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# Drawing up and administering intramuscular injections: a review of the literature

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**Drawing up and administering intramuscular injections: a review of the literature**

Intramuscular (IM) injections have been an integral part of drug administration in nursing practice for almost half a century. However, there are some conflicting practices which warrant investigation to determine their effectiveness in this aspect of patient care. To this end, this paper presents the results of a literature review which was carried out in order to establish current understanding of present day knowledge, procedures and guidelines for the administration of IM injections. Areas addressed within this review include injection sites used, injuries associated with IM injections, issues surrounding needle selection and volume administered through IM injections, injection techniques and nursing skills associated with IM injections. Synthesis of the research reviewed allows the development of research-based guidelines for this skill. These guidelines offer a framework for nurses who wish to provide practice in line with current research into the process of drawing up and administration of intramuscular injections.

*Keywords:* intramuscular injections, evidence-based nursing practice

## INTRODUCTION

Smith & Duell (1988) and Winslow (1996), suggest that the teaching of IM injections has become an integral part of nursing syllabi. The literature review reported here was therefore undertaken in order to develop an understanding of present day knowledge, procedures and guidelines in the drawing up and administration of intramuscular injections to inform both practice and nurse education. Several databases were employed (CINAHL

and MEDLINE) to develop an initial reference list. This was followed by a study of clinical nursing texts and cross-referencing of the articles to identify any gaps in the literature.

Within this paper, central themes such as drug administration, injection sites used, issues surrounding technique, nursing skills and problems associated with IM injections are reviewed. Despite a number of discrepancies between authors, the review provides sufficient consensual evidence for the establishment of clinical guidelines for the drawing up and administration of IM injections. It is suggested that further studies will be required to determine the extent to which nurses adhere to research-based guidelines in this field.

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## ROUTES OF DRUG ADMINISTRATION

Parenteral medication refers to medication given by routes other than oral, topical or inhalation and thus encompasses drugs given intradermally, subcutaneously, intramuscularly or by intravenous (IV) infusion (Berger & Williams 1992). [John & Stevenson \(1995 p. 1194\)](#) state that 'by choosing the most appropriate route for drug administration it is possible to optimize therapy'. Intramuscular injections tend to be utilized to administer medication requiring a relatively quick uptake by the body but with reasonably prolonged action. As with all drug prescriptions, medication dosage, time and method of administration should be checked with another nurse.

## INTRAMUSCULAR INJECTION SITES

[Newton et al. \(1992 p. 36\)](#) claim that 'properly administered, an IM injection deposits medication under the muscle fascia below the fatty subcutaneous layer'. These authors suggest that this skeletal muscle has fewer pain-sensing nerves than subcutaneous tissue, thus decreasing discomfort, and that larger volumes of drug can be injected due to the rapid uptake into the bloodstream through muscle fibres. Further, [Craven & Hirnle \(1996 p. 622\)](#) contend that 'site choices are influenced by the age of the client, the medication to be injected, the amount of medication to be injected and the general condition of the client'. Damaged or scarred tissue, poor muscle mass or tone and accessibility or mobility factors may also contra-indicate a particular site ([Hahn 1990](#), [Newton et al. 1992](#), [Covington & Trattler 1997](#)).

Numerous authors including [Mallet & Bailey \(1996\)](#), [Kozier et al. \(1993\)](#) and [Craven & Hirnle \(1996\)](#) suggest that there are five sites that can be utilized for the administration of IM injections. Nurse educators would appear to teach from one to all of these sites. We contend that it is incumbent on educationalists to present current research evidence on the use of all five sites for IM injections. An understanding of each of the five sites is essential if nurses are to make informed decisions with regard to administration of IM injections. These sites (the deltoid, dorsogluteal, rectus femoris, vastus lateralis and ventrogluteal — see Figure 1 for diagrammatic display of sites) are described below.

### *The deltoid site*

Intramuscular injections into the mid-deltoid muscle, like other IM injections, should be given into the densest part of the muscle. This is located 'by drawing an imaginary horizontal line two to three finger breadths 2.5–5 cm below the lower edge of the acromion process' ([Craven & Hirnle 1996 p. 622](#)). The injection should be given into an imaginary triangle whose base is the central half of this

horizontal line and whose apex is formed inverted on the midpoint of 'the lateral aspect of the arm in line with the axilla' ([Kozier et al. 1993 p. 871](#)).

