FIT Forum for Injection Technique Canada

Recommendations for Best Practice in Injection Technique

Optimizing Diabetes Care

Canadian Diabetes Association

BD

PARTNERS in PROGRESS

Diabetes Québec

FIT Canada will provide evidence-based best practice information for all those with diabetes using injectable therapies to achieve the best possible health outcomes by ensuring that the dose is delivered in the right injection site, using the right technique, every time. This will be done through professional and patient education, accessible support and research.

Objectives

- Identify the injection techniques currently being used in practice amongst Canadian Health Care Professionals (HCPs) and people living with diabetes.
- Raise awareness of the impact that existing and emerging research related to injection technique may have on health outcomes.
- Facilitate opportunities in which best practice can be discussed, developed, implemented, and evaluated throughout Canada.

Introduction

The results of an international survey[40] have led to an increasing awareness of the problems associated with inadequate injection techniques. The Canadian FIT initiative has been developed in response to these concerns.

Following the precedence set by the United Kingdom FIT[74] as well as other international injection technique documents, [1, 35, 43, 58, 68] this document has been established to promote best practice in injection technique for all involved in diabetes care.[43, 58, 68]

A meeting of leading experts in diabetes education was held to identify areas of priority in injection technique. The three leading priorities identified were:

1. Avoid intramuscular injections;
2. Ensure healthy injection sites; and
3. Provide clear and concise instruction to health care professionals regarding injection techniques.

Utilizing these priorities as a framework, this best practice document was developed and reviewed by the Canadian FIT Board. This document has been reviewed by the diabetes education expert committee. Where evidence did not exist, expert opinion has guided the recommendation.

The recommendations within this document aim to raise awareness of existing and emerging research related to injection technique. Implementation of these recommendations may have a direct impact on the health outcomes of those individuals living with diabetes who require subcutaneous injection therapy. This document will be distributed to all Health Care Professionals involved in injection therapy for diabetes. A Canadian injection practice survey will be conducted. Analysis of this data will guide future recommendations.

The development of FIT and the subsequent Canadian recommendations for injection technique have been supported by BD Canada and endorsed by the pharmaceutical companies whose therapies include subcutaneous injections of insulin and GLP-1 receptor agonists.

The Canadian FIT Initiative has been led by the FIT Board:

Lori Berard
RN, CDE, FIT Board Chair
Winnipeg, MB

Françoise Desrochers
RN, BSc, Nurse Clinician
Montréal, QC

Allison Husband
RN, MN, CDE
Calgary, AB

Gail MacNeill
RN, BNSc, MEd, CDE
Toronto, ON

Rob Roscoe
BSc Pharm, ACPR, CDE, CPT
Rothesay, NB

Endorsements

Supported by BD - Canada

"Sanofi Canada is committed to improving diabetes management through our integrated offering of treatments, medical devices and services. We are proud to support the Forum for Injection Technique (FIT) Canada, whose goal it is to promote best practice in diabetes injection technique. Proper injection technique is key to ensuring that patients receive the full benefit of injectable therapies. At Sanofi Canada, our focus is to simplify the management of a complex disease – for people with diabetes and their healthcare providers. We are working hard in partnership with everyone committed to diabetes care, developing innovative solutions to help people with diabetes live as people not as patients."

Stanislav Glezer, MD, MBA
Vice-President, Medical Affairs
Sanofi Canada

"Utililizing the correct technique to administer injectable therapies for diabetes is critically important to help ensure patients benefit fully from their treatment. Eli Lilly Canada is dedicated to improving care for people with diabetes and welcomes the introduction of the Forum for Injectable Therapy (FIT) as a means to improve both Healthcare Professional and patient understanding of good injection technique. The comprehensive, evidence based guidelines provided through FIT will play an important role in supporting improved diabetes care in Canada."

Mark Pemberton
Vice President, Diabetes Care
Eli Lilly Canada

"As we are guided by our care for patients' well being, Novo Nordisk is pleased to endorse the Canadian Injection Technique Recommendations. We believe that this timely work will help thousands of health care professionals deliver quality care to patients living with diabetes. As the leader in injectable therapeutics for diabetes, Novo Nordisk lauds this evidence-based manual as a step towards improved outcomes in diabetes management."

Dr. Nikolai Nikolov, MD, MBA
Director Medical and Scientific Affairs
Novo Nordisk Canada Inc.

