

FITTER Forward:

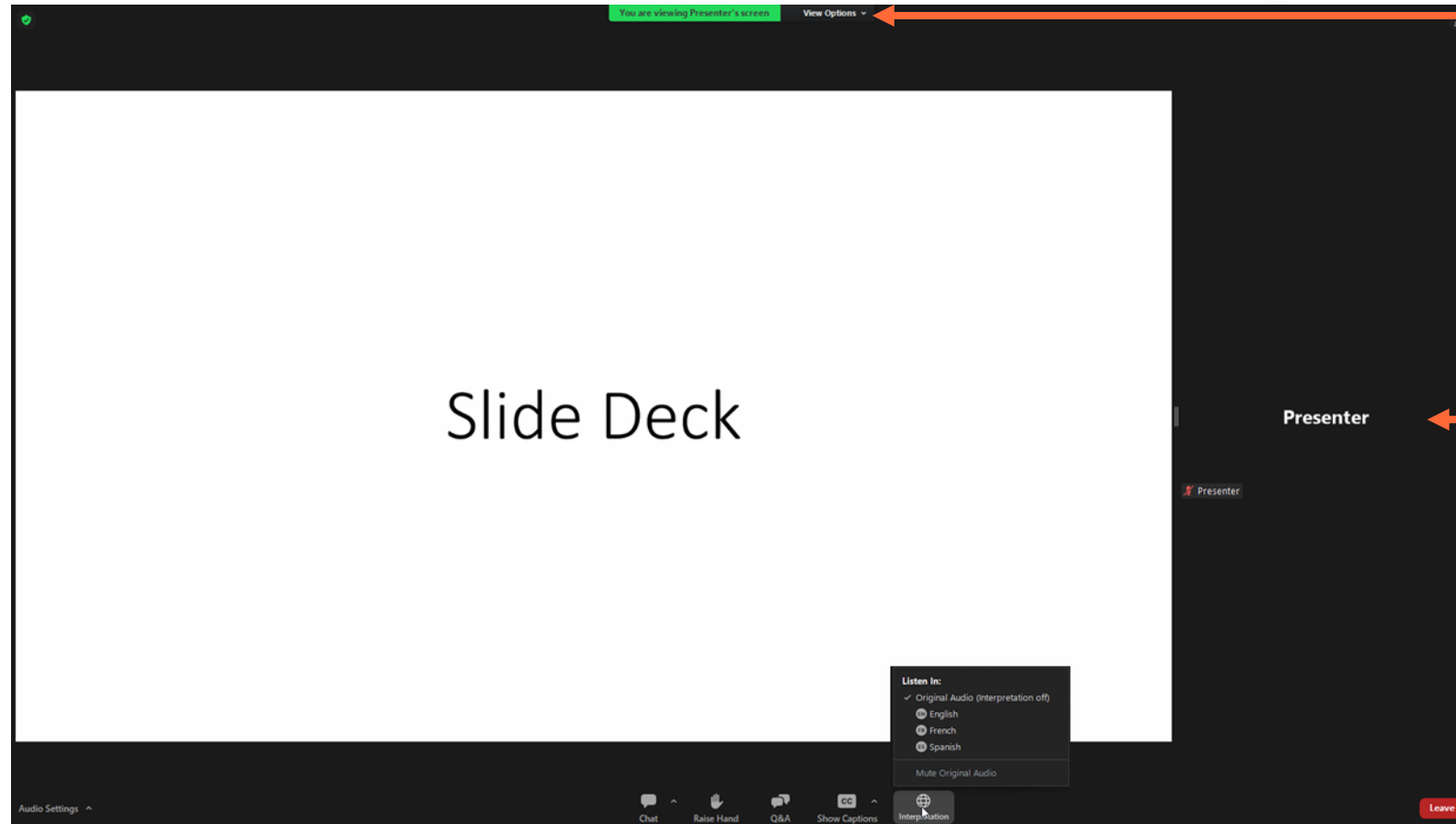
Advancing diabetes care with improved insulin delivery technique

April 2025



fitter[™]
FORWARD

Platform Controls Overview



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Presenter Webcam Display Area

