t·r·e·n·d™ DIABETES

For Healthcare Professionals:

CORRECT INJECTION TECHNIQUE IN DIABETES CARE BEST PRACTICE GUIDELINE

4th Edition, September 2025

OUR SPONSORS

Lilly UK

This educational material has been funded by Eli Lilly and Company, Nipro and Embecta. The contents have been independently developed by Trend Diabetes and the sponsors have had no input or involvement into the content of the materials.

Nipro

Nipro and our 4SURE brand of Diabetes management products is proud to support Trend Diabetes and the latest edition of the Injection Technique Matters – Best Practice in Diabetes Care Guideline.

As a company committed to supporting Healthcare Professionals in delivering high-quality diabetes care, we recognise the vital role of accurate and evidence-based injection techniques in achieving the best possible outcomes for people living with diabetes.

As well as our comprehensive range of advanced 4SURE Pen Needles, the 4SURE range also contains the Smart Duo meter, offering both blood glucose and ketone testing, which is designed to support clinical decision-making by providing reliable and accessible point-of-care results.

As innovations in diabetes care continue to develop, blood glucose testing remains a fundamental aspect of safe and effective self-management—offering a trusted method to confirm results, assess risk, and guide treatment decisions. Our support for this important work reflects a shared commitment with TREND Diabetes to equip Clinicians and Diabetes Specialist Nurses with the tools, knowledge, and confidence needed to deliver consistent, safe, and effective care across all settings.

embecta

With nearly a century of experience in diabetes care, embecta is dedicated to supporting people as they begin and continue their journey with insulin therapy. Through innovation, education, and strong community partnerships, we strive to advance the standards of insulin delivery. embecta is proud to support the Injection Technique Matters initiative and its commitment to improving injection technique and outcomes for people living with diabetes.

CONTENTS

INTRODUCTION

In 2009 work to promote the benefits of optimal injection technique began. Since then many thousands of clinicians across the United Kingdom have fully implemented the Injection Technique Matters (ITM) Guidelines.

In the last decade huge progress has been made. Improvements in health outcomes and overall wellbeing for people who use insulin following ITM Guideline intervention are clinically proven.

This newly refreshed and updated guideline seeks to build upon this success and support all clinicians with the most up to date evidence based clinical practice, information and guidance.

Thousands of clinicians across the United Kingdom deliver injection technique care using the ITM guidelines. They experience first hand the benefits for their practice and the joy of seeing people with diabetes who use injectable therapies achieve their health potential.

Our goal is to make the Guideline simple to implement and ultimately support the development of clinicians to become experts in insulin and GLP-1 Receptor Agonist (GLP-1 RA) delivery and enable people who inject to become experts in their own, leading to best possible health outcomes and supporting improved health and wellbeing.

Join thousands of clinicians across the UK and other countries throughout the world who are such as Germany, France, Southern Ireland, New Zealand and Australia, who are implementing the ITM Guidelines.

ABOUT THIS GUIDANCE

Authors

Debbie Hicks: Consultant Nurse - Diabetes Nursing, Chair Trend Diabetes

Trend Diabetes Committee Contributors

Associate member:

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Committee members:

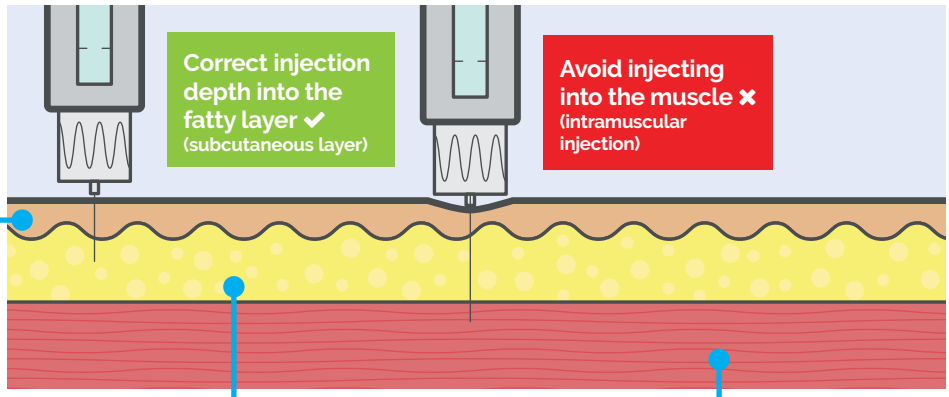
Sam Calder: ANP Carlton House Surgery, Medicus Health Partners

INJECTION DEPTH

Insulin must be injected into fat layer under the skin.

- **Always** use 4mm needle or a lifted skinfold when required to ensure deposition in fat layer
- **Never** reuse needles

Rationale: People who reuse needles have a high risk of developing lipohypertrophy.



