, check the medication label against the patient's medication record.[15] Discard the filter needle and the ampule in a leakproof, puncture-resistant sharps disposal container.[27] Attach the appropriate needle to the syringe.[7] [10]

For a single-dose or multidose vial: Use a single-dose instead of a multidose vial whenever possible, especially when you'll be administering medications to multiple patients.[28] Dedicate a multidose medication vial to one patient whenever possible *to reduce the risk of bloodborne pathogen transmission and infection.* If you must use multidose vials for more than one patient, keep and access them in a dedicated medication preparation area away from immediate patient treatment areas *to prevent inadvertent contamination of the vial through direct or indirect contact with potentially contaminated surfaces or equipment that could lead to infections in subsequent patients.*[25] [28] [29] [30]

Reconstitute powdered drugs according to the manufacturer's instructions. Make sure all crystals have dissolved in the solution. Warm the vial by rolling it between your palms *to help the drug*

dissolve faster.

Disinfect the stopper of the medication vial with an alcohol pad. Allow the stopper to dry completely. Draw up the prescribed amount of medication. Read the medication label as you select the medication, as you draw it up, and after you've drawn it up *to verify the correct dosage.*

Don't change the needle between drawing up the medication from a vial and injecting it into the patient unless it becomes damaged or contaminated. Cover the needle with the needle sheath.[11]

Store all multidose vials according to the manufacturer's guidelines.

- Perform hand hygiene.[19][20][21][22][23]
- Confirm the patient's identity using at least two patient identifiers.[7][31]
- Provide privacy.[32][33][34]
- Explain the procedure to the patient and family (if appropriate) according to their individual communication and learning needs *to increase their understanding, allay their fears, and enhance cooperation.*[7][35][36][37]
- If the patient is receiving the medication for the first time, teach the patient and family (if appropriate) about potential adverse reactions or other concerns related to the medication.[15][17]
- Verify that you're administering the medication at the proper time, in the prescribed dose, and by the correct route *to reduce the risk of medication errors.*[15][16][17]
- If your facility uses bar-code technology, use it as directed by your facility.

◆ ***Clinical alert:*** Some medications administered by IM injection may be considered high-alert medications *because they can cause significant patient harm when used in error*.[38][39] Note that medical assistants don't administer most high-alert medications, including narcotics and chemotherapeutic agents, unless they're permitted by their state's scope of practice and they have received additional training.[4] ◆

- If required by your facility, before administering a high-alert medication, have another qualified team member perform an independent double-check *to verify the patient's identity and make sure that you have the correct medication in the prescribed strength or concentration, the medication's indication corresponds with the patient's diagnosis, the dosage calculations are correct and the dosing formula used to derive the final dose is correct, the prescribed route of administration is safe and proper for the patient, and the prescribed time and frequency of administration are safe and proper for the patient.*[38][39]
- After comparing results of the independent double-check with the qualified team member (if required), administer the medication if there are no discrepancies. If discrepancies exist, rectify them before administering the medication.[38]
- Perform hand hygiene.[19][20][21][22][23]
- Put on gloves if contact with blood or body fluids is likely or your skin or the patient's skin isn't intact. *Note thatroutine IM injections don't require gloves because gloves don't protect against needlestick injury*.[40]
- Select an appropriate injection site. The ventrogluteal site is safest for large-volume IM injections in adults, although you may use the deltoid muscle for a small-volume injection (2

mL or less).[1] (See *Locating IM injection sites*.) Always remember to rotate injection sites for patients who require repeated injections.[6] [7] [10] [11]