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Click to change language

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Webinar Agenda

Section	Faculty
Welcome and Introduction to FITTER Forward	David C. Klonoff, MD, FACP, FRCP (Edin), Fellow AIMBE (Moderator)
Factors influencing injection experience	Lutz Heinemann, PhD
Evidence-based injection technique procedure	Eden M. Miller, DO, FBOM
Implement proactive risk reduction & detection of lipohypertrophy	Lori Berard, Nurse Consultant
Panel on utilizing structured injection technique training for optimal outcomes	All
Audience Q&A	All

PWD, People with diabetes

Insulin therapy can have a profound impact on diabetes management when delivered correctly

Regularly updated expert recommendations are needed as the therapeutic landscape evolves



The Forum for Injection Technique and Therapy Expert Recommendations (FITTER):

- Involved 183 diabetes experts from 54 countries
- Publication has been cited over 300 times, including the ADA Standards of Care

Hot off the press:



April 2025
FITTER Forward
published, *Mayo Clinic Proceedings*

1997/ 1998

1st Injection Technique
Questionnaire (ITQ) Workshop;
published, *Practical Diabetes
International*

2000/2002

Second Injection Technique Event
(SITE); published, *Practical
Diabetes International*

2009/2010

Third Injection Technique
workshop in Athens (TITAN);
published, *Diabetes Metabolism*

2015/2016

FITTER and 4th ITQ Workshop;
published, *Mayo Clinic
Proceedings*

2023-2024

FITTER Forward
virtual workshops

ADA, American Diabetes Association; FITTER, Forum for Injection Technique and Therapy Expert Recommendations; ITQ, Injection Technique Questionnaire; SITE, Second Injection Technique Event; TITAN, Third Injection Technique workshop in Athens

Klonoff DC, Berard L, Franco DR, et al. Advance Insulin Injection Technique and Education with FITTER Forward Expert Recommendations. *Mayo Clin Proc.* 2025;100(4):682-699. doi:10.1016/j.mayocp.2025.01.004

FITTER Forward: the latest chapter in insulin injection technique



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Diabetes care
specialists



13

Countries
represented



4

Virtual
meetings/modules

For discussion with minimal carbon footprint

FITTER Forward provides updated insights on:

- Recent insulin injection technology
- Lipohypertrophy risk reduction
- Patient-centric education and training practices for HCPs

HCPs, Healthcare professionals

Klonoff DC, Berard L, Franco DR, et al. Advance Insulin Injection Technique and Education with FITTER Forward Expert Recommendations. *Mayo Clin Proc.* 2025;100(4):682-699. doi:10.1016/j.mayocp.2025.01.004

Navigating the FITTER Forward Recommendations

1

Factors influencing injection experience

- Needle characteristics (length, sharpness, geometry) affect injection force and pain
- PWD & technique characteristics also factor into experience

2

Evidence-based injection technique procedures

- Storage, handling, and disposal
- Selection, prep, and rotation of injection sites
- Proper injection technique — pens vs. syringes

3

Risk reduction and detection of lipohypertrophy

- Who is at risk?
- How to detect?
- Proper site selection and rotation

4

Structured training for optimal outcomes

- HCP as guide/educator
- Evidence-based educational strategies
- Reducing fear, pain, and anxiety around insulin use
- Warning signs that technique review is needed

HCPs, Healthcare professionals; PWD, People with diabetes

Klonoff DC, Berard L, Franco DR, et al. Advance Insulin Injection Technique and Education with FITTER Forward Expert Recommendations. *Mayo Clin Proc.* 2025;100(4):682-699. doi:10.1016/j.mayocp.2025.01.004

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Factors influencing injection experience

