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## Intramuscular injection techniques

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### Summary

The administration of intramuscular (IM) injections is an important part of medication management and a common nursing intervention in clinical practice. A skilled injection technique can make the patient's experience less painful and avoid unnecessary complications.

### Author

Janet Hunter is lecturer in adult nursing, City Community and Health Sciences, incorporating St Bartholomew School of Nursing and Midwifery, City University, London. Email: [j.a.hunter@city.ac.uk](mailto:j.a.hunter@city.ac.uk)

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THE NURSING and Midwifery Council's (NMC's) (2007) *Standards for Medicines Management* state that administration of medicines 'is not solely a mechanistic task to be performed in strict compliance with the written prescription of a medical practitioner (now independent/supplementary prescriber). It requires thought and the exercise of professional judgement.' Therefore, the administration of intramuscular (IM) injections requires the healthcare practitioner to possess the knowledge and rationale of the guiding principles that underpin these clinical skills. It is essential that all aspects of these techniques – anatomy, physiology, patient assessment, preparation and nursing interventions – are evidence based so that the nurse can perform safe and accountable practice (Shepherd 2002, NMC 2007). The aim of this article is to update the nurse's knowledge and skills on injection techniques. This article describes the practical, step-by-step approach for administering IM injections, which will assist nurses to perform this skill safely and competently.

### Intramuscular injections

An IM injection is chosen when a reasonably rapid systemic uptake of the drug (usually within 15-20 minutes) is needed by the body and when a relatively prolonged action is required. The amounts of solution that can be given will depend on the muscle bed and range from 1-5ml for adults. Much smaller volumes are acceptable in children (Rodger and King 2000, Corben 2005).

The medication is injected into the denser part of the muscle fascia below the subcutaneous tissues. This is ideal because skeletal muscles have fewer pain-sensing nerves than subcutaneous tissue and can absorb larger volumes of solution because of the rapid uptake of the drug into the bloodstream via the muscle fibres. This means that IM injections are less painful when administered correctly and can be used to inject concentrated and irritant drugs that could damage subcutaneous tissue (Rodger and King 2000, Greenway 2004). Examples of drugs administered via this route are analgesics, anti-emetics, sedatives, immunisations and hormonal treatments.

It is important to recognise and understand potential complications associated with IM injections and that rapid absorption of the drugs may increase these risks (Foster and Hilton 2004). The administration of any medication can present a risk and, therefore, the nurse must be able to recognise the signs of an anaphylactic (allergic) reaction, with signs of, for example, urticaria, pruritus, respiratory distress, shock or even cardiac arrest. Inappropriate selection of site and poor technique can increase the risk of patient injury and lead to pain, nerve injury, bleeding, accidental intravenous administration and sterile abscesses caused through repeated injections at one site with poor blood flow (Rodger and King 2000).

### Intramuscular injection sites

There are five sites that can be considered for IM

injections (Figure 1). The two recommended sites for IM injections are the vastus lateralis and the ventrogluteal sites (Donaldson and Green 2005, Nisbet 2006). However, when the patient is obese, the vastus lateralis is a better option (Nisbet 2006).

When choosing an appropriate site for administration, the nurse needs to ensure that the medication will be absorbed. The nurse needs to consider whether the patient is receiving regular IM injections because the site will need to be rotated to avoid irritation, pain and sterile abscesses. Choice will also be influenced by the patient's physical condition and age. Active patients are more likely to have a greater muscle

mass than older or emaciated patients, so individuals will need to be assessed to see if they have sufficient muscle mass. If not, the muscles may need to be 'pinched' up before the injection (Workman 1999, Rodger and King 2000). Any area or presence of inflammation, swelling or infection should be avoided (Workman 1999).

### Patient preparation

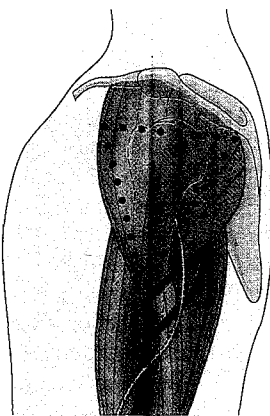
It is important to explain the procedure so that the patient fully understands and is able to give his or her informed consent and co-operation. The discussion should include the choice of site for the injection and information about the medication, action and side effects. The patient can then express any concerns or anxieties relating to the procedure and the patient's knowledge can be