Skin:
- Skin over injections sites is on average 3mm thick

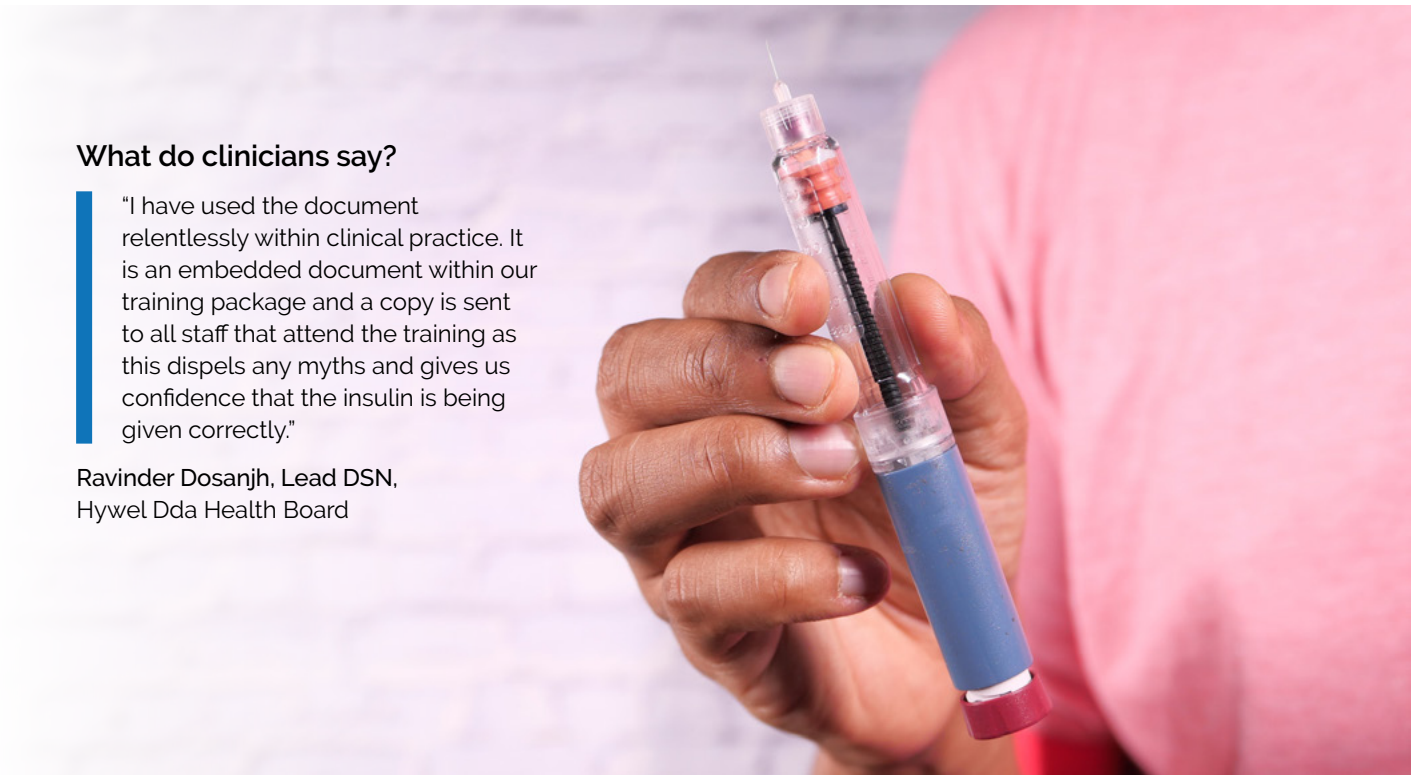
Fat:
- The fat layer thickness is highly variable
- Fat thickness depends upon age, gender, race and can even vary across individual injection site
- **Rationale:** Fat layer has a stable and steady blood flow making it ideal for insulin & GLP1 absorption

Muscle:
- The muscle layer is highly vascular with a blood flow many times greater than fat
- Blood flow in muscle is highly variable dependent upon activity levels
- **Rationale:** Insulin injected into muscle can lead to hypoglycaemia and suboptimal blood glucose levels

What do clinicians say?

> "I have used the document relentlessly within clinical practice. It is an embedded document within our training package and a copy is sent to all staff that attend the training as this dispels any myths and gives us confidence that the insulin is being given correctly."

Ravinder Dosanjh, Lead DSN,
Hywel Dda Health Board



INJECTION SITES

Always inject into correct site.

Correct injection sites are:
- Back of upper arms (via 3rd party injector)
- Abdomen
- Upper buttocks
- Upper outer thighs

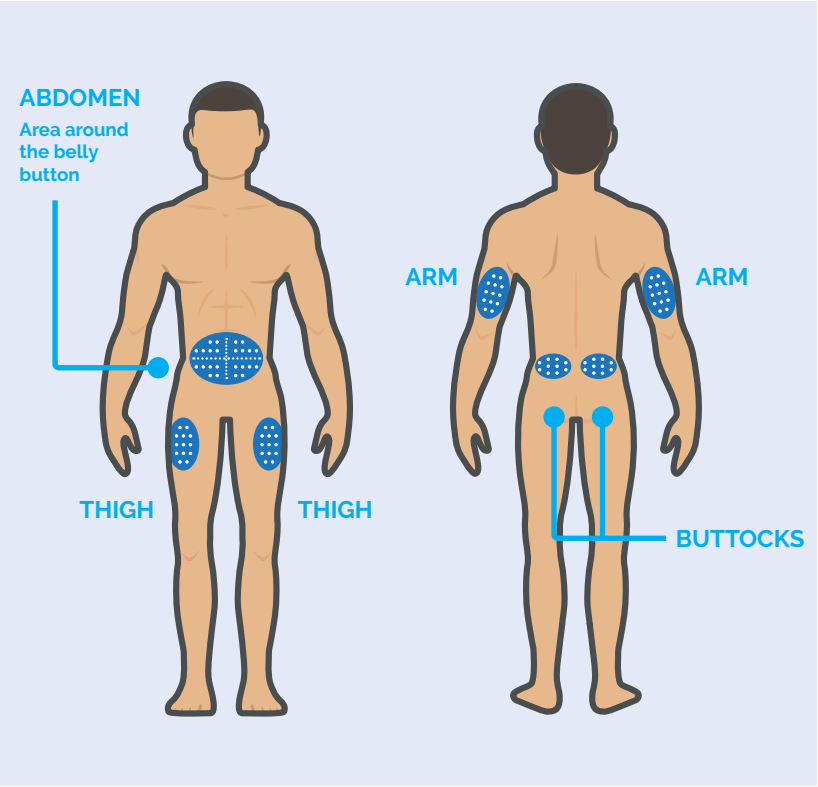
For Analogue insulins and GLP1s:

All sites suitable

For Human insulins:

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.