1.0

Preparing for Injection

1.1 Psychological challenges of injections: Adults

1 The Health Care Professional (HCP) should prepare all people with type 2 diabetes early after diagnosis that they will likely require injectable therapy in the future to treat their diabetes. It is important to explain the natural progression of diabetes and that requiring injection therapy at any point in their treatment should not be seen as personal failure. [103]

2 Both the short and long term advantages of achieving target glucose levels should be emphasized. It is important to explain that finding the right combination of therapies, which may include injectable therapy to achieve individualized glycemic targets is the goal of treatment.[18, 36, 37]

3 The HCP should spend time exploring the individual's anxieties about the injecting process, addressing any patient concerns or barriers to treatment, with the goal of working together to improve treatment adherence and quality of life. [27, 69, 87, 101, 107, 114, 113, 117, 150, 42]

1.2 Injection site care

1 Injections should be given into a clean site using clean hands.[63]

2 If cleaning is required, soap and water should be used.[63]

3 Disinfection of the site is usually not required; however, alcohol swabs may be used prior to injections given in the hospital or care home setting for immobile clients. If alcohol is used to clean the site, let dry completely before injection is done.[44, 43, 42, 97, 102, 125, 134]

4 Cleaning the cartridge or vial with an alcohol swab may be required (i.e. hospital setting).

Figure 1. If unclean, hands should be washed with soap and water.

Figure 2. If unclean, wipe cartridge or vial with an alcohol swab.

2.0

The Correct Use of Devices

2.1 Use of syringes

1 Choose the right syringe. The decision should be based on amount of insulin to be given (volume: U-30, U-50 or U-100 syringes) and length of needle. The use of 8mm needle is recommended.[61]

   12.7mm needles are not recommended due to increased risk of intramuscular injection.

2 When preparing to draw up the insulin, the air equivalent to the dose should be drawn up first and injected into the vial to facilitate easier withdrawal.

3 If air bubbles are seen in the syringe, hold it with the needle uppermost, tap the barrel to bring them to the top and then remove the bubbles by pushing the plunger to expel the air.

4 Injections should be given into a skin lift at 90 degrees. To prevent possible intramuscular (IM) injections, slim individuals may need to inject into the skin lift at 45 degrees.[17, 51, 94, 126]

5 Insert needle completely into the skin lift; depress the plunger and hold for 5 seconds while maintaining the lift; remove the syringe straight out with a quick movement and release the skin lift.
[7, 21, 51, 62, 126]

6 A syringe should be used only once and disposed of in an approved sharps container.
[44, 28, 43, 41, 100, 125, 133, 140]

Figure 3. Preparing an insulin syringe.

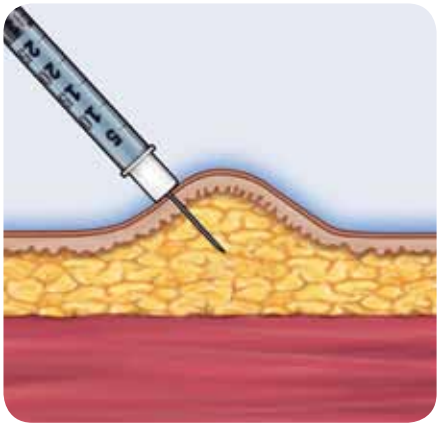


Figure 4. Proper injection into skin lift at a 45 degree angle.

2.2 Use of pen devices

For specific pen teaching, please reference the instruction manual for the device.

1 Pen devices, designed to deliver insulin therapy, should be primed (pen with the needle pointing upwards) observing a flow of insulin at the needle tip before each injection of insulin. Once flow is verified, the desired dose should be dialed and the injection administered. [18, 40]

2 Priming with each injection is not required for the GLP-1 agents. Due to the design of the pen device, priming of a GLP-1 pen only occurs prior to the first dose from the pen.

3 Pen devices and cartridges are for single person use only and should never be shared due to the risk of cross contamination. [15, 97]

4 Pen needles should be used only once. [44, 29, 43, 41, 100, 125, 133, 140]

5 Using a new needle each time may reduce the risk of needle breakage in the skin, "clogging" of the needle, occurrence of lipohypertrophy, inaccurate dosing and indirect costs (e.g. abscess). [140]

6 After pushing the thumb button in completely, the individual counts to 10 slowly (10 seconds), before withdrawing the needle in order to deliver the full dose and prevent the leakage of medication. Counting past 10 seconds may be necessary for higher doses. [7, 21, 62, 83, 91, 119]

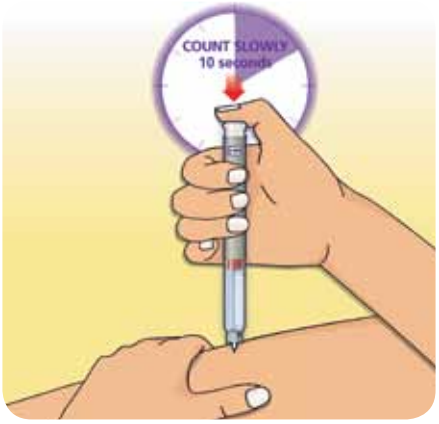


Figure 5. After pushing in insulin pen thumb button completely, count to 10 seconds before withdrawing the needle from the skin.

