Forum for Injection Technique Singapore

FIT-SG 2.0

Updated Insulin Delivery Technique Recommendations

fitter™ FORWARD

ADES EST. 1997

Association of Diabetes Educators Singapore

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DISCLAIMER

This document will be made accessible to Healthcare Professionals involved in insulin injection therapy. The recommendations are based on current best practices and available evidence at the time of publication.

The information and recommendations stated in this publication are not a substitute for individual medical and/or nursing assessment and treatment by professional staff. The implementation of these recommendations may significantly impact the health outcomes of individuals living with diabetes who require subcutaneous insulin injection therapy.

Although the publisher has taken every care to ensure the accuracy of the professional, clinical and technical components of this publication, it accepts no responsibility for any loss or damage suffered by any person as a result of following the procedures described or acting upon information set out in this publication.

PREFACE

Welcome to the second edition of the Forum for Injection Technique Singapore (FIT-SG) 2.0: Updated Insulin Delivery Technique Recommendations.

Since the publication of the educational flipchart on the best recommendations for injection techniques for people with diabetes in 2012 and the first edition of FIT-SG in 2018, we have witnessed significant advancements in the field of injection techniques and a growing emphasis on best practices in healthcare. This updated edition aims to reflect these developments and provide healthcare professionals with the most current and evidence-based recommendations for safe and effective injection practices.

The importance of proper insulin injection techniques cannot be overstated. They play a vital role in ensuring patient safety, enhancing therapeutic outcomes, and minimising complications. We trust that the FIT-SG will continue to serve as an invaluable resource for diabetes educators in their clinical practice.

Thank you for your dedication to providing the highest standard of care to your patients. Together, let us continue to advance our knowledge and skills in injection techniques for the benefit of those we serve.

Ms. Winnie Poh
FIT-SG Project Chairperson
President
Association of Diabetes Educators (Singapore)

FOREWORD

This updated guide reflects our commitment to enhancing injection technique education and patient care in Singapore. Building upon the success of our first edition in 7 years, this educational resource provides a practical insight to support healthcare professionals in delivering optimal diabetes care through proper injection techniques.

Ms Brenda Lim
FIT-SG Project Co-Chairperson
Vice President (Special Project)
Association of Diabetes Educators (Singapore)

Many individuals with diabetes mellitus require injection medications (especially insulin) for blood glucose control. This updated publication, incorporating the most recent scientific evidence, provides clear and accurate information for safe and effective injection techniques. It is my hope that the individuals with diabetes and their caregivers will benefit greatly from the up-to-date guide.

Dr Abel Soh Wah Ek
President
Endocrine and Metabolic Society of Singapore (EMSS)

ENDORSEMENTS

"Heartfelt congratulations to the Association of Diabetes Educators Singapore (ADES) on the release of the second edition of FIT-SG. This updated publication marks a meaningful step forward, introducing key advancements in injection technique that enhance patient safety, clinical precision, and therapeutic outcomes. We trust FIT-SG will continue to serve as a valuable and practical resource for diabetes educators in their daily practice. Diabetes Singapore looks forward to deepening our partnership with ADES as we work together to improve the lives of those living with diabetes.."

DIABETES SINGAPORE

Dr. Bee Yong Mong
President
Diabetes Singapore

"This publication with clear and practical advice backed up by up-to-date scientific evidence should benefit patients coping with daily insulin injections and healthcare providers tasked to teach the fundamentals of safe insulin injection techniques and skills."

EMSS
Endocrine & Metabolic Society of Singapore

Dr Abel Soh Wah Ek
President
Endocrine and Metabolic Society of Singapore (EMSS)

"We are heartened to be collaborators for the review and endorsement of this latest publication by the Association of Diabetes Educators (ADES). This latest version serves to be a useful resource for our various healthcare professionals managing diabetes care, focusing on end to end education including mental model, communication and techniques. Congratulations on the successful publication and look forward to many more future collaborations between nurses and pharmacists!"

PHARMACEUTICAL SOCIETY OF SINGAPORE
NOT FOR SELF BUT FOR ALL

Ms Lim Hong Yee
President, 119th council
Pharmaceutical Society of Singapore (PSS)

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Second Published Date: August 2025

The FIT-SG working committee would like to thank Dr. Lim Shu Fang, a member of the Pharmaceutical Society of Singapore, for vetting the FIT-SG 2.0.

ACKNOWLEDGMENT

The Association of Diabetes Educators (Singapore) would like to extend our heartfelt thanks to embecta Singapore, formerly part of BD, for their support in the development of FIT-SG 2.0.

KEY

Advance Insulin Injection Technique and Education with FITTER Forward Expert Recommendations, published in 2025.

- A STRONGLY RECOMMENDED
- B RECOMMENDED
- C UNRESOLVED ISSUE

For the scientific support the following scale was used.

1. At least one randomised controlled study.
2. At least one non-randomised (or non-controlled or epidemiologic) study.
3. Consensus expert opinion based on extensive patient experience.

A number of significant studies have been published in the intervening years since 2009. Therefore FITTER has conducted a further review of critical evidence and included this within the 1st Edition of the new Injection and Infusion Recommendations. The body of evidence has been subjected to the rigour of the strength scale of recommendations as above with a slightly modified KEY for the scientific support:

For the scientific support the following modified scale was used.

1. At least one rigorously performed study, peer-review and published.
2. At least one observational, epidemiologic or population-based study.
3. Consensus expert opinion based on extensive patient experience.

Thus each recommendation is followed by both a letter and number. The letter indicates the weight a recommendation should have in daily practice and the number, its degree of support in the medical literature . The most relevant publications bearing on a recommendation are also cited. There are few randomised clinical trials in the field of injection technique (compared, for example, with blood pressure control) so judgements such as ‘strongly recommended’ versus ‘recommended’ are based on a combination of the weight of clinical evidence, the implications on patient therapy and the judgement of the group of experts.

These recommendations apply to the majority of people with diabetes using injectable therapy, but there will inevitably be individual exceptions for which these recommendations must be adjusted.

Acknowledgment

The New Insulin Injection and Infusion Recommendations for Patients with Diabetes: Frid AH, Kreugal G, Grassi G, et al. New insulin therapy recommendations. Mayo Clin Proc. 2025 Apr;100(4):682-699. informed these recommendations and we thanked the editors of the Mayo Clinics for permission to use materials from this article and also to the FITTER Forward, latest effort to update insulin delivery technique recommendations sponsored by embecta.

LIST OF ABBREVIATIONS

Abbreviation	Term
BMI	Body Mass Index
CGMS	Continuous Glucose Monitoring Systems
HbA1c	Glycated Hemoglobin
HCP	Healthcare Professionals
IM	Intramuscular
NPH insulin	Neutral Protamin Hagedorn insulin, which is also known as olsophane insulin
PWD	People with Diabetes
SC	Subcutaneous
T1DM	Type 1 Diabetes Mellitus
T2DM	Type 2 Diabetes Mellitus
TDD	Total Daily Dose

1.0

Therapeutic Education by Healthcare Professionals (HCP)

Insulin therapy is essential in the management of type 1 diabetes mellitus (T1DM) but also often necessary for managing hyperglycaemia in type 2 diabetes mellitus (T2DM). Hence, it is crucial for people with diabetes (PWD) who are on insulin therapy to be educated on the proper use of insulin and healthcare professionals (HCP) must have adequate training to be able to provide the education.

1.1 Management of Barriers to Starting Insulin Therapy

It is necessary to identify, address and manage all barriers presented by PWD and caregivers when initiating insulin therapy.

1.1.1. Explore Barriers to Starting Insulin Therapy

- Several barriers have been identified that hinder the initiation of insulin, including fear of hypoglycaemia, commitment to treatment, the need for glucose monitoring, the insulin administration method, social rejection associated with the stigma of injections, weight gain, a sense of therapeutic failure at initiation, lack of experience among some HCP and the delayed and reactive positioning of insulin in recent clinical guidelines. (1)
- Other issues include:
- Psychological (e.g., misconceptions, anxieties, fear of needles).
- Physical (e.g., disabilities and impairments).
- Financial burden (extra or hidden costs).
- Lack of support from family, employer, etc.

1.1.2 Address and Manage the Barriers

- Individualised strategies can be developed to manage these barriers.
- Acknowledge fear and concerns with empathy.
- Provide education for knowledge gaps on diabetes and importance of insulin.
- Utilise various methods to minimise barriers, pain and fear of injections with training and ongoing support.
- Facilitate shared decision making by involving PWD to empower them and foster adherence to insulin therapy.
- Refer to Medical Social Worker or Financial Counsellor for social and financial issues if required.
- Overcome systemic barriers: Advocates for streamlined processes within healthcare systems to reduce delays and ensure timely treatment for PWD.

