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1. Scope

This Standard Operating Procedure (SOP) applies to the staff and students using the Intramuscular and Subcutaneous Injection Trainer (IMSIT S403) in the Pharmacy Practice Resource Unit (PPRU) at the Pharmacy Department, University of Malta.

2. Objective

To describe the procedure for the preparation, use and maintenance of IMSIT S403.

3. Definitions

3.1. Anterior superior iliac spine: Bony projection at the anterior end of the iliac crest that is important to locate the ventrogluteal injection site (Appendix SOP/PD/230_01/A1a).

3.2. Dorsogluteal (upper outer quadrant) site: Located 2cm above the centre of an imaginary line drawn between the posterior superior iliac spine and the greater trochanter. It is an IM injection site (Appendix SOP/PD/230_01/A1b).

3.3. Gauge: Diameter of the lumen of the needle, which is usually between 16 and 30G. The larger the number, the smaller the diameter.

3.4. Greater trochanter: Large projection of the femur connecting to the hip bone (Appendix SOP/PD/230_01/A2). Palpation for the greater trochanter is important to locate the correct site for administration of ventrogluteal, dorsogluteal and lateral thigh IM injections.

3.5. Iliac crest: Thick curved upper border of the ilium, the most prominent bone on the pelvis. One can feel the iliac crest by pushing his/her hands on the sides at the waist, feeling for the bone and following it downwards and to the front (Appendix SOP/PD/230_01/A2). Palpation for the iliac crest is important to locate the correct site for administration of ventrogluteal IM injections.

3.6. Intramuscular and Subcutaneous Injection Trainer (IMSIT S403): Lifelike simulator of the human lower torso, which may be used for training of IM and SC injections. There are 3 sites for IM injection (ventrogluteal, dorsogluteal and lateral thigh) and 1 site for SC injection (lower abdominal wall above inguinal area). The simulator may also be used to practice palpation for the femoral artery/vein pair to determine the location for placement of a femoral intravenous line.
The posterior right side of the simulator is hand-painted and illustrates the deep anatomic structure of the head and shaft of the femur, sciatic nerve, deep layers of muscles, major blood vessels and the aspect of the bony pelvis underlying the gluteus muscles.

3.7. **Injections**: Sterile solutions, suspensions or emulsions, presented in a suitable aqueous or non-aqueous vehicle intended for parenteral administration into body tissues.

3.8. **Intramuscular (IM) injection**: Injection of a substance directly into a large muscle, generally the gluteal, deltoid or lateral thigh. When administering an IM injection the syringe needle is inserted deep into the selected site at an angle of 90° generally using a 22 gauge needle (Appendix SOP/PD/230_01/A3). The volume of injection should not exceed 5ml. This route of administration is suitable for both aqueous and oily suspensions and is commonly used as a route of administration for vaccination.

3.9. **Lateral thigh (vastus lateralis) site**: Located slightly towards the outer side of the thigh in between the left and right hands, when the palm of one hand is placed just below the greater trochanter and the palm of the other hand is placed just above the knee of the same leg. It is an IM injection site (Appendix SOP/PD/230_01/A1c).

3.10. **Palpation**: Used as part of a physical examination in which a body part is felt or touched to determine its size, shape, firmness/tenderness, location, consistency or texture.

3.11. **Parenteral administration**: Administration of a substance by injection, infusion or implantation, through a route that bypasses the gastrointestinal system.

3.12. **Posterior superior iliac spine**: Bony projection at the posterior end of the iliac crest that is important to locate the correct site for dorsogluteal injections (Appendix SOP/PD/230_01/A1b).

3.13. **Subcutaneous (SC) injection**: Injection of a substance into the layer of fat between the skin and muscle. When administering a SC injection the syringe needle is inserted at an angle of 45° using a 25-30 gauge needle (Appendix SOP/PD/230_01/A3). The injection fluid should not exceed 2ml in volume. The SC route is often used for administration of insulin in patients with diabetes mellitus.
3.14. **Ventroneal site**: Located in the V area in between the index finger and middle finger when the palm of the hand is placed on the greater trochanter, the index finger is pointing towards the anterior superior iliac spine and the tips of the other fingers are touching the iliac crest. It is an IM injection site (Appendix SOP/PD/230_01/A1a).