**FIGURE 1**

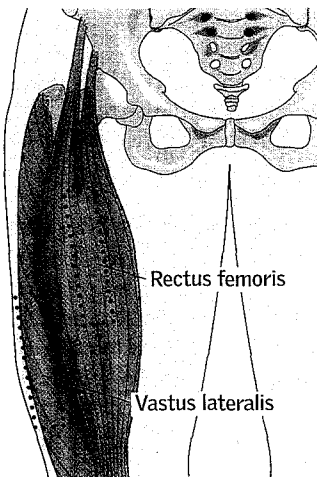
### Sites for intramuscular injections (IM)

#### Mid-deltoid site

The mid-deltoid site is easily accessible but due to the size of the muscle the area should not be used repetitively and only small volumes should be injected. The maximum volume should be 1ml (Rodger and King 2000). The denser part of the deltoid must be used. It is useful to visualise a triangle whereby the horizontal line is located 2.5-5cm below the acromial process and the mid-point of the lateral aspect of the arm in line with the axilla forms the apex. The injection is given about 2.5cm down from the acromial process, avoiding the radial and brachial nerves (Workman 1999, Rodger and King 2000).



1-5ml can be injected, although for infants this would be 1-3 ml. The rectus femoris is a large and well-defined muscle and is the anterior muscle of the quadriceps. It is located halfway between the superior iliac crest and the patella (Workman 1999).

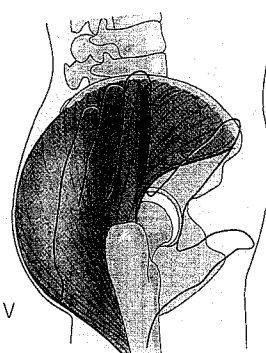


#### Vastus lateralis site

The vastus lateralis site: used for deep IM and Z-track injections. Up to 5ml can be administered (Rodger and King 2000). The muscle forms part of the quadriceps femoris group of muscles and is located on the outer side of the femur. It is found by measuring a hand's breadth from the greater trochanter and the knee joint, which identifies the middle third of the quadriceps muscle (Workman 1999). There are no major blood vessels or structures which could cause an injury in this area (Rodger and King 2000).

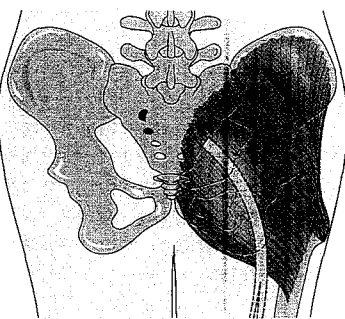
#### Ventrogluteal site

This site is used for deep IM and Z-track injections. This site is located by placing the palm of the nurse's hand on the patient's opposite greater trochanter (for example, the nurse's right palm on the patient's left hip), then extending the index finger to the anterior superior iliac spine to make a 'V'. The injection is then given into the gluteus medius muscle, which is the centre of the V (Workman 1999, Rodger and King 2000).



#### Dorsogluteal site

This area is used for deep IM and Z-track injections. Up to 4ml can be injected into this muscle (Workman 1999, Rodger and King 2000). Commonly referred to as the outer upper quadrant, it is located by using imaginary lines to divide the buttocks into four quarters. To identify the gluteus maximus, picture a line that extends from the iliac spine to the greater trochanter of the femur. Draw a vertical line from the midpoint of the first line to identify the upper aspect of the upper outer quadrant. This location avoids the superior gluteal artery and sciatic nerve (Workman 1999, Small 2004).



#### Rectus femoris site

This site is used for deep IM and Z-track injections. Between

evaluated. It is important to check whether the patient has any known allergies to identify potential reactions to the medication.

**Preparation of the equipment** All the necessary equipment should be prepared before commencing the procedure to avoid any delays or interruptions during the procedure. The equipment required for administering IM injections is listed in Box 1 and preparation of the equipment is described in Box 2. The techniques used for administering IM injections are outlined in Box 3.

## Skin cleansing

There are inconsistencies regarding skin preparation for IM injections. It is known that cleansing the injection site with an impregnated alcohol swab before an IM injection reduces the number of bacteria on the skin (Workman 1999, Lister and Sarpal 2004). However, if the injection is given before the skin is dry this procedure is ineffective and the patient may experience pain and a stinging sensation from the antiseptic. This may allow entry of bacteria into the injection site and cause local irritation (Workman 1999, Lister and Sarpal 2004). Therefore, when using

an alcohol swab to prepare the skin it should be used for 30 seconds and then allowed to dry (Lister and Sarpal 2004). Some local policies no longer recommend skin cleansing if the patient's skin is physically clean (Little 2000, Wynaden *et al* 2005) and the nurse maintains the required standard of hand washing and asepsis during the procedure (Workman 1999).

