# GUIDELINES ON THE ADMINISTRATION OF INTRAMUSCULAR AND SUB-CUTANEOUS INJECTIONS

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## Document Review History

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## Document Change History

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*Department of Nursing*
1.0 Introduction

Certain medications may only be administered by injection, when alternative routes are not viable or do not facilitate absorption of medication (Ford et al 2010). Injections may be viewed as a traumatic procedure for children, therefore it is important to assess if an injection is necessary and justified prior to its administration. An appropriate injection technique reduces discomfort and complications for the child (Hunter 2008). Necessary skills for good injection technique include: knowledge of anatomy and physiology, pharmacology, suitable injection sites and injection techniques for children, clinical holding and effective communication skills.

The introduction of alternative analgesia techniques, (epidurals, patient and nurse controlled analgesia) has reduced the volume of injections administered. Therefore, it is acknowledged that nurses are currently administering fewer injections. Some principles of administering injections may be based on custom and practice (Greenway 2014). It is essential that nursing practice is evidence based and each child is individually assessed. It is recommended that nurses regularly review information on this practice (Greenway 2014).

**NOTE:** Nursing students must be supervised *at all times* when administering IM and SC medications (OLCHC 2010a).

2.0 Definition of Guidelines

This guideline represents written instructions to ensure high quality care. Guidelines must be accurate, up to date, evidence-based, easy to understand, non-ambiguous and emphasise safety. When followed they should lead to the required standards of performance.

3.0 Definitions

**Intramuscular (IM) injection:** A method of administering medication directly into muscle tissue (Macqueen et al 2012).

**Subcutaneous (SC) injection:** Delivers medication below epidermis and dermis layers into SC tissue (Ford et al 2010)

4.0 Applicable to

These guidelines are applicable to nurses who administer medications by injection to children.

5.0 Objectives of the Guideline:

These guidelines provide an evidence-based approach and support best practice for the administration of intramuscular (IM) and subcutaneous (SC) injections. The goal of these guidelines is to facilitate the maximum therapeutic effects of medications while reducing complications, injury and discomfort for the child. Algorithms are presented for both IM and SC injections (Appendix 1, 2). Specific information in relation to administering immunisations is also included (10.0).
6.0 Complications associated with injections

Most complications are associated with intramuscular injections but may occur with any route. Complications may be due to the use of an incorrect site, inappropriate depth or rate of injection (Malkin 2008).

Potential complications include:

- Pain (minor discomfort for a short time after an injection is normal) (Barron and Hollywood 2010).
- Nerve damage, tissue necrosis, intramuscular haemorrhage, abscess, allergic reaction, needle phobia (Ford et al 2010)
- Intravascular injection, cellulitis
- Muscle fibrosis with repeated use of the same site (Ford et al 2010)
- Medication errors with use of low dose insulin syringes (measurements in units not mls) (Ford et al 2010)

7.0 IM Injections

<table>
<thead>
<tr>
<th>INTRAMUSCULAR INJECTION</th>
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<tbody>
<tr>
<td>• Absorption rate is faster than SC route</td>
</tr>
<tr>
<td>• Muscles tolerate greater fluid volumes (Barron and Hollywood 2010)</td>
</tr>
<tr>
<td>• Maximum volume = 2mls (Macqueen et al 2012)</td>
</tr>
</tbody>
</table>

7.1 IM Injection Sites

There is no universally accepted optimum site for IM injections in children (Macqueen et al 2012). Clinical judgement is vital to assess each child individually in order to avoid complications and ensure best practice.

<table>
<thead>
<tr>
<th>Recommended sites for IM Injections (NIAC 2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-12 months</td>
</tr>
<tr>
<td>13-36 months</td>
</tr>
<tr>
<td>3 years and older</td>
</tr>
</tbody>
</table>

Dorsogluteal site: **NOT RECOMMENDED FOR CHILDREN** due to potential damage to sciatic nerve and gluteal artery (Bagis et al 2013, Ford et al 2010). Ventro-gluteal site is also not recommended (Barron and Hollywood 2010).
### 7.2 Deltoid

- Commonly used as it is easily accessible
- Not recommended for repeated injections or large volumes due its small muscle mass (Dougherty and Lister 2011)
- Radial nerve is superficial in infants: bunch up the skin prior to injection (NIAC 2013)

#### Land marking the Injection Site:
- Remove clothing and expose the arm completely
- 2 finger widths down from the acromion process; the bottom edge is at an imaginary line drawn from the axilla
- Injection site: 5cms below acromion process (Dougherty & Lister 2011)

![Fig 2: Deltoid Site](image)

