

Subcutaneous Injection Guidelines for the Education of Persons with Diabetes – 2019

Updated by the Professional Practice Committee

There are three classes of subcutaneously injected diabetes medications: insulin, GLP-1 receptor agonists and analogues of amylin.² Lack of knowledge related to self-injection of these medications leads not only to unwanted low and high glucose levels but can cause serious consequences. By providing clear, evidenced based injection instruction, diabetes care & education specialists and other healthcare professionals have the opportunity to improve not only glycemic outcomes, but also quality of life for persons living with diabetes.

Injection Education by Non-professionals

Although the administration of injectable medications may be limited by some state regulations to only professional healthcare workers, many locations must depend on the assistance of non-professionals (e.g. medical assistants, promotoras) to teach the basic concepts of medication injection. Demonstration of injection technique using an injection practice pad may be appropriate for those who have been trained to do so. The educational practice of these individuals must be supervised by a responsible medical professional who regularly assesses their knowledge, technique and ability to provide accurate, safe instruction to others.

Providing Person-Centered Education

Successful injection education extends beyond simply teaching the use of devices (pens and syringes). It begins with respectful person-centered communication which helps to achieve goals through collaboration.¹ Active listening at the beginning of an injection education session provides information that can impact both the direction of the education encounter and the individual's willingness and ability to self-inject.

- What is the person's experience and knowledge related to injectable medications?
- What is his/her attitude toward self-injection? Does he/she perceive this change in therapy as a personal failure, represent a loss or indicate their diabetes is getting worse? Are there other psychological barriers (beliefs, self-efficacy) to self-injection? What coping skills and social supports are available?
- Does he/she have concerns (financial, time constraints, weight gain, pain, hypoglycemia or other side effects)?
- What is the individual's preferred language for the education encounter and for provided educational materials?
- Are there issues related to numeracy or health literacy? Will these impact the ability to safely and accurately follow the prescribed medication regimen?
- Does the person have physical limitations such as tremor, arthritis, or limited eyesight that might affect the ability to safely self-inject?

Language

The use of empowering, strengths based language during educational encounters motivates persons

with diabetes.¹ Avoid the use of medical jargon (e.g. “subcutaneous tissue”). Provide printed materials on all topics covered in the individual’s preferred written language. Certified medical translation services are available by phone and video for persons who do not speak the same language as the educator. Be sensitive to individuals who may have issues with healthcare literacy and numeracy, have alternate educational materials available for use as needed.

Injection Device Education

General Guidelines

In 2015 the Forum for Injection Technique and Therapy: Expert Recommendations (FITTER) workshop was held. Recommendations for injections of diabetes medications were heard from experts from around the world.² The committee’s recommendations are included in the following guidelines:

1. Hands should be clean prior to injection.
2. Injections should be made into clean sites. Disinfection (e.g. with alcohol) of the injection site is necessary only if the site is dirty or if the injection is being administered in an institutional environment.
3. Sight Selection
 - Do not inject through clothing.
 - Avoid compromised areas (lipohypertrophy, swelling, inflammation, infection, ulceration, scars, etc.).
 - Avoid intramuscular and intradermal injection.
 - For GLP-1 receptor agonists and amylin analogs - follow manufacturer’s injection site direction.
 - Insulin injection sites include the subcutaneous fat of the abdomen, thighs, buttocks and upper backside of arms (triceps area).

Insulin injection sites for most adults (non-pregnant) and children (as noted):

Abdomen:

- Adults: At least 1 cm (adult finger width): away from the umbilicus, 1 cm

above the symphysis pubis and 1 cm below the ribs

- Children: Avoid bony prominences by 1 to 2 adult finger widths and at least two adult finger widths away from the umbilicus
- Anterior /lateral aspects of the upper third of the thighs
- Middle third of the back of the upper backside of arms (triceps)
- Upper outer quadrants (posterior lateral) of the buttocks and flanks

Pregnancy injection sites:

The abdomen is generally a safe site for insulin injection dependent on thinning of fat secondary to uterine growth.

