Recognizing the evidence and changing practice on injection sites

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Intramuscular injections: a review of best practice for mental health nurses

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Intramuscular injections: a review of best practice for mental health nurses

This paper reviews practice in the area of intramuscular (IM) injection administration, an everyday activity for many nurses in clinical practice. The authors address administration of neuroleptic depot drugs within the adult mental health environment and examine the evidence base for this practice. A historical overview of injection practices and use of the dorsogluteal site is given, followed by more contemporary evidence on the benefits of using the ventrogluteal, deltoid and thigh sites. The authors point out that despite being a very commonplace nursing activity, there is a dearth of research-based guidelines for nurses in this area. A quantity of published papers and nursing texts on injection sites and techniques were assessed to evaluate their quality and relevance and their overall benefit to improving clinical practice. Much of the literature available was in the form of opinion pieces without a sound research/evidence base. There appears, however, to be enough consensual evidence to form an evidence-based clinical guideline for the administration of IM injections. The review of the available evidence, albeit at times contradictory, is presented along with a discussion of the implications for nurses.

Keywords: depot neuroleptic injections, evidence-based practice guideline, injection sites, intramuscular injections

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Introduction

Despite the push for evidenced-based practice, many nursing practices are deeply rooted by tradition (Tarnow & King 2004). Since the 1960s, the administration of various therapeutic medicines by intramuscular (IM) injection has become a common practice for nurses (Greenway 2004). The authors of this paper review practice in relation to IM injection practices in order to raise awareness in relation to the injection sites utilized for IM injections; and to highlight best practice in regard to IM injection administration. The authors explored issues surrounding injection technique, nursing skills, problems associated with injection and drug administration with a particular focus on the mental health setting in light of the high number of 'depot' injections administered by mental health nurses. In the preparation of this paper, several databases were searched followed by a study of clinical nursing texts in addition to the utilization of findings from one author's dissertation (Murray 2003).

The review focused on published literature from 1960 to 2007. It should be noted that literature purely on IM injection technique was searched for in conjunction with the search for literature on the more specialist area of depot neuroleptic injection technique, as both were relevance to the area of interest of this review. The following electronic databases were searched: CINAHL, MEDLINE and EMBASE, using the keywords 'depot neuroleptic/injection technique'; inclusion criteria were articles which must have related to injection procedure in adults patients. A total of 44 articles were reviewed, dates back from the early 1960s (Zelman 1961, Lachman 1963) to more contemporary research-based literature (Chan *et al*. 2006, Wynaden *et al*. 2006). Many of the earlier articles reviewed were written as opinion pieces, written by reflective scholars or practitioners in the field, who have much to share with readers and despite not being scientific rigorous (owing largely to lack of evidence) are worthy of inclusion in this review. Sixteen nursing textbooks/clinical skills manuals from the more traditional fundamentals of nursing (Berger & Williams 1992) to the more contemporary basic nursing skills (Ellis & Bentz 2007), were perused to ascertain their recommended techniques relating to IM injection administration. The British National Formulary was also consulted. The literature reviewed was predominantly from Europe and North America and Australia. In regard to consultation with experts, contact was made with Mr L. MacGabhann and Ms M.A. McGarvey, two Irish researchers who have contributed papers in this area to seek their advice in relation to recent findings in this subject area.

Overview of the use of IM injections

In IM injections, the skin is punctured with a needle and the medication is administered deep into a large muscle of the body for prophylactic or curative purposes (World Health Organisation 1999). Intramuscular injections tend to be utilized to administer medication, requiring a relatively quick uptake by the body with reasonably prolonged action (Rodger & King 2000). Greenway (2004) suggests that the administration of IM injections has become a common nursing intervention in clinical practice and an activity perceived as fundamental to patient care (Beyea & Nicoll 1995). Injections are among the most frequent used pharmacological administrative procedures, with an estimated 12 billion administered throughout the world on an annual basis. Of these, 5% or less are for immunization and more than 95% of injections are given for curative purposes (Nicholl & Hesby 2002). Many drugs may be administered by this route, provided they are non-irritant to soft tissue and are sufficiently soluble (Mallet & Dougherty 2000). Absorption is usually rapid and can produce blood levels comparable with those achieved by intravenous bolus injection and relatively large doses, from 1 mL up to 5 mL can be given (Workman 1999).