### 7.3 Vastus Lateralis

- Part of the quadriceps group, found on the anterior aspect of the thigh
- Stretches from the greater trochanter of the femur to the lateral condyle of the knee
- Ideal site as it is easily accessible and has no major blood vessels or nerves in the area (Dougherty and Lister 2011)

![Fig 3: Vastus Lateralis Site](image)
Identify greater trochanter and lateral femoral condyle. Identify the muscle position

Divide the muscle into thirds. The middle third = injection site

Inject medication in the middle third. Position: within the upper lateral quadrant of the thigh

Fig 4: Landmarking the Site

7.4 Selecting the injection site: Assess the following

<table>
<thead>
<tr>
<th>Child’s Size/Age</th>
<th>Under 2 years: vastus lateralis Over 3 years: deltoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle</td>
<td>Select a muscle that is accessible, well vascularised, well-developed. Is the muscle large enough to tolerate medication volume?</td>
</tr>
<tr>
<td>Frequency of Injections</td>
<td>Rotate sites to avoid fibrosis (Macqueen et al 2012) Review nursing documentation on sites used previously. Observe for any areas of fibrosis and avoid this site if present.</td>
</tr>
<tr>
<td>Medication, Manufacturer’s instructions</td>
<td>Any specific requirements?</td>
</tr>
<tr>
<td>Safety</td>
<td>What position can the child maintain? Do you need another person to hold the child? Remove clothing and landmark the site.</td>
</tr>
<tr>
<td>Child/Parent’s Preference</td>
<td>Consider their past experiences. Parents reported less distress with use of the deltoid site (Malkin 2008). Less pain was associated when children were sitting up and infants were held by parents (Taddio et al 2009).</td>
</tr>
<tr>
<td>Child’s Position</td>
<td>Correct positioning may minimise anxiety or discomfort (Ford et al 2010). Positioning will also assist in accurate land marking of the site.</td>
</tr>
</tbody>
</table>
7.5 Z-Track Technique for Intramuscular Injection

This technique reduces pain and prevents complications associated with IM injections (Barron and Hollywood 2010). It displaces skin and SC layer from the muscle to be injected and seals off the needle track once the needle is removed (Dougherty and Lister 2011). For an uncooperative child, use of z-track technique may be difficult. **Clinical judgement is necessary** to ensure the safety of the child. **NOTE:** This technique is not advised for immunisations.

![Diagram of Z-Track Technique](image)

- Gently pull the skin with your non-dominant hand, 1cm laterally to the injection site
- Hold this position until the medication has been injected and the needle is removed
- After removing the needle quickly, release the pull on the skin

7.6 Volumes for IM Injections: Individually assess the child and the medication to be injected. There is no universally accepted volume but a maximum of 2mls is suggested (Macqueen et al 2012).

7.7 Select Needle/Syringe: Select the smallest possible syringe that will accommodate the medication volume. Consider the needle length needed to ensure the medication reaches the muscle layer. **Individual assessment is needed**

<table>
<thead>
<tr>
<th>Gauge</th>
<th>Length</th>
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<tbody>
<tr>
<td>23-25 gauge</td>
<td>25mm</td>
</tr>
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</table>

7.8 IM Injection for children with bleeding disorders:
- Link with relevant medical team / CNS
- Factor replacement may be necessary prior to IM injection (NIAC 2013)
- Use a 25 gauge needle for children (NIAC 2013)
- Consider administering the medication by SC injection (NIAC 2013, DoH, UK 2013).
- Apply pressure to the injection site for 1-2 minutes after the injection (NIAC 2013)
7.9 **Aspirating before IM Injection:** may be based on custom and practice. Some literature continues to recommend this practice for IM injections but there is no research to support aspiration (Dougherty and Lister 2011). Individual child assessment and professional judgement are required as aspiration may not be necessary for all IM injections (D&T 2014). Aspiration may increase pain associated with injections (Canadian Agency 2014). It is not necessary to aspirate when administering immunisations (NIAC 2013, DoH, UK 2013).

8.0 **Guidelines on the Administration of an IM Injection**

Individual child assessment and clinical judgement is essential as there is no universal agreement on optimum site, needle size or injectable volumes.