- First trimester: requires no change to site selection
- Second trimester: All areas of the abdomen with lifted skin fold, lateral aspects of the abdomen with no lifted skin fold
- Third trimester: Lateral aspects of abdomen with lifted skin fold. Alternately back of arms, thighs or buttocks may be used.

4. Site rotation.

Allow at least 1 cm (adult finger-width) between injections in the same site. Avoid injecting into the same spot for at least 4 weeks.

Injecting Regular insulin and NPH into different injection sites (e.g. abdomen to buttock) may impact absorption and action. Insulin analogs however may be injected into any injection site without this concern.

5. Needle length:

Shorter needles (4, 5 and 6 mm) have shown equal effectiveness as longer ones (8 or 12 mm) for all persons, even with obesity. Longer needles increase injection discomfort and the risk for IM injection.

Pens: Choose 4 mm pen needles for most persons, 5 mm pen needles may be

acceptable for obese individuals. Inject at a 90° angle. Very thin individuals and children less than 6 years of age should use a lifted skin fold technique to avoid IM injection. Older children using a 5 mm pen needle should also use a lifted skinfold technique, but optimally should use 4 mm pen needles.

Syringes: Syringes are not recommended for children less than 6 years of age or very thin adults (BMI <19). Choose 6 mm needle length for all other individuals. Children older than 6 years and thin adults (BMI of 19-25) should use a lifted skinfold technique or inject at a 45° angle.

6. The reuse of insulin pen needles and syringes is not recommended as needle sterility is compromised, and as this practice may increase the risk of lipohypertrophy and discomfort/bleeding, especially with repeated use.
7. Medication pens, pen needles, syringes, and cartridges should never be shared between individuals to prevent the transmission of infectious diseases.

Syringe Education

Syringes were the first devices used to administer insulin and continue to be used in many populations.³

Use only syringes specifically made for insulin dosing that are designed with markings appropriate to the specific concentration of insulin used (U-100 and U-500 in the U.S.). Using an incorrect syringe type can cause serious under/overdosing of insulin.²

1. Wash hands
2. NPH and pre-mixed (biphasic) insulins (e.g. Humalog 75/25, Humalog 50/50, Novolog 70/30, Humulin 70/30) must be suspended before use. Roll the vial on its side between the hands 10 times (for 5 seconds) then invert the vial 10 times (for 10 seconds) to re-suspend the insulin.² Alternately the vial may be rolled and/or inverted 20 times prior to use.³ Do not shake the vial vigorously.
3. Remove protective needle cap from the syringe.

4. Draw air into the insulin syringe to, or just beyond the intended dose. Inject the air into the vial. This facilitates the removal of insulin from the vial.
5. Leave the needle in the vial, invert the vial so the needle is pointing up.
6. Draw the insulin dose into the syringe and tap the barrel. Push the plunger up to expel any air bubbles back into the vial, then draw plunger back to correct dose.
7. Remove the needle from the vial.
8. If necessary, clean the area to be injected.
9. Inject into subcutaneous (fatty) tissue.
10. Press plunger down slowly.
11. Remove needle from skin.
12. Dispose of syringe in an appropriate sharps container.

Mixing insulins in syringes:

- Do not mix the rapid-acting analog Fiasp, long-acting insulin analogs (Lantus, Levemir, Tresiba, Toujeo, Basaglar) or Humulin R U-500 with other insulins.
- NPH insulin may be mixed with the rapid-acting insulin analogs (Humalog, Novolog, Apidra) and short-acting Regular insulin (Humulin R, Novolin R U-100).
- First inject air equivalent to the intended dose into the NPH vial, and then inject air equivalent to the intended dose into the clear insulin vial.
- Draw the clear insulin into the syringe first to avoid contamination with NPH insulin.