[Mallet & Bailey \(1996\)](#) state that due to the small area of this site, the number and volume of injections which can be given into it are limited. For example, vaccines which are usually small in volume tend to be administered into the deltoid site ([Mallet & Bailey 1996](#)).

### *The dorsogluteal site*

Often referred to as the upper outer quadrant, the method of dividing the buttock into four equal areas by drawing imaginary lines to bisect it vertically and horizontally has been utilized by many nurses over the years to locate this injection site. [Craven & Hirnle \(1996\)](#) suggest that the site is better located by palpating to find the greater trochanter and the posterior iliac spine, then injecting laterally and superior to the midpoint of an imaginary line joining these points.

The presence of major nerves and blood vessels, the relatively slow uptake of medication from this site compared with others and the thick layer of adipose tissue commonly associated with it, make this site problematic ([Bolander 1994](#), [Rosdahl 1995](#)).

Injury constitutes a major threat with the use of this area for IM injections. The sciatic nerve and superior gluteal artery lie only a few centimetres distal to the injection site, thus great care needs to be taken to identify landmarks accurately. 'Palpating the ileum and the trochanter is important; visual calculations alone can result in an injection that is placed too low and injures other structures' ([Kozier et al. 1993 p. 870](#)).

Injections should not be given into this area whilst the patient is standing ([Bolander 1994](#)). Similarly, [Rettig & Southby \(1982\)](#) conclude that patients should assume a prone or side lying position with the femur internally rotated to minimize pain at the injection site by relaxing the muscle group.

### *The rectus femoris site*

Located midway between the patella and superior iliac crest on the mid-anterior aspect of the thigh ([Bolander 1994](#)), this site incorporates a large and well-developed muscle. The uptake of drugs from this region is slower than from the arm but faster than from the buttock, thus facilitating better drug serum concentrations than is possible with the gluteal muscles ([Newton et al. 1992](#)).

The site may be utilized when other sites are contra-indicated or by clients who administer their own medication according to [Kozier et al. \(1993\)](#) as it is readily available in the sitting or lying back position. These authors and colleagues ([Berger & Williams 1992](#)), however, note that its main disadvantage is that injections into this area may cause considerable discomfort.

