

Beneath the Surface

Recognizing and Preventing Lipohypertrophy: *Recommendations From an Expert Panel*

September 9, 2026

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Webinar Agenda

Section	Faculty
Welcome and Introduction	Lutz Heinemann, PhD Julia Mader, MD
Why Lipohypertrophy Matters	Lutz Heinemann, PhD
Applying FITTER Forward Lipohypertrophy in Clinical Practice	Julia Mader, MD
Key Takeaways and Manuscript Highlights	Lutz Heinemann, PhD
Audience Q&A	Lutz Heinemann, PhD Julia Mader, MD

FITTER, Forum for Injection Technique and Therapy Expert Recommendations.

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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



1997/1998
First 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 Fourth ITQ Workshop; **published, *Mayo Clinic Proceedings***

2023-2024
FITTER Forward virtual workshops

ADA, American Diabetes Association.
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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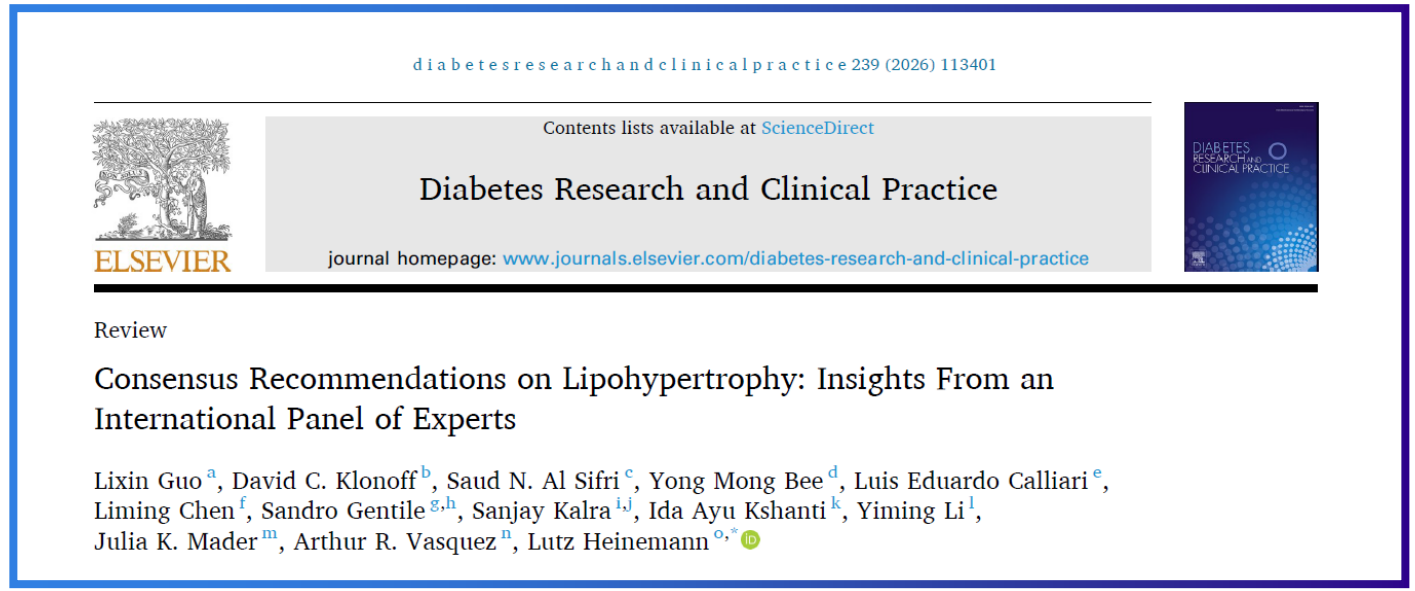
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FITTER Lipo: The Latest Member in the FITTER Family

Hot off the press:

July 2026

FITTER Lipo published, *Diabetes Research and Clinical Practice*



diabetesresearchandclinicalpractice 239 (2026) 113401

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Review

Consensus Recommendations on Lipohypertrophy: Insights From an International Panel of Experts