Pen Device Education

Today many diabetes medications are delivered via disposable pens. These devices are often not used correctly, resulting in poor glycemic outcomes.³

*Institutional pens versus home. It is very important to assess recently hospitalized individuals for accurate insulin pen technique. Many hospitals use safety needles that do not have an inner needle shield. There have been recent reports that persons taught insulin pen use in the hospital have failed to realize that home-use needles have an inner shield

that must be removed and discarded. This has resulted in injection of insulin into the needle shield causing severe hyperglycemia.⁵

Do not leave needles on pens between uses. Leaving needles on pens allows air to enter the medication cartridge or leakage, which can affect the accuracy of the dose.²

1. Wash hands
2. NPH and mixed (biphasic) insulins (e.g. Humalog 75/25, Humalog 50/50, Novolog 70/30, Humulin 70/30) must be re-suspended prior to use. Roll and/or invert the pen 20 times.³ Alternately, roll the insulin pen between the hands 10 times (for 5 seconds) then invert the pen 10 times (for 10 seconds) to re-suspend the insulin.² Do not shake the pen vigorously.
3. Use an alcohol swab to wipe the rubber seal on the end of the medication cartridge if suggested by the manufacturer.
4. Attach pen needle onto the end of the pen, remove outer needle cover (save).
5. Remove and dispose of the inner needle cover.
6. Prime insulin pens prior to each pen use. Prime GLP1 agonists and amylin pens *only* prior to the first dose from each new pen.
 - a) Dial priming dose based on manufacturer's direction.
 - b) Point needle up and tap reservoir to bring any bubbles to the top. Push firmly up on the dose knob.
 - c) Observe for drops or small stream of medication (if none repeat steps a-c). If none appears after several attempts, change the needle and repeat priming steps.
7. Dial the appropriate dose.
8. If necessary, clean the area to be injected with an alcohol swab, allow to air dry.
9. Inject into subcutaneous (fatty) tissue.
10. Depress plunger slowly. Maintain positive pressure on plunger. Count to 5 or ten (per

manufacturer's direction) before removing needle from the skin.

11. After injection is complete, replace the outer needle cover and remove needle from pen.
12. Dispose of needle in an appropriate sharp container.

Additional Education

Injection education should include the following topics:

- The name (generic and name brand) of the prescribed medication.
- Action (onset and approximate duration of action) of insulins.
- Timing and dosage of individual injectable medications.
- Sharps disposal. All syringes, pen needles and glucose testing lancets should be disposed of in a puncture-proof, non-breakable container. Information should be provided on the appropriate disposal of sharps for the location in which the individual lives. Educators should be aware that this information varies from state-to-state, county-to-county and occasionally from community-to community.
- Storage of the injectable and expiration times, of both in use and stored medications.
- Hypoglycemia. All persons taught the injection of insulin, or those whose other diabetes therapies include sulfonylureas or meglitinides, should be taught the symptoms and treatment of hypoglycemia. Encourage these individuals to carry a glucose source (e.g. glucose tablets) for emergent hypoglycemia treatment away from home, and also diabetes identification.
 - In the case of severe (needing assistance) or repeated episodes of hypoglycemia, instruction should include direction to notify the medical practitioner for possible therapy adjustment.
 - Glucagon. Family members/significant others of persons who use insulin should be

- taught how to give glucagon in emergency situations, and when to notify emergency medical personnel. Caregivers for the elderly or children (e.g. teachers, babysitters, sports coaches, camp counselors) should also have glucagon available and have instruction in its use.
- Hyperglycemia. The injection education encounter provides an excellent opportunity to review the symptoms of hyperglycemia and when to call the medical provider.
 - Ketone testing. Persons with type 1 diabetes (including their families/significant others/caretakers) should be taught when and how to test for ketones, and when to notify the medical provider.
 - Self-monitoring of blood glucose. If not already monitoring blood glucose, persons

injecting insulin should have their own glucometer and be instructed in its use.

Teach-back

Teach-back is not a test of the person's knowledge but assures that the educational information you presented was explained clearly. Ask the individual to repeat/demonstrate what they have learned. If there has been a miscommunication, re-explain using a different approach. Ask for teach-back again to assure comprehension.⁴

Ongoing Support and Education

Injection technique should be reviewed whenever doses, medications, or injection devices are changed, and at least every 12 months thereafter as social, economic and physical needs will change during the lifespan. Education is not a onetime intervention but is a lifelong process.³

References

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Acknowledgements

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