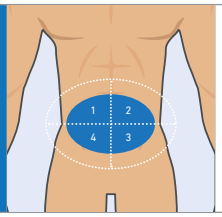


INJECTION ROTATION

Always follow correct injection rotation

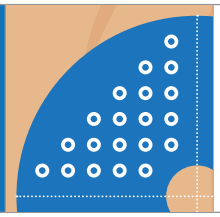
Correct injection site rotation principles:

1



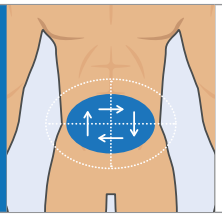
- Inject into one area no more frequently than every 4 weeks

2



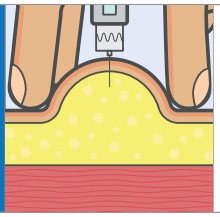
- Each new injection should be given at least 1cm or one finger's width away from the last

3



- Use an injection area for approximately one week then move to the next

4



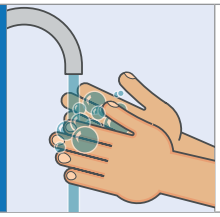
- Never inject into areas affected by lipos
- Use a lifted skin fold in children and slim adults to avoid an intramuscular injection

Rationale: 98% of patients with lipohypertrophy did not rotate injection sites or rotated incorrectly in a study by Smith M. Clapham L. and Strauss K, (2017) https://daneshyari.com/en/article/5587110

10 STEPS TO INJECTION SUCCESS

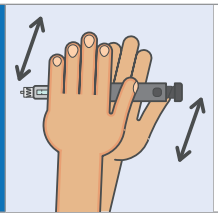
The correct 10 step injection process to teach people with diabetes who need to inject insulin is illustrated below:

1



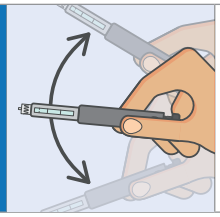
- Wash and dry hands

2



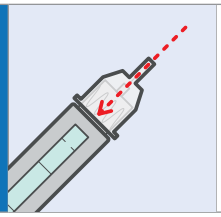
- Remove pen cap
- Cloudy insulin - roll pen 10 times

3



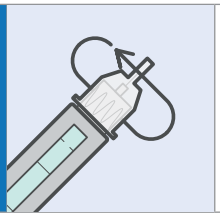
- Then invert pen 10 times

4



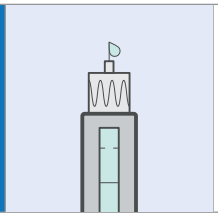
- Select new needle and remove paper tab

5



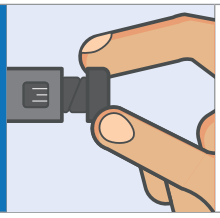
- Apply new needle to pen device & remove outer cover

6



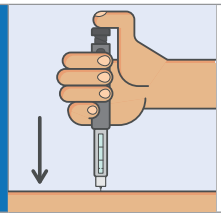
- Check needle patency by expelling 2 units of insulin (Air shot)

7



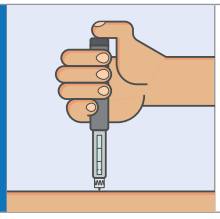
- Dial required dose

8



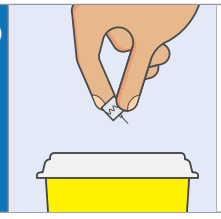
- Insert needle through skin at 90°
- Inject dose fully

9



- Count to ten before withdrawing needle from skin

10



- Remove needle and dispose safely

⚠ Never inject into areas affected by lipos
⚠ Use a lifted skin fold in children and slim adults to avoid an intramuscular injection

What do clinicians say?

> "This document provides a useful aide memoire and guidance for healthcare professionals supporting injectables management in people with diabetes"

Sam Calder,
Advanced Nurse Practitioner,
Carlton House Surgery

PSYCHOLOGICAL AND EDUCATIONAL ISSUES

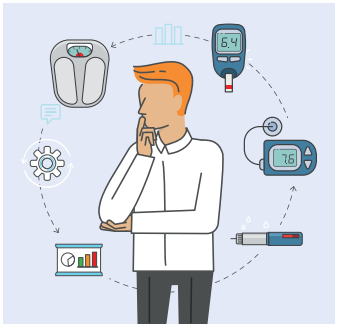
- At commencement of injection therapy and at regular intervals (e.g. at annual review) Health care professionals (HCP) should discuss the individuals' psychological and emotional concerns and encourage them to express their feelings and fears.

  Rationale: this may help overcome any hurdles to optimal injection technique.