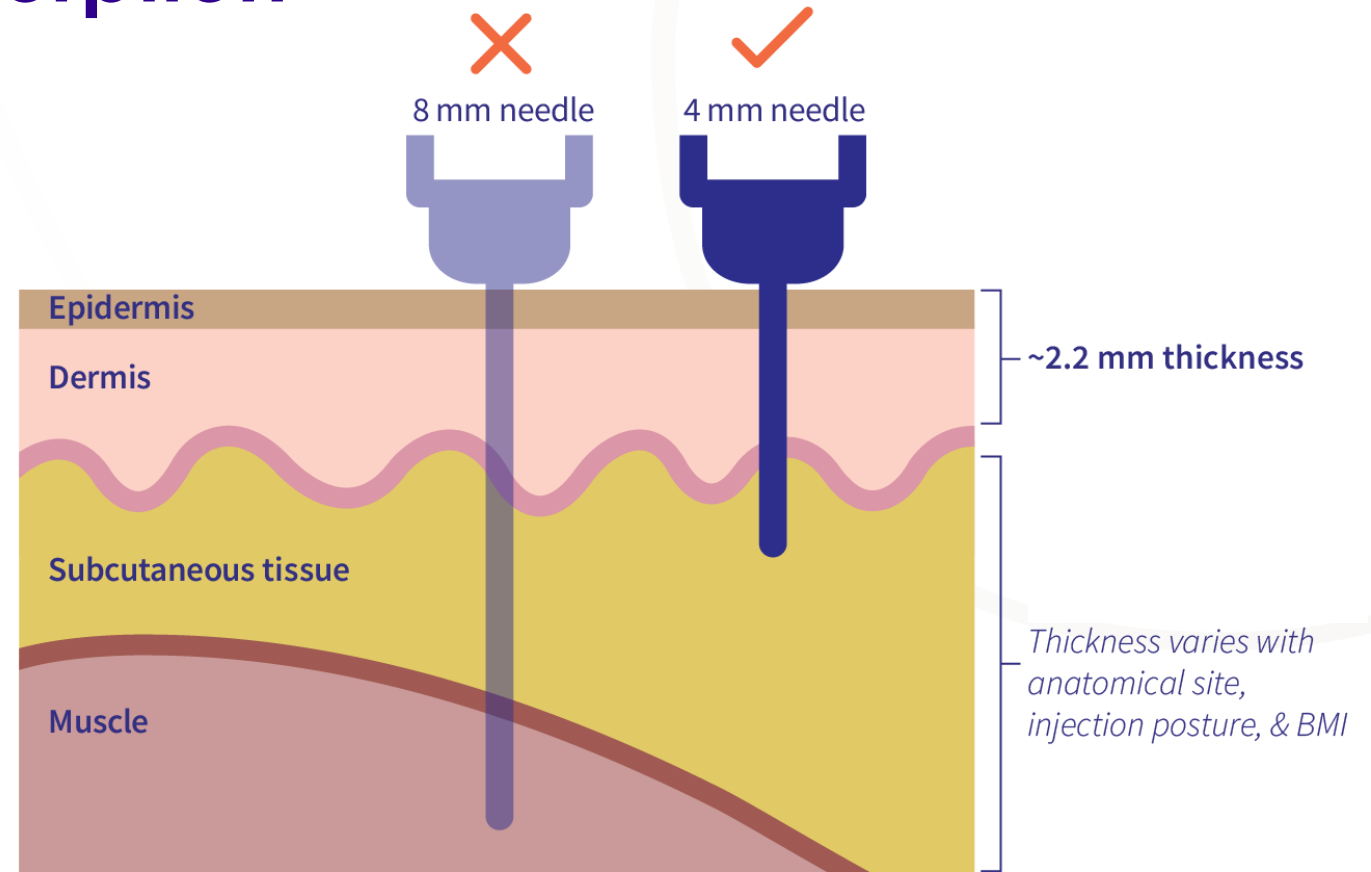
Lutz Heinemann, PhD

Science Consulting in Diabetes GmbH

Düsseldorf, Germany

Needle length is critical for optimal insulin administration and absorption

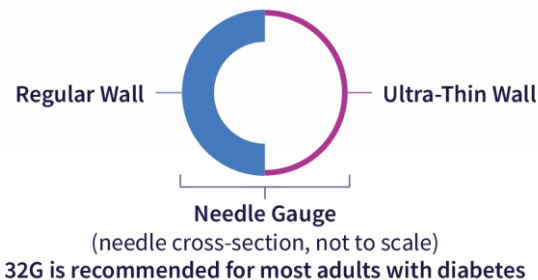
- 4 mm needle length is ideal
- Some experienced patients may still be using older 5-6 mm needles
- Skin lift/skinfold may be warranted in certain populations or situations



Needle characteristics influence injection force and pain

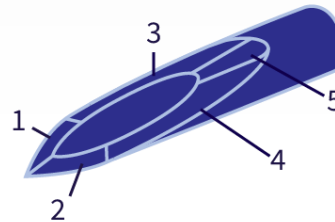
Diameter

- **Needle width** should be thin to reduce injection pain – higher gauge needles are recommended
- **Needle wall thickness** should also be thin for higher flow rate