### BOX 1

#### Equipment for intramuscular injections

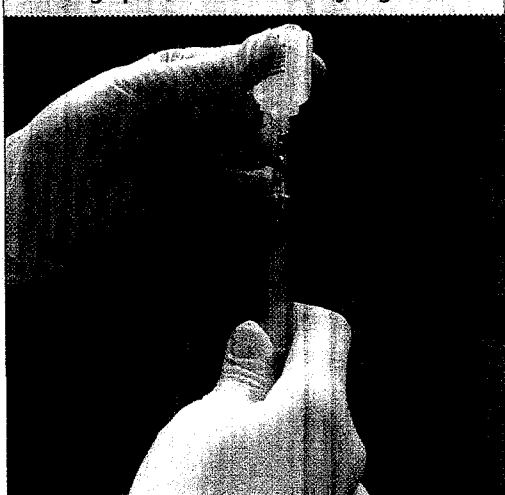
1. Prescription chart.
2. Prescribed drug to be administered.
3. If required, diluent for reconstitution.
4. Clean tray or receiver for equipment.
5. Syringe of appropriate size (2-5ml).
6. Sterile 21G (green) needle for adult patients.
7. Alcohol-impregnated swab with isopropyl alcohol 70%.
8. Gloves.
9. Tissue or clinical wipe.
10. Clinical sharps container.

### BOX 2

#### Preparation for intramuscular (IM) injection administration

The following steps describe the procedure when preparing the equipment for an IM injection.

- ▶ Wash and dry hands thoroughly with bactericidal soap and water or use bactericidal handrub to prevent any contamination of the equipment or medication. Put on gloves. Gloves are required for all invasive procedures including IM injection (Pratt *et al* 2007). Check the patient's prescription chart and determine the:
  - Drug that is to be administered.
  - Required dose.
  - Route for administration.
  - Date and time of administration.Prescription is legible and signed by an authorised prescriber. These actions ensure that any risk to the patient is minimised and that the patient is given the right dose of medication at the correct time by the prescribed route (Jamieson *et al* 2002, Lister and Sarpal 2004). If any errors are noticed withhold the medication and inform the medical team.
- ▶ Check the drug against the prescription chart. As all medications deteriorate over time, check the expiry date – this shows when a drug will no longer be guaranteed to be effective.
- ▶ To prepare the syringe for medication:
  - (a) Check all packaging is intact to retain sterility. Check the expiry date. If any packaging is damaged or has expired, discard.
  - (b) Open the packaging of the syringe at the plunger end and remove the syringe. Make sure that the plunger moves freely inside the barrel. Take care not to touch the nozzle end to prevent contamination.
  - (c) Open the needle packaging at the hilt (coloured) end. Hold the syringe in one hand and then attach the needle firmly onto the nozzle of the syringe. Loosen the sheath but do not remove it. Place the syringe on the tray. This prevents contamination or any potential injuries.
- ▶ Examine the solution in the ampoule for cloudiness or sedimentation. This may show that the medication is contaminated or unstable. Make sure that all the contents are in the bottom of the ampoule by tapping the neck gently. To prevent injury, splashing or contact with the medication use a clinical wipe or tissue to cover the neck of the ampoule and break it open. Observe the solution for any glass fragments because these pose a risk to the patient if injected. Discard the ampoule and contents if any foreign matter is visible. If you are using a plastic ampoule, break the top off, making sure not to touch the top.
- ▶ Pick up the syringe and allow the sheath to fall off the needle onto the tray and insert the needle into the solution of the ampoule. Avoid scraping the needle on the bottom of the ampoule, because this will blunt the needle.
- ▶ Pull back the top of the plunger with one finger on the flange and draw up the required dose. It may be necessary to tilt or hold the ampoule upside down to make sure the needle remains in the solution to prevent drawing in air (Figure 2). Take care not to contaminate the needle.
- ▶ Re-sheath the needle carefully using the aseptic non-touch technique to maintain sterility (Figure 3).
- ▶ Expel the air. Hold the syringe upright, at eye level and let any air rise to the top of the syringe. To encourage air bubbles to rise, lightly tap the barrel of the syringe. Slowly, push the plunger to expel the air until the solution is seen at the top of the needle.

**FIGURE 2**
**Drawing up solution into the syringe**

**Needles**

Re-sheathing a needle before the medication is administered to a patient is safe. This method is achieved by using the aseptic non-touch technique (Figure 3) and prevents droplets of the medication from being sprayed onto the skin or inhaled when air is being expelled from the syringe (Nicol *et al* 2004).