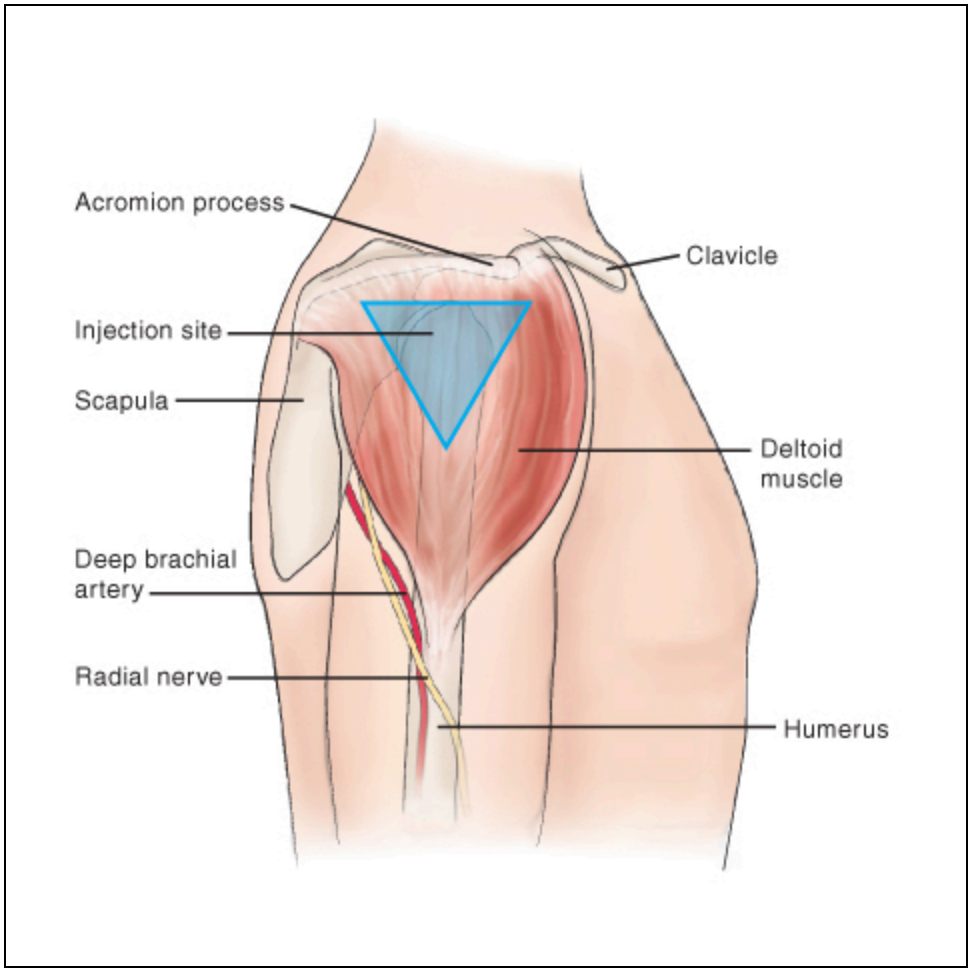
◆ ***Clinical alert:*** If you use the ventrogluteal site, take care to identify anatomic landmarks before administration. Use of the dorsogluteal site isn't recommended by guidelines *because of potential nerve damage.*[1] ◆

LOCATING IM INJECTION SITES

Use the techniques illustrated below to locate intramuscular (IM) injection sites.