Lixin Guo [a], David C. Klonoff [b], Saud N. Al Sifri [c], Yong Mong Bee [d], Luis Eduardo Calliari [e], Liming Chen [f], Sandro Gentile [g,h], Sanjay Kalra [i,j], Ida Ayu Kshanti [k], Yiming Li [l], Julia K. Mader [m], Arthur R. Vasquez [n], Lutz Heinemann [o,*]

FITTER, Forum for Injection Technique and Therapy Expert Recommendations.
Guo L, Klonoff DC, Al Sifri SN, et al. Consensus Recommendations on Lipohypertrophy: Insights From an International Panel of Experts. *Diabetes Res Clin Pract*. 2026;239:113401. doi:10.1016/j.diabres.2026.113401

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Advancing Global Standards on Lipohypertrophy Prevention



13
Diabetes care specialists

11
Countries represented

2
Virtual meetings
For discussion with minimal carbon footprint

2
Surveys
Offline consensus alignment

FITTER Lipo provides updated insights on:

- Lipohypertrophy prevention practices worldwide based on recommendations to reduce lipohypertrophy risk discussed in FITTER Forward
- Evidence-based consensus for **screening, risk reduction, and available treatments**, **and highlights key areas of remaining unmet need**

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Welcome and Introduction: Why Lipohypertrophy Matters

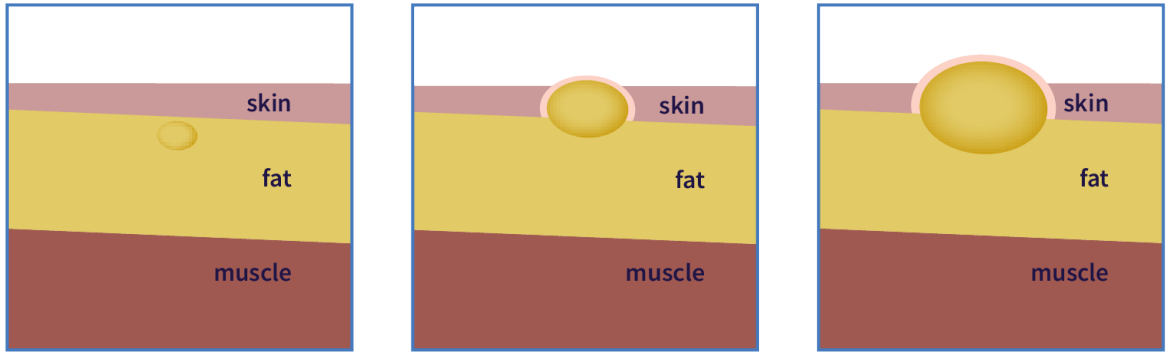
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Lipohypertrophy Is the Most Common Subcutaneous Complication of Insulin Therapy

- Lipohypertrophy is an enlargement of adipocytes that presents 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

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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Myth Buster #1: “Lipohypertrophy Is Rare”

MYTH

“Lipohypertrophy is uncommon and not a major concern for most insulin-treated PwD”

It is often assumed to be a minor or infrequent issue, leading to missed site checks and continued injections into affected areas

FACT

Prevalence in insulin-treated PwD*

At least **29%** – Could be as high as **76%**

Yet remains under-recognized and undertreated in daily practice

*Varies by method of detection.
PwD, patient(s) with diabetes.

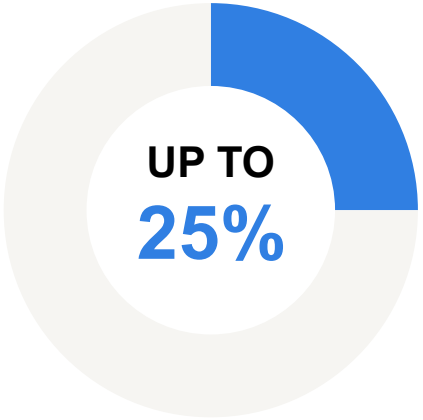
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Why Lipohypertrophy Matters