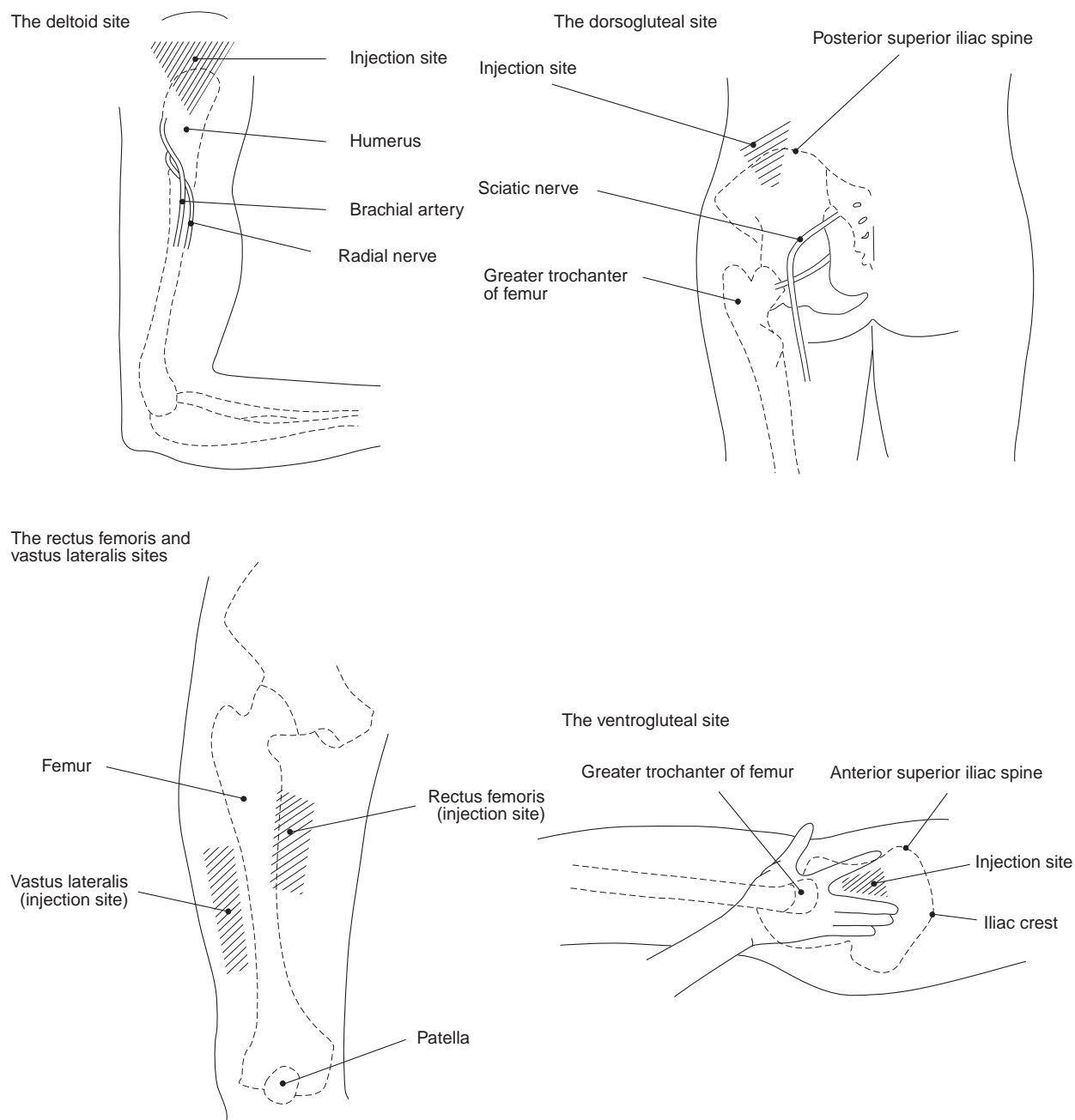


Figure 1 Intramuscular injection sites (illustration by Alison Tingle).

*The vastus lateralis site*

This muscle, like the rectus femoris, is associated with the quadriceps femoris group of muscles (Bolander 1994) and has similar absorptive properties (Craven & Hirnle 1996). For IM injection purposes, the lateral aspect of the thigh between the greater trochanter of the femur and the lateral femoral condyle of the knee, is divided into thirds with the middle third being used as the injection site.

One of the advantages of the vastus lateralis site, is its ease of access but more importantly there are no major blood

vessels or significant nerve structures associated with this site. The bulk of muscle tissue of non-atrophied patients in this region further reduces the likelihood of injury.

*The ventrogluteal site*

The ventrogluteal site was originally proposed as an appropriate IM injection site by Hochstetter (1954). This site is easily accessible for most patients and located as Kozier *et al.* (1993) suggest, by the nurse placing the heel of his/her opposing hand (i.e. right hand for left hip) on the client's greater trochanter. The index (second) finger of the hand is placed on the client's anterior superior iliac

spine and the middle finger stretched dorsally towards but below the iliac crest. The triangle formed by the index finger, the third finger and the crest of the ilium is the injection site.

The site provides the greatest thickness of gluteal muscle (consisting of both the gluteus medius and gluteus minimus), is free of penetrating nerves and blood vessels and has a narrower layer of fat of consistent thinness than is present in the dorsogluteal (Zelman 1961).

The ventrogluteal site has come to attract significant attention in the nursing literature and is seen by many as being the site of choice for IM injections (Beecroft & Redick 1990, Hahn 1990, Covington & Trattler 1997). However, Farley *et al.* (1986), in a study at a large midwestern (USA) teaching hospital involving the entire nursing population ( $n=875$ ), found that only 12% of nurses utilized this location. Furthermore, Cockshott *et al.* (1982) noted that nurses in their study only used the dorsogluteal site for IM injections. The extent to which the ventrogluteal site is used in the United Kingdom (UK) is unknown.