1.2 Psychological Challenges of Injection

People with diabetes especially those requiring insulin, and their caregivers may face with many challenges and disruptions in their daily lives and routines. Providing diabetes self-care management with the use of therapeutic education is beneficial to PWD requiring insulin.

Key points:
Encourage all PWD and caregivers to:

- Express their feelings especially on fears, frustration, anger and struggles.
- Know that they are not alone and it is part of a learning process.
- Feel reassured of the support and assistance by HCP to promote self- management in individualised insulin regimens that fit their lifestyles
- Understand that insulin is not a punishment or failure and that insulin can be most effective for optimal glucose control. (11)

A 3

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1.0

Therapeutic Education by Healthcare Professionals (HCP)

- Explore strategies to overcome psychological barriers on injection.
- Improve blood glucose levels which make them feel better in the long run and prevent long term complications. (7) A 3

1.2.1 Strategies to Reducing Fear, Pain and Anxiety: Adult

- Include caregiver or family member in the plan for patient education, if PWD is agreeable.
- Individualised insulin regimen according to needs and lifestyles with emphasis on both short & long term benefits of optimal glycaemic control with insulin therapy as a goal.
- Provide clear and meaningful education on all aspects of insulin injection through discussion, demonstration of skills and use of apps or visuals. To assess ability to self-inject with a return demonstration by PWD and caregiver
- Use devices which hide the needle from PWD who is fearful of needles.
- Use of the shortest needle available, i.e., 4mm pen needle or 6mm insulin syringe for less painful injections. (12) A 2
- Usage of pen devices may be more acceptable due to the psychological advantages over syringes. (13) A 2
- Consider applying cold compress to the injection site for less painful injection. (14) A 3

1.2.2 Strategies to Reducing Fear, Pain and Anxiety: Children and Adolescents

- Address pain tolerance and anxiety issues of children due to their lower threshold for pain and their fear of the unknown. (15) A 2
- The presence of parents who are well-prepared and calm will transmit less anxiety and being the most effective support for a distressed child.
- Apply distraction techniques or play therapy (e.g., injecting the child's soft toy or doll). (16) A 2
- Use cognitive behavioural therapies that includes relaxation training, guided imagery, graded exposure, active behavioural rehearsal, modelling and positive reinforcement as appropriate rewards for older children. (17) A 2
- Encourage self-injection using a dry injection to allow first-hand experience of a relatively painless injection
- Use of injection ports to help reduce fear of injections and pain (17, 18) B 1
- Parents need to be firm with adolescents on the importance of rotating injection sites and to avoid favourite spots.
- Children over the age of 10 years old should take over their injections from their parents after being taught.
- In cases of suspicious dose manipulation, parents are advised to participate / get involved or at least provide supervision in insulin administration. (19) A 2

Recommendations:

Evaluate injection techniques if:

1. Bleeding or bruising occur, assess and reassure that these issues do not affect absorption of insulin or overall blood glucose control.
2. Bruising continues or appearance of haematoma, to observe the injection technique and suggest to rotate injection sites correctly
3. Patients who experienced random sharp pain need not be alarmed as the needle may have touched a nerve ending without causing any damage.

1.0

Therapeutic Education by Healthcare Professionals (HCP)

1.3 Communication and Observation Plan

- Develop individual education care and document current injection practice.
- Make time to observe attitude and learning capabilities in coping with the injection regimens and injectable.
- Examine and palpate the injection sites at least annually. (4, 5, 7) A 3
- Instruction should be given in both verbal and written form, tailored to the individual needs of PWD. Digital instruction could be used as a supplementary reminder.
- Ensure proper documentation in the PWD's manual or electronic records. (4, 5, 7) A 3
- A quality management process should be put in place to ensure that correct injection technique is regularly practiced by the PWD and is documented in the record.

1.4 The Role of Healthcare Professionals in Insulin Therapy

It is essential for HCP to be well equipped with comprehensive knowledge about diabetes management and stay updated on new treatments and technologies. A well-informed HCP can empower PWD with up-to-date information and resources, significantly improving their quality of care.

- Identifying psychological issues which impact insulin therapy and administration. (7, 8)
- Knowing the time action profile of the different types of injectable therapies and the absorption profiles from different injection sites. (9)
- Teaching PWD and caregivers how to inject correctly and address the psychological hurdles patient may face when injecting or infusing, especially at the initiation of treatment. (7, 8)
- Understanding the anatomy of insulin delivery sites in order to help patients avoid intramuscular (IM) injections.
- Ensuring that injections and infusion cannulae are consistently given into the subcutaneous (SC) tissue, without leakage/backflow or other complications. (10)
- Utilising various methods of minimising barriers, pain and/or fear of injection in order to reduce psychological distress and impact on insulin therapy and administration. (7, 8)

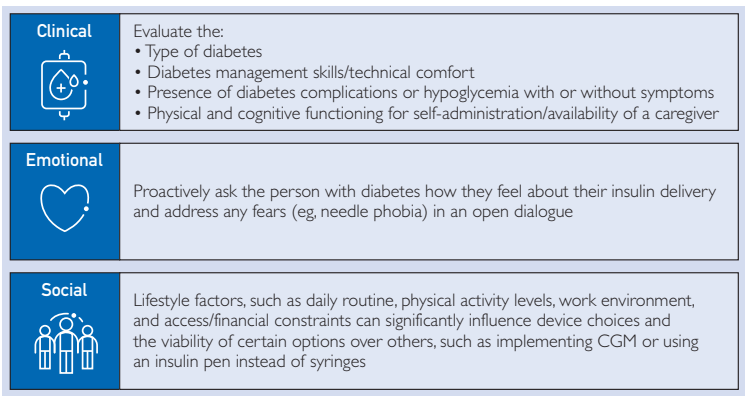

Figure 1. Consider the clinical, emotional and social needs of the PWD to support appropriate individualised insulin delivery device selection and understand key concerns when training on their use. (20)

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1.0

Therapeutic Education by Healthcare Professionals (HCP)

1.5 Adopt Evidence-based Educational Strategies when Initiating Insulin

Many studies have found that structured, intensive educational programs for insulin injection technique improve clinical outcomes by using visual aids, simulated injection tools, or instructional videos. Examples of impactful protocols include:

- Providing early education on insulin and its devices to familiarise PWD and caregivers with its role, especially when diabetes is newly or recently diagnosed, to correct any misconceptions about insulin.
- Allowing adequate time for PWD and caregivers to choose preferred insulin delivery devices based on their needs, concerns, and affordability.
- Offering meaningful education on all aspects of insulin injection through discussion and the use of apps or visuals.
- Assessing understanding by having a return demonstration of skills by PWD or caregivers on correct injection techniques after initial instructions by HCP.
- Implementing ongoing assessment, refresher education, or reinforcement at every opportunity to promote adherence to treatment.
- Ensuring all HCPs are kept abreast of new insulin delivery technology and educational tactics.
- Considering the clinical, emotional, and social needs of the PWD to support appropriate individualized insulin delivery device selection and to understand key concerns when training on their use.

1.6 Essential Topics for Discussion with People with Diabetes and Caregivers for Correct and Safe Insulin Delivery

- Individualised injectable therapy regimen.
- Choice and management of the devices for more comfortable and easier insulin delivery including safety devices.
- Choice, care and self-examination of injection sites.
- Correct injection techniques for both pen and syringe users including site rotation, injection angle and use of lifted skin fold if required.
- Resuspension of insulin vials or pens with cloudy or milky appearance, for e.g., NPH (isophane) insulin and premixed insulin containing intermediate-acting insulin with added protamine.
- Management of injection complications such as lipodystrophy particularly lipohypertrophy. (2)
- Optimal needle lengths: use of shortest needles available to avoid intramuscular injections for all adults and children e.g., 4 mm for pen and 6 mm for syringe with skin folds. (3)
- Avoid needle reuse to prevent infection and pain from blunt needles.
- Safe disposal of used sharps. General standards and regulations can vary by country. It is important to follow local guidelines regarding sharps disposal.
- Correct storage for both new and in use insulin and expiration as per manufacturer's guidelines. (14)
- Regular glucose monitoring including implementing the use of Continuous Glucose Monitoring Systems (CGMS) with benefits for real-time monitoring and reducing the frequency of finger pricks. (15)

1.0

Therapeutic Education by Healthcare Professionals (HCP)

- Management of hypoglycaemia from risk of increased use of insulin therapy (7, 8, 11, 21, 22) A 3

Many studies have found that structured, intensive educational programs for insulin injection technique improve clinical outcomes by using visual aids, simulated injection tools, or instructional videos.