- Aim for a positive and therapeutic environment at commencement of injections.

  Rationale: Threats and intimidation that therapy is a punishment, or a sign of failure to manage type 2 diabetes are counter productive and could lead to long term issues with treatment.

- People who inject should be supported to self-manage the administration of their medication and be involved in the choice of regimen appropriate to their individual needs.
- Tailor-made educational programmes should be developed according to the needs of the individual including physical functioning, cognitive functioning, culture and emotional wellbeing.
- When demonstrating correct injection techniques, distraction therapies, stories, and imagery or devices may be helpful for those who are nervous of the procedure.
- If a child, young person or adult is nervous of giving themselves an injection of insulin then there are devices which could be discussed which may help (see page 10).



What do clinicians say?

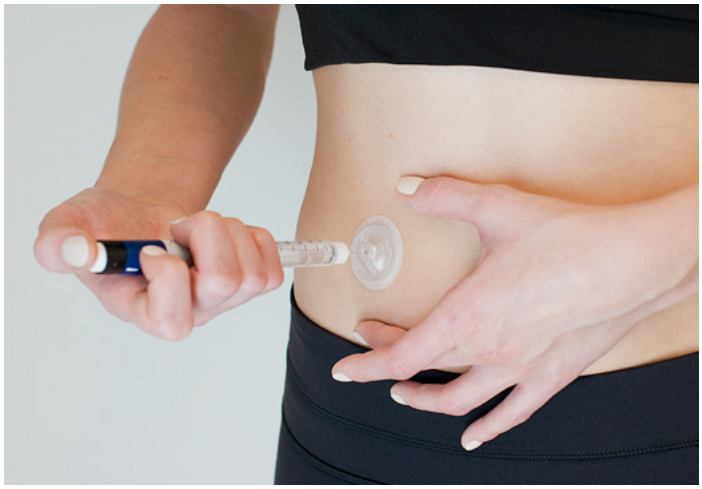
> "This document is a fantastic resource for HCPs and has a real impact to the lives of people with diabetes. The practical information provided is clear, easy to follow and is applicable to all care environments. The online access to the resources is really useful."

Erica Richardson,
DSN Nurse Lecturer,
Leicester Diabetes Centre

TickleFLEX Injection Aid is an accessory for the end of an insulin pen that proposes to make self-injecting a safer, more comfortable, more consistent and worry free process. See www.tickleflex.com for more information.

⚠ This device cannot be used with a safety engineered needle

iPort Advance injection port is a small injection port that lets you take your injectable medications without having to puncture your skin for each injection. It's easy to wear and easy to use. The port can be worn for up to three days during all normal activities, including sleeping, bathing and exercise. See www.medtronicdiabetes.com for more information.



InsulCheck Connect is an example of a connected device that supports people with diabetes to achieve best practice, better adherence, avoid double dosing events and be more independent. See www.glucorx.co.uk for more information.

Smart insulin pens, available on the NHS, are devices that automatically record and transmit insulin injection data to a paired app, helping people with diabetes manage their treatment more effectively. Two models, the NovoPen 6 and NovoPen Echo Plus, are available and compatible with specific Novo Nordisk insulin cartridges. These pens can help improve diabetes management by providing accurate records, facilitating more informed consultations with healthcare professionals, and potentially reducing the mental burden associated with managing the condition

INJECTION TECHNIQUE TROUBLE SHOOTING: LIPOHYPERTROPHY

Correct injection technique self-care and clinician education & support is critical in order to prevent the development of lipohypertrophy. Lipohypertrophy is very common, found in at least 2/3 of patients who use insulin. Lipohypertrophy (lipo) is a thickened, rubbery lesion of fat tissue that develops in the subcutaneous layer where insulin is repeatedly injected. Lipo lesions vary in size and shape and can sometimes be difficult to observe and palpate.

See examples below (permission for use given by Linda Clapham, DSN)

The primary causative factors of lipohypertrophy are:

- Incorrect injection site rotation technique or not rotating
- Duration of insulin use
- Frequency of injections
- Needle reuse

Injecting into lipohypertrophic tissue can cause severe glycaemic variation. Research has shown that glycaemic variation can cause:

- Hypoglycaemia (weight gain, increased fear of further hypos)
- Hyperglycaemia (weight loss)
- General malaise
- Poor HbA1c
- Long term complications

As you will see in the case study, later in this document correct injection technique is crucial to achieve the expected absorption and action of the injected medication. Lipohypertrophy is a consequence of poor injection technique and has been linked to multiple problems. In a study group of people who injected insulin:

- 39.1% of people experienced unexplained hypoglycaemia
- 49.1% of people experienced glycaemic variation
- An excess insulin usage of an average 15 units per patient per day (450 units per month = £90 per person per year was observed) Smith M. Clapham L. and Strauss K, (2017) https://daneshyari.com/en/article/5587110

Healthcare professionals (HCPs) should teach correct injection technique when initiating insulin and GLP-1 RAs but also at subsequent reviews so ensuring that all people who inject insulin should:

- Be taught to check for signs of developing lipohypertrophy and report any abnormalities to their HCP. (see Section 2. How to examine for lipos - page 12)
- Be taught to rest areas of lipohypertrophy **BUT** discuss with HCP before switching to a different site (dose adjustment may be required to minimise risk of hypoglycaemia)

Using the correct injection technique has major benefits for the person with diabetes:

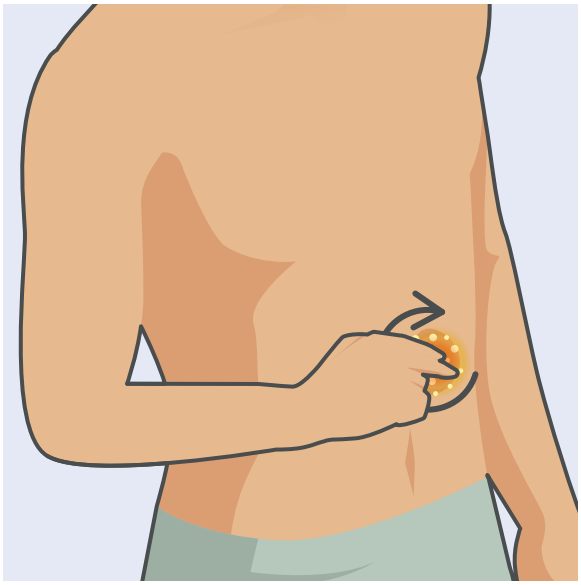
- Optimal absorption of insulin
- Less glycaemic variation i.e. unplanned admissions for severe hypoglycaemia
- Lower dose of insulin required

Using the correct injection technique has major benefits for the NHS. Improved health outcomes and lower overall cost of treatment:

- Fewer unplanned admissions for severe hypoglycaemia
- Less cost of ineffective insulin
- Less prescribed insulin used

How to examine for lipos

- Watch new video 'How to examine for Lipohypertrophy' on www.trenddiabetes.online
- Always inspect for lipohypertrophy in good light
- Gain consent to examine
- Look for changes in contour of skin
- Use warm, clean hands
- Apply water soluble gel to finger tips
- Use tips of fingers to firmly examine the skin and underlying tissue
- Work towards suspected area of lipohypertrophy with a light massage-like motion (Figure 10)
- Push deep into tissue through fat to feel muscle below (if possible) then push forward toward until lipohypertrophic tissue is felt
- Feel for a change in the subcutaneous tissue
- Document size and position of lipohypertrophy
- Avoid using area for at least 3-6 months
- Re-examine at next visit



What do clinicians say?

> "This document is user-friendly, relevant and key to the training needs of all new and established DSNs. It is a powerful tool that is essential in diabetes management."

Elizabeth Camfield,
Senior Diabetes Nurse Specialist,
Guys & St Thomas' Teaching Hospital

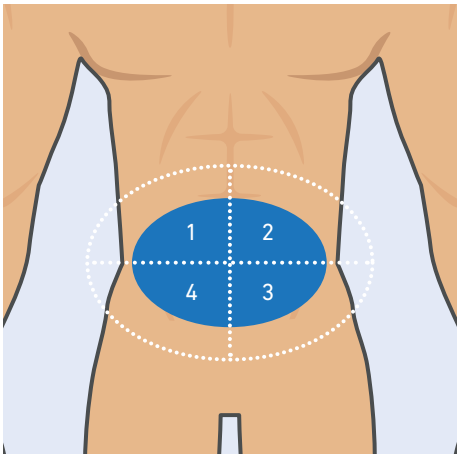
INJECTION TECHNIQUE TROUBLE SHOOTING: BLEEDING AND BRUISING

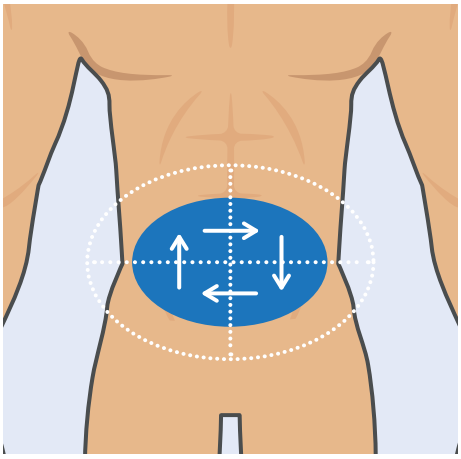
Occasionally bleeding may occur at the site of an injection. Bleeding or bruising may be a sign of poor injection technique i.e. jabbing hard with the needle, pushing the needle too deeply into the tissue or moving the needle once in the subcutaneous tissue leading to micro trauma. This is more likely to occur in those people who are taking anti-coagulant or anti-platelet therapies.

Evidence has shown that neither bleeding nor bruising has any negative impact on blood glucose levels,

Bleeding or bruising can be minimised by:

- Review injection technique
- Using a new needle for every injection to prevent distortion of needle
- Rotating injection sites, as well as within sites
- Applying pressure with a cotton pad or tissue for a minute should stop any bleeding.





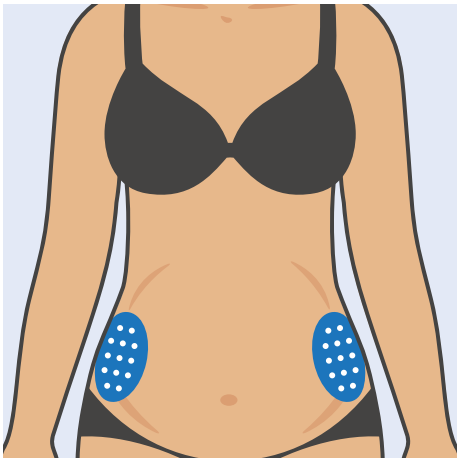
PREGNANCY

- There is a lack of research into the best injection technique during pregnancy so any recommendations are based on expert opinion and individual experience.
- During pregnancy the skin on the abdomen stretches to accommodate the growing baby.