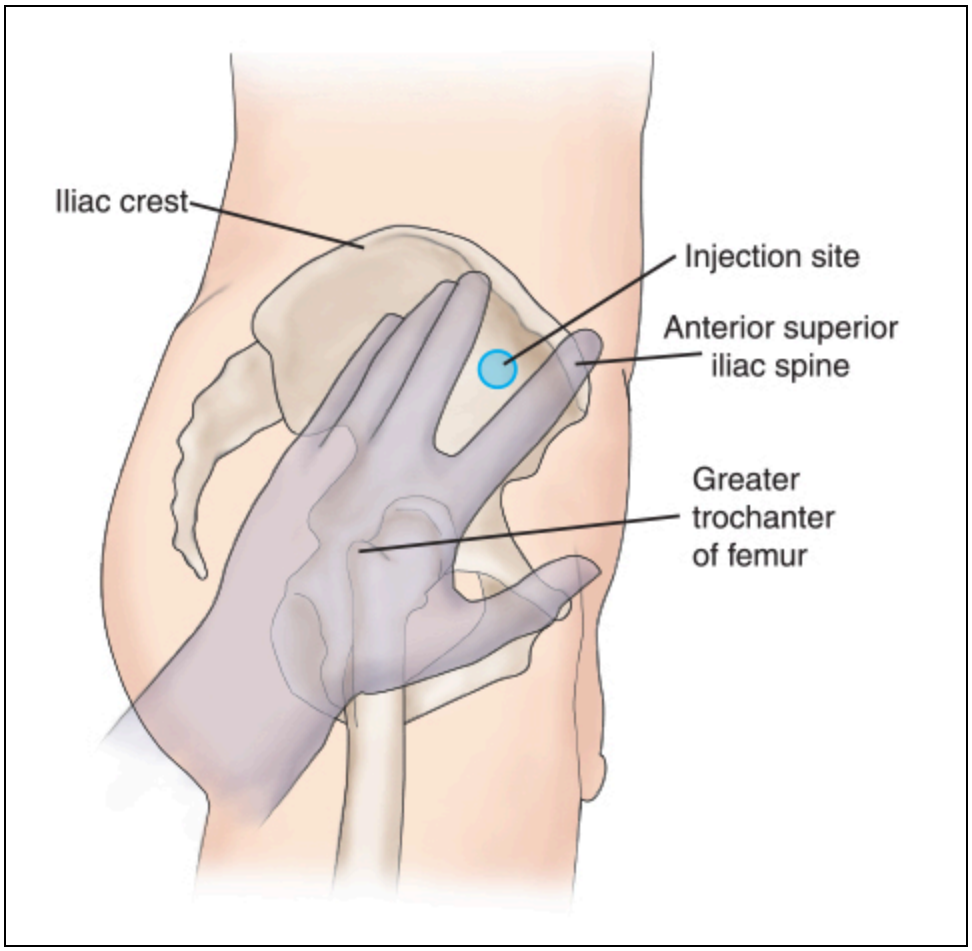
Deltoid

To identify the correct injection site for IM injection into the deltoid muscle, have the patient sit or stand. Find the lower edge of the acromion process and the point on the lateral arm in line with the axilla (shown below). Insert the needle 1" to 2" (2.5 to 5 cm) below the acromion process, usually two or three fingerbreadths, at a 90-degree angle or angled slightly toward the process. The maximum injection volume for this area is 2 mL.[1]



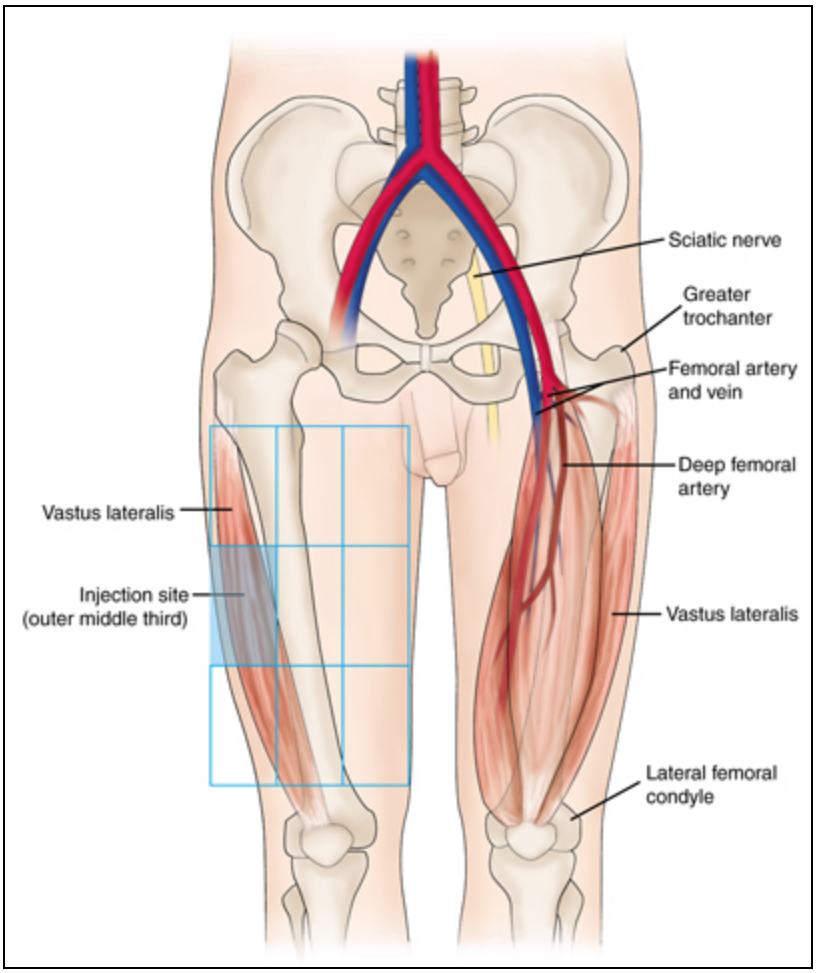
Ventrogluteal

To identify the correct injection site for IM injection into the ventrogluteal muscle, have the patient sit, stand, lie laterally, or lie in a supine position. Locate the greater trochanter of the femur with the heel of your hand. Then spread your index and middle fingers from the anterior superior iliac spine to as far along the iliac crest as you can reach (as shown below). Insert the needle between your two fingers at a 90-degree angle to the muscle. (Remove your fingers before inserting the needle.) The maximum injection volume for this area is 5 mL.[1]