HCP to ensure that the topics discussed are fully understood by PWD and caregivers at the beginning with subsequent assessment of topics revisited annually for continued understanding and adherence. (6, 7) A 3

Physical reviews and visits to the healthcare professionals are still needed/warranted despite increased use of telehealth.

Additional Information:

- The increasing use of other subcutaneous injectable treatment for diabetes, such as therapies based on incretins (hormones that stimulate endogenous insulin secretion), is noteworthy. It is important that the use of these injectables follows the same recommendations as for insulin injections to ensure safe and effective management of diabetes.

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2.0

Injection Techniques

Proper injection techniques are important to avoid intramuscular injections and ensure the appropriate delivery of insulin to the subcutaneous tissue. (107)

2.1 Choosing the Injection Sites

Insulin absorption is fastest and most consistent when injected into the abdomen, which is the preferred site for insulin injection for the majority of people with diabetes(PWD). Other sites include the upper and outer thighs, upper arms and upper buttocks. Figure 2 shows the current recommended subcutaneous injection sites injectable medication.

A. Abdomen within the following boundaries
   - ~1cm above the symphysis or pubic joint
   - ~1cm below the lowest rib
   - ~1cm away from umbilicus and laterally flanks
B. Upper third anterior lateral aspect of both thighs
C. Posterior lateral aspect of both upper buttocks and flanks
D. Middle third posterior aspect of the upper arm

Optimal injection site characteristics

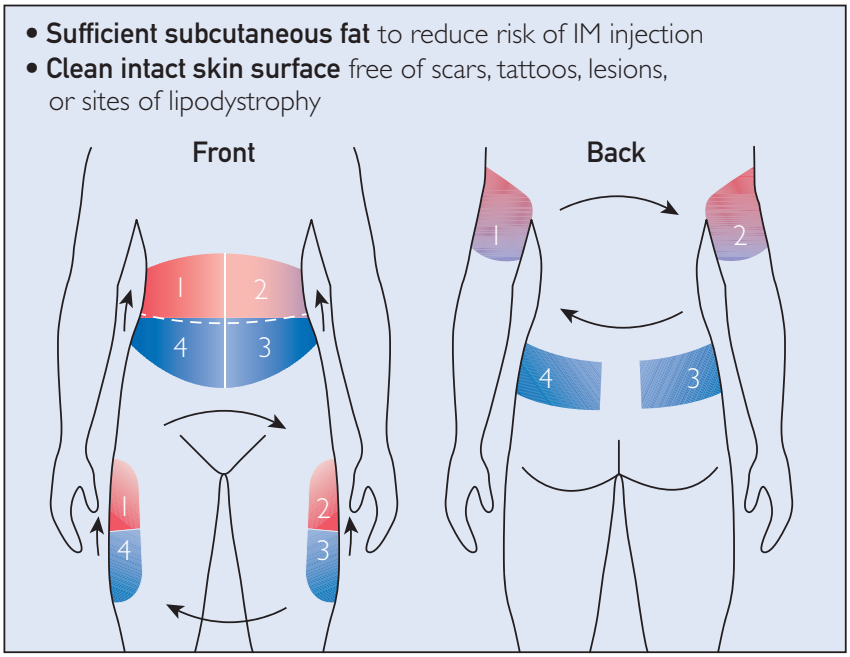

Figure 2. Current Recommended Injection Sites

2.1.1 Insulin Absorption

- Optimal absorption of insulin depends on injection into subcutaneous tissue. Absorption rate can be affected by various factors such as type of insulin, insulin storage, skin temperature, site of injection and exercises.
- Intramuscular (IM) injections increase hypoglycemia risk because of a faster absorption rate and should be avoided. (20, 66)
- The abdomen is the preferred site for subcutaneous soluble human insulin injection since absorption of soluble insulin is the fastest. (72, 73, 74) A 1
- Soluble human insulin / NPH mix should be given in the abdomen to increase the speed of absorption of these short-acting insulin, in order to cover post-prandial glycaemic changes. (75) A 1

2.0

Injection Techniques

- IM injections and long-acting insulin must be strictly avoided due to the risk of hypoglycaemia. (76, 77, 78) A 1
- Rapid-acting and long-acting insulin analogues may be administered at injection sites such as abdomen, thighs, upper buttocks or upper arms as absorption rates do not appear to be site-specific. The abdomen remains the most commonly preferred site due to faster and more consistent absorption. (79, 80, 81) A 1
- Rapid-acting insulin analogues should be given subcutaneous and not IM. (80, 81, 82) A 2

Additional Information:
Patients using subcutaneous non-insulin injectable therapies should follow the recommendations already established for insulin injections with regards to needle length, site selection and site rotation.

2.1.2 Rotation of Injection Sites

- Systematic rotation of injection sites reduces the risk of lipodystrophy and minimizes skin thickening at overused sites. (20, 108, 109)

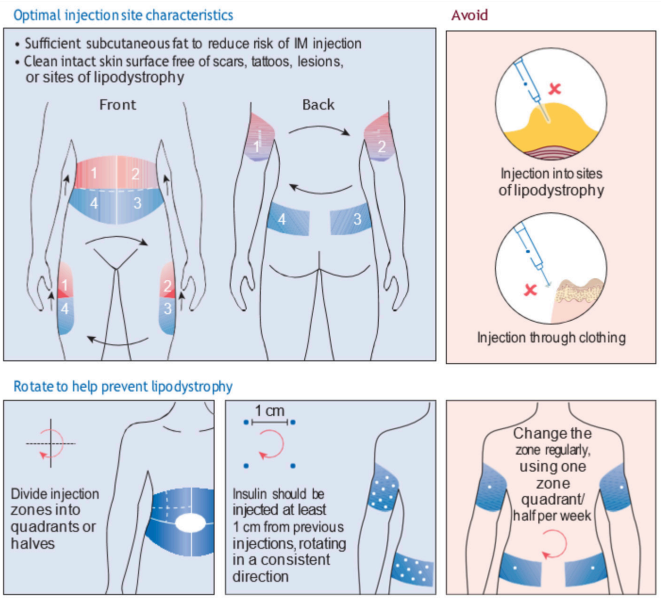

Figure 3. Optimal injection site characteristics (20).

- Teach patients an easy-to-follow scheme to systematically rotate sites to prepare for injections in such a way that they are spaced approximately one finger's breadth apart to avoid repeat tissue trauma.
- Divide the injection site into quadrants and move quadrant to quadrant in a consistent direction. (Figure 3)
- Insulin should be injected at least 1 cm from previous injection sites (approximately the width of one adult finger), rotating in a consistent direction. If administering 2 injections at the same time (e.g., prandial and basal insulin), then they should be given at separate injection sites. (20)
- Pre-empt patients that site rotation may need to be adjusted as insulin therapy changes. Follow up with patients on their rotation scheme taught at each visit and provide advice where necessary. The HCP should review the site rotation scheme with the patient at least once a year. (20, 83, 84, 85) A 1

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2.0 Injection Techniques

2.2 Injection Process

2.2.1 Preparing the Injection Site

- Ensure both the injection site and the hands are clean prior to injection.
- The site should be inspected and palpated by the individual prior to injection. (86, 87, 88) A 2
- The site should be cleansed with soap and water when found to be unclean. Injections should be given into a clean site using clean hands. (89, 90) A 3
- Routine use of alcohol swab for disinfection is not strictly necessary unless the area is dirty or contaminated. However, within healthcare institutions, it is important to follow the institution's standard protocol if it includes cleaning of injection site with an alcohol swab before injection.If alcohol is used to clean the site, the skin must be allowed to dry completely before the injection is administered. (91, 92, 93) A 1
- Do not inject into sites of lipohypertrophy, inflammation, edema, ulceration or infection, nodules, scar tissue, tattoos, hernias and stoma area. (20, 94, 95, 96) A 1
- Do not inject through clothing because doing so prevents the examination of the injection site, proper skin lift technique, and the needle penetration verification. (20, 69, 89) B 2

2.2.2 Preparing Insulin Suspension

- Roll the cloudy insulin (e.g., NPH and pre-mixed insulin) gently for ten times and inverted ten times (not shaken) until the insulin suspension appears uniformly milky. (98, 99, 100) A 2
- Inversion and rolling should be performed a total of 20 times immediately before every cloudy injection. (Figure 4)
- Confirmed that the re-suspended insulin is sufficiently mixed after each rolling and inversion and repeat the procedure until the insulin suspension appears uniformly milky. (98, 99, 100) A 2
- Avoid vigorous shaking as this produce bubbles which reduce accurate dosing (98, 99) A 2

2.2.3 Proper Use of Pen Device

- Pen devices should be primed (observing at least a drop at the pen needle tip) according to the manufacturer's instructions before the injection to ensure there is unobstructed flow and to clear needle dead space. (20). Once flow is verified, the desired dose should be dialed, and the injection administered. (93) A 3
- Pen and cartridges are for a single patient and should never be shared between patients due to the risk of biological material from one patient being drawn into the cartridge and then injected into another. (101) A 2
- Needle should be disposed of immediately after use instead of being left attached to the pen.