⚠ The use of GLP-1/GIP injections are contraindicated in pregnancy and during breastfeeding

Many women who inject insulin are concerned that the injection may penetrate into the womb. This is highly unlikely with a 4mm needle.

During the first trimester the abdomen is still a safe site for injections using 4mm needles even at a 90 degree angle. However, during the second and third trimester women should be advised to use either the sides (if they can be reached - see figure) or into the upper outer thighs, or back of upper arms.



- During the first trimester the abdomen is still a safe site for injections using 4mm needles even at a 90 degree angle.
- During the second and third trimester women should be advised to use either the sides (if they can be reached - see figure) or into the upper outer thighs, or back of upper arms.

⚠ Reassure mums to be that a 4mm pen needle will not penetrate into the womb by following the above injection advice

CONTINUOUS SUBCUTANEOUS INSULIN INFUSIONS (INSULIN PUMPS)

There are many different models of insulin pumps to date. Initiation of Insulin Pump therapy is a specialist area of practice but is becoming more commonly seen now, especially in pregnant women with type 1 diabetes. It is still important, within the education process, to encourage an appropriate rotation of sites as good practice.

Examples of CGMS systems available in the UK.

Unfortunately, there is conflicting evidence as to whether good rotation has any major effect on injection sites or glycaemia when using cannulas which are part of an insulin pump delivery system. The average recommended time a cannula is in situ is 3 days.

In the most recent studies from 2014 onwards which was found, as documented below, they tried to explore whether lipohypertrophy was an issue for insulin pump users:

Nonmetabolic Complications of Continuous Subcutaneous Insulin Infusion: A Patient Survey

John C. Pickup, BM, DPhil, Nardos Yemane, BSc, SRD, Anna Brackenridge, MD, et al,
Diabetes Technology & Therapeutics Volume 16, Number 3, 2014,[a] Mary Ann Liebert, Inc. DOI: 10.1089/dia.2013.0192

- The commonest infusion site problem was lipohypertrophy (26.1%), which occurred more often in those with long duration of CSII.
- **Conclusions:** Pump, infusion set, and infusion site problems remain common with CSII, even with contemporary technology.

Duration of Infusion Set Survival in Lipohypertrophy Versus Nonlipohypertrophied Tissue in Patients with Type 1 Diabetes

Andrew W. Karlin, BA, Trang T. Ly, MBBS, FRACP, et al, Diabetes Technology & Therapeutics. Volume 18, Number 7, 2016 Mary Ann Liebert, Inc. DOI: 10.1089/dia.2015.0432

- **Conclusion:** Lipohypertrophy did not significantly affect infusion set survival or mean glucose. Achieving optimal infusion set performance requires research into factors affecting set survival. Additionally, the recommendation for duration of set change may need to be individualised.

Improving Patient Experience with Insulin Infusion Sets: Practical Guidelines and Future Directions

Alison B. Evert, MS, RDE, CDE, Bruce W. Bode, MD, FACE, Bruce A. Buckingham, MD et al, The Diabetes Educator Online. First, published on April 7, 2016 as doi:10.1177/0145721716642526

- **Conclusion:** Development of practical tools and standardized guidelines for empowering patients to prevent, diagnose, and troubleshoot CIIS problems that contribute to unexplained hyperglycaemia will be necessary to realize the full benefit of insulin pump therapy along the continuum of diabetes education.

Lipohypertrophy in CSII patients and its relationship to key clinical parameters poster (ATTD,2018)

Smith M, Baggott A, Green E, et al,Plymouth Diabetes Centre, Derriford Rd, Crownhill, Plymouth PL6 8DH, UK

- **Conclusion:** Lipohypertrophy is present in nearly 3 out of 5 CSII patients and palpation picks up more lipohypertrophy than visualisation alone. In our CSII patients lipohypertrophy is not related to HbA1c, TDD, hypoglycaemia, glycaemic variability or DKA suggesting that the mechanism and clinical implications in CSII patients may differ from those in insulin injectors.

More recent evidence by Damian Ucieklak et al., 2023—although based on a small cohort—suggests that lipohypertrophy can occur with insulin pump use. This highlights the continued importance of education around site rotation for pump cannulae. The reason is that the cannula stays in place for the duration of the infusion set, acting as a foreign body within the tissue. Meanwhile, insulin—a growth hormone—washes over the adipocytes continuously, encouraging them to grow.

Damian Ucieklak et al. Endocrine Practice Vol 29, Issue 3 March 2023 P174-178. https://doi.org/10.1016/j.eprac.2022.12.015

SAFETY

⚠ All HCPs, downstream workers and members of the public are at risk of sharps/needlestick injury (NSI). Sharp medical devices present a potential risk for both injury and transmission of disease e.g. hepatitis/HIV

Ensure a safe working environment:

- ✔ All HCPs, employers and employees must comply with relevant national and local legislation for the use of sharps.
- ✔ This should include:
  - Conducting regular risk assessments in all situations where there is potential for exposure to sharps injury.
  - Injectors, caregivers, family and downstream workers (e.g. porters and cleaners) must receive appropriate education and training in how to minimise risk of sharps injury by:
    - › following optimal techniques
    - › being made aware of the potential adverse effects of an injury
    - › provide and wear appropriate protective clothing (e.g. gloves)
    - › use safety engineered needle devices.
  - HCPs should be involved in the selection, trial and choice of all injection/safety devices used in their health care setting.
  - Health care settings where insulin pens are used must follow a strict one-patient/one-pen policy.
  - Hepatitis B Virus (HBV) vaccination should be offered by the employer to all workers exposed to sharps. Vaccination status should be reviewed annually.
  - Needle recapping **must not** be undertaken.
  - First aid information on what to do in the event of a sharps/NSI should be readily available.
  - HCPs must report all sharps/NSI following local policy guidelines.