7 Pen devices with a dose window should be checked at the end of each injection, "0" should be showing when the desired dose has been injected. If a number other than "0" is showing, this indicates dose of insulin that has not been given. Replace the cartridge; prime the needle and administer the remainder of the dose.

8 Needles should be safely disposed of immediately after use and not 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 of the cartridge, which can affect subsequent dose accuracy. [7, 15, 45, 28, 62, 83]

9 Non disposable pen devices should never be stored in the refrigerator as the device consists of parts such as rubber, etc., whose hardness is affected by cold temperature, this in turn will affect the functioning of the pen.

10 Keep a spare syringe or a second pen in case of pen breakage or malfunction.

2.0

The Correct Use of Devices

2.3 Use of pen needles

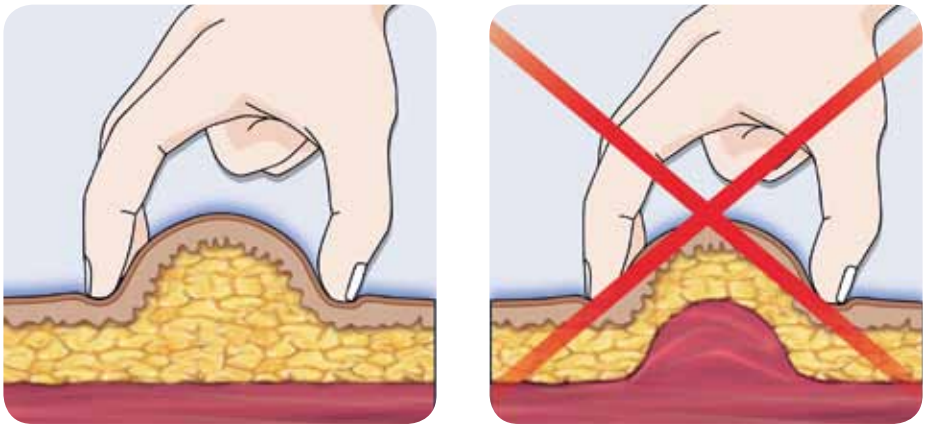
1 Choose the right needle:
   - **a.** Gauge: 30 – 31 – 32 G (higher gauge = smaller needle diameter).
   - **b.** Length: 4 – 5 – 6 – 8mm (12 – 12.7mm may increase risk of intramuscular injection).
   - **c.** 4, 5 and 6mm needles are suitable for all people with diabetes regardless of BMI.
   - **d.** A skin lift may not be required, particularly if using a 4mm needle. [17, 32, 61, 77, 79, 83, 94, 95, 126, 143]
   - **e.** Research does not support the recommendation of needles longer than 8mm.
   - **f.** Initial insulin therapy should start with the shorter length. [56, 83, 126]

2 Injections with shorter needle lengths (4, 5, 6mm) should be given in adults at 90 degrees to the skin surface. [17, 32, 56, 77, 83, 94, 126, 131, 143]

3 A skin lift may be warranted to prevent an IM injection in a slim limb or abdomen even when using short needles. [17, 56, 94, 126]

4 Injection at a 45 degree angle may be required in extremely lean adults with the 6 mm needle, if no skin fold is used.

5 When using 8, 12 and 12.7mm needles, injection should be given into a skin lift at a 90 degree angle. Slim individuals should use a skin lift and a 45 degree angle to prevent possible IM injections. [17, 56, 94, 126]



Performing a correct skin lift

Figure 6. Correct (left) and incorrect (right) ways to perform a skin lift. To perform a skin lift, delicately lift the skin and subcutaneous tissue between the thumb and index finger, leaving the muscle behind.

2.4 Injections should be given into subcutaneous tissue

1 To ensure proper injection technique, individuals should consult with a HCP who is trained in appropriate injection techniques. [43, 58, 61, 74]

2 Appearance of the skin when the needle is taken out:
   a. Subcutaneous: tissue beneath the skin appears normal. [61]
   b. Intradermal: a white area appearing when the needle is withdrawn can indicate that the insulin has not been injected deeply enough.
   c. Blood and/or bruising at the injection site may indicate that a minor capillary has been penetrated with no resulting effect on absorption of the insulin. [58, 88, 94]

Figure 7. Proper injection technique for subcutaneous absorption of insulin and GLP-1: (left) 4mm pen needle, no skin lift, (right) 8mm pen needle, skin lift.