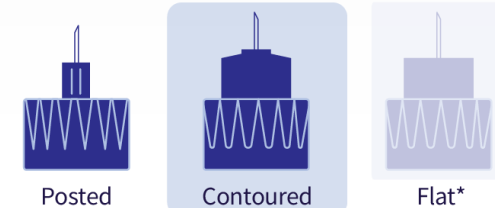
Sharpness

- Needles should be sharp to minimize penetration force
- **5 bevels** are recommended over 3 bevels



Base

- Pen needle base design can influence the way pressure is concentrated at the injection site
- **Contoured bases** are recommended



*Data on non-posted pen needles derives from contoured bases only; flat base is available but no data is published on the impact of flat base on injection force. Klonoff DC, Berard L, Franco DR, et al. Advance Insulin Injection Technique and Education with FITTER Forward Expert Recommendations. *Mayo Clin Proc.* 2025;100(4):682-699. doi:10.1016/j.mayocp.2025.01.004

Physiological considerations that affect injection experience

SC layer thickness

- The thickness of skin is relatively consistent between individuals, however, the thickness of SC layer is highly variable
- Age, BMI, sex, and pregnancy status influence SC thickness
- SC thickness also varies by anatomical location

Injection site selection

- Injection into skin areas with lipohypertrophy hinders insulin absorption
- The presence of scars, tattoos, or skin lesions may alter insulin absorption and should be avoided

Dexterity/Movement limitations

- For self-injection, people with diabetes (PWD) will need sufficient dexterity to assemble and use an injection device
- PWD will also require ability to comfortably reach multiple injection sites or access to assistance

BMI, Body mass index; PWD, People with diabetes; SC, subcutaneous
Klonoff DC, Berard L, Franco DR, et al. Advance Insulin Injection Technique and Education with FITTER Forward Expert Recommendations. *Mayo Clin Proc.* 2025;100(4):682-699. doi:10.1016/j.mayocp.2025.01.004

A FITTER Forward journey with your patient

- Talking with your patient about optimal needle size and design

Evidence-based injection technique procedure

Eden M. Miller, DO

Diabetes and Obesity Care LLC

& Diabetes Nation, 501 3c

Bend, Oregon, USA

Proper insulin storage, handling, and disposal procedures



- Unopened insulin cartridges — stored in a refrigerator between 2°-8°C (36°– 46°F)
- Opened insulin — stored at ambient temperatures (15°– 30°C or 59°– 86°F)
 - Away from direct sunlight exposure per the expiration date
 - For cloudy resuspension, gently roll/tip; avoid vigorous agitation to prevent bubbles



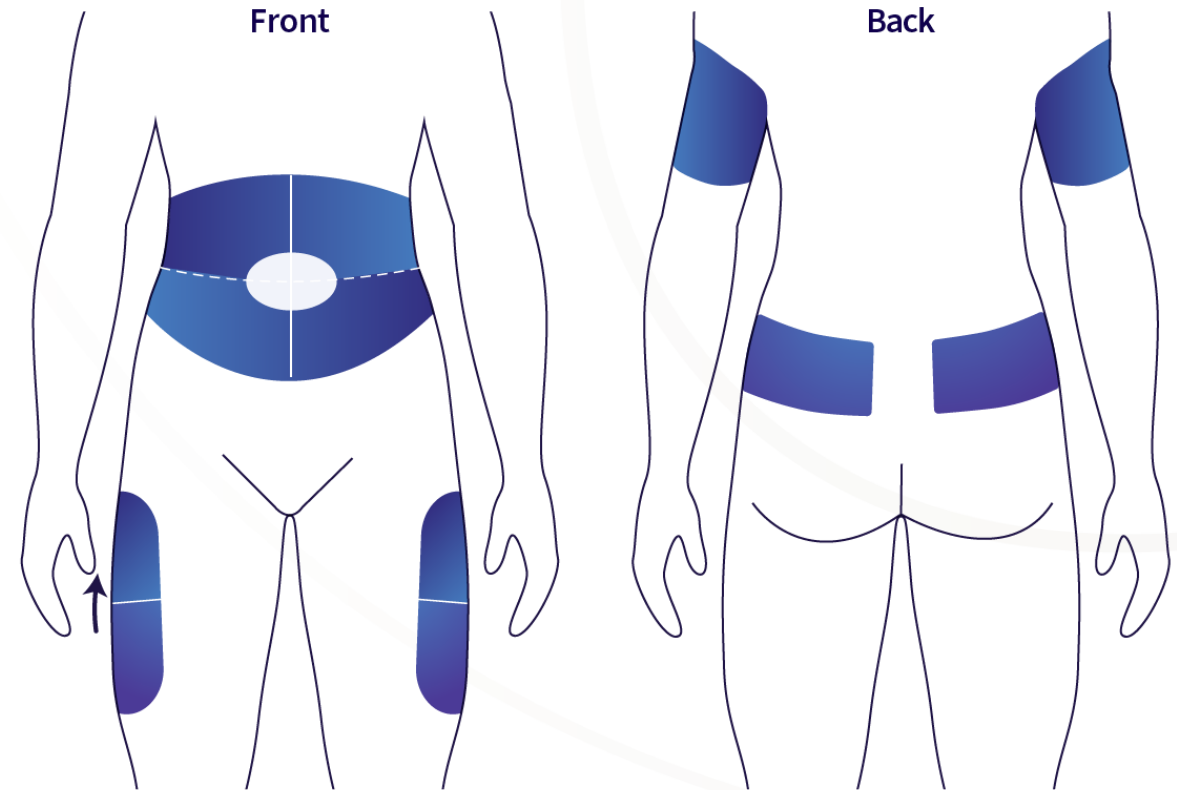
- Insulin should never be removed from a prefilled disposable insulin pen to fill another device
- Before injecting, insulin should come to room temperature
 - Decreases pain
 - Reduces lipohypertrophy risk