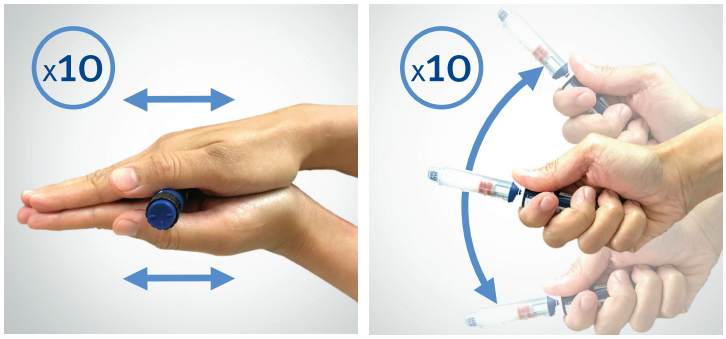

Figure 4. Method of mixing cloudy insulin; roll 10 times and invert 10 times

2.0

Injection Techniques

This prevents the entry of air (or other contaminants) into the cartridge as well as the leakage of medication out, which can affect subsequent dose accuracy. (70, 95, 96, 97) A 2

- Pen needles should be used only once. (102, 103, 104, 105) A 2
- After pushing the insulin pen's dose delivery button in completely, patients should count slowly to 10 before withdrawing the needle to get the full dose and prevent the leakage of medication (2). Counting past 10 may be necessary for higher doses. (86, 95, 106) A 1

2.2.4 Proper Use of Insulin Syringes

- When drawing up insulin, the air equivalent to the dose or slightly greater than the intended dose should be drawn up first and injected into the vial to facilitate insulin withdrawal. (3)
- If air bubbles are seen in the syringe, tap the barrel to bring them to the surface and then remove the bubbles by pushing up the plunger. (20)
- Unlike pens, it is not necessary to hold the syringe needle under the skin for 10 seconds after the plunger has been depressed. (95, 106) A 2
- Syringe needles should be used only once. (71, 102, 103, 104, 105) A 3

2.3 Lifting a Skin Fold

- Each injection site should be examined individually, and a decision made as to whether lifting a skin fold is required, considering the needle length used (refer to Chapter 3 Needle Length). The recommendation should be provided to the patient in writing and documented in their care plan.
- The lifted skin fold should not be squeezed so tightly that it causes skin blanching or pain. (Figure 5)
- The optimal sequence should be:

1. Lift a skin fold;
2. Inject insulin slowly at ninety-degree angle to the surface of the skin fold;
3. Leave the needle in the skin for a count of 10 after the dose button is fully depressed when injecting with a pen;
4. Withdraw needle from the skin at the same angle it was inserted;
5. Release skin fold;
6. Dispose of used needle safely.

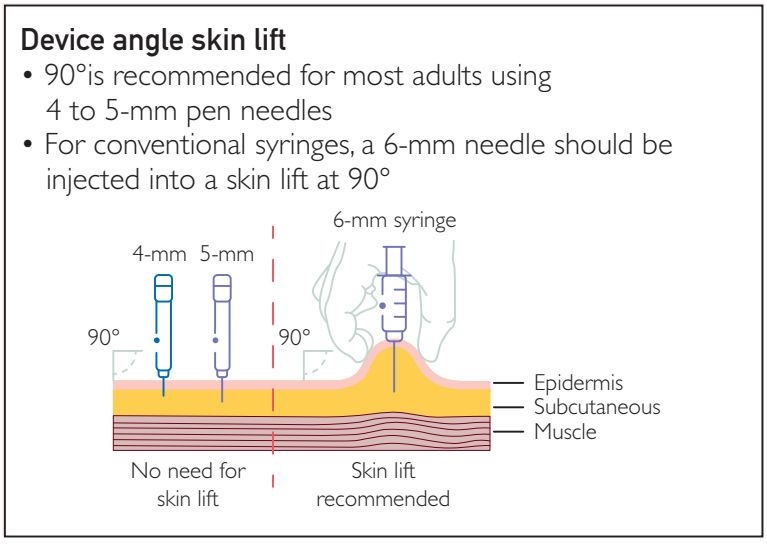

Figure 5. Correct and incorrect technique of performing skin fold

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2.0 Injection Techniques

2.4 Post Injection Care

2.4.1 Needle Reuse

- Syringe or pen needles should only be used once. Reusing insulin needles is not optimal injection practice and patients should be discouraged from doing so. (93, 107) (Figure 6) A 2
- There is an association between needle reuse and the presence of lipohypertrophy, although a causal relationship has not been proven. Patients should be made aware of this association (and the association between reuse and pain or bleeding). (71, 93, 94) A 2

Needle reuse
Avoid needle reuse to prevent infection
pain from dull needles

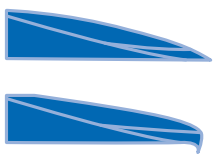

Figure 6. Needle reuse damages the tip of the needle.

Additional Information:

- Only cloudy insulin suspension requires re-suspension.
- Clear insulin: Soluble human insulin, rapid-acting insulin analogue (aspart, glulisine, lispro), long-acting insulin analogues (detemir, glargine), premixed degludec/aspart.
- Cloudy insulin: NPH (neutral protamine Hagedorn also known as Isophane), premixed insulin containing NPH or protamine, for e.g. aspart/aspart protamine premix, lispro/lispro protamine premix.
- Note: Not all premixed insulin are cloudy in appearance. Only premixed insulin containing protamine are cloudy in appearance. For example, Ryzodeg (premixed degludec/aspart) is clear in appearance.

2.4.2 Bleeding and Bruising

- Patients should be reassured that bleeding and bruising do not appear to have adverse clinical consequences for the absorption of insulin or for overall diabetes management. (108) A 2

2.4.3 Needle Disposal

- Needles must be disposed of safely into a puncture-proof sharps container to avoid accidental needlesticks or environmental contamination. (20)

2.5 Storage of Injectable Medication (Cartridge, Pre-filled Pens or Vials)

- Do not expose injectable medication to direct sunlight.
- Insulin should be removed from the fridge at least 30 minutes before injecting. (68)
- Always check the expiry date before using.
- Injectable medication not opened or not in use should be stored in a refrigerator between two to eight degrees Celsius (110).
- (2-8° C) where freezing is unlikely to occur, and without contamination by food (4, 20), as per manufacturer's instructions.
- Store opened injectable medication at room temperature between fifteen to thirty degrees Celsius (15 – <30° C). Refer to the product insert for in-use expiry date as it is brand specific. (3, 4, 20)
- Use cooler packs/insulated bags if bringing insulin outside in hot or cold/freezing conditions (4, 20, 67)

2.0

Injection Techniques

Tips for Less Painful Injection:

- Insulin should be allowed to come to room temperature by leaving it out of the fridge at least for 30 minutes. (20, 68) A 2
- Store in-use insulin at room temperature. (47, 48)
- If using an alcohol swab which is optional, allow to dry completely on the skin before injecting. (111, 112) B 1
- Use needles with shorter length and smaller diameter (higher gauge). (29, 118) A 1
- Insert the needle at 90-degree angle to the skin in a quick smooth movement. (114) A 3
- Inject the insulin slowly ensuring that the syringe plunger or pen's dose delivery button has been fully depressed. (114) A 3
- Single use of syringes and pen needles. (25, 26, 54, 55, 87, 88, 115, 116) A 2
- Gentle lifting instead of squeezing tightly of skin fold if required. (3) A 3

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B RECOMMENDED
C UNRESOLVED ISSUE

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3 Consensus expert opinion based on extensive patient experience.