2.5 Tips for making injections more comfortable

1 The site should be inspected and palpated by the individual prior to each injection. Any area showing signs of lipodystrophy, inflammation, edema or infection should be avoided. [43, 44]

2 Avoid injection in hair roots, scars, moles and other skin abnormalities.

3 Keep injectable therapy in use at room temperature. [5, 112]

4 Use needles of shorter length and smaller diameter. [77]

5 Use a new needle for each injection. [44, 18, 29, 43, 40]

6 Insert the needle in a quick smooth movement through the skin. [62]

7 Inject slowly and evenly. Ensure that the plunger (syringe) or thumb button (pen) has been fully depressed. [62]

8 If using alcohol swabs, inject only when the alcohol has fully dried.

9 Injection through clothing should be discouraged. As needle lengths are becoming shorter there is increased risk of intradermal injection and sites cannot be inspected. [49]

10 In some cases, it is recommended that the dose be distributed between two injection sites to make absorption easier, as discomfort at the injection site decreases when the volume injected is smaller than 50 units. [86]

11 Use ice or analgesic cream on site before injection, if needed.

12 Use devices such as NeedleAid®, Inject-Ease®, Insuflon® and i-port®, if needed.

3.0 Disposal of Injecting Material

1 All HCPs, individuals with diabetes and caregivers should be aware of local regulations regarding sharps disposal and the consequences of inappropriate disposal (e.g. needle stick injuries to others such as refuse workers). [11, 149]

2 Teach correct disposal technique to all persons on initiation of injection therapy and reinforce at subsequent visits.

3 Where available, a needle-clipping device can be used.

4 Needles should never be re-sheathed.[2]

Figure 8. All needles should be disposed of in an approved sharps container after use.

4.0 Physical Aspects of Insulin

4.1 Temperature of the insulin

1 The temperature of the insulin does not affect the absorption or kinetics of insulin, if at room or refrigeration temperature. [76, 112]

2 Insulin injected at room temperature may reduce irritation, burning or painful injections and facilitates the re-suspension of cloudy insulin. [3, 5, 68, 60, 133, 147]

4.2 Insulin storage

1 Insulin should be stored at refrigeration temperature (2-8°C). Once in use, insulin may be stored at room temperature.

2 Insulin should never be frozen or exposed to extreme heat (›30°C) for prolonged periods as this will affect insulin potency and alter its action.

3 As per product monographs, once insulin is opened it should not be used for longer than 28 days with the exception of insulin detemir which can be used for up to 42 days.

4 Insulin should never be used past the product expiry date.

5.0 Factors Involving Absorption from Different Sites

5.1 Intramuscular Injection

1 Intramuscular injection of all human insulin, rapid acting analogues, and long acting analogues should be avoided due to risk of erratic control and risk of severe hypoglycemia. [116, 57, 98, 90, 52, 142]

5.2 Injection Site

1 Insulin is absorbed fastest from the abdomen. [3, 5, 68, 147, 55, 53, 8, 73, 14, 13, 20, 32, 16, 24]

2 The upper arm and lateral side of the thigh, not proximal to the knee, have moderate absorption rates. [3, 5, 68, 147, 73, 14, 13, 20, 32, 16, 24]

3 The buttock is the slowest absorbed site and may be preferred if slow absorption is desired. [3, 5, 147, 73, 129]

5.3 Damaged Skin

1 Damaged skin (surgical scars, lipohypertrophy as described in section 8.1) should be avoided when injecting insulin and GLP-1. [76, 68, 64, 60, 99, 91]

6.0

Factors Affecting Absorption

6.1 Re-suspension of cloudy insulin

1 When using cloudy insulin (i.e. NPH and pre-mixed insulin) the vial, cartridge or pen device should first be gently rolled 10 times, then tipped (not shaken) 10 times, and finally visually checked to ensure the suspension has a consistently milky white appearance. [68, 60, 133, 147, 91, 22, 84, 105, 50, 92]

6.2 Volume of injection

1 Insulin injections above 50 units per dose may be more desirable to split into 2 separate injections. The larger the dose, the more delayed the action of NPH, short-acting human insulin, and rapid-acting analog insulin. [76, 68, 86, 30, 83]

2 Larger doses of insulin are associated with more leakage and potentially more discomfort. [76, 68, 86, 30, 83]

3 The time action profile of the long acting analogues does not appear to be affected by the volume of injection.

6.3 Other factors

1 Massaging the injection site is not recommended as it increases the absorption rate, and results in an unpredictable time action profile. [76, 68, 60, 99, 48, 120]

2 Increased skin temperature such as a sauna or hot bath can also increase absorption rate. [80, 75]

3 Injecting into a exercising limb may hasten absorption of insulin and result in a faster action and quicker decrease of blood glucose values. [3, 52]

