



Teaching Injection Technique to People with Diabetes
American Association of Diabetes Educators
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For people with diabetes who use insulin or other injectable medication(s), the diabetes educator can enhance and improve patient engagement to maximize clinical outcomes by mitigating injection concerns and teaching methods to maximize insulin absorption and action while reducing discomfort. So while the discussion about algorithms for the use of regular insulin, rapid-acting insulin and other injectable medications for management of hyperglycemia is ongoing, the aim of this advisory is to outline the topics that should be covered by diabetes educators when teaching patients proper injection technique.

State law regulates which healthcare professionals are authorized by license to provide hands on instruction for injection administration, and it behooves diabetes educators to be aware of the level of practice for which they are covered.

As with any type of patient education, it is critical to assess and make accommodations for patient literacy and numeracy level, learning and visual disabilities, or other impairment issues.

Recommended topics

- Information about the drug(s) to be administered (beyond the scope of this document)
- Injection sites, site rotation and sterile technique
- Choice of injection device
 - Proper storage of injectable medications, including expiration date awareness
- Injection technique
- Injection discomfort and complications
- Disposal of used sharps

Injection site, site rotation and sterile technique

The most common injection site is the abdomen (or stomach) while avoiding the area within two inches of the umbilicus. The back of the upper arms, the upper buttocks or hips, and the outer side of the thighs are also used. Individuals self-injecting medications should be taught to inspect the intended injection site prior to injection.¹ They need to understand the value in proper site rotation as well as to change sites when there are signs of lipohypertrophy, inflammation, edema or infection. It is good practice to wash hands prior to injecting

medication.² Outside of institutional settings, disinfecting sites prior to injection is not usually required.³

Choice of injection device

The most common choices for medication injection are vial and syringe, and injection pens. The decision may be a function of the particular medication which may only be available via a particular delivery system. Both pens and syringes have characteristics which can be perceived as advantages and disadvantages. Financial factors such as insurance coverage, can impact injection device choice.

Vial and Syringe

Individuals injecting medications need to be taught to engage in 'quality control' and should know how the medication is to be stored and be advised to inspect the injectable medication before each use. If altered in appearance, a new vial (with a normal appearance) must be used to ensure potency. Patients should be aware that medications have expiration dates which should to be checked prior to use.

Insulin is typically injected subcutaneously using insulin syringes which measure units of insulin. People need to know that injecting a volume of air equal to the amount of medication to be withdrawn from the vial greatly eases pulling the medication into the syringe and that tapping the syringe is an effective means to move air bubbles to the top where they can be removed by moving the medication up with the plunger.² Because the aim is to inject the medication in the subcutaneous space⁴ while at the same time minimizing discomfort, smaller gauge and shorter needles i.e. < 8 mm are preferable to decrease the chance of intramuscular (IM) injection.^{5, 6} Four mm needles are appropriate for most individuals including youths⁷ and those lean,⁷ or obese⁶ adults for minimizing discomfort while optimizing medication delivery. Although reuse of either needles or syringes is not recommended, many patients adopt this practice.⁸ Needles and syringes should never be used to administer insulin to more than one person and should be disposed of immediately after use in an approved sharps container. The CDC 'One and Only' campaign is a resource of materials that can be used to reinforce this message.⁹

Pens

It is important for individuals considering use of pens that they will not be able to see the insulin being injected and that while obstructed flow with pens is rare, it can occur.² It should be recommended that patients not keep needles on pens other than for injection because the needle can provide a channel for the medication to leak from the cartridge, allowing air to enter which can affect accuracy of the dose delivered. Pens need to be primed according to the manufacturer's instructions.¹⁰ It is essential to raise awareness that pens and cartridges are for use by a single individual and should not be shared.

Injection Technique

When administering medication with a syringe, the needle should be inserted quickly (but carefully). Especially when using needles > 5mm, pinch up a thick fold of skin and quickly insert the needle at a 90 degree angle (or, to avoid IM injection in thin persons, inject at a 45 degree angle). Slowly inject the insulin, hold for 5 seconds, then pull the needle straight out. Remind the person to avoid injecting insulin near scar tissue or moles.

When administering medication with a pen, after pushing the thumb button in completely, patients should be advised to wait for a slow count to 10 before withdrawing the needle to help reduce leakage and ensure complete expulsion of the medication.¹¹

Injection Discomfort and Complication

It is useful for individuals to be aware of possible complications from injections they may encounter so that they are prepared with an appropriate course of action to take.

Rotation of the injection site is helpful for reducing irritation, bruising and risk of infection. It is also critical for lipohypertrophy prevention, a complication reported in nearly 50% of individuals using insulin who fail to rotate injection sites.¹²

While a definitive cause for lipohypertrophy has not been established,¹³ patients should recognize the appearance of lipohypertrophic tissue. This will enable them to avoid injecting into this tissue as it may alter kinetics of insulin absorption.¹⁴

There are a number of practical tips for minimizing pain during injection that should be shared as part of the process of educating about injection.¹⁵ These include:

- Using insulin and other injectable medication at room temperature
- Always using a new needle for injection
- Being sure to remove air bubbles from the syringe
- Waiting for alcohol to evaporate completely from injection site prior to injection
- Rapid insertion of the needle
- Maintaining needle alignment during insertion and withdrawal

For intramuscular injection of insulin, relaxing the muscle prior to injection can minimize discomfort during injection.

One problem that can occur with medication injection is leakage. When this occurs, pressure should be applied to the injection site for 5-8 seconds. Following the incident, blood glucose monitoring during that day should be more frequent since the dose of the medication injected was less than was planned.¹⁶

Education about injection technique for delivery of insulin should include review of hypoglycemia (causes, treatment, and prevention). Periodic review of injection education is warranted, especially when blood glucose control is suboptimal.

Disposal of used sharps

There is a need to raise awareness about the risks associated with sharps, including syringe needles and pens, so that persons with diabetes can minimize infection risk to themselves and others. This should include information about proper disposal both at home and when out in public, as well as being alert to keep all needles and other sharps out of the reach of children and pets.^{17, 18}

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