Sharps Disposal:

- ✔ Safe disposal of sharps should be taught to people with diabetes who inject, care-givers and all others who may encounter the sharp device from the beginning of the injection therapy initiation and reinforced thereafter. They should be made aware of local safety and disposal regulations.
- ✔ Approved healthcare waste sharps containers must be beside the person who is receiving or administering the injection.
- ✖ Under no circumstance should sharps material be disposed of into the public refuse or rubbish system.

Safety Engineered Needle Devices (SENDs):

Safety engineered pen needles (SENDs) are designed to prevent accidental needlestick injuries after injection. They may also reduce the risk of bilateral exposure, which is when the needle penetrates both the patient's and clinician's skin during injection.

- https://www.legislation.gov.uk/uksi/2013/645/pdfs/uksi_20130645_en.pdf
- https://www.hse.gov.uk/healthservices/needlesticks/eu-directive.htm
- https://www.hse.gov.uk/pubns/hsis7.pdf

- All members of staff using safety engineered needle devices should be taught how to use the device safety and competently.
- Attention must be paid to the use of safety devices, specifically with regards to mechanism of insulin delivery and safe disposal. If they are used incorrectly or not activated, they provide no additional risk reduction over conventional (non-safety) devices and may lead to dosing errors.
  - **Passive** safety pen needles require constant pressure to be applied to the skin during administration and have a mechanism that automatically covers the needle tip when it is withdrawn from the skin, without requiring any extra steps from the user.
  - **Active** safety pen needles are used in a similar way to conventional pen needles for insulin delivery and have a mechanism that requires the user to manually activate the safety feature, by pushing a button or a tab, which covers the needle tip when it is withdrawn from the skin.
  - There are at least five companies that produce SENDs in the UK including:
    - Embecta
    - GlucoRx
    - Microdot
    - NeonDiagnostics
    - Owen Mumford
- Safety devices should be considered first-line choice if injections are given by anyone other than the patient, such as:
  - Community nurses
  - Social care staff who have been specifically trained in insulin administration
  - People who inject with small children at home and/or sub-optimal sharps disposal options should also consider using safety-engineered devices
  - For certain people with diabetes e.g. those known to be seropositive for Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV), children injecting at school, care homes and prisons.
- It is crucial that SEND devices are reviewed and procured or prescribed aligned to their usability to ensure use supports safety and cost effectiveness.
- Available resources should be available for education and training of individual users.

CLINICAL CASE STUDY

⚠ This case study is real. The facts are real. Personal details have been changed. Stock photo has be used to illustrate case study

Background to this clinical case

The clinician who published this case study had for some time been developing considerable expertise in the diagnosis and management of lipohypertrophy. The diabetes clinical team had detected that a significant number of individuals with diabetes were experiencing hypoglycaemia requiring emergency third party assistance and yet were not getting any follow up support or therapy change. The diabetes team worked in close liaison with the ambulance and paramedic service and set up a systematic referral process (pathway). This ensured that all individuals who experience hypoglycaemia requiring paramedic intervention, either discharged by paramedics or admitted to hospital, get an automatic referral to the diabetes specialist team.

Stewart's story

Stewart, a 63-year-old man with type 1 diabetes, was involved in a serious car accident whilst driving home from work. Stewart's job required him to drive many thousands of miles each year. Stewart was seriously injured in the crash and his car was written off. He was stabilised by paramedics at the scene. He was subsequently transferred to the local emergency department and admitted to hospital. Stewart was referred to the diabetes specialist team using the local 'pathway' and seen following discharge from hospital.

Let's take a look at Stewart's clinical history:

- Male
- 63 years old
- Diagnosed Type 1 diabetes aged 35 years
- Long history of unexplained hypoglycaemia

What did Stewart's clinic notes show?

20 years ago	• Stewart had been advised that abdominal injection sites were 'overused' and that he was recommended to 'rest and rotate' injection sites › Total daily dose of insulin was 78 units › HbA1c was 75mmol/mol (9%) › Following intervention i.e. resting and rotating sites, HbA1c dropped to 55mmol/mol (7.2%)
19 years ago	• Stewart was changed to multiple daily injections of insulin › Insulin isophane and insulin lispro, total daily dose 48 units › Again written in notes requested to 'rest' abdomen injection sites
10 years ago	• Stewart's insulin doses increased to 24 units of isophane and 72 units of lispro per day • Using 8mm pen needles • Driving >1000 miles per week • Stewart stated that he was deliberately keeping blood glucose levels high to avoid hypoglycaemia whilst driving
1 year ago	• 2 severe hypoglycaemic episodes over three days • Required paramedic assistance • Stewart was referred to diabetes team by paramedics using local referral pathway • Seen by dietitian, diet reviewed no further intervention noted • Routine annual diabetes clinic review followed a few weeks later • HbA1c stable 66mmol/mol (8.2%) › No hypoglycaemia reported by Stewart › Noted that needle reuse was significant 'wanted to save the NHS some money'. Stewart was supported to use needles once only