4. **Responsibility**

4.1. The members of the Department of Pharmacy (staff and students) are responsible for following this SOP.

4.2. The designated Laboratory Officer or Laboratory Assistant is responsible for ensuring that this SOP is followed.

5. **Procedure**

5.1. **Diagrams of the IMSIT S403**

*View from the Back*

![Diagram of the IMSIT S403 - View from the Back](image)
5.2. **Injection Preparation**

5.2.1. Wash hands thoroughly and wear disposable gloves.

5.2.2. Prepare a sterile syringe and needle using water.

5.3. **Injection Site Location and Injection Administration**

5.3.1. **Vento-gluteal Site**

5.3.1.1. Place the simulator in a lying down position, on the right sideline, such that the left hip is facing upwards and the buttocks is towards the user.

5.3.1.2. Locate the greater trochanter using the right thumb.
5.3.1.3. Replace the right thumb with the palm of the left hand at the site of the greater trochanter; keep the palm at this position.

5.3.1.4. Point the index finger of the left hand towards the simulator’s anterior superior iliac spine and fan out the other three fingers.

5.3.1.5. Form a V area with the index finger separated from the other three fingers; the tips of the fingers should feel along the iliac crest, whilst the thumb should be pointing towards the buttocks.

5.3.1.6. Wipe the injection area with an alcohol wipe using the right hand.

5.3.1.7. Insert the needle of the IM injection towards the bottom of the V formed in 5.3.1.5 at an angle of 90°. The injection site should be half way between the iliac crest and the greater trochanter (Appendix SOP/PD/230_01/A1a).

5.3.1.8. Push the plunger of the syringe until the whole volume of water is administered.

5.3.1.9. Withdraw the needle at the same angle it was inserted.

5.3.2. Dorsogluteal Site

There are two methods for performing dorsogluteal injections.

Method 1:

5.3.2.1. Place the simulator in a lying down position, such that the buttocks is facing upwards.

5.3.2.2. Divide the left buttock into 4 imaginary quadrants, by dividing it half way down the middle and halfway across. (Appendix SOP/PD/230_01/A1b).
5.3.2.3. Wipe the centre of the upper outer quadrant with an alcohol wipe.

5.3.2.4. Administer the injection in the centre of the upper outer quadrant at an angle of 90° to the surface of the buttocks.

5.3.2.5. Push the plunger of the syringe until the whole volume of water is administered.

5.3.2.6. Withdraw the needle at the same angle it was inserted.

**Method 2:**

5.3.2.7. Place the simulator in a lying down position, such that the buttocks is facing upwards and the left hip is towards the user.

5.3.2.8. Locate the greater trochanter using the right hand and place the right thumb on this location.

5.3.2.9. Locate the posterior superior iliac spine using the left hand; place the left thumb on this position.

5.3.2.10. Draw a diagonal imaginary line between the two thumbs, such that the diagonal line dissects the buttock into two parts.

5.3.2.11. Locate the middle point of this imaginary line and place the right index finger on this position.

5.3.2.12. Move the index finger of the dominant hand 2 cm in a straight line towards the waist of the simulator. This is the location where the IM injection is to be administered (Appendix SOP/PD/230_01/A1b).

5.3.2.13. Wipe the injection area identified in 5.3.2.12. with an alcohol wipe using the non-dominant hand.

5.3.2.14. Stretch the skin of the injection site using the non-dominant hand and administer the IM injection at an angle of 90° using the dominant hand.
5.3.2.15. Push the plunger of the syringe until the whole volume of water is administered.

5.3.2.16. Withdraw the needle at the same angle it was inserted.

5.3.3. **Lateral Thigh Site**

   5.3.3.1. Place the simulator in a lying down position on the buttocks, such that the left leg is closest to the user.

   5.3.3.2. Locate the greater trochanter on the left leg and place the right hand just below it.

   5.3.3.3. Place the left hand above the knee of the left leg.

   5.3.3.4. Locate the injection area which is in the centre of the two hands, slightly towards the outer side of the thigh; it is 2-3 cm wide. (Appendix SOP/PD/230_01/A1c).