<table>
<thead>
<tr>
<th>Equipment</th>
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<tbody>
<tr>
<td>Appropriate needle and syringe</td>
</tr>
<tr>
<td>Plaster, if necessary</td>
</tr>
<tr>
<td>Sharps disposal bin</td>
</tr>
<tr>
<td>Child's Chart</td>
</tr>
<tr>
<td>Sublingual sucrose (if indicated)</td>
</tr>
<tr>
<td>Gloves, clean tray</td>
</tr>
<tr>
<td>Sterile gauze</td>
</tr>
<tr>
<td>Toys (for distraction)</td>
</tr>
<tr>
<td>Alcohol swab (if indicated)</td>
</tr>
<tr>
<td>IV tray</td>
</tr>
<tr>
<td>Medication</td>
</tr>
<tr>
<td>Medication sheet</td>
</tr>
<tr>
<td>immunisation record sheet/ book</td>
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</tbody>
</table>
ACTION AND RATIONALE

Preparation of the child:
1. Explain procedure to child/parents, to gain co-operation and trust and reduce anxiety.
2. Ensure privacy/dignity for the child throughout the treatment (OLCHC 2007)
3. If the infant/child needs to be clinically held, the local guideline is followed at all times (OLCHC 2009).

Reducing Pain:
1. Distraction is very effective in reducing pain/anxiety, involve the play specialist
2. Rubbing or stroking the skin close to the injection site
3. Rapid needle insertion and do not aspirate, if possible (NIAC 2013)
4. Infants up to 6 months: administer sublingual sucrose to reduce pain.
5. Offer soother to infant if appropriate as non-nutritive sucking enhances analgesic effect of sucrose (OLCHC 2010b)
6. Apply ice to numb the site, (GOSH 2013)

Preparation of Medication:
1. Gather equipment. Ensure it is intact, to prepare for the procedure.
2. Select a syringe size that is appropriate to the medication volume (Macqueen et al 2012).
3. Individual assessment of child to determine appropriate needle length and gauge.
4. Change needles after drawing up medication to ensure a clean needle for administration. This reduces irritation, pain and inadvertent administration of foreign particulate matter (Ford et al 2010)
5. Avoid the presence of air bubbles in injection syringes, to ensure accurate dosage
6. Administer all medication as per hospital/national policy (An Bord Altranais 2003, OLCHC 2001)

Select and Assess Injection site:
1. Assess injection site by observation and palpation. If any evidence of damage or trauma, do not use.
2. Identify and landmark the injection site
4. If administering more than one injection, use separate sites (NIAC 2013). If using one limb, allow a distance of 2.5cm between sites (NIAC 2013)

Positioning:
1. Position child to allow relaxation of the muscle to be used, to reduce pain/anxiety (Ford et al 2010).
2. Lie the infant down or ensure the child is seated.

Skin Disinfection:
1. Not required if the child is socially clean. Soap and water can be used if necessary (NIAC 2013).
2. If immunosuppressed: do require skin disinfection, to prevent infection (Malkin 2008)
3. If an alcohol swab is used, allow it to dry for 40 seconds prior to injection, to ensure alcohol is effective.

Administering an IM Injection:
1. Aseptic Non-Touch Technique (ANTT) level 3 throughout the procedure (OLCHC 2013). It is not
necessary to use gloves if the nurse’s and patient’s skin is intact (NIAC 2013).

2. Use the Z-track technique, if possible.

3. Use non-dominant hand to secure the injection site/tissue and use the dominant hand to inject the medication. This ensures control of the needle and syringe during the procedure (Barron and Hollywood 2010).

4. Hold syringe firmly between thumb and forefinger, with heel of hand resting on the thumb of the non-dominant hand. This ensures a 90-degree angle is achieved and the correct site is targeted (Ford et al 2010).

5. At the injection site: spread the skin taut between the thumb and forefinger. Infants or children with little muscle: skin can be bunched up (NIAC 2013)

6. Insert needle smoothly and swiftly

7. Inject at a 90 degree angle, to ensure the medication reaches the muscle (Macqueen et al 2012, NIAC 2013)

8. Use clinical judgement to assess if aspiration is necessary (do aspirate if it is felt that injection site is near a blood vessel

9. If blood is evident on aspirating, discard medication and syringe and prepare a new injection


11. If possible, leave needle in place for 5-10 seconds after injecting medication, to allow surrounding tissue to expand and absorb the medication (Ford et al 2010). Use clinical judgement (child may be distressed /unable to hold their position safely).

12. After removing needle, use gentle pressure with sterile gauze. Do not rub injection site, to avoid discomfort (Macqueen et al 2012).