When giving an IM injection a 'green' or size 21 gauge needle is used for all adult patients to ensure that the medication is injected into the muscle. This also applies to patients who are cachectic or thin, except that the needle is not inserted as deeply. If a smaller gauge needle is used the nurse needs to apply more pressure to inject the solution, which will increase the patient's discomfort (King 2003).

**Single and multi-dose powder vials**

Some medications come in single or multi-dose vials and need to be reconstituted before being drawn up and injected. This method

**BOX 3**
**Intramuscular (IM) injection technique**

The following steps should be undertaken when administering IM injections to patients:

- ▶ Take the tray with the syringe, ampoule, impregnated alcohol swab, tissue, prescription and sharps container to the patient's bedside. Re-check the prescription and medication with the patient's name band according to local policy. Draw the curtains for privacy and assist the patient into a comfortable position to allow access to the injection site and to make sure that the identified muscle group is flexed and relaxed.
- ▶ Clean the skin with an impregnated alcohol swab for 30 seconds and then allow to dry to minimise the risk of infection (Lister and Sarpal 2004), or alternatively it should be cleansed in accordance with local policy.
- ▶ With the non-dominant hand stretch the skin slightly over the chosen injection site to displace the underlying subcutaneous tissues and to aid the insertion of the needle.
- ▶ With the dominant hand hold the syringe like a dart. Having informed the patient, quickly and firmly in a 'dart-like' motion insert the needle into the patient's skin at a 90° angle until approximately 1cm of the needle is left showing (Nicol *et al* 2004, Corben 2005) (Figure 4).
- ▶ Hold the skin with the ulnar edge of the hand and with the thumb and index finger hold the coloured part of the needle to maintain stability and prevent movement.
- ▶ Withdraw the plunger slightly to confirm that the needle is in the correct position and has not entered a blood vessel. If blood is not present, depress the plunger and carefully inject the solution at a rate of 1ml per 10 seconds until the syringe is empty to allow the tissues to expand and absorb the solution (Workman 1999, Lister and Sarpal 2004). This rate also reduces patient discomfort. If blood is present, stop the procedure and withdraw the needle and syringe. Start again with new equipment and drug and explain to the patient what has happened to reduce patient anxiety.
- ▶ Wait ten seconds to allow the drug to diffuse into the tissues then quickly and smoothly withdraw the needle. Use a tissue to apply pressure to the injection site or until any bleeding ceases. It is not necessary to massage the area because this may cause the drug to leak from the injection site and cause local irritation (Rodger and King 2000).
- ▶ Discard the needle and syringe immediately into the sharps container to prevent any injury. Do not re-sheath the needle. Remove gloves and wash hands.
- ▶ Record the administration of the medication on the prescription chart to show that the drug has been given. Report any abnormalities or complications.
- ▶ Replace any clothing and make sure that the patient is comfortable. Return to the patient after 15-20 minutes to observe and check the effectiveness of the medication, especially anti-emetics and analgesics. Observe the injection site within two to four hours for signs of local irritation (Rodger and King 2000).

involves some key principles to ensure safe practice.

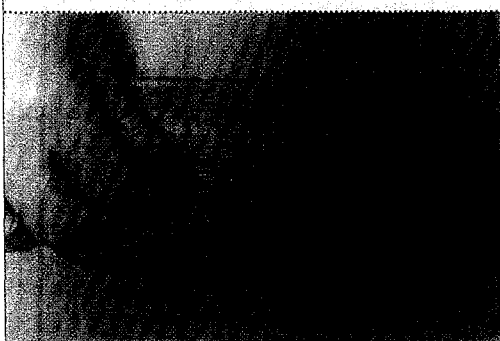
- ▶ Before reconstituting any medication, the nurse should first read the manufacturer's information sheet.
- ▶ It is important that the powder is at the bottom of the vial so that all the medication is dissolved.
- ▶ The cap must be cleaned with an alcohol-impregnated swab and allowed to dry to prevent bacterial contamination.
- ▶ It is vital that the correct volume of diluent is used according to the manufacturer's recommendations to provide the most therapeutic concentration.
- ▶ The diluent should be injected slowly into the vial so that the powder is wet before mixing.
- ▶ When mixing, ensure the needle remains inside the vial to maintain sterility. If there is pressure in the vial hold the plunger down while doing this to avoid the separation of the needle and syringe from the vial (Nicol *et al* 2004). To mix the medication, agitate or roll the vial until the powder has dissolved. For some powder multi-dose vials, a needle is inserted into the cap before adding the diluent because this allows air to escape and releases the vacuum in the vial. Then with a second needle and syringe, inject the diluent into the vial. Remove the needle and syringe and place a sterile swab over the venting needle to prevent contamination of the drug and the atmosphere. Agitate or roll the ampoule until the powder has dissolved (Jamieson *et al* 2002, Lister and Sarpal 2004). All solutions need to be inspected for precipitation and cloudiness. Continue to agitate until the powder and diluent have fully mixed to form a solution.
- ▶ To draw up the drug, hold the ampoule upside down to avoid drawing in air, insert the needle so that it is below the level of the solution and pull back the plunger to withdraw the correct amount of solution. For multi-dose vials, clean the cap with an impregnated alcohol swab and allow to dry before inserting the needle and syringe to prevent bacterial contamination.