   5.3.3.5. Wipe the injection area with an alcohol wipe and insert the needle at an angle of 90°.

   5.3.3.6. Push the plunger of the syringe until the whole volume of water is administered.

   5.3.3.7. Withdraw the needle at the same angle it was inserted.

5.3.4. **Subcutaneous Site**

   5.3.4.1. Place the simulator in a lying down position on the buttocks.

   5.3.4.2. Locate the SC injection site on the lower abdominal wall above the inguinal area (Section 5.1.).

   5.3.4.3. Wipe the inguinal area with an alcohol wipe.
5.3.4.4. Pinch up the padding representing the fatty tissue in the inguinal area using the non-dominant hand and administer the SC injection into it.

5.3.4.5. Hold the syringe between the thumb and middle finger of the dominant hand and insert the needle at a 45° angle.

5.3.4.6. Push down the plunger of the syringe using the index finger of the dominant hand until the whole volume of water is administered.

5.3.4.7. Withdraw the needle at the same angle it was inserted.

5.3.5. Location of and palpation for the femoral artery/vein pair

5.3.5.1. Place the simulator in an upright position such that the groin is facing the user.

5.3.5.2. Open the lid of the simulator and look inside, focusing on its right leg.

5.3.5.3. Locate the first tube towards the outside of the simulator; this represents the femoral artery.

5.3.5.4. Locate the second tube that lies medially to the artery; this represents the femoral vein.

5.3.5.5. Close the lid of the simulator.

5.3.5.6. Palpate for the femoral artery using the index finger of the non-dominant hand; once it is located, keep the index finger at this position.

5.3.5.7. Locate the femoral vein medially using the dominant hand. This is the location for placement of a femoral intravenous line (Section 5.1.).
5.4. Maintenance

5.4.1. Remove any wet sponges after each training session and allow them to dry completely before reinserting them into the simulator.

5.4.2. Remove the lid of the simulator, locate each site, detach the Velcro seals and remove the sponges to clean them. Reverse the process to reassemble.

5.4.3. Clean the simulator with a mild detergent or with soap and water and dry thoroughly.

5.5. Flow Charts

5.5.1. Injection Preparation

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Start

Prepare a sterile syringe and needle using water

Wash hands thoroughly and wear disposable gloves

End
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5.5.2. IM Injection and Administration into Ventrogluteal site

Start

Place simulator in a lying down position, on the right sideline, such that left hip is facing upwards towards user and buttocks is facing user

Use right hand thumb to locate greater trochanter

Replace right thumb with palm of left hand at site of the greater trochanter; keep palm at this position

Point index finger towards simulator’s anterior superior iliac crest and fan out other three fingers

Form a V area with index finger separated from other three fingers; fingertips should feel along iliac crest, whilst thumb should be pointing towards buttocks

Wipe injection area with an alcohol wipe

Insert needle of IM injection towards bottom of V at an angle of 90°; injection site should be half way between iliac crest and greater trochanter

Push plunger of syringe until whole volume of water is administered

Withdraw needle at same angle which it was inserted

End
5.5.3. IM Injection Administration into Dorsogluteal site

**Method 1**

Start

Administer dorsogluteal injection

Place simulator in a lying down position, such that buttocks is facing upwards towards user

Divide left buttock into 4 imaginary quadrants, by dividing it halfway down the middle and halfway across

Wipe centre of upper outer quadrant with an alcohol wipe

Administer injection in the centre of upper outer quadrant at an angle of 90° to the surface of the buttocks

Push plunger of syringe until whole volume of water is administered

Withdraw needle at same angle which it was inserted

End

**Method 2**

Place simulator in a lying down position, such that buttocks is facing upwards and left hip is towards the user

Locate greater trochanter using right hand and place right thumb on this location

Locate posterior superior iliac spine using left hand; place left thumb on this position

Draw a diagonal imaginary line between the two thumbs, such that diagonal line dissected buttock into two parts

Locate middle point of this imaginary line and place right index finger on this position

Move index finger of dominant hand 2 cm in a straight line towards the waist of simulator; this is the location where IM injection is to be administered

Wipe injection area with an alcohol wipe using non-dominant hand

Stretch skin of injection site and administer IM injection at an angle of 90° using dominant hand