- Needle reuse is not recommended
- Needles should never be shared/reused between individuals
- Dispose of needles safely to avoid accidental needlesticks or environmental contamination

Proper site selection

- Recommended sites of injection include the **abdomen, thighs, buttocks, and upper arms** to reduce risk of intramuscular injection
 - Back of upper arm may pose challenge for correct self-injection (4 mm needle, 90° angle, and if skin-lift is needed)
- Inject into clean skin
 - Avoid scars, stretch marks, and tattoos when possible
- Avoid injection into sites with lipohypertrophy (LH)
 - Site rotation can reduce risk of LH



LH, Lipohypertrophy

Klonoff DC, Berard L, Franco DR, et al. Advance Insulin Injection Technique and Education with FITTER Forward Expert Recommendations. *Mayo Clin Proc.* 2025;100(4):682-699. doi:10.1016/j.mayocp.2025.01.004

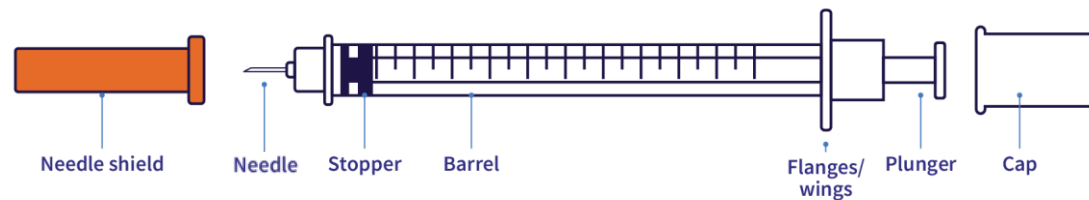
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Proper injection technique: syringes

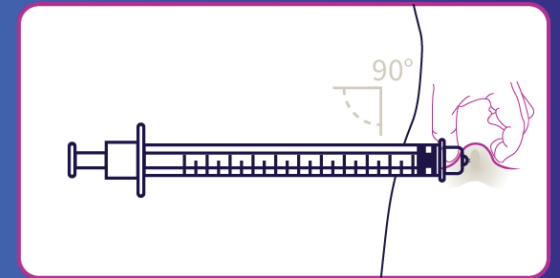
Important points to review

- Review parts of the syringe with patient



- Recommendations for insulin injection technique using a syringe have not changed since the previous version of FITTER

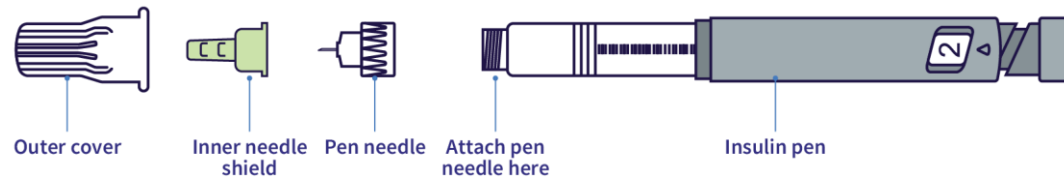
- Inject straight in at a 90 degree angle
 - Review skin lift procedure if warranted