13. Leakage at injection site after withdrawal of needle: apply light pressure with gauze. A plaster may be applied.

Swift needle entry, slow injection of medication and swift needle withdrawal = less pain

**After the injection:**

- Dispose of equipment as per hospital policy, to ensure the safety of staff and children (OLCHC 2014, OLCHC 2011).
- Assess child during and after the procedure, documenting any adverse events, refer to medical team as appropriate.
- If the child is discharged after the injection, verbal advice is given to parent/carer.
- Record the medication administration as per hospital policy, including which site was selected
9.0 SC Injections

- Slower absorption than the IM route as SC tissue has less blood supply (Dougherty and Lister 2011)
- Absorption rate depends on site (Barron & Hollywood 2010)
- It is appropriate for certain drugs, e.g. heparin, insulin
- May use an automatic injection device or pen
- Maximum volume = 2mls (Macqueen et al 2012)

Many available sites as SC tissue is found all over the body

- Sites include:
  - Upper thigh
  - abdomen
  - upper arm
  - buttocks

- Sites must be rotated to prevent fibrosis and ensure adequate absorption (Macqueen et al 2012)
- Often self-administered, education and support is essential

SAFETY: Insulin must be administered in insulin syringes, to ensure accurate dosage (Macqueen et al 2012)
Recommended Gauge & Length of Needle for SC Injections (NIAC 2013)

- Gauge: 23-25 gauge
- Length: 16mm

Note: insulin syringes have shorter needle length (appendix 3).

Insulin Administration: needle length of 6mm is adequate (FIT 2011, GOSH 2013)

Always Use Insulin Syringe

9.1 Guidelines on the Administration of a SC Injection:

*Individual assessment and clinical judgement essential: no universal optimum site, needle size or volumes.*
### Equipment: as per IM

<table>
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<th>ACTION AND RATIONALE</th>
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<td><strong>as per IM guideline, specific information related to SC below</strong></td>
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1. For regular injections: ensure rotation of sites
2. Use of alcohol swab not necessary, repeated use may harden skin (GOSH 2013)
3. Gently bunch up the skin, avoids injection into muscle
4. (Macqueen et al 2012)
5. Insert the needle at 45 or a 90 degree angle, depending on
6. needle length and size of child (Macqueen et al 2012)

*Needle should be short enough so that the medication does not reach the muscle layer*

- **90-degree angle**: for all ages (Barron and Hollywood 2010) and insulin administration (Dougherty and Lister 2011)

- **45-degree angle**: needle length > 8mm or children with little SC tissue

5. Inject the medication slowly (for example: count from 1-10)

6. Unnecessary to aspirate prior to injecting as it is unlikely to reach blood vessels (NIAC 2013, Dougherty and Lister 2011)

**Swift needle entry, slow injection of medication and swift needle withdrawal = less pain**
9.2 Auto Injectors

![Auto Injector Diagram](image)

**Fig. 8: Use of an automatic injection device for Sc injection**

**Fig. 9: Automatic injection device**

- Needle angle is 90 degrees
- Refer to manufacturer’s instructions and CNS

10.0 Specific Care when Administering an Immunisation

Equipment: as per IM

- Resuscitation equipment, appropriate refrigerated immunisation storage
- HSE consent, and infant hospital prescription
- HSE immunisation leaflet given to parent prior to immunisation
### ACTION AND RATIONALE as per IM guideline, specific information related to immunisations below. Refer to Immunisation Guidelines for Ireland (2013), for immunisation specific information

1. Assess the child’s suitability for immunisation, to ensure safety (history of allergies, reactions, contraindications). Refer to national guidelines for accepted contraindications (NIAC 2013)

2. Avoid prophylactic use of anti-pyretics (paracetamol and ibuprofen, they may reduce antibody response (NIAC 2013)

3. Ensure consent has been obtained (OLCHC consent form and consent section of the Primary Childhood Immunisation Record Form).

4. Always use a new needle to administer the immunisation, unless immunisation is supplied with a prefilled needle/syringe attached (DoH, UK 2013)

5. Sites for SC injection of immunisations are: vastus lateralis and deltoid (NIAC 2013)

6. Any leakage of immunisation from the syringe during the administration would provide an insufficient dose: another dose should be given at a different site (NIAC 2013)

7. Z- track technique not advised, aspiration not necessary (NIAC 2013)

8. Documentation includes immunisation record book (from parents) and Primary Childhood Immunisation Record Form.

9. Return these forms as indicated to ensure accurate and updated records. Documentation within the child’s medical record should include: batch number, dosage, injection site and patient response.

10. Observe the child for 15 minutes post-immunisation and discharge home if no evidence of any side-effects. Children with a history of allergies may be observed for longer.

11. Pre-term infants: monitor for 4hrs after the immunisation, due to increased risk of apnoea and bradycardia (NIAC 2013).

12. Advice on potential side-effects for individual immunisations and their management should be explained to parents / guardians and written leaflet given.