3.0

Needle Length

3.1 Adult

- The 4mm pen needle inserted perpendicularly is long enough to penetrate the skin and enter the subcutaneous tissue, with little risk of intramuscular injection. Therefore, it should be considered the safest pen needle for adults regardless of age, gender and Body Mass Index (BMI). (20, 21, 26, 28, 29, 30)
- The 4mm pen needle may be used safely and effectively in all obese patients. Although it is the needle of choice for these patients, a 5mm needle may be acceptable. (20, 24, 31-36)
- The 4mm pen needle should be inserted perpendicularly (at ninety-degree angle) regardless of whether a skin fold is raised. (40, 41) (Refer to Figure 7 below)
- If arms are used for injections with needles ≥6mm long, a skinfold must be lifted, which requires injection by a third party. (38)
- Avoid pushing the pen device into the skin thus indenting the skin during injection, as the needle may penetrate deeper than intended and enter the muscle.
- A contoured-based pen needle design has a wider surface area in contact with the skin, which helps distribute pressure more evenly during injection. This reduces the overall force needed to inject, minimized skin indentation, and therefore reduces bruising and the risk of accidental IM injection- supporting more comfortable and safer injection. (20, 117, 118)
- Extremely thin adults (BMI<19) should use the 4mm pen needle by lifting a skin fold and inserting the needle perpendicularly (at ninety-degree angle) into it. Others may inject using 4mm pen needle without lifting a skin fold. (10, 23, 26, 35, 37, 38)
- When any syringe needle is used in slim to normal weight adults (BMI 19-25), injections should always be administered into a lifted skin fold. (10, 23, 24, 36, 39-65)
- In adult injection, there is no clinical reason for recommending needles ≥ 8mm. (24, 25)

3.2 Children and Adolescents

- Very young children (6 years old and below) should use the 4mm pen needle by lifting a skin fold and inserting the needle perpendicularly into it. Children above 6 and adolescent may inject using the 4mm pen needle without lifting a skin fold. (10, 23, 26, 35, 37, 38)
- Children using the 5mm pen needle should be injected using a lifted skin fold. But children using pen needles of 5mm or longer should be changed to 4mm pen needles if possible; and if not, should always use a lifted skin fold. (10, 23, 35, 37, 38)
- When any syringe needle (i.e., 6mm needle) is used in children and adolescents, injections should always be administered into a lifted skin fold. (10, 23, 24, 36, 39-65)
- In children and adolescents, there is no clinical reason for recommending ≥6mm. (26, 27)
- Healthcare authorities and payers should be alerted to the risk associated with using syringe or pen needle ≥6mm in children. (26, 41, 43, 65)

3.0

Needle Length

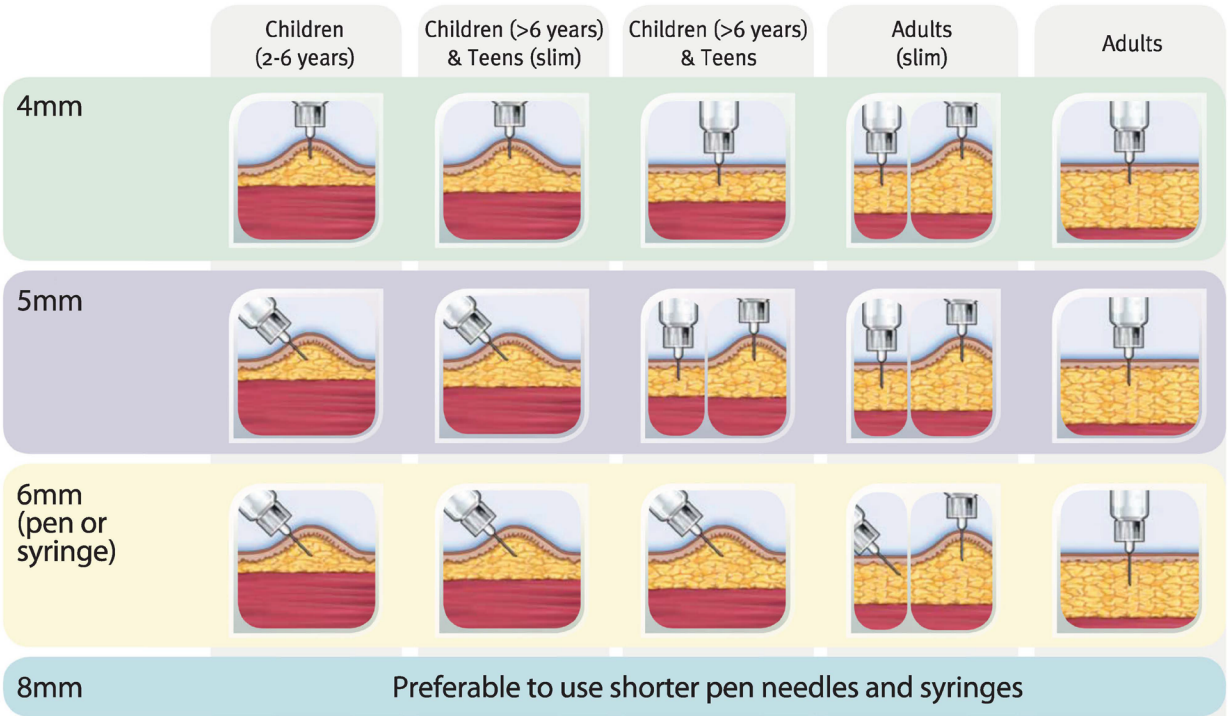

Figure 7. Injection angle for children & teens

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4.0 Safety Use of Device

- Pens and cartridges are for a single patient and should never be shared between patients due to the risk of biological material from one patient being drawn into the cartridge and injected into another. (119, 121)
- Needles should be disposed immediately after use instead of being left attached to the pen. This prevents the entry of air (or other contaminants) into the cartridge as well as the leakage of medication out, which can affect subsequent dose accuracy. (114, 119, 122-125)
- Injecting through clothing is discouraged because with shorter needle length, there is an increased risk of intradermal injection.
- When drawing up insulin, the air equivalent to the dose should be drawn up first and injected into the vial to facilitate insulin withdrawal.
- If air bubbles are seen in the syringe, tap the barrel to bring them to the surface and then remove the bubbles by pushing up the plunger.
- Unlike syringes, it is necessary to hold the pen needle under the skin for 10 seconds after the plunger has been depressed. (114, 122, 126)
- Syringe and needle should be disposed of safely, for example using a sharps container. (119, 122-125)
- Needle Reuse
  - Syringe or pen needles should only be used once. (87, 88, 116, 127-130)
  - Reusing insulin needles is not optimal should be discouraged from doing so.

Tips for safe injection:
- No sharing of pens and cartridges
- Avoid injecting through clothing
- Single use of syringes and pen needles
- Disposed sharps into sharps container or its equivalent

4.1 Syringes

- Inject the same amount of air as insulin dose into insulin vial first
- Remove air bubbles from syringe by tapping the barrel and pushing up the plunger

4.2 Pen Needles

- Dispose pen needles immediately after use
- Unlike syringes, pen needle must be kept under the skin for 10 seconds after injecting insulin for accurate dosing

5.0

Lipohypertrophy

- Lipohypertrophy is a common skin complication that happens when insulin is repeatedly injected into the same spot under the skin. (139)
- Lipohypertrophy appears as a rubbery or thickened lump under the skin, usually painless. It is commonly found on the abdomen, thighs or arms, sites where insulin is often injected. (3)
- Injecting into lipohypertrophy sites may cause unpredictable insulin absorption which increases the risk of hypoglycemia, hyperglycemia and glycemic variability leading to higher Hba1c. (138)
- A meta-analysis found that the prevalence of lipohypertrophy in patients on insulin is estimated to be 41.8% and the prevalence is higher in those who have been on insulin therapy for a longer duration. (140)
- PWD on insulin are at risk of developing lipohypertrophy due to various factors such as inadequate rotation of injection sites, repeated use of the same needle, the length of the needle used for injections and the number of injections per day. (138)

5.1 Lipohypertrophy Assessment

Assessment of lipohypertrophy should be done at every visit if possible or at least once a year for patients on insulin therapy. (137). Physical examination for lipohypertrophy should be done more frequent if PWD is known to have lipohypertrophy. (7, 85) A 2

Check for lipohypertrophy by following a clear, step-by-step assessment process.

Start by Asking Targeted Questions

- "Do you rotate your injection sites regularly?"
- "Have you noticed any lumps or swelling at injection sites?"
- "Do you reuse needles?"