Vastus lateralis

To identify the correct injection site for IM injection into the vastus lateralis muscle, have the patient sit or lie in a supine position. Ask the patient to flex the knee slightly and internally rotate the foot, if possible, *to relax the muscle and reduce pain.*[8] Use the lateral muscle of the quadriceps group, from a handbreadth below the greater trochanter to a handbreadth above the knee (shown below). Insert the needle into the middle third of the muscle parallel to the surface the patient is lying on. The maximum injection volume for this area is 5 mL.[1]



- Position and drape the patient appropriately, making sure the site is well exposed (as shown below) and that lighting is adequate.

- After selecting the injection site, clean the skin with an alcohol pad (as shown below). Move the pad outward in a circular motion to a circumference of about 2" (5 cm) from the injection site and then allow the skin to dry.[3] [40]

- Remove the needle sheath.
- With the thumb and index finger of your nondominant hand, gently displace the skin and subcutaneous tissue of the injection site by pulling the skin laterally for the Z-track technique.[1] [3] [4] [7]
- Position the syringe at a 90-degree angle to the skin surface with the needle a couple of inches from the skin. Tell the patient to expect to feel a prick as you insert the needle.
- With your dominant hand, insert the needle quickly and smoothly through the skin and subcutaneous tissue, deep into the muscle at a 90-degree angle.[1] [3] [7]
- Support the syringe with your nondominant hand (if desired).
- Inject the medication slowly into the muscle. *A slow, steady injection rate makes IM injections less painful, regardless of the volume or type of medication.*[1] Expect to feel little or no resistance against the force of the injection.
- After the injection, wait 10 seconds before removing the needle.[7] Then withdraw the needle at a 90-degree angle.[1] [3] If present, activate the needle's safety mechanism *to prevent accidental needlestick injury.*[27]
- Release the displaced skin and subcutaneous tissue *to seal the needle track.*
- Immediately cover the injection site with a gauze pad and apply gentle pressure (as shown below).

- Remove the gauze pad and inspect the injection site for signs of active bleeding or bruising. If bleeding continues, apply pressure to the site.
- Apply an adhesive bandage, as necessary.
- Monitor the patient for adverse reactions after the injection.[41]

◆ ***Older adult alert:*** An older adult patient may bleed or ooze from the site after the injection *because of decreased tissue elasticity.* Applying a small pressure bandage may be helpful.◆

- Discard used supplies in appropriate receptacles. Don't recap needles. Discard needles and syringes in a puncture-resistant sharps container *to avoid needlestick injuries.*[27]
- Remove and discard your gloves and other personal protective equipment, if worn.
- Perform hand hygiene.[19] [20] [21] [22] [23]
- Document the procedure.[42] [43] [44]

Special Considerations

- The Joint Commission issued a sentinel event alert concerning the transmission of pathogens related to the misuse of vials that have caused viral and bacterial infections, including hepatitis B, hepatitis C, meningitis, and epidural abscesses. These infections have been attributed to the reuse of single-dose vials that don't typically contain preservatives, reentering multidose vials with used syringes and needles, and using multidose vials for multiple patients. To prevent these infections, follow evidence-based best practices, such as disinfecting the vial's rubber stopper before piercing, using single-dose vials only once and then discarding the vial, dedicating multidose vials to a single patient, and using a new syringe and needle when reentering a multidose vial. Assign the appropriate "beyond-use" date when first entering a multidose vial, and store multidose vials as directed by your facility and according to the manufacturer's instructions.[30]
- Some drugs for IM administration are dissolved in oil or other special solutions *to slow their absorption*. Mix these preparations well before drawing them into the syringe.
- Although not routinely recommended, aspiration for blood return may be indicated for IM injection of certain medications. Consult the medication's prescribing information before

administration.[45]