6 months ago	• Referred to diabetes team by ambulance service following severe road traffic accident. Following history obtained from Stewart when seen by diabetes team: › Stewart was driving home when he experienced severe hypoglycaemic episode and crashed his car – no other vehicle involved › Stewart was badly injured and admitted to hospital, his car was subsequently written off » Stewart's driving licence was suspended, causing immense challenges to his working life › **Day of the accident** › Stewart told diabetes team his blood glucose was 7mmol/L when he planned to leave work at 18.20hrs » He was delayed and finally left work at 20.00hrs » Ambulance recorded time of accident call out as 20.56hrs » Stewart said he injected 22 units of insulin glargine at 06.00hrs » He had not taken any insulin doses during the day » Stewart ate a banana and chocolate bar at approx. 17.00hrs › All hypoglycaemic episodes up to and including this one are 'unexplained' › Stewart and his wife insisted he had no lumps at his injection sites and that he correctly rotated - notes show they both responded similarly at all review clinics in the past › **Following assessment by diabetes nurse:** » Stewart was asked to record all blood glucose levels and clinical team would telephone in one week to discuss » The following week Stewart reported blood glucose levels mostly ranging from 7-13, but again he had 2 unexplained hypoglycaemic episodes » Despite firmly declining in the past Stewart agreed to return to clinic to have his injection sites examined and palpated › **Follow up clinic to assess injection sites:** » All injection sites including non-orthodox were visually checked and palpated » Lipohypertrophic lesions were found (see images on page 11) - Bilaterally lower abdomen - Bilaterally upper medial thigh › **Clinical plan:** » Avoid injecting into lipohypertrophic lesions » Educate and support Stewart to correctly rotate injection sites » Switch to a 4mm pen needle to minimise accidental intramuscular injection » Reinforced single needle use message » Dietary support in regard to correct 'carb counting' and insulin ratio » Frequent telephone and clinic follow up to continue education and support
Currently	• Insulin glargine reduced from 22 units per day to 16 units • Insulin lispro doses approximately 30 units each reduced to no more than 12 units (1 unit/10g carbohydrate ratio) • Total daily dose reduced from 112 units to 52 units • Home blood glucose showed >70% readings within target range • One reading of 3.8mmol/L in last few months • All subsequent 'mild' hypoglycaemic episodes are 'explained' • Stewart is happier, more confident and can predict his blood glucose levels with more accuracy

What do we learn from this case study?

- Injection technique is a critical part of diabetes self-care.
- All clinicians must support people who inject to:
  - Correctly rotate injection sites
  - Never reuse needles
  - For people of all sizes always use 4mm pen needle
  - Avoid injecting into lipohypertrophic lesions
- All clinicians must:
  - Examine and palpate injection sites at least every year
- In the event of unexplained hypoglycaemic episodes and or detection of lipohypertrophy:
  - Take history of injection technique habits paying careful attention to rotation, needle length and reuse
  - Examine and palpate injection sites
  - Monitor the person closely as significant hypoglycaemia may be a consequence of correcting suboptimal injection technique
  - Support patients to alter insulin doses according to blood glucose results

This is a statement made by a different person cared for by Stewarts team

> "I hesitate to say it this early in case I jinx it, but it looks as if you have another success story with me and the injection site experiment. For hours on end yesterday I was 5 and 6 mmol/L and this was on vastly reduced insulin doses. I am astonished, literally, it feels like a miracle! Thank you so much for sharing the information with me and good luck for your ongoing important research."

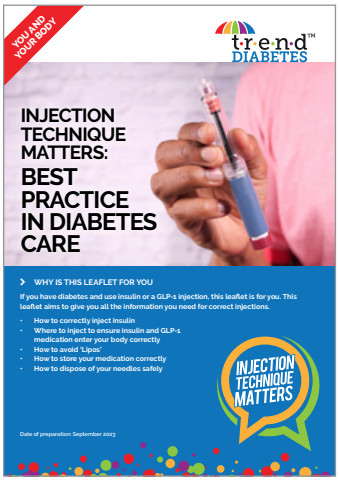
Footnote: Continuous Glucose Monitoring is available to all people who inject insulin as part of their diabetes management.

APPENDIX: ROUTINE CARE CLINICAL PROCESS CHECKLIST

Health professionals also have a responsibility to reassess injection technique and examine injection sites as part of routine, on-going diabetes management. These are some of the questions you may choose to use during your consultation to assess injection technique.

1. Show me where you inject your insulin?
2. How do you inject your insulin?
3. Do you check for lumps under the skin, have you identified any and if so what do you do thereafter?
4. How often do you change the sites where you inject?
5. How far apart do you space injections?
6. How often do you change your needles?
7. What angle do you insert the needle into the skin?
8. How long do you leave the needle in the skin after pressing down the dose button?
9. How do you dispose of your used “sharps”?
10. Where do you store your insulin?

RESOURCES FOR PEOPLE LIVING WITH DIABETES



Handbook

- Injection Technique Matters: Best Practice in Diabetes Care

Checklist

- Key things to remember if you use injectable medication to treat your diabetes

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Injection Technique Matters – Best Practice in Diabetes Care is supported by:

www.lilly.co.uk

www.nipro-group.com

www.embecta.com

Access our YouTube videos

info@trenddiabetes.online www.trenddiabetes.online @TrendDiabetes