4 Glucagon Like Peptide-1 (GLP-1), exenatide (Byetta) and liraglutide (Victoza), are absorbed equally from each of the usual injection sites (abdomen, arm and thigh). [46, 108, 25]

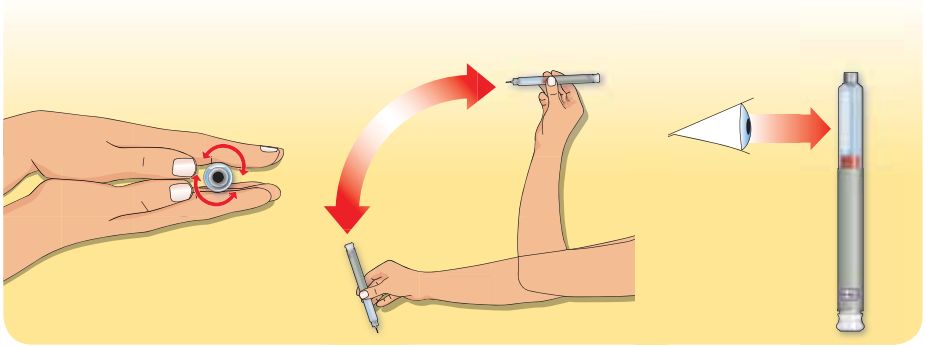


Figure 9. Method of mixing cloudy insulin. Roll 10 times. Tip 10 times. Perform a visual check.

7.0

Injection Sites

Site Selection

Recent evidence supports the conclusion that the skin thickness (epidermis and dermis) of most adults regardless of age, BMI, gender or race is relatively consistent and varies on average from 1.9 to 2.4mm. [61, 145, 96, 135]
The thickness of the subcutaneous tissue shows a much wider variance and is related to gender, body site and BMI. [61, 145, 132, 139, 137, 14]

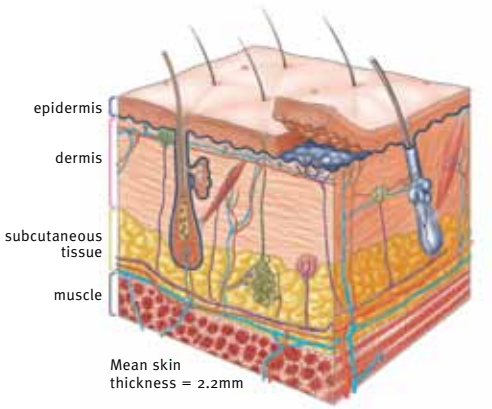
7.1 Recommendations

To avoid IM injections and considering ease of self-injection:

1 Abdomen, thighs and buttocks are the recommended injection sites for adults; [145, 35]

2 The abdomen offers the most consistent absorption; [68]

3 The arm is not a preferred site for self-injection due to difficulty accessing the correct zone and the lower thickness of subcutaneous fat resulting in a greater potential for IM injection. [139, 35, 68, 54]



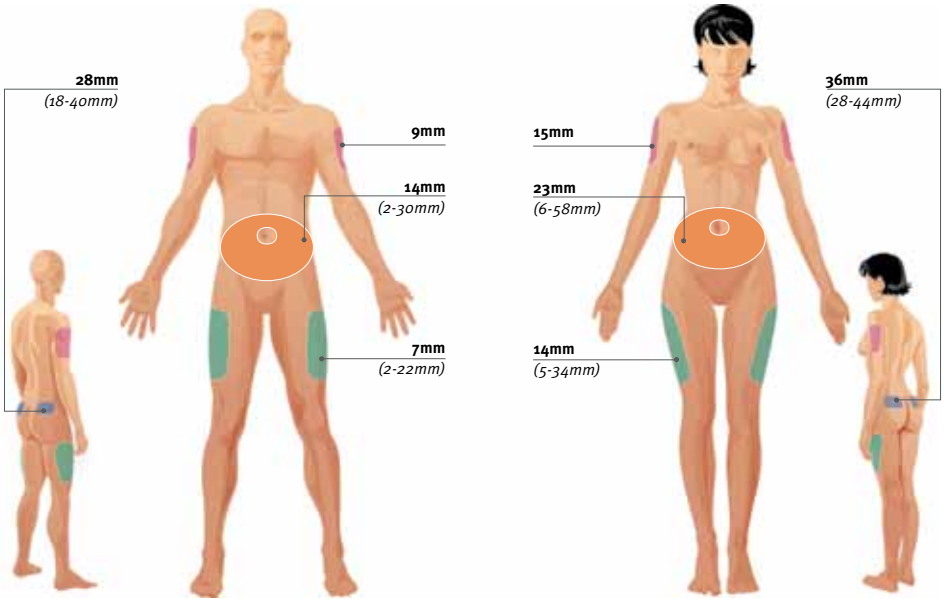


Figure 10. Subcutaneous tissue (in mm) for male and female adults. The mean values (bold) and ranges (in parentheses) are the result of a series of studies using ultrasound. [36]