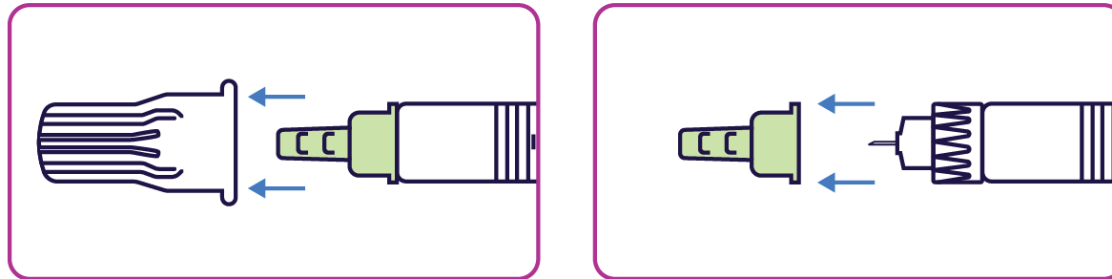
Proper injection technique: pens

Important points to review

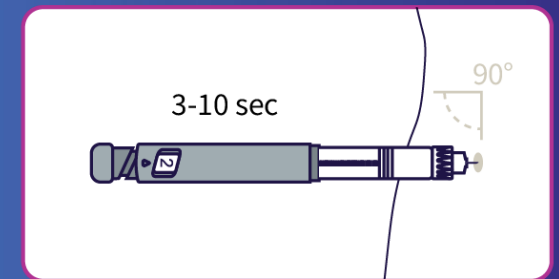
- Review parts of insulin pen with patient



- Ensure patient is aware of both outer needle cover and inner needle shield



- Inject straight in at a 90 degree angle
 - Regardless if skin lift is used



A FITTER Forward journey with your patient

- Talking with your patient about proper injection technique



Risk reduction and detection of lipohypertrophy

Lori Berard

Nurse Consultant

Winnipeg, Manitoba, Canada

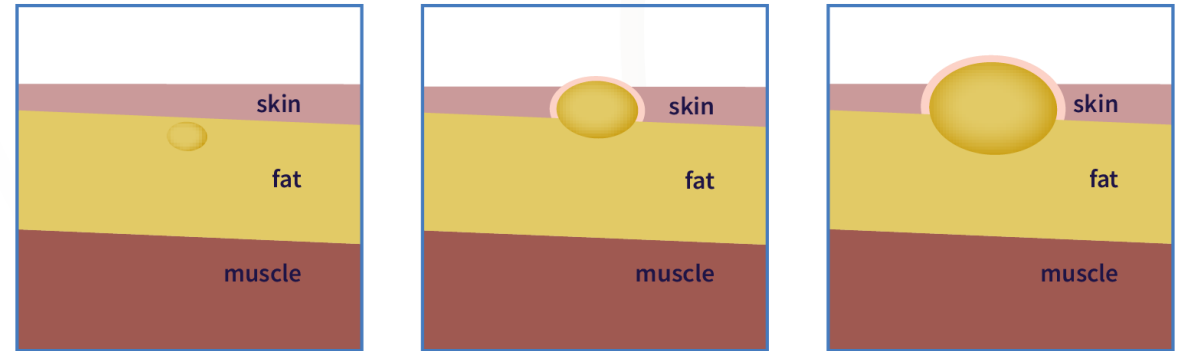
Injection into skin sites of lipodystrophy can cause erratic insulin absorption

Lipodystrophy is a class of skin adipose fat tissue disorders which can arise from repeated insulin injection or infusion into one site

- Lipodystrophy includes:
 - Lipohypertrophy
 - Lipoatrophy
 - Amyloidosis
- Lipohypertrophy increases the risk of hypoglycemia, hyperglycemia, and glucose variability