Next, Inspect the Skin

- Visually examine the common injection areas and look out for swelling, asymmetry, lumps, skin discoloration or scarring.
- As lipohypertrophy can be difficult to detect visually, palpation is key to detect lipohypertrophy. With clean and warm hands, gently press the injection sites with fingertips using circular motion. Feel for any rubbery, thickened or firmed areas. (136)

5.2 Managing Lipohypertrophy

- If lipohypertrophy is detected, instruct patient to stop injecting insulin over areas with lipohypertrophy at least until next review.
- Use visual documentation, to record the location and size of lipohypertrophy to monitor progress and improvements over time. Explore strategies to reduce risk of lipohypertrophy, including rotating injection sites, always use a new needle for each injection and use appropriate needle length. (20)
- Advise PWD to check their blood glucose levels more often when changing from an area with lipohypertrophy to healthy subcutaneous tissue for injections. This is important because patients may have an increased risk of experiencing hypoglycemia during this transition. (135) A 1
- HCP should consider insulin dose reduction when patient is switching injection sites from lipohypertrophy area to normal subcutaneous tissue. (131, 132, 133) A 1

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5.0

Lipohypertrophy

- Advise PWD not to re-use insulin needle as there has been association between reusing needle and lipohypertrophy. (103) A 2
- PWD on insulin therapy should receive education about proper insulin injection technique and how to recognise lipohypertrophy. (134) A 2

5.3 Lipohypertrophy Cases

Case 1: Site Rotation

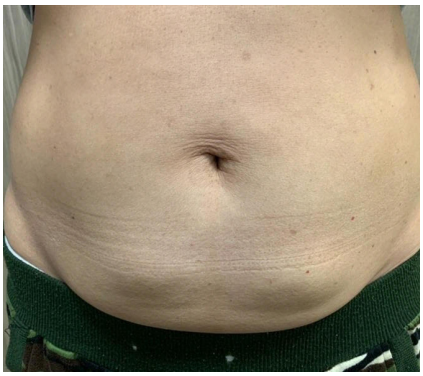

Figure 8. Multiple lipohypertrophy all over abdomen. (Photo courtesy of patient)

Patient was prescribed pre-mixed insulin twice daily. Patient was injecting insulin only over two areas of the abdomen. Patient was given an injection rotation map and was taught on how to divide the injection zones for proper rotation. Advise to inject insulin at least 1 cm away from previous injection sites (approximately the width of one adult finger), following a consistent rotational pattern.

Case 2: Insulin Dose Reduction to Prevent Hypoglycaemia

Figure 9. Multiple lipohypertrophy all over abdomen. (Photo courtesy of patient)

Patient had been injecting insulin around umbilicus. Total daily dose (TDD) of insulin was 133 units a day. After switching injection sites from lipohypertrophy area to normal subcutaneous tissue, TDD reduced to 64 units a day. A reduction of> 50% of initial insulin dose. HbA1c improved from 9.4% to 7.5°/o within 3 months after switching injection sites on reduced dose of insulin.

Key Points:

- Rotate injection sites
- Inspect sites regularly
- Avoid injecting into areas with lipohypertrophy
- Use a new needle each time
- Educate patients on prevention and management of lipohypertrophy

6.0

Troubleshooting for Injection Issues

6.1 Site Reactions (Pain, Bleeding and Bruising)

- Use of the thinner (higher gauge) needles (such as 32G), and shortest pen needles (4mm) was associated with significantly fewer painful insertions and fewer bleeding insertions as compared with larger gauge (28G) needles. (20, 141) B 2
- Bleeding and bruising may occur once in a while, but it does not affect the absorption of insulin. (2, 142) A 2
- If bleeding occurs, apply light pressure on insulin injection site to stop the bleeding. Do not rub the injection site as it may lead to bruising. Advise patient to avoid injecting insulin over bruised area until bruise has resolved.
- Injection technique has to be carefully assessed in patient who are using anticoagulant or antiplatelet agents as these may cause frequent or excessive bleeding or bruising.

6.2 Leakage of Insulin

- Small amount of insulin leakage post insulin adminstration (little pearl of liquid at tip of insulin needle) can be ignored as it is usually not clinically significant. (126, 143, 144, 145) A 1
- Advise patient to count up to 10 seconds after injecting insulin before removing pen needle from injection site. This is to ensure that all the insulin is delivered. (144) A 2
- For large doses of insulin, patient may need to discuss with their doctor or HCP before splitting the dose to reduce the insulin volume per injection. (146) A 2
- However, if patient reports frequent leakage or dripping, reassess patient's insulin injection technique as it may be due to poor insulin injection technique (126, 144, 145) A 2
- Use needles which have a wider inner diameter and improved insulin flow (e.g. Extra-thin wall needles). (147, 148) A 1

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7.0

Pregnancy

- No differences in needle length recommendations are required for pregnant women. (20) B 2
- The 4mm pen needle inserted perpendicularly is long enough to penetrate the skin and enter the subcutaneous tissue, with little risk of intramuscular injection. Therefore, it should be considered the safest pen needle for adults regardless of age, gender and Body Mass Index (2, 20, 21, 26, 28, 29, 30 75, 77, 78, 79) A 1
- Standard injection sites including the abdomen may be used throughout pregnancy. The abdomen is a safe site for insulin administration in pregnancy. (20, 150, 151) B 2
- In the 1st trimester, no change in site/technique is needed; 2nd trimester, use lateral abdominal areas or implement skin lift in central areas overlying fetus; 3rd trimester, use lateral parts of the abdomen with skin lift. (20, 152) B 2
- Given the thinning in abdominal fat from uterine expansion during pregnancy, skin lift technique and shorter needles (4mm) decrease the potential for intramuscular injections (20, 30, 50, 51, 149) B 3

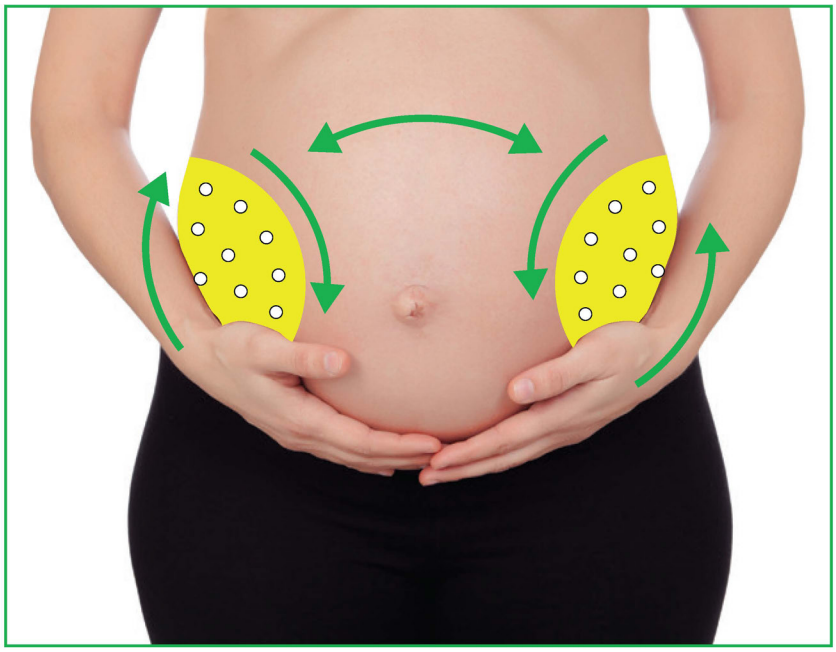

Figure 10. Recommended injection sites (highlighted in yellow) during the third trimesters of pregnancy

Key Points:

- First Trimester: Women should be reassured that no change in injection site and technique is needed.
- Second Trimester: Lateral abdominal areas or implement skin lift in central areas overlying uterus.
- Third Trimester: Use lateral abdominal with skin lift.
- Patients may use the thigh, upper arm or lateral flanks of the abdomen.