### 11.0 Comparison Documents


Our Lady’s Hospital for Sick Children (2001) Administration of Medication Policy, Our Lady’s Hospital for Sick Children: Dublin.

### 12.0 Implementation Plan: Communication and Dissemination

- Guidelines available on hospital intranet
- Hard copies of the guidelines will be included in the Nurse Practice Guideline Folder in each clinical area
- Information will be circulated in NPDU Newsletter

*Department of Nursing*
Training

- Education will be delivered within clinical areas that using existing educational resources, e.g. Clinical Nurse Facilitators
- Development of an educational programme in the CCNE and on the OLCHC intranet

13.0 Monitoring and / or Audit

Feedback from nursing staff on the guidelines to contribute to ongoing guideline development

14.0 References


Department of Nursing
Great Ormond Street Hospital for Children (2013) Safe Administration of Insulin
http://www.gosh.nhs.uk/health-professionals/clinical-guidelines/safe-administration-of-insulin/#Rationale (last accessed 12/06/2014)


Our Lady’s Children’s Hospital (OLCHC) (2007) Prevention of Abuse of Children by a Staff Member While in the Care of the Hospital, Our Lady’s Children’s Hospital: Dublin.

Our Lady’s Hospital for Sick Children (2001) Administration of Medication Policy, Our Lady’s Hospital for Sick Children: Dublin.


References for Diagrams: (last accessed 12/06/14) Fig 1, 2, 3, 5, 6: diagrams by Andrew Pendred, Audio-Visual Technician, OLCHC Fig 4:

Department of Nursing
<table>
<thead>
<tr>
<th>Our Lady’s Children’s Hospital, Crumlin</th>
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<tr>
<td>Reference Number: AISCI-02-2017-NB-V3</td>
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http://wps.prenhall.com/chet_wilson_drugguides_1/0,5513,403564,-00.html

Fig 7, http://www.drugs.com/cg/how-to-give-a-subcutaneous-injection.html

Fig 8, 9:
http://www.gosh.nhs.uk/medical-conditions/medicines-information/giving-subcutaneous-injections/
15.0 Appendix 1: Quick Guide: Administering an IM Injection

Is this the Correct and Appropriate Route for this child?

YES

Prepare Child/Family

Individual Assessment
Select Site

NO

Do not Administer Injection

Refer to CNM/Prescriber

0-12 months: Vastus Lateralis
13-36 months: Vastus Lateralis/Deltoid
3 years and older: Deltoid

Select Needle

Individual Assessment

Needle Gauge: 23-25
25 gauge (bleeding disorders)
Length: 25 mm
Shorter length: very small infants/pre-term babies

Prepare Medication

Administer with Z-track Technique
90-degree angle
Aspirate prior to injecting medication (use professional judgement)
Inject slowly 1-2 secs.
Immunisation: do not use Z-Track / do not aspirate

Reassure and praise the child

Observe the child

Document
16.0 Appendix 2: Quick Guide: Administering a SC Injection

Is this the Correct and Appropriate Route for this child?

NO

Do not Administer Injection

Refer to CNM/Prescriber

YES

Prepare Child/Family

Select Site

Individual Assessment

Infant: consider buttocks
Older child: thigh, abdomen, upper arm
Rotate sites

Select Needle

Individual Assessment

Gauge: 23-25 gauge
Length: 16mm OR
Insulin syringe
Use insulin syringe to administer insulin

Prepare Medication

Bunch up skin
45 or 90-degree angle
Do not aspirate
Inject slowly, count 1-10

Reassure and praise the child

Observe the child

Document

Department of Nursing
17.0 Appendix 3

Available Needles in OLCHC

<table>
<thead>
<tr>
<th>Needle Colour</th>
<th>Gauge</th>
<th>Needle Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>21</td>
<td>1 ½ ” or 40 mm</td>
</tr>
<tr>
<td>Blue</td>
<td>23</td>
<td>1 ¼ ” or 30 mm</td>
</tr>
<tr>
<td>Orange</td>
<td>25</td>
<td>5/8” or 16 mm</td>
</tr>
<tr>
<td>Orange</td>
<td>25</td>
<td>1” or 25mm</td>
</tr>
</tbody>
</table>

Table 3: Needle Gauge and Length

<table>
<thead>
<tr>
<th>Units</th>
<th>Gauge</th>
<th>Needle Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>30</td>
<td>8mm</td>
</tr>
<tr>
<td>50</td>
<td>29</td>
<td>12.7mm</td>
</tr>
<tr>
<td>100</td>
<td>29</td>
<td>12.7mm</td>
</tr>
</tbody>
</table>

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