Depot neuroleptic injections

Neuroleptic (antipsychotic) medications were originally used to deepen anaesthesia before surgery, producing a state of calmness and detachment (Marland & Sharkey 1999). In the 1950s, Henri Laborit, a French neurosurgeon, noted that patients assumed a state of 'beatific quietude' meaning: calmness. Psychiatrists were quick to seize the opportunities these drugs presented for aggressive or agitated patients. Antipsychotic drugs generally tranquillize without impairing consciousness and without causing paradoxical excitement; for conditions such as schizophrenia, the tranquillizing effect is of secondary importance (British National Formulary 2006). Depot neuroleptics medications were developed in the 1960s in order to facilitate patient

compliance, to reduce relapse and improve functioning, particularly in the treatment of schizophrenic illness. These are long-acting IM preparations formulated by binding an alcohol radical of the drug to a long-chain fatty acid, forming an 'ester', and dissolving this in oil vehicle (Dencker & Axelsson 1996). The British National Formulary (2006) states for maintenance therapy long-acting depot injections of antipsychotic drugs 'are used especially when compliance with oral treatment is unreliable' and goes on to say that:

> Depot antipsychotics are administered by deep IM injection at intervals of 1–4 weeks. In general not more than 2–3 mL of oily injection should be administered at any one site; correct injection technique (including the use of Z-track technique) and rotation of injection sites are essential (p. 184).

Injection of these substances causes the formation of a 'depot' within the muscle, which is released over time; this release must last at least 1 week to be defined as a depot medicine (Dencker & Axelsson 1996). The 1990s witnessed major advances in the drug treatment of schizophrenia; new compounds became available, with improved side-effect profiles and tolerability and, in some cases, superior efficacy. A large number of patients have been discharged from institutional care, and their mental health, has been maintained by depot injections (MacGabhann 1996), as a front-line treatment, running side by side with supportive social and person-centred interventions and therapies. The most commonly prescribed depot preparations include: zuclopenthixol decanoate (Clopixol-conc), flupenthixol decanoate (Depixol) and haloperidol decanoate (Haldol), which are licensed as a deep IM injection into any large muscle site in the body. Fluphenazine decanoate (Modecate) and pipothiazine palmitate (Piportil) are licensed as an IM injection into the gluteal muscle region (either ventrogluteal or dorsogluteal). Risperdal consta is licensed only for administration into alternate buttocks using the long (50 mm) needle, which is supplied with this product in order to ensure that the depot to be administered deep into the dorsogluteal muscle and not into the subcutaneous fatty tissue.

The dorsogluteal injection site

The literature suggests that historically the dorsogluteal region was the main site for IM injections (Lachman 1963, Ross-Kerr & Wood 2001). The dorsogluteal site commonly referred to as the 'upper outer quadrant' appears to be 'traditionally' the favoured site for the administration of depot injections for mental health nurses in Ireland. In Murray's (2003) Irish study, the vast majority of respondents, community mental health nurses indicated that the dorsogluteal site was the most commonly used site by them when administering depot injections. This site was traditionally located by dividing the buttock into four equal areas by drawing imaginary lines to bisect it vertically and horizontally (often referred to as: making the sign of the cross). The Dorsogluteal site is located in the superior lateral aspect of the gluteal buttocks muscles (see Fig. 1). Some authors consider the target muscle to be the gluteus medius (e.g. Monaghan 1990, Gilsenan 2000), and others refer to it as the gluteus maximus (e.g. DuGas & Knor 1995, Harkreader 2000), and still others as the thick gluteal muscles of the buttocks, suggesting that both muscles are appropriate (Kozier *et al.* 1993). Such inconsistency causes confusion in locating the best site.

Figure 1
Dorsogluteal site

What makes this site problematic (Bolander 1994, Rosdahl 1995) is the presence of major nerves and blood vessels, the relatively slow uptake of medication from this site compared with others along with the thick layer of adipose tissue (commonly associated with it). Injury constitutes another major threat with the use of this area for IM injections, with the sciatic nerve and superior gluteal artery lying only a few centimetres distal to the injection site; thus great care needs to be taken to identify landmarks accurately. Kozier *et al*. (1993) suggest that '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' (p. 870). In more recent years, authors have specified that a dorsogluteal injection site be located 5–7.5 cm below the crest of the ilium (DuGas & Knor 1995, Perry & Potter 1998). The sciatic nerve is located near the inner lower angle of the upper outer quadrant. The most recent literature (Small 2004) strongly advises that the upper outer quadrant be divided into quadrants and that the injection be given in the upper outer quadrant of the upper outer quadrant (thereby landmarking by making a double cross).