8.0 Lipohypertrophy

Lipohypertrophy is the most common lipodystrophy found at injection sites. [136]

1 These areas are identified as thickened or 'rubbery' lesions [74, 58] that can feel hard when palpated. [118, 138, 127, 10]

2 Although the exact cause has not been substantiated, increased areas of lipohypertrophy are associated with use of non purified insulins, repeated injections into a small (less than postage stamp) area, reuse of needles and failure to inspect the injection sites on a regular basis. [35, 136, 74, 67, 144, 38, 58, 70, 133]

3 The resulting effect has been documented as a decrease in the rate of insulin absorption, inconsistent insulin absorption and unsightly anatomical lesions. [137, 118, 151, 31, 85]

4 Patients repeatedly choose the lipohypertrophic sites because these areas have limited nerve innervation and are relatively painless. [109, 71]

5 A recent international survey on insulin injection technique revealed that 47% of the participants had experienced lipohypertrophy and this was associated with repeated injections into a site smaller than a postage stamp. Twenty-eight percent of the participants could not remember ever having their injection sites checked by a HCP. [39]

6 Higher A1C levels have been reported with patients injecting into lipohypertrophic sites. [31, 39] Both pen and syringe devices, all needle lengths and gauges, as well as, insulin pump cannula have been associated with lipohypertrophy. [58]

8.1 Recommendations

1 To prevent lipohypertrophy and maintain consistent absorption, patients should rotate their injections within an anatomical area, use larger injection zones and use their needles only once. [71, 39, 58, 68, 65, 18]

2 Injection sites should be inspected and palpated by a HCP at each visit. Ideally this should be done in a standing position. [127]

3 Patients should be instructed not to inject into lipohypertrophic sites. [151, 138, 85, 65]

4 When changing injection sites from a lipohypertropic to healthy site patients should be cautioned to initially reduce the insulin dose and monitor their blood glucose more frequently. [123]

5 Teach patients how to inspect and palpate their injection sites to detect lipohypertrophy. [65, 123]

Figure 11. Lipotropic lesions: lipohypertrophy

Figure 12. The different 'pinch' characteristics of normal (left) versus lipohypertrophic (right) tissue. **122**

9.0 Rotation of Sites

Site rotation is essential to avoid lipohypertrophy and ensure consistent absorption of the medication. [67, 144, 38, 118, 151, 31]

9.1 Recommendations

1 To prevent lipohypertrophy and maintain consistent absorption, patients should be taught a personalized "structured rotation" for their injection sites. [152, 122]

2 Structured rotation is recommended in the same anatomical region at the same time of day with the injections being at least 2 to 3cm apart (2 fingers) across the entire area. [14, 152, 4]

3 The abdomen remains a preferred injection site although patient preference is always a consideration;[15] care should be taken to avoid injecting within 3.5cm of the umbilicus.

4 Rotation of injection sites should be discussed at each patient visit. [35, 65, 123]

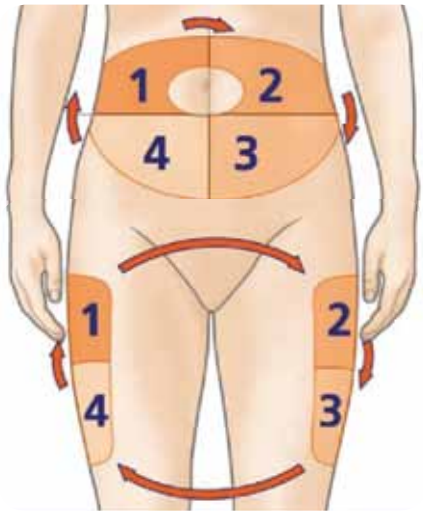


Figure 13. Sample structured rotation plan for abdomen and thighs. Divide the injection site into quadrants or halves. Use 1 section per week and move clockwise. [35]

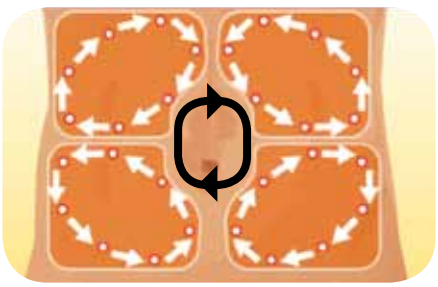


Figure 14. Injections within any quadrant or half should be spaced at least 2-3cm from each other