### The Z-track technique

The literature suggests two methods for administering IM injections. The first has already been outlined and the second method involves the Z-track technique. It is recommended that this technique should be used for many IM injections because it causes less discomfort and prevents leakage from the needle site (Rodger and King 2000).

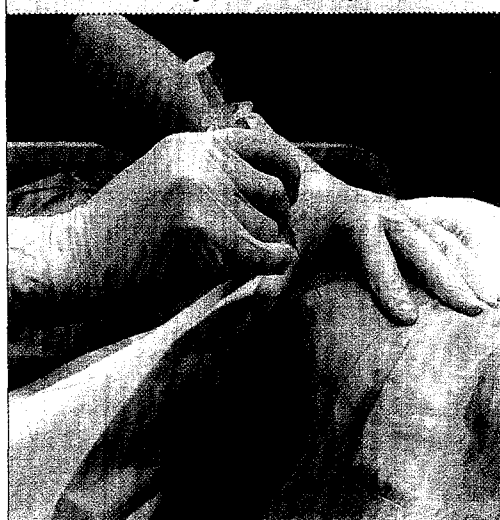
**FIGURE 3**

#### Non-touch technique



**FIGURE 4**

#### Intramuscular injection technique



Using the non-dominant hand, pull the skin 2-3cm sideways or downwards from the injection site. This action causes the skin and subcutaneous tissues to slide over the underlying muscle by 1-2cm. With the dominant hand, hold the needle at a 90° degree angle above the injection site and quickly pierce the skin in a dart-like motion until 1cm of the needle is left. Aspirate for blood, if no blood is withdrawn then slowly inject the medication (1ml per 10 seconds) and hold in place for 10 seconds. Withdraw the needle quickly and release the tension on the skin. This causes the tissues to return to their original position to create a disjointed pathway and seals the injection entry point to prevent the medication from seeping into the subcutaneous tissues or from leaking out through the injection site (Workman 1999, Rodger and King 2000, Jamieson *et al* 2002).

### General principles for practice

To provide a safe standard of practice, nurses should adhere to local policies, procedures and

guidelines for their organisation. These will provide guidance on whether one or two nurses are required to check the medication for the procedure. Only registered nurses may administer medications unsupervised. It is essential that nursing students are supervised by a registered nurse so that they can develop safe and competent practice. A registered nurse must countersign any documentation signed by a nursing student (NMC 2007).

Hands must be washed and dried thoroughly before starting this procedure and immediately afterwards. Gloves should be worn during all invasive procedures such as IM drug administration (Pratt *et al* 2007). Gloves help to prevent cross-infection and drug-induced allergies, which occur through contact with the skin. Gloves do not protect the nurse from needlestick injury so careful and immediate disposal of all sharps is essential following administration (Workman 1999).

## Conclusion

Although IM injection is considered a routine procedure, it is a valuable and necessary skill for nurses. To provide safe practice and ensure accurate and therapeutic drug administration, the nurse should use clinical judgement when choosing the injection site, understand the relevant anatomy and physiology, as well as the principles for administering an IM injection.

The actions of the nurse can enhance the physical and emotional experience of the patient which, in turn, influences the nurse's confidence. Nurses should regularly update their knowledge and skills and be cognisant with, and adhere to, the organisation's local policies, procedures and guidelines. The revised and renamed *Standards for Medicines Management* (NMC 2007) provide standards by which the administration of medications should be performed and act as a benchmark to measure performance in clinical practice.

This article has emphasised the principles of best practice when administering IM injections, accompanied with a rationale to encourage nurses to practise safely and competently **NS**

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