A number of studies have demonstrated that the distance between skin and muscle in the dorsogluteal region is greater than the standard needle length used to administer IM injections (Cockshott *et al*. 1982, Haramati *et al*. 1994). Haramati *et al*. (1994) reviewed 338 (50% males and 50% females) pelvic computerized tomography (CT) scans, and this study demonstrated that women have a greater average gluteal fat thickness varying from 1.8 cm to 5.7 cm and from 1.7 cm to 4.4 cm in men. The standard needle lengths used for injection in the dorsogluteal region which are 3.5–3.8 cm were not sufficient to reach muscle most cases; therefore, these patients would not have received a true IM injection. Chan *et al*. (2006) conducted a study with 50 Irish patients who were scheduled for CT's of the abdomen or pelvis. The CT images were then analysed to determine the location of the air bubble as well as the distance to the injection site, the thickness of fat and muscle and the body mass index (BMI). The average success rate into the muscle of the injections was 32%. The rate fell to 8% in women, where the injected substance did not reach the muscle in 23 of the 25 women studied. Chan *et al*. (2006) identified this problem related, in part, to the increasing amount of fat in patients' buttocks, the more fat tissue is in the buttocks, the less likely the needle will reach the muscles underneath that fat. If the medication is not absorbed into the bloodstream, it remains in the fatty tissue where it can cause local infection and irritation (Chan *et al*. 2006).

The dorsogluteal site appears to have had lost favour in the USA over the years (Ellis & Bentz 2007), owing to the potential for complications and the difficulty in accurately locating landmarks and boundaries (Small 2004). Injuries to the sciatic nerve, which may lead to problems ranging from foot drop to paralysis of the lower limb, or puncture of the superior gluteal artery, accompanied with potential poor absorption rates owing to the presence of too much fatty tissue and abscess formation, have contributed to its decline in use. Rettig & Southby (1982) suggest 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, and in practice this may not be achievable. The majority of community mental health nurses practicing in health centres, clinics and patients homes, administer depots into the dorsogluteal site while patients are standing (with the toe turned inwards to relax the muscle); however, the literature advises that injections should not be given into this area while that patient is standing (Bolander 1994), but provides no reasons for this advice.

The needle length depends on the patient's size, the selected insertion site and the muscle tissue one is trying to reach (Evans-Smith 2005). Chan *et al*. (2006) recommend that longer needle lengths are required to increase the success rates of IM injections and that this particularly applies in the case of female patients, and also suggests that the majority of IM injections into the buttocks are not truly IM, but instead subcutaneous. Nisbet (2006) also suggests that if the gluteal site is to be used, using longer needles should be considered, suggesting a longer needle, e.g. 21 gauge 2 or 20 gauge 2, which is 50 mm in length, would be required to deliver an effective IM injection to obese clients, those with a BMI of 30+. Wynaden *et al*. (2006), supporters of the dorsogluteal injection site, recommended that mental health nurses need education on the importance of needle selection based on assessment of the consumers BMI, and that BMI scales should be available to staff working in the mental health setting.

The ventrogluteal injection site

The contemporary evidence-based literature on IM injection sites highlights the ventrogluteal site as the site of choice for IM injections. The ventrogluteal site was first introduced in the early 1950s and proposed as an appropriate IM injection site by Hochstetter (1954), in response to frequent dorsogluteal site complications, most notably sciatic nerve injury (Zelman 1961). The ventrogluteal site has gained favour as a site of choice in many countries and several reasons have been given: the bony landmarks there are considered easy to palpate, making the site simple to locate (Beecroft & Redick 1990, Covington & Trattler 1997, Hemsworth 2000). Whether it is less technically difficult to locate the ventrogluteal site than the dorsogluteal site, however, appears to not have been examined. The ventrogluteal part has a greater thickness of gluteal muscle than the dorsogluteal site, and the thinner layer of subcutaneous fat there makes inadvertent subcutaneous injection less likely (Michaels & Poole 1970). Greenway (2004) states that a nurse can be sure that a standard 21 gauge (1.25) 0.6/30 mm or a 23 gauge (1.5) 0.8/40 mm needle will penetrate muscle at the ventrogluteal site. This site is relatively free of large penetrating nerves and blood vessels but is innervated and receives blood from multiple small nerve and blood vessel branches, thus reducing the potential for more significant injury (Zelman 1961). While there are numerous literature reports linking the dorsogluteal site which complications, only one report (Muller-Vahl 1985) was found of a complication from use of the ventrogluteal site. This case reported a patient resulting in paralysis of the tensor fasciae latae muscle.