Higher insulin doses required



When injecting into areas of lipohypertrophy due to unpredictable absorption

Has clinical and economic impact

Glycemic variability
Fibrotic, poorly vascularized areas of lipohypertrophy cause erratic absorption despite consistent dosing

Dose escalation cycle
Inulin doses are increased to compensate for poor absorption, while reduced pain sensitivity perpetuates injections into lipohypertrophic areas

Elevated HbA1c levels and hypoglycemia risk
PwD with lipohypertrophy show higher HbA1c levels and elevated rates of hypoglycemic events

Economic burden
Increased healthcare utilization costs associated with poor glycemic management

HbA1c, hemoglobin A1c; PwD, patient(s) with diabetes.

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Applying FITTER Forward Lipohypertrophy in Clinical Practice

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Meet Matthew*

Matthew has been transferred to your care, and this is your first clinical encounter. He is here for his regularly scheduled check-up. In preparation, you review his health record, which reveals the following:

Male, 52 years old	
Medical history:	Type 2 diabetes (x11 years)
Weight:	91.7 kg (202 lbs)
BMI:	28.3 kg/m² (overweight)
HbA1c (most recent):	9.2% (target 6.5%) – suboptimal
Fasting blood glucose (most recent):	169 mg/dL; 9.4 mmol/L (target 80-130 mg/dL; 4.4-7.2 mmol/L)
Medications:	• Daily insulin (basal and bolus therapy), SC injection (x9 years) • Daily metformin, oral (x11 years)



*Hypothetical case.
BMI, body mass index; HbA1c, hemoglobin A1c; SC, subcutaneous.

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Walking Through the Clinical Encounter

Chief Concern

Matthew presents frustrated that his insulin “isn’t working anymore”

- Doses have been progressively increased over the past 2 years with no improvement in HbA1c

“I’m doing everything right, but my sugars are still all over the place!”

Physical Examination

Systematic inspection and palpation of injection sites reveals a soft, rubbery, raised area at the preferred injection zone

Presentation History

Detailed history reveals SC insulin injection to the same abdominal zone used daily for the past 8 years

Occasional needle reuse. Injection sites have never been formally examined during clinical visits

“I always inject in the same spot on my abdomen. It hurts less there.”

HbA1c, hemoglobin A1c; SC, subcutaneous.

Guo L, Klonoff DC, Al Sifri SN, et al. Consensus Recommendations on Lipohypertrophy: Insights From an International Panel of Experts. *Diabetes Res Clin Pract*. 2026;239:113401. doi:10.1016/j.diabres.2026.113401

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Matthews's History and Examination Reveals the Diagnosis

Multiple Risk Factors Present
Nine years of insulin therapy, fixed injection site, needle reuse

Lipohypertrophy Confirmed on Palpation
Soft, rubbery, raised area at preferred abdominal injection zone, consistent with lipohypertrophy.
Not visible on inspection

No Previous Injection Site Assessment
Lipohypertrophy had been developing undetected for years, a missed opportunity for prevention and early detection

CONSENSUS RECOMMENDATION
All PwD using SC insulin therapy should undergo systematic injection site examinations every 6 months during the first 2 years of insulin therapy, then annually thereafter, with more frequent screening (every 3 months) for high-risk PwD



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PwD, patient(s) with diabetes; SC, subcutaneous.
Guo L, Klonoff DC, Al Sifri SN, et al. Consensus Recommendations on Lipohypertrophy: Insights From an International Panel of Experts. *Diabetes Res Clin Pract*. 2026;239:113401. doi:10.1016/j.diabres.2026.113401

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Connecting the Dots

- HCPs should recognize that the risk of developing lipohypertrophy increases progressively with the duration of insulin therapy *(Consensus Recommendation)*
  - Likely due to cumulative insulin exposure and repeated trauma at injection sites, with a variable time-to-onset among patients
- Lack of systematic injection site rotation represents the strongest modifiable risk factor for lipohypertrophy development *(Consensus Recommendation)*
- Additional established risk factors include insulin therapy duration of longer than 2 years, using a single needle more than four times for insulin administration, higher insulin doses and concentrations, and inadequate injection technique training *(Consensus Recommendation)*

HCP, healthcare professional.