10.0 Bruising and Bleeding

Local bruising and/or bleeding will occasionally occur at the injection site and is seen more frequently in patients taking anti-platelet therapy. This does not appear to be associated with specific needle length or site but may be affected by injection technique. Studies suggest that bruising and/or bleeding does not affect the absorption of the medication. [58, 88, 94]

10.1 Recommendations

1 Reassure patients that occasional bruising or bleeding at the injection site does not affect the action of the medication. [88, 94]

2 Frequent bruising or bleeding at the injection site warrants a review of injection technique.

Special Populations

11.0

Pregnancy

There is limited research but many clinical practice hours on which to base injection recommendations for pregnancy. The following are concluded from a study using routine fetal ultrasonography assessing the subcutaneous fat patterns of pregnant women (weeks 16 to 38)[47] and expert opinion from practitioners.[121]

11.1 Recommendations

1 The abdomen is the preferred site of injection for pregnant women.[121]

2 The use of a skin lift and shorter needles (4mm, 5mm) decreases the potential for IM injections.[61, 145, 96, 135]

3 Avoid injections around the umbilicus[145, 96] or areas on the abdomen with taut skin.

12.0

Elderly

Safety, which is the major consideration in injection therapy, becomes the most significant factor when assessing cognitive and functional abilities affected by aging.[26]

Education and treatment approaches for this population are challenged by physical changes such as loss of muscle mass and strength and a decrease in skin integrity coupled with changes in memory, sight and hearing. The approach with elderly patients needs to be highly individualized integrating all aspects of their life including physical, social and spiritual realms.[26, 82]

12.1 Recommendations

1 Individualized assessment should be done using standardized tests for cognitive and functional abilities.[72, 26]

2 A structured management plan is desirable based on a comprehensive assessment.[72, 82]

3 The use of premixed insulin is a safety consideration for the elderly. The use of premixed insulin in the elderly results in greater accuracy in the insulin dose as compared to self-mixed insulin.[34, 115]

4 Pen use, including the use of memory pens and other assistive devices are recommended.[18]

5 Involvement and education of family members/friends is encouraged for support and safety.[9, 82]

6 For elderly patients with little subcutaneous adipose tissue, particular care is needed in lifting the skin.[14]

7 All training regarding injection therapy should include a return demonstration.[72]

13.0

Pediatrics

Physiological Challenges

13.1 Thickness of Subcutaneous Fat

Many children and adolescents are emaciated at time of diagnosis. As well, slim children and especially lean teenage boys have minimal subcutaneous adipose mass. These factors can make it challenging to administer insulin into subcutaneous fatty tissue.

Recommendations

1 The HCP should do an individualized assessment to determine the amount of subcutaneous fat thickness at each of the injection sites. This assessment will guide the HCP in choice of needle length and technique required. [33]

2 Insulin pens are the injection devices of choice due to shorter needle size – 4, 5 or 6mm. [141]
   - i. A 4mm needle can be inserted at a 90 degree angle without a skin lift in most children and adolescents. [17]
   - ii. If the child or adolescent is lean, 5 and 6mm needles require a 45 degree angled injection with a skin lift. [79, 78]

3 If a young child will not hold still for the injection procedure as is required with pen use (see section 2.3) a syringe with an 8mm needle may be used. It is critical to inject into sites with the most adipose mass, perform a skin lift and angle the injection in an attempt to avoid an IM injection. [141, 78]

13.2 Sites

Small children have less surface area at injection sites. As well, many youth do not adhere to an adequate plan for rotating sites making lipohypertrophy a very frequent problem. Barriers to use of multiple sites are fear that new sites will be painful and comfort with their existing routine. [110, 93]

Recommendations

1 The HCP should instruct parents and youth on the need for a proper system of rotation. Parents need to be firm about not injecting into “favourite spots”.

2 For youth who self-inject, supervision may be required to ensure adequate site rotation.

Pediatrics

Psychosocial Challenges

13.3 Self-Injection

The age at which children can self-inject is related to developmental maturity rather than chronological age. Most children over the age of ten years can either give their own injections or help with them. [12]

Recommendation

1 If self-injecting, young children should share this responsibility with their parents and do so under supervision. [33, 12]

13.4 Needle Anxiety and Pain

Needle anxiety is common in both youth with diabetes and their parents, with younger children reporting more fear and pain. Parents' attitudes are important for youth's acceptance of injections. [81, 128, 66]

Recommendations

1 Ask about needle fear and pain, as many will not report it. [74]

2 At diagnosis the HCP should consider intervention strategies for the parents:
- **a.** Inform them that their displayed distress and negative attitudes can influence their child's cooperation.
- **b.** Let them experience a saline injection with a syringe or pen tip needle attached to an empty insulin pen.