The description for locating this site given in the literature appears complicated, despite the site having been located midway between the two bone structures of the hip and head of the femur. Kozier *et al*. (1993) suggest the nurse placing the heel of his/her opposing hand (i.e. right hand for left hip) on the client's greater trochanter (the bump of bone on the outside of the hip bone). 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 thick curved upper border of the pelvic bone). The triangle formed by the index finger, the third finger and the crest of the ilium is the injection site (see Fig. 2). This site is a soft pad which 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 site (Zelman 1961).

Figure 2
Ventrogluteal site

Many authors (Farely *et al*. 1986, Fieldman 1987, Beecroft & Redick 1990) suggest that the ventrogluteal site is the safest site for IM injections. However, the research favouring the ventrogluteal site for the administration of IM injections does not appear to have 'filtered-down' to clinical practice, and some nursing textbooks, e.g. Jamienson *et al*. (1994) and Chandler (1994), make no reference to the ventrogluteal site in their chapters on IM injection technique. More recent journal articles in the UK have begun to endorse the ventrogluteal site (Workman 1999). Rodger & King (2000) advocate 'using the ventrogluteal, as the site of choice unless contra-indicated' (p. 580), and in an Irish context, McGarvey (2001) states 'the ventrogluteal site is advocated as the safest site for an IM injection' (p. 186). A study by Farley *et al*. (1986) at a large Midwestern (USA) teaching hospital involving the entire nursing population found that only 12% of nurses utilized this injection site. Rodger & King (2000) state that the extent to which the ventrogluteal site is used in the UK is unknown. Murray

(2003) reflects these findings as it is noted that none of the nurses surveyed utilized the ventrogluteal injection site. It is difficult to understand why the evidence which endorses the ventrogluteal site as the safer option for the administration of IM injections has not filtered down to practice level in the UK and Ireland. Melnyk & Fineout-Overholt (2005) suggest that this may be due to nurse's lack of knowledge of evidence-based practice and awareness of, or familiarity with an evidence-based practice guideline.

The deltoid injection site

The deltoid injection site is so-called, because it is in the shape of the Greek letter delta meaning 'V-shaped triangle'. The mid-deltoid site is used for the administration of small volume non-irritating medication such as: vaccines (hepatitis A & B), analgesics, antiemetics, antibiotics and antipsychotics (McGarvey & Hooper 2005). McGarvey & Hooper (2005) found that the majority of general practitioners and practice nurses in Ireland use this site for administering vaccines and other medications, no doubt that the ease of access especially in an outpatient setting for IM injections possibly adds to the frequency with which the deltoid site can be used. In contemporary community mental health practice, Murray (2003) found that many female clients prefer the use of this site for depot injections in preference to having to expose areas below the waistline, particularly if the injection is being administered by a male nurse.

Intramuscular injections into the mid-deltoid muscle like other IM injections should be given into the densest part of the muscle. Make sure that the whole shoulder is exposed, e.g. by removing the arm from the garment sleeve. This site 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). Find the acromion process as the upper marker, then find the deltoid tuberosity (in line with the axilla) as the lower marker, draw an imaginary triangle pointing downward from the acromion. The injection site is in the centre of the triangle or the point halfway between the markers (it will be from one- to four-finger widths from the acromion, depending on the size of the arm). The injection should be given at or immediately below the midpoint of the muscle (McGarvey & Hooper 2004) (see Fig. 3), and a deltoid injection could never be given below the level of the axilla (armpit) (Kozier *et al*. 1993, p. 871). The literature highlights that pain appears to be one of the most frequently reported complications associated with this site (Greenblatt & Allen 1978). 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 can occur; therefore, proper landmarking of this site is essential (Berger & Williams 1992, Rosdahl 1995).