Lipohypertrophy is the most common subcutaneous complication of insulin therapy

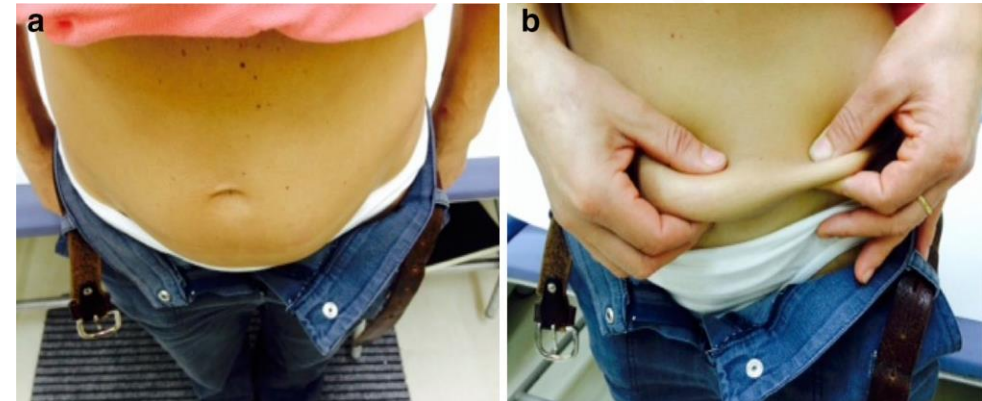
- Lipohypertrophy (LH) is an enlargement of adipocytes that present as swelling or induration of fat tissue
- Most common risk factors include incorrect site rotation, longer duration of insulin use, and needle reuse



Subclinical
(below skin/not visible)

Small nodule

Large nodule



(a) Moderate swelling seen by eye; (b) Patient's right hand pinches a thick fold (large LH) while left hand squeezes thin fold in an area systematically ignored for insulin shots

LH, Lipohypertrophy

These images are reproduced from Gentile et al, 2016, under the terms of the Creative Commons Attribution 4.0 International License <http://creativecommons.org/licenses/by/4.0/>

Gentile, S., Guarino, G., Giancaterini, A. et al. A suitable palpation technique allows to identify skin lipohypertrophic lesions in insulin-treated people with diabetes. *SpringerPlus* 5, 563 (2016). <https://doi.org/10.1186/s40064-016-1978-y>; Klonoff DC, Berard L, Franco DR, et al. Advance Insulin Injection Technique and Education with FITTER Forward Expert Recommendations. *Mayo Clin Proc.* 2025;100(4):682-699. doi:10.1016/j.mayocp.2025.01.004

How to detect lipohypertrophy



Visual inspection and palpation of injection sites



If detected, document size and position of lipohypertrophy (LH)



Patients should avoid injecting insulin into the affected skin area for 3-6 months, until resolved



Monitor blood glucose levels closely as insulin dose may need to be reduced when no longer injecting into skin sites with LH

LH, Lipohypertrophy

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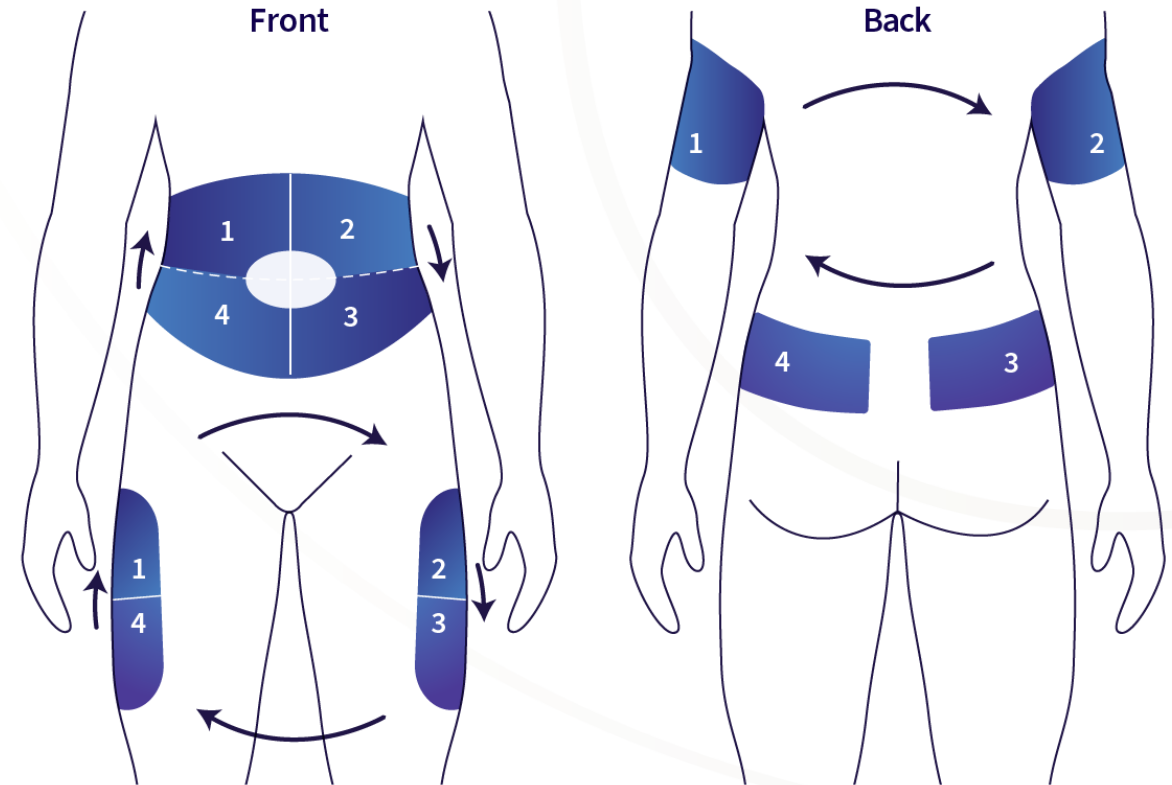
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Proper site rotation reduces risk of lipohypertrophy