3 Younger children may be helped by:[33]
- **a.** Distraction therapy as long as it does not involve trickery. For example, injecting while watching a favourite show, blowing bubbles, looking for hidden objects in picture books, etc.
- **b.** Play therapy. For example, injecting a favourite stuffed toy.

4 Older children and adolescents may be helped by cognitive behavioural therapy if available: [33]
- **a.** Relaxation training
- **b.** Guided imagery
- **c.** Graded exposure
- **d.** Active behavioural rehearsal
- **e.** Modeling and reinforcement
- **f.** Incentive scheduling

13.5 Insulin Under and Overdosing

Intentional under and overdosing of insulin is common in children and adolescents and can lead to severe hypoglycemia or diabetic ketoacidosis. [124, 19, 130, 146]

Recommendations

1 If insulin dose manipulation is suspected or confirmed, the HCP should instruct parents to be more involved in insulin administration. [6]

2 If omission or over-dosing is an ongoing problem, the parents should be instructed to take over the task of injecting insulin.

14.0

Institutions

The safety of patients and HCPs living and working in medical institutions and long-term care facilities is the primary consideration for review of injection technique. Needle stick injuries are a frequent yet largely preventable occurrence among HCPs. Cross contamination among the patients is also preventable with appropriate use of the injection devices.

14.1 Recommendations:

1. Safety engineered devices (syringes or pen needles) should be used by all HCPs for all injections in an institutional setting eliminating the need to recap needles. [58, 2, 3]

2. Injectable delivery system should be for individual use. [58, 97]

3. Injection site should be clean and free of infection, edema, bruising or lipohypertrophy. [18. 44, 102]

4. Alcohol swabs may be used to clean the site (note: this does not disinfect the site and the skin should be thoroughly dry before injecting). [18, 44, 102, 125]

5. Due to the potential for needlestick injury the use of a shorter syringe needle and an angled injection is preferred over the use of a skin lift to avoid IM injections in the thin elderly. [61, 145, 96, 135]

15.0

10 Best Practice Recommendations

1 Begin preparing all people with type 2 diabetes soon after diagnosis, that they will likely need injectable therapy in the future, to achieve glycemic targets.

2 Injections should be given into a clean site using clean hands.

3 Initial insulin therapy should start with the shorter length. 4, 5 and 6mm needles are suitable for all people with diabetes regardless of BMI. Research does not support the use of needles longer than 8mm.

4 Abdomen is the preferred site for consistency of absorption.

5 Rotation of injection site within an anatomical area is essential to avoid lipohypertrophy.

6 Teach patients how to inspect and palpate their injection sites to prevent lipohypertrophy.

7 Safety engineered devices (syringes and pen needles) should be used within institutional settings.

8 Insulin injected at room temperature may reduce irritation, burning or painful injections. Re-suspension of cloudy insulin is facilitated at room temperature.

9 When using cloudy insulin it should be rolled gently 10 times, then tipped (not shaken) 10 times, and finally visually checked to ensure the suspension has a consistently milky white appearance.

10 Special Populations
- a. The abdomen is the preferred site of injection for pregnant women.
- b. In elderly safety is the major consideration, assess cognitive and functional abilities.
- c. Young children who self-inject and older children and adolescents who are suspected of insulin under or overdosing should be **closely supervised** by a parent.

16.0

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List of Expert Committee Members

Kathryn Arcudi	PDt, CDE	**Tracy Hoillett**	RN, CDE	**Heather Nichol**	RN, MScN, CDE
Joyce Arsenault	RN, BN, CDE	**Shelley Jones**	RN, BScN, CDE	**Pam Osborne**	RD, CDE
Michèle Comeau	RN, CDE	**Bev Kernohan**	RN, CDE	**Rick Siemens**	BSc Pharm, BSc Biol, CDE, CPT
Michelle Corcoran	RD, CDE	**Sandy Koropas**	RN, CDE		
Lynne Cormack	RN, CDE	**Louise Lemire**	RN, CDE, CPT		
Rose Dumsha	RN, CDE	**Freda Leung**	RPh, CDE, CGP	**Linda Staresinic**	RD, CDE
Karen Gorecki	RN, MN, CDE	**Michele Forsythe**	Phc, CDE	**Louise Tremblay**	RN, MEd.
Jackie Gregoire	BN, CDE	**Tara McAfee**	BN, RN, CDE	**Lee Ann Trimble**	RN, BScN, CDE
Donna Hagerty	RN, BEd, CDE	**Amanda Mikalachki**	RN, BScN, CDE	**Janet Von Weiler**	RD, CDE

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