Craven & Hirnle (1996 p. 62) state that the site is not appropriate until around the age of 3 years and claim that for this age group, the rectus femoris should be 'the site of choice'. However, Kozier *et al.* (1993 p. 869) assert that the site is suitable for all patients, regardless of age and 'particularly suitable for immobilized clients whose dorsogluteal muscles may be atrophying'.

Research suggests that knowledge and use of appropriate sites reduces the likelihood of injuries identified with the giving of IM injections. Injuries associated with IM injections are numerous and it is incumbent on nurses to minimize this risk by making sound choices in practice.

### INJURIES ASSOCIATED WITH INTRAMUSCULAR INJECTIONS

Winslow (1996) claims that the ventrogluteal site is the only area for IM injections that does not appear to have any reported associated injuries. It could be argued that its relatively infrequent use by nurses (Farley *et al.* 1986) may have contributed to this finding. However, the site's uniform and minimal layering of adipose tissue (Michaels & Poole 1970), overlapping muscle structure providing depth of tissue for injection (Zelman 1961), and absence of major blood vessels or nerves (Craven & Hirnle 1996), may be more likely factors.

Reported injuries associated with sites other than the ventrogluteal for IM injections include contractures, palsy, peripheral nerve injury, local irritation, pain, infection, neuropathy, haematomas, bleeding, persistent nodules, arterial punctures, permanent damage to sciatic nerve resulting in paralysis, fibrosis, abscess, tissue necrosis, gangrene, and muscle contraction (Farley *et al.* 1986, Feldman 1987, Hahn 1990, Beyea & Nicoll 1995, Winslow 1996).

The ease of access, especially in out-patient settings for IM injections such as tetanus toxoid boosters (Newton *et al.* 1992), possibly adds to the frequency with which the deltoid site is used. Pain appears to be one of the most frequently reported complications associated with this site (Greenblatt & Allen 1978). However, its relatively small area and muscle mass, especially in atrophied patients, compounded by the close proximity of the radial nerve, brachial artery and bony processes to this site means that more substantial injuries may occur (Berger & Williams 1992, Rosdahl 1995).

In light of the literature, Beyea & Nicoll (1995, 1996) conclude that more research exploring nurses' interventions which reduce the likelihood of complications from IM injections is warranted. This research needs to focus not only on the prevention of complications but also on what is done to minimize these effects after they occur and promote healing. Important to effective administration are the choices made in relation to needle selection and determination of the volume that can be given into particular sites during IM injection. Similarly, monitoring of the site post-injection for early detection of trauma is important. Mallet & Bailey (1996) recommend observation of the injection site 2- to 4-hourly post-injection.

### ISSUES SURROUNDING NEEDLE SELECTION AND VOLUME ADMINISTERED FOR INTRAMUSCULAR INJECTIONS

For IM injections, Lenz (1983) advocates a technique known as the pinch test in order to determine the length of needle required to penetrate subcutaneous layers and deposit medication into the muscle group elected. For the deltoid and quadriceps group of muscles the arm or leg is 'pinched' between thumb and forefinger in a manner that allows the muscle to be palpated between thumb and finger. Lenz (1983) states that half the distance between thumb and forefinger plus (0.6–1.3 cm) to allow for the exposed hub of the needle on insertion, represents the length of the needle required.

The gluteus muscle groups are not easily 'grasped', therefore a slightly different technique needs to be employed. The thumb and forefinger are used to 'pinch' the skin and subcutaneous tissue. This time half the distance between thumb and forefinger should represent the depth of tissue to reach the muscle. The nurse then determines the extra length to penetrate well into the muscle mass and allow for the exposed hub. For frail patients this may only require a 1-inch needle but for very obese patients, Lenz (1983) argues, 4–6 inches or longer will be required.

Cockshott *et al.* (1982 p. 357), in analysing over 200 simulated injections to the dorsogluteal region by nurses, found through computerized axial tomography (CAT) scans of the sites that 'under 5% of the women and under

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