Figure 3
Deltoid site

Mallet & Bailey (1996) state that owing to small size of the muscle, the number and volume of injections, which can be given into it, are limited, and a maximum dosage of 2 mL for injection is recommended at this site. It is suggested that the deltoid site is a better site than the gluteal muscle for small volume (less than 2 mL) rapid onset injections, because the deltoid has the greatest blood flow of any muscle routinely used for IM injections (Mallet & Dougherty 2000). Injury to the brachial artery and radial nerve (if the injection is given too low) and limited volume of medication, which can be administered (0.5–2 mL maximum), are highlighted as risks associated with the deltoid site.

The vastus lateralis injection site

There is little or no evidence in the literature to suggest whether this site is used or not for depot

Figure 4
Vastus lateralis site

injections by psychiatric nurses, perhaps because advice on using this site in adults is not specific. The target muscle is the anterolateral aspect of the vastus lateralis muscle of the thigh, which is part of the quadriceps muscles, one of the largest muscle groups in the body that is well developed at birth and for infants <12 months is the preferred site for injection (Nicholl & Hesby 2002). This site is located (see Fig. 4) at the lateral aspect of the thigh between the greater trochanter of the femur and the lateral femoral condyle of the knee: when divided into thirds with the middle third being used as the injection site.

Advantages in using the vastus lateralis site are its ease of access, and more importantly there are no major blood vessels or significant nerve structures associated with this site. The bulk of muscle tissue in non-atrophied patients in the thigh region further reduces the likelihood of injury. However, the vastus lateralis site has been like many other the other sites associated with injury (Haber *et al.* 2000) through inadvertent damage to the femoral nerve or the femoral artery owing to inaccurate landmarking of the site.

Rationale for this practice guideline

The authors of this review found that the literature highlighted numerous potential complications of IM injections such as: abscesses, cellulites, tissue necrosis, granulomas, muscle fibrosis, contractures, haematomas and injury to blood vessels, bones and peripheral nerves (Nicholl & Hesby 2002, Small 2004). Most of these injection complications are related to the tissue damage at the injection site and are preventable. We suggest that when complications occur they usually can be attributed to inaccurate landmarking of the injection site and faulty injection technique. Although IM injections are a common nursing intervention, the literature points to a dearth of guidelines for nursing staff in this area. MacGabhann (1996) outlined that there were few developed policies or procedures on administering injections to which nurses could refer, and suggests that the technique and preparation of IM injections may not be substantiated by research evidence. Rodger & King (2000) suggest that despite some discrepancies in the literature, there is sufficient consensual evidence for the establishment of clinical guidelines regarding the drawing up and administration of IM injection. Small (2004) highlights that for a routine procedure, it is surprising that there is so little research evidence to support the practice of IM injection. The importance of safe injection administration cannot be underestimated, as once a medication is administered via IM injection, it is irretrievable (Quinlan 2000). Australian nurses Wynaden *et al.* (2006) also suggest that best practice guidelines are not well developed in this area. Their paper recommends the dorsogluteal site as the preferred site for the administration of IM injections, despite contemporary evidence advocating the ventrogluteal site and deltoid sites. Because IM injections are administered on a daily basis by nurses in mental health settings, the authors of this review have perused the literature of Beyea & Nicoll (1995), Rodger & King (2000), McGarvey (2001) and Nicholl & Hesby (2002) to develop the evidence-based guideline which may apply to nurses administering depot injections.

Injections site choices are influenced by the age of the client, the medication to be injected and the

general condition of the client (Rodger & King 2000). The identification of the most appropriate muscle site for each injection is vital in order to ensure that the medication reaches its target area and to avoid injury/trauma to the client. It should always be remembered that the medication effect can be enhanced or diminished depending on the site of injection chosen. For each site for IM injection, the practitioner should know how to properly identify the site by using anatomical landmarks and should be familiar with potential complications inherent at each site. Numerous authors (Kozier *et al*. 1993, Craven & Hirnle 1996, Mallet & Bailey 1996, Evans-Smith 2005) suggest that there are four muscle sites that should be utilized for the administration of IM injections: the ventrogluteal, vastus lateralis, mid-deltoid and dorsogluteal sites. The injection volume will depend on the muscle depth; IM injections should be given into the densest part of the muscle at an angle of 90 degrees (Dougherty & Lister 2004). Before undertaking this procedure, the nurse must be able to assess their competence in all aspects of injection techniques, ensuring appropriate continuing professional development to achieve or maintain that competence. The nurse should also be able to rationalize the procedure to the patient/client, requesting consent before it and giving necessary advice during the procedure. The following guideline ensures best practice in administering a depot injection.