- Keep a rotation record that lists all available injection sites divided into various body areas for a patient who requires repeated injections. Rotate from a site in the first area to a site in each of the other areas. Then return to a site in the first area that's at least 1" (2.5 cm) away from the previous injection site in that area.
- If the patient experienced pain or emotional trauma from repeated injections, consider numbing the area before cleaning it by holding ice on it for several seconds.
- Always encourage the patient to relax the muscle you'll be injecting *because injections into tense muscles are more painful and may bleed more easily.*
- Note that IM injections can damage local muscle cells, causing elevations in serum enzyme levels (creatine kinase [CK]) that can be confused with elevations resulting from damage to cardiac muscle, as in MI. *To distinguish between skeletal and cardiac muscle damage,* diagnostic tests for suspected MI must identify the isoenzyme of CK specific to cardiac muscle (CK-MB) and include tests to determine lactate dehydrogenase and aspartate aminotransferase levels. If it's important to measure these enzyme levels, suggest that the practitioner switch to IV administration and adjust dosages accordingly.
- If you aren't going to administer the medication immediately, label the medication syringe clearly *to prevent a medication error.* An immediately administered medication is one that is prepared, taken directly to the patient, and administered without any break in the process.[46] Don't draw a vaccine dose into a syringe until immediately before administration.[11] (See the "Immunization [vaccine] guidelines, ambulatory care" procedure.)
- Know that dosage adjustments are usually necessary when changing from the IM route to the oral route.

Patient Teaching

If the patient will self-administer IM injections at home, teach the patient about the medication and the technique for properly preparing and administering the injection. Have the patient perform a return demonstration *to determine medication administration competency.*

Complications

Complications associated with intramuscular injection may include:

- abscess formation
- pain
- inflammation
- muscle fibrosis and contracture
- tissue necrosis
- nerve injury
- infection
- hematoma
- intravascular injection
- injury to bone or blood vessels[1][2][7]
- adverse reaction to the prescribed medication.

◆ ***Older adult alert:*** Because older adult patients have decreased muscle mass, they can absorb IM medications more quickly than expected.◆

Documentation

Documentation associated with intramuscular injection includes:

- medication administered
  - medication name
  - medication strength
  - dose
  - route of administration
  - date and time of administration
  - injection site
  - lot number and expiration date (if appropriate)
- adverse reactions
  - name of practitioner notified
  - date and time of notification
  - prescribed interventions
  - response to those interventions[47]
- teaching provided to the patient and family (if applicable)
  - understanding of that teaching
  - follow-up teaching needed.

See also *Documenting administration of controlled substances*.

DOCUMENTING ADMINISTRATION OF CONTROLLED SUBSTANCES

Some facilities use a computerized system that confirms the opioid count for each drug as it's used or removed from the system via a secure identification code, which eliminates the need for opioid counts during the day.[48]

Regardless of the system you use, always verify the amount of drug in the container and sign out the medication as required by your facility before administering a controlled substance, according to your role and scope of practice.

If you must waste part of a dose of a controlled substance, another regulation requires that a second qualified team member document your activity and observe you.[48]

What to report

If you discover a discrepancy in the controlled substance count, report it as required by your facility. You'll need to file an occurrence report as well. An investigation will follow.

This procedure has been co-developed and reviewed by the American Academy of Ambulatory Care Nursing.

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Related Procedures

- Chemotherapy administration, intramuscular (IM)
- Hepatitis B vaccine administration, neonate
- Intramuscular injection
- Intramuscular injection, home care
- Intramuscular injection, neonate
- Intramuscular injection, pediatric
- Intramuscular injection, pediatric, ambulatory care

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(Rating System for the Hierarchy of Evidence for Intervention/Treatment Questions)

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Rating System for the Hierarchy of Evidence for Intervention/Treatment Questions

The following leveling system is adapted from *Evidence-Based practice in nursing & healthcare: A guide to best practice,* Fifth edition, by Bernadette Mazurek Melnyk and Ellen Fineout-Overholt (2023).

Level I	Evidence from a systematic review or meta-analysis of all relevant randomized controlled trials (RCTs)
Level II	Evidence from well-designed single RCTs (experimental)
Level III	Evidence from well-designed nonrandomized controlled trials (quasi-experimental), systematic reviews of a complete body of evidence, and intervention studies using mixed methods

Level IV	Evidence from well-designed case-control and cohort studies (observational)
Level V	Evidence from systematic reviews of qualitative and descriptive studies
Level VI	Evidence from single descriptive and qualitative studies, evidence-based practice implementation, and quality improvement projects
Level VII	Evidence from expert opinion, expert committee reports, and literature reviews

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