

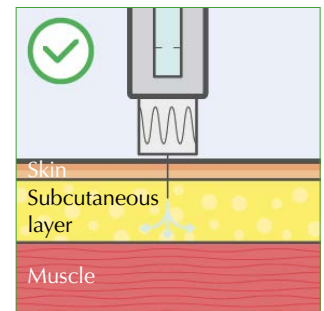
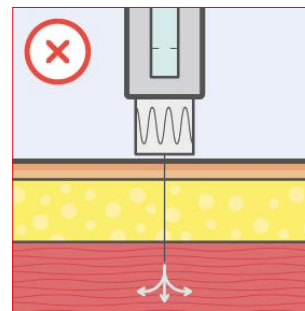


### What and why

- **An injectable therapy will be suboptimal if it is not administered correctly.** Increasingly, primary care has an important role to play in supporting people using insulin and glucagon-like peptide-1 receptor agonists (GLP-1 RAs) to achieve best practice injection technique.
- In one UK-based study<sup>1</sup> of people injecting insulin:
  - 60% had not changed their needle size since starting injectable therapy.
  - 75% did not follow any site rotation routine.
  - 54% reported lipohypertrophy at some point.
  - 28% admitted injecting into areas of lipohypertrophy.
  - 17% were using an incorrect technique for lifting a skin fold.
  - 41% failed to re-suspend their cloudy insulin adequately.
- **Correct injection technique is crucial to achieve the expected absorption and action of insulin.** This includes using the appropriate needle length, rotating injection sites and avoiding needle reuse. Failure to follow any of these recommendations can lead to injectable therapies being absorbed in an unpredictable manner and variable glucose levels.
  - Insulin injected into muscle is likely to be absorbed more quickly, increasing the likelihood of hypoglycaemia.

- Insulin injected into an area where it is poorly absorbed can lead to high blood glucose levels, possibly diabetic ketoacidosis (DKA) in those with type 1 diabetes and, in the long term, poor glycaemic control and an increased risk of diabetes-related complications, including retinopathy and blindness, kidney failure and amputations.

- **Lipohypertrophy (LH) is a common consequence of poor injection technique.** It appears as thickened “rubbery” lesions that appear over time in the subcutaneous tissue of overused injection sites. Around 50% of people with diabetes who inject may experience LH at some time in their life<sup>1</sup>. LH is disfiguring, and leads to unpredictable and delayed absorption that results in glycaemic variation<sup>2,3,4,5</sup>. Poor absorption may also lead to unnecessarily large doses of insulin being given, which has cost implications<sup>4</sup>.



### Essential information

#### Storage

- Store unopened insulin and GLP-1 RA medication in a fridge according to manufacturer's instructions and do not allow to freeze.
- Insulin or GLP-1 RA medication that is in use may be stored at room temperature for up to 28 days (but check manufacturer's instructions, as this may vary).
- Keep medication out of direct sunlight and avoid extremes of temperature (>30°C will result in loss of efficacy).

#### Re-suspension of cloudy insulins

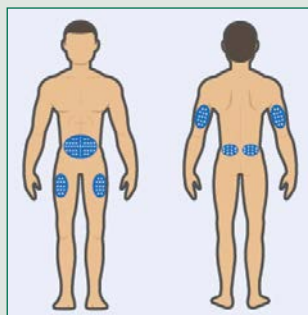
- Roll cloudy and premixed insulins between the palms 10 times and gently invert 10 times to achieve a uniform milky appearance.

#### Needle length

- 4-mm pen needles injected at a 90° angle to the skin are appropriate for all individuals, regardless of their body weight.
- A lifted skin fold is generally not required, other than for children, young people or very slim adults.

#### Site selection and absorption rates

- The four preferred injection sites are the abdomen, the outer aspect of the thighs, the buttocks and the upper arms (see image). The rate of absorption of some insulins varies according to the site of delivery.
  - The abdomen is the preferred site for the injection of soluble insulin (as it is absorbed faster in this area).



- The thighs and buttocks are the preferred sites for neutral protamine Hagedorn (NPH) insulin, where absorption is slowest.
- When pre-mixed insulin is being injected, it is suggested that the abdomen is used in the morning, and the thigh or buttock in the evening.

#### Site rotation

- Correct rotation technique has the highest protective value against the formation of lipohypertrophy<sup>5</sup>.
- Each injection site (abdomen, thighs, buttocks or arms) should be divided into sections and these should be rotated on a weekly basis. Move in the same direction (anticlockwise or clockwise) within a section. Injections should be spaced at least 1 cm apart.

#### Ensuring full dose is delivered

- The dose button should be fully depressed and the needle should remain in the skin for the count of 10 before being withdrawn.