Intramuscular (IM) injection procedure	Rationale for procedure
Assemble the equipment. Check the drug for prescription and time validity (expiry date), medication dosage and method of administration. Check if the drug is licensed for a recommended muscle site.	To minimize risk of error.
Use a filter needle or 23 gauge needle or smaller for drawing up medication. Change needle after drawing up to one of the following needles: 23 gauge (1.25) 0.6/30 mm can be used for drawing up: this needle will penetrate muscle in the ventrogluteal, vastus lateralis and deltoid sites for adults. Twenty-one gauge (1.5) 0.8/40 mm will penetrate the dorsogluteal muscle most patients that are overweight. Twenty-one (2) gauge 0.8/50 mm will penetrate the dorsogluteal in most patients that are obese (body mass index 30+).	To prevent glass contamination. Preston & Hegadonen (2004) support the use of a filter needle when drawing medication from a vial or ampoule in order to prevent shards of glass or rubber particles being injected into the patient to reduce or prevent injury. Needle size must be sufficiently long to reach the muscle (Greenway 2004).
Check patient's identity, explain procedure and ensure that informed consent is given.	To ensure that the correct patient receives the drug as prescribed by the physician. Ensure that the patient understands the procedure and gives consent (Ellis & Bentz 2007).
To administer the IM injection, use a needle of appropriate length to ensure that the medication will be deposited into the muscle bed.	Different patients need different needle sizes: never be guided by the colour of needles alone as different manufactures vary in their colour-coding systems (Zuckerman 2000).
Rotate injection sites (from right side to left) and utilize the ventrogluteal, vastus lateralis, deltoid and dorsogluteal muscles.	(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, Covingston & Trattler 1996).
Assist patient into position to facilitate the injection into the chosen site, and encourage the patient to relax the target muscle.	Ensure privacy. Accurately landmark the site by palpating rather than relying on visual identification alone to prevent injury. Injection into a tense extremity causes discomfort (Evans-Smith 2005).
Follow the individual healthcare setting's policy and procedure with regard to cleansing of the injection site. Some health setting's recommend no skin cleansing prior to administration.	If using alcohol swab, cleanse the site in a circular motion for 30 s and allow to dry for 30 s prior to administration (Simmonds 1983, Workman 1999).
Use the Z-track technique for all IM injections. In order to make use of the Z-track technique the nurse should use their non-dominant practitioner's hand to pull the skin and subcutaneous tissue 1–1.5 inches to one side of the injection site prior to injecting. The Z-track technique creates a disjoint perforation or broken injected pathway that locks the medication into the target muscle preventing flowback.	Keen (1986, 1990), Newton *et al*. (1992) and Beyea & Nicoll (1995) forward the view that the Z-track should be used for all IM injections.

Intramuscular (IM) injection procedure	Rationale for procedure
Quickly plunge the needle into the skin using a smooth steady motion at an angle of between 70 and 90 degrees in to the muscle tissue; leaving one-third of the shaft of the needle exposed.	Newton *et al*. (1992) outline that a properly administered IM injection deposits medication under the muscle fascia below the fatty subcutaneous layer.
Aspirate for blood, if blood is aspirated, withdraw needle, place dry gauze over site, and recommence procedure with new sterile equipment.	To prevent an intra-artery injection (Rodger & King 2000)
Inject medication at a rate, which does not exceed 1 mL per 10 s.	This slow, steady rate promotes comfort and allows time for the tissues to expand and begin absorbing the solution (Workman 1999) and helps to avoid damage to the muscle tissue.
Withdrawing the needle rapidly apply pressure to any bleeding point and apply small sterile dressing. Do not massage the site post injection.	Massaging the site can could cause tissue irritation (Roger & King 2000).
Do not recap needle, dispose of sharps safely and document procedure.	20% of needle stick injuries occur when giving an IM and subcutaneous injection (CDC 1999).
Observation of the injection site 2–4 h post injection as needed to identify and monitor the side effects.	This may not be possible in the community setting, therefore the client should be encourage to notify the community mental health nurse or general practitioner, if any adverse effects such as signs of redness, swelling, pain or any other side-effects should they occur following an IM injection.