Optimal injection site characteristics

- **Sufficient subcutaneous fat** to reduce risk of intramuscular injection
- **Clean & intact skin surface** free of scars, tattoos, lesions, or sites of lipodystrophy

Site rotation can look different between individuals based on their lifestyles or preferences – these suggestions can establish a system that works well for the individual patient

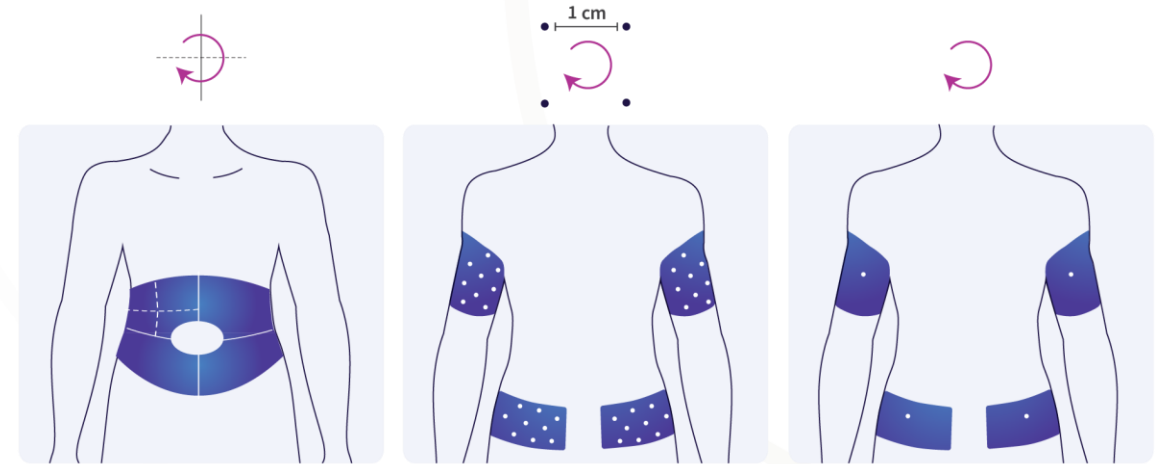


Proper site rotation reduces risk of lipohypertrophy

Rotate to prevent lipohypertrophy

- Divide injection zones into quadrants or halves
- Insulin should be injected at least 1 cm from previous injections, rotating in a consistent direction
- Change the zone regularly, using one zone quadrant/half per week

Site rotation can look different between individuals based on their lifestyles or preferences – these suggestions can establish a system that works well for the individual patient



A FITTER Forward journey with your patient

- Talking with your patient about their lipohypertrophy



Injection technique training for optimal clinical outcomes

Group Discussion

Conclusions

Insulin injection device characteristics, technique, and individual characteristics of PWD can all play a role in insulin injection experience

Evidence-based handling, storage, and disposal procedures and proper, patient- and device-specific injection technique should be utilized

Site selection and site rotation can reduce the risk of lipohypertrophy

Structured, individualized education and training, with refresher training, can improve outcomes

PWD, People with diabetes

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Audience Q&A



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