8.0

Insulin Pump

- Insulin pump cannula should be changed every 72 hours. (153, 154, 155)
- Change site if there are blood, pain, leakage or rising blood glucose. (156)
- All patients on insulin pump therapy must be taught to rotate infusion sites like how patients are taught to rotate injection sites. (157, 158, 159)
- Infusion sites should be at least 5 cm away from the belly button, previous site, and glucose sensor. (160, 161)
- Avoid waistline/pant line to prevent irritation. (160, 161)
- Patients with erratic glycaemic control should check infusion sites for any signs for lipohypertrophy, bleeding, inflammation or other conditions that could affect insulin absorption or flow. (162, 163, 164)
- Healthcare professionals should check infusion sites at least annually for lipohypertrophy (158)
- Avoid inserting insulin pump cannula over areas with lipohypertrophy. (133, 134)
- Suspect occlusion of insulin flow when unexplained erratic glycemic control or unexplained hyperglycemia occurs. (163, 165)
- If occlusion or flow interruption is suspected, consider changing a new cannula. (177)
- Keep the old cannula for up to 8 hours after ensuring the new cannula is working. (158)
- Remove the adhesive slowly and with low peeling force to reduce skin injury. (156, 160)
- After removal, gently clean and moisturize the area. (160)

Key Points:

- Change insulin pump cannula every 72 hours (3 days)
- Rotate infusion sites regularly to prevent lipohypertrophy
- If glycaemic control is erratic while on insulin pump, check infusion sites to assess for any conditions that may affect insulin flow or absorption
- Check infusion sites for any lipohypertrophy at least once a year
- Avoid inserting infusion cannula over areas with lipohypertrophy.
- Check infusion site after removal of cannula for any signs of infection

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9.0

Needle Stick Injury / Blood-Borne Infection Risks

- The use of shorter needles (e.g., 4 mm pen needles) without lifting a skin fold is recommended to minimize the risk of needle stick injuries. (170) A 2
- If a lifted skin fold is used, the patient, caregiver, or healthcare provider should ensure the index and/or middle finger and thumb are approximately 2.5 cm (1 inch) apart and inject into the centre of the fold to reduce injury risk. (170) A 2
- Needles should not be recapped, as this greatly increases the likelihood of accidental injuries. (167, 173) A 1
- Sharps containers must be accessible at the point of care, ideally beside the patient, before any injection or infusion. (166) (Figure 11 & 12) A 2
- Patients, caregivers, and others who may come into contact with needles should receive training on safe disposal and injury prevention. (169, 174) A 2
- The potential adverse events of needle stick injuries, such as blood-borne infections like Hepatitis B, Hepatitis C, and Human Immunodeficiency Virus (HIV), should be clearly communicated to patients, caregivers, and healthcare professionals. (168, 174)
- Healthcare institutions should routinely conduct needle stick awareness programs and include all individuals potentially exposed to sharps. (170) A 1
- Mandatory Hepatitis B screening and vaccination should be provided to new healthcare workers who lack immunity or prior vaccination. (166) A 1
- Anyone who may be exposed to medical sharps must be trained in first aid procedures and the institution's injury protocols. (169) A 2
- Institutions must cultivate a culture that supports the reporting of needle stick injuries or non-compliance, promoting both worker safety and ongoing education. (168) A 1
- Sharing of insulin pens, cartridges, or vials must be strictly avoided to prevent infectious disease transmission. (166) A 2
- Evidence-based safety devices and compliance with international standards have significantly reduced injury rates and should be used where available. (171, 172)

Figure 11. Sharps container for pen needles

Figure 12. Sharps container for syringes

10.0

Ensuring Quality and Safety

- All HCP, employers, and employees must comply with relevant international, national, and local legislation for the use of sharps.
- Inform health workers in possible contact with sharps to be aware of local safety and disposal regulations, and legal, societal and health related consequences of noncompliance. (176) A 3
- Provide standardised sharps containers that is easily accessible at the point of care beside the patient.
- Provide safety injection devices and ensure there are protective mechanisms for all sharps. (175) B 1
- Ensure health works are scheduled for vaccination on hepatitis and review annually.
- Train health workers to avoid needle recapping.
- Provide education to health workers who are required to use a lifted skin fold to exercise caution to avoid needle stick injury.
- Encourage health workers in reporting of near misses and needlestick injuries. Employers should establish a blame free culture, review of all needle stick injuries and near misses should take place regularly to assess educational needs and allow for policy change.
- Provide education to PWD, caregivers and all others on safe disposal of sharps, and never place sharps directly in public or household trash bin.
- Encourage use of a needle clipping device, a sharps container to dispose according to local policy.

10.1 Legal and Regulatory Compliance

- Healthcare organisations and practitioners must adhere to all international, national, and local regulations governing sharps handling and disposal, including workplace safety legislation and healthcare standards. (176) A 3
- Healthcare facilities must maintain updated documentation of their sharps safety protocols and ensure these are readily accessible to all staff members.

10.2 Staff Education and Training

- Provide comprehensive training for all HCP who handle injectable medications, covering proper injection techniques, safety protocols, and risk management. (175) B 1
- Conduct regular refresher courses on safe injection practices, including proper use of safety devices and appropriate disposal methods.
- Include practical demonstrations and competency assessments in training programmes to ensure proper technique.

10.3 Safety Equipment and Infrastructure

- Install standardised, puncture-resistant sharps containers in all patient care areas.
- Provide safety-engineered injection devices with integrated protective mechanisms, such as needle shields or retractable needles.

10.4 Infection Prevention and Control

- Implement a mandatory vaccination programme for healthcare workers, including:
  - Hepatitis B vaccination for all staff handling sharps
  - Annual review of immunisation status

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10.0

Ensuring Quality and Safety

10.5 Safe Injection Practices

- Strictly enforce no-recapping policy for used needles.
- When using lifted skin fold technique for injection:
- Maintain proper hand positioning
- Use appropriate injection angle

10.6 Sharps Disposal Guide for Home Self-Injection

HCP must educate patients on safe sharps disposal before initiating home self-injection therapy, including:

- Proper handling techniques for needles and lancets
- Safe storage of unused sharps
- Correct disposal methods
- Emergency procedures for needlestick injuries

11.0

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Appendix
Golden Rules
Injection Technique in Adults [1-4]

1. Insulin and GLP 1 receptor agonists must be deposited into healthy subcutaneous fat tissue, avoiding the intradermal and intramuscular spaces as well as scars and lipohypertrophy.

2. 4mm pen needles inserted at ninety degree angle are recommended for all adults regardless of age, gender or BMI. If patients need to use needle lengths >4mm or a syringe (or where the presumed skin surface to muscle distance is less than the needle length) they must use a correctly-lifted skinfold to avoid IM injections.

3. Recommended sites for injection are abdomen, thighs, buttocks, upper arms:
    a. Abdomen within the following boundaries: ~ 1 Cm above symphysis pubis, ~ 1 cm below lowest rib, ~ 1 cm away from umbilicus and laterally at the flanks
    b. Upper third anterior lateral aspect both thighs
    c. Posterior lateral aspect of both upper buttocks and flanks
    d. Mid third posterior aspect of upper arms

4. Detect and avoid injection into areas of lipodystrophy.

5. Rotation of injection sites is critically important and can be correctly performed by:
    a. Spacing injections within a site approximately one finger's breadth apart
    b. Using a single injection site no more frequently than every 4 weeks

1. Frid et al, 2015, New Recommendations, Anatomy and Physiology. Accessible at www.FITTER4Diabetes.com
2. Frid et al, 2015, New Recommendations, Pathology. Accessible at www.FITTER4Diabetes.com
3. Frid et al, 2015, New Recommendations, Psychology and Technology. Accessible at www.FITTER4Diabetes.com
4. Frid et al, 2015, New Recommendations, Glossary, Attendees, Golden Rules. Accessible at www.FITTER4Diabetes.com

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Golden Rules
Injection Technique in Children and Adolescents [1-2]

1. Insulin must be deposited into healthy subcutaneous fat tissue, avoiding the intradermal and intramuscular spaces as well as scars and lipohypertrophy.

2. Injection should avoid bony prominences by one to two adult finger widths. Preferred sites are:
    a. Abdomen, two adult finger widths away from umbilicus
    b. Upper third anterior lateral aspect of both thighs
    c. Posterior lateral aspect of both upper buttocks and flanks
    d. Mid third posterior aspect of upper arms

3. Consideration should be given to the type of insulin and the time of (injection) day when selecting injection sites.

4. Correct rotation of injection sites must be followed at all times to prevent lipohypertrophy and 4mm pen needles should be used for all children and adolescents regardless of age, gender or BMI.

5. Children and adolescents are at risk of accidental IM injection. A two-finger lifted skinfold usually prevents IM injection except in the thigh. Lean children should use a lifted skinfold when the presumed skin surface to muscle distance is less than the needle length plus 3mm.

1. Frid et al, 2015, New Recommendations, Anatomy and Physiology. Accessible at www.FITTER4Diabetes.com
2. Frid et al, 2015, New Recommendations, Pathology. Accessible at www.FITTER4Diabetes.com

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Golden Rules
Treating and Preventing Lipohypertrophy [1-3]

1. All patients who inject or infuse insulin must have their injection sites checked at every regular visit, or at least every year:
    a. HCPs in diabetes must be trained to correctly screen for lipohypertrophy and other site complications
    b. All persons who self-inject/infuse insulin or other injectables must be taught to self-inspect injection sites and be able to distinguish healthy from unhealthy skin

2. Clinicians must monitor and record evolution of lipohypertrophy, possibly using photography (with patient's consent), body maps with descriptors for size, shape, texture or transparent graduated recording sheets.