Push plunger of syringe until whole volume of water is administered

Withdraw needle at same angle which it was inserted
5.5.4. IM Injection Administration into *Lateral Thigh*

Start

Place simulator in a lying down position on buttocks, such that left leg is closest to user

Locate greater trochanter on left leg and place right hand just below it

Place left hand above knee of left leg

Locate injection area which is in the centre of the two hands, slightly towards outer side of the thigh; it is 2-3 cm wide

Wipe injection area with an alcohol wipe and insert needle at an angle of 90°

Push plunger of syringe until the whole volume of water is administered

Withdraw needle at the same angle which it was inserted

End
### 5.5.5. SC Injection Administration

<table>
<thead>
<tr>
<th>Start</th>
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<tbody>
<tr>
<td>Place simulator in a lying down position on buttocks</td>
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<tr>
<td>Wipe inguinal area with an alcohol wipe</td>
</tr>
<tr>
<td>Pinch up padding representing fatty tissue in inguinal area and administer SC injection into it</td>
</tr>
<tr>
<td>Hold syringe between thumb and middle finger of dominant hand and insert needle at a 45° angle</td>
</tr>
<tr>
<td>Push down plunger of syringe using index finger of dominant hand until whole volume of water is administered</td>
</tr>
<tr>
<td>Withdraw needle at the same angle which it was inserted</td>
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</tbody>
</table>

**End**
5.5.6. Location of and Palpation for the Femoral Artery/Vein Pair

Start

Place simulator in an upright position such that groin is facing user

Open lid of simulator and look inside, focusing on the right leg

Locate first tube towards outside of simulator; this represents the femoral artery

Locate second tube that lies medially to the artery; this represents femoral vein

Close lid of simulator

Palpate for femoral artery using index finger of non-dominant hand; once it is located, keep index finger at this position

Locate femoral vein medially using the dominant hand. This is the location for placement of a femoral IV line

End
6. Precautions

6.1. Use the same gentle techniques with the simulator that would be used when performing an injection on a patient.

6.2. Do not clean simulator with harsh abrasives.

6.3. Store the simulator in the provided carrying case.

6.4. Do not make indelible marks with ballpoint pens, ink or markers on the simulator as they will remain.

6.5. Do not use povidone-iodine on the simulator to avoid staining it.

6.6. Dispose of all syringes and needles in a sharps container.

6.7. Do not resheath the needle after use.

6.8. Do not perform actual cannulation since repeated needle sticks will begin to degrade the smooth outer skin of the simulator. The femoral artery/vein pair is presented in the simulator for palpation only.

7. References


8. Appendices

SOP/PD/230_01/A1a – Diagram showing ventrogluteal injection site.

SOP/PD/230_01/A1b – Diagram showing dorsogluteal injection site.

SOP/PD/230_01/A1c – Diagram showing lateral thigh (vastus lateralis) injection site.

SOP/PD/230_01/A2 – Diagram showing greater trochanter and iliac crest.

SOP/PD/230_01/A3 – Diagram showing angles of injections.

9. Revision History

<table>
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<tr>
<th>Version Number</th>
<th>Amendments/ Reasons for change</th>
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<tr>
<td>01</td>
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UNIVERSITY OF MALTA
FACULTY OF MEDICINE & SURGERY
PHARMACY DEPARTMENT

STANDARD OPERATING PROCEDURE

INTRAMUSCULAR AND SUBCUTANEOUS INJECTION TRAINER (IMSIT S403)

Valid for: 2 years from approval

SOP/PD/230_01/A1a – Diagram showing ventrogluteal injection site

SOP/PD/230_01/A1b – Diagram showing dorsogluteal injection site
### STANDARD OPERATING PROCEDURE

**INTRAMUSCULAR AND SUBCUTANEOUS INJECTION TRAINER**  
(IMSIT S403)

**Valid for:** 2 years from approval

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**SOP/PD/230_01/A1c – Diagram showing lateral thigh (vastus lateralis) injection site**

![Diagram showing lateral thigh injection site](image1)

**SOP/PD/230_01/A2 – Diagram showing greater trochanter and iliac crest**

![Diagram showing greater trochanter and iliac crest](image2)
SOP/PD/230_01/A3 – Diagram showing angles of injections