#### Needle reuse

- Advise single use of needles. Following every injection, the needle should be removed from the pen device and disposed of safely in a sharps bin, as per local policies.

#### Detection of lipohypertrophy

- Detection of LH requires both visual inspection and palpation of injection sites, as some lesions are more easily felt than seen.

## What causes lipohypertrophy?

The primary causative factors are<sup>6</sup>:

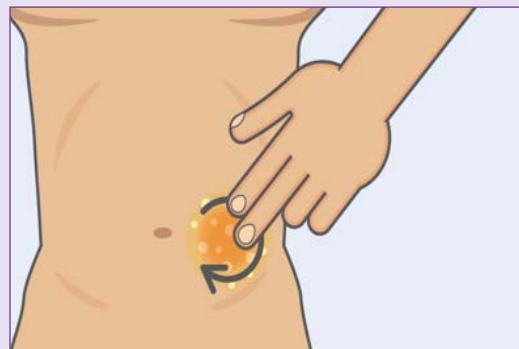
- **Duration of insulin use.** Longer duration is strongly associated with more lipohypertrophy.
- **Incorrect site rotation.** Weekly rotation greatly reduces the incidence of lipohypertrophy compared to random site choice.
- **Reuse of needles.** Lipohypertrophy is much less likely to be present with single use of a needle compared to multiple use (i.e. 4–5 times).



**Regular assessment of injection technique should be an integral part of the diabetes review for every person using injectable therapy.**

## How to examine for lipohypertrophy

- Always inspect for lipohypertrophy in good light.
- Gain consent to examine.
- Look for changes in contour of skin.
- Use water-soluble gel.
- Use tips of fingers.
- Work towards suspected area of lipohypertrophy with a light massage-like motion (see image).
- Push deep into tissue through fat to feel muscle below (if possible), then push forward until lipohypertrophic tissue is felt.
- Feel for a change in the subcutaneous tissue.
- Document size and position of lipohypertrophy.
- If lipohypertrophy is detected, advise to avoid using this area for at least 3–6 months (and consider reducing current insulin dose to avoid hypoglycaemia that may occur as a result of improved insulin absorption).
- Re-examine at next visit.



## How to achieve best practice injection technique

Consider the following at every diabetes review:

- How is the insulin being stored?
- Can the person use the delivery device (consider manual dexterity and eyesight)?
- Does the person understand how to “dial” the correct dose?
- Does the insulin require re-suspension and, if so, is it performed correctly?
- Review needles:
  - What size?
  - Single use?
  - Left *in situ* on pen?
  - Angle of insertion?
  - Is lifted skin fold required and, if so, is it performed correctly?
- Which injection sites are being used?
- Have the injection sites been examined as part of a regular review?
- Does the individual inspect the site before injecting?

## Resources

The following resources

can be accessed at <https://trenddiabetes.online>

- *Injection Technique Matters (ITM) Assessment Checklist.* Questions to consider when assessing injection technique.
- The *ITM Patient Toolkit* provides essential information for people using injectable diabetes therapies, including:
  - Needle length and how deep to inject.
  - 10 steps to giving an injection using a pen device.
  - How to perform a lifted skin fold correctly.
  - All you need to know about lipohypertrophy.
- *Injection Technique Matters: Best Practice Guideline to Support Correct Injection Technique in Diabetes Care.* This [guideline](#) provides information to inform evidence-based best practice in injection technique.



## References

- <sup>1</sup>Frid A, Hirsch L, Gaspar R et al (2010) The third injection technique workshop in Athens (TITAN). *Diabetes Metab J* **36**(Suppl 2): S19–29
- <sup>2</sup>Young RJ, Hannon WJ, Frier BM et al (1984) Diabetic lipohypertrophy delays insulin absorption. *Diabetes Care* **7**: 479–80
- <sup>3</sup>Chowdhury TA, Escudier V (2003) Poor glycaemic control caused by insulin induced lipohypertrophy. *BMJ* **327**: 383–4
- <sup>4</sup>Johansson UB, Amsberg S, Hannerz L et al (2005) Impaired absorption of insulin aspart from lipohypertrophic injection sites. *Diabetes Care* **28**: 2025–7
- <sup>5</sup>Famulla S, Hövelmann U, Fischer A et al (2016) Lipohypertrophy leads to blunted, more variable insulin absorption and action in patients with type 1 diabetes. *Diabetes Care* **39**: 1486–92
- <sup>6</sup>Blanco M, Hernández MT, Strauss KW, Amaya M (2013) Prevalence and risk factors of lipohypertrophy in insulin-injecting patients with diabetes. *Diabetes Metab* **39**: 445–53

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