3. With patient consent clinicians should mark the border of all lipohypertrophy and other site complications with skin-safe single-use markers and instruct patients to avoid using marked areas until instructed otherwise.

4. Patients with lipohypertrophy who have been instructed to stop injecting/infusing into affected tissue must be:
    a. Allowed to experience the actual metabolic difference it makes to use normal tissue instead of lipohypertrophy (as this is a key to long-term adherence)
    b. Informed that some pain may be experienced when injecting into normal tissue
    c. Supported by a HCP to monitor glucose levels frequently due to the risk of unexpected hypoglycemia
    d. Assisted in the reduction of their insulin doses in line with glucose results, knowing that reductions often exceed 20% of their original dose
    e. Use 4mm Pen Needles/6mm Insulin Syringes or the shortest needle length available to minimise accidental IM risk due to using larger zones
    f. Use advanced tip geometry including thin gauge and extra thin wall needles if available) to minimise pain and discomfort and to maximise ease of injection

5. All patients must be supported to correctly rotate injection/infusion sites and cautioned of the risks of reusing needles to minimise risk of injection site complications.
    a. Principles of correct rotation technique must be taught to patients and rotation technique assessed at least every year and more frequently if required
    b. Correct rotation ensures that injections are spaced out approximately 1 cm (a finger breadth) from each other and that a single injection site is used no more frequently than every 4 weeks

1. Frid et al, 2015, New Recommendations, Anatomy and Physiology. Accessible at www.FITTER4Diabetes.com
2. Frid et al, 2015, New Recommendations, Pathology. Accessible at www.FITTER4Diabetes.com
3. Frid et al, 2015, New Recommendations, Psychology and Technology. Accessible at www.FITTER4Diabetes.com

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Golden Rules
Psychological Issues around Insulin Delivery [3]

1. All patients and care givers should be offered general as well as individualized education/ counselling which will facilitate optimal care.
2. Ensure all patients and care givers are supported by their HCP using patient-centered evidence-based psychological educational tools / strategies to achieve mutually-agreed goals.
3. Diabetes care HCP should be skilled in identifying psychological issues which impact insulin delivery.
4. HCPs must have a range of therapeutic behavioral skills to minimize the psychological distress and the impact of insulin therapy.
5. Various methods of minimising pain and/or fear of injection should be utilized in order to reduce psychological impact.

3. Frid et al, 2015, New Recommendations, Psychology and Technology. Accessible at www.FITTER4Diabetes.com

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Golden Rules
Needlestick injuries and Sharps disposal [3]

1. All HCP, employers and employees must comply with relevant international, national and local legislation for the use of sharps.

2. Sharp medical devices present a potential risk for injury and transmission of disease. All HCP, employers and employees must ensure the safest possible working environment by
   a. Conducting regular risk assessment and providing continuing education and training
   b. Providing and using a means of safe disposal of used sharps
   c. Prohibiting needle recapping (except by the self-injector)
   d. Encouraging reporting of incidents

3. Safety engineered devices must be used by all HCP and by all caregivers to minimise risk for disease transmission (i.e. HIV and hepatitis).

4. Safe needle disposal requires that:
   a. Correct needle disposal procedures and personal responsibility be taught and reinforced regularly to patients and caregivers
   b. Safe sharps disposal systems and processes be present and known to all persons at risk of sharps contact
   c. Patients diagnosed with blood borne diseases such as HIV and Hepatitis be supported to use safety-engineered devices and dispose of them safely
   d. Sharps must never be discarded directly in public or household trash bin

3. Frid et al, 2015, New Recommendations, Psychology and Technology. Accessible at www.FITTER4Diabetes.com

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Golden Rules
Insulin Infusion [1, 3]

1. Insulin infusion cannula must be inserted into healthy subcutaneous fat tissue, avoiding underlying muscle as well as areas of skin irritation, scarring, lipohypertrophy and lipoatrophy.

2. If bleeding or significant pain occurs upon insertion, the set should be removed and replaced.

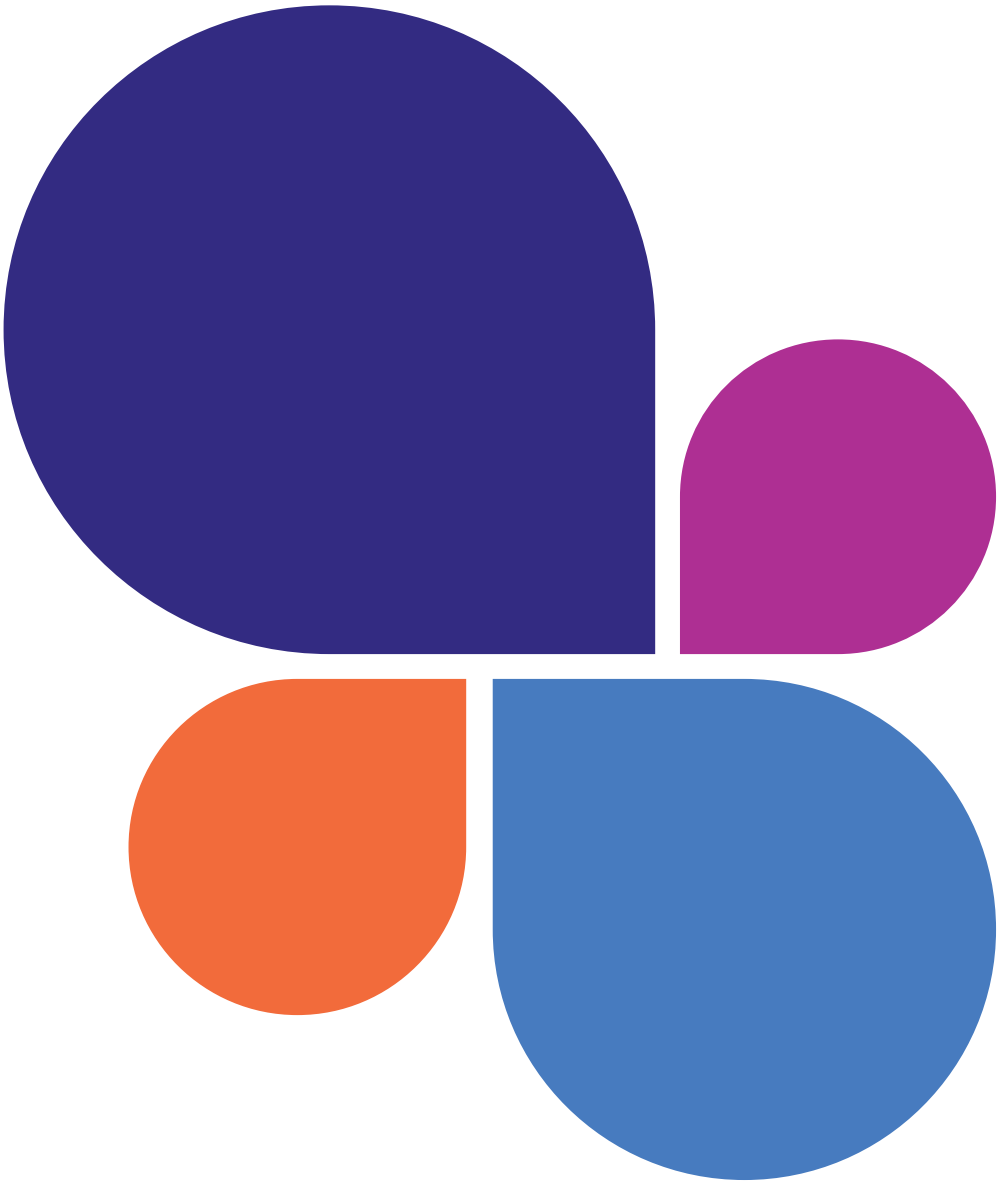
3. Preferred sites for infusion cannula should be individualized but include:
    a. Abdomen, avoiding bony prominences and umbilicus
    b. Posterior lateral aspect of both upper buttocks and flanks
    c. Mid third posterior aspect of upper arms
    d. Upper third anterior lateral aspect of both thighs

4. Infusion cannula sites should be rotated to avoid complications. This usually involves moving to a new location. In-site duration should be individualized but typically should not be more than 72 hours.

5. If kinking occurs consider a shorter cannula or an oblique or steel set. If silent occlusions or unexplained hyperglycemia occur, consider using a different type of infusion set, including a cannula with a side port, if available.

1. Frid et al, 2015, New Recommendations, Anatomy and Physiology. Accessible at www.FITTER4Diabetes.com
3. Frid et al, 2015, New Recommendations, Psychology and Technology. Accessible at www.FITTER4Diabetes.com

Note



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