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Myth Buster #2: “I Would Have Noticed It”

MYTH

“If my patient with diabetes (PwD) had lipohypertrophy, I would be able to see it”

Many clinicians rely on visual inspection alone during routine visits and assume they would catch lipohypertrophy if it were present

FACT

Visual inspection alone is insufficient

Lipohypertrophy is often missed without a structured examination protocol. Some forms of lipohypertrophy are detectable only with palpation or ultrasound imaging

CONSENSUS RECOMMENDATION

A lipohypertrophy-focused clinical examination of the skin of PwD should follow standardized protocols, including visual inspection and systematic palpation of all insulin administration sites, with documentation using validated grading systems

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Myth Buster #3: “Once Lipohypertrophy Forms, Not Much Can Be Done”

MYTH

“Once lipohypertrophy has developed, it’s too late to make a meaningful difference”

Some clinicians and patients assume lipohypertrophy is a permanent, unmodifiable finding and do not address it with active management

FACT

Lipohypertrophy is managed with site avoidance and improved technique

Avoidance of lipohypertrophic sites, combined with proper rotation, allows resolution

CONSENSUS RECOMMENDATION

Complete avoidance of lipohypertrophic sites for insulin administration for 6-12 months represents first-line treatment

- Insulin dose reduction of 10-25% is anticipated due to improved absorption

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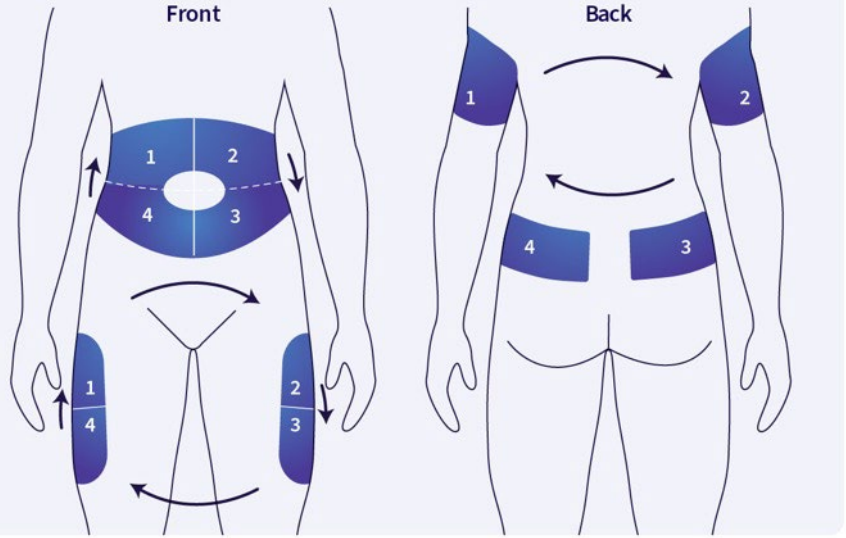
Applying FITTER Forward Lipohypertrophy Guidelines in Clinical Practice

Using consensus-based recommendations to address lipohypertrophy and restore normoglycemia:

1. **Strictly avoid injecting into areas with lipohypertrophy**
2. **Implement structured site rotation**
3. **Avoid needle reuse**
4. **Structured patient education and (re)assessment**
5. **Monitor and reassess insulin doses**

Optimal injection site characteristics

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



FITTER, Forum for Injection Technique and Therapy Expert Recommendations; IM, intramuscular; PwD, patient(s) with diabetes.

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Key Takeaways and Manuscript Highlights

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Key Takeaways

Lipohypertrophy is common but underdiagnosed, occurring in 29–76% of insulin-treated PwD*

Palpation is essential for detection as visual inspection alone is insufficient

Site rotation and injection best practices are the cornerstones for management of lipohypertrophy

Lipohypertrophy is manageable with proper site selection, structured rotation, education, and dose adjustment as tissue heals

*Prevalence of lipohypertrophy varies by method of detection.
PwD, PwD, patient(s) with diabetes.

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