Discussion

Many authors appear to be consistent in the view that nurses are hampered by the absence of well-developed practice guidelines for the administration of IM injections (MacGabhann 1996, Wynaden *et al*. 2006). Also it appears that nurses have received little or no formal instruction pertaining to the landmarking of injection sites or actual techniques of IM injection administration (Nichol & Hesby 2002). Site selection for IM injections appears to be haphazard and not evidence based, and needle selection is usually based on the nurse preference or ritualistic practice and not on an individual assessment of each client. The contrast between what is currently being taught in undergraduate nursing programmes advocating the ventrogluteal site and what is observed in clinical practice is of stark difference, where students rarely or never observe the ventrogluteal site being utilized. Nurses are reluctant to change to using the ventrogluteal, deltoid or vastus lateralis sites for a variety of reasons (Greenway 2004). These include the difficulty of landmarking these sites, possibly because nursing texts and educators throughout the last 40 years proliferated using the dorsogluteal site.

Nurses are often reluctant to adopt a different injection site from the dorsogluteal or use a different technique (Z-tracking) from one that they have become accustomed to using, and the provision of an evidence base alone appears not to be sufficient to changing practice (Franks 2004). Melnyk & Fineout-Overholt (2005) suggest that the gap in getting research evidence translated into practice to improve clinical care is a cause for concern, with Balas & Boren (2000) suggesting that it takes 17 years to translate research findings into practice. Chiondini (2000) suggests that even though IM injections are known to have iatrogenic complications, nurses have reported not receiving any education beyond their basic training on how to administer injections by the IM route. This surely has implications for nurse educators, particularly those involved in ongoing practice development and the education of post registration nurses as well as authors of nursing text books. McGarvey (2001) outlines that it is the responsibility of nurse educators to ensure that appropriately informed guidelines are devised as a large research base in the area of IM injection administration which now exists. Much of the original research endorsing the ventrogluteal site has emanated from without the British Isles. Hochstetter (1954) originally proposed the ventrogluteal as an appropriate IM injection site in Germany and in the USA (Zelman 1961, Cockshott *et al*. 1982, Farley *et al*. 1986, Kozier *et al*. 1993, Bolander 1994, Beyea & Nicoll 1995). This may have resulted in nursing literature in the UK and Ireland, not embracing this research resulting in nurses in practice sticking to the upper and outer quadrant (i.e. the dorsogluteal site) with its inherent danger of damaging major nerves and blood vessels and its relatively slow uptake of medication owing

to its thick layer of adipose tissue (Bolander 1994, Rosdahl 1995). Nurses must also consider that many dorsogluteal injections inadvertently become subcutaneous, with Chan *et al*. (2006) highlighting that the poor drainage within the fatty subcutaneous tissue leads to an increased rate of local side effects, such as abscess and granuloma formations.

Nicholl & Hesby (2002) suggest that site selection is the single most consistent factor associated with complications and injury. Wynaden *et al*. (2006) note that although the literature identified the ventrogluteal site as suitable for an IM injection, Australian nurses in their study did not routinely use this site and were very reluctant to change, as they had difficulty in locating the site anatomically and believed that the site was not as safe as the dorsogluteal. Further studies may also be warranted into exploring the matching of client's BMI to be correct needle length for each injection site. The literature outlines that giving injections is a regular and commonplace activity for nurses and good injection technique can make the experience for the patient relatively painless (Workman 1999); however, mastery of injection technique without developing and utilizing an evidence base from which to practise can put a patient at risk of unwanted complications, needle phobia and non-compliance.

While the administration of depot injections remains a fundamental nursing task, it is imperative the nurses depot injections in a safe and effective way to ensure patient comfort and safety. The reasons for the apparent underutilization of injections sites apart from the dorsogluteal by mental health nurse warrant further investigation. The authors of this paper believe that further research is also warranted to determine the levels of patient comfort/discomfort in receiving injections in the ventrogluteal, deltoid and vastus lateralis injection sites.

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