Best Practice Guideline to support Correct Injection Technique in Diabetes Care

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Introduction

In the United Kingdom, during 2009, work commenced to raise awareness about the negative impact of poor injection technique. This information was then shared amongst people with diabetes who inject, and healthcare professionals who provide advice and support to them.

Nearly ten years on there is still much work to do to ensure that those people with diabetes who need injectable therapies receive the appropriate education and support to achieve the best outcome possible from their medications.

This new guideline is for healthcare professionals. It has been developed to be a **Practical, Clear** and **Concise** document to inform evidence-based best practice in injection technique with the aim to increase knowledge and skills to improve health outcomes as a result of optimal insulin and GLP-1 receptor agonist delivery.

This guideline is informed by the publication:

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doi.org/10.1016/j.mayocp.2016.06.010

This guideline has been developed by the Injection Technique Matters Board and reviewed by people with diabetes:

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This initiative is supported via an educational grant from B Braun, GlucoRx and Owen Mumford.

™ TREND-UK Limited. Content to be reviewed November 2020.

Our Supporters

B Braun

B. Braun is one of the world's leading providers and manufacturers of healthcare solutions today, established for over 175 years. Our focus in Diabetes Care is to offer high quality products, innovative value added services and educational literature for both patients and healthcare professionals. B. Braun's corporate Vision is to 'Protect and improve the health of people around the world' and we are very excited to be directly supporting the Injection Technique Matters Initiative. ITM aims to educate Nurses and their patients on best practice Injection Technique and by supporting an initiative like this B. Braun hope to be able to make a difference to people with diabetes. We truly believe ITM has the power to increase awareness, improve understanding and empower patients to make the small changes that can make a big difference.

GlucoRx

GlucoRx Ltd. is very pleased to sponsor and unconditionally support this first edition of the "'Injection Technique Matters - Best Practice in Diabetes Care". Achieving the best injection technique possible enhances the lives of the many people living with diabetes having to medicate with injectables, helping them to obtain the best possible (and individualised) outcomes and to minimise the risks involved. It is vitally important for them to be taught correctly from the outset and to have access to the most relevant information. The contents of this document will allow healthcare professionals to access the latest research and to promote the importance of adhering to the latest recommendations on injection technique. Promoting best practice plays a core role in GlucoRx's day to day activities and helping to disseminate this practical guideline could not be more in line with our company's ethos.

Owen Mumford

Owen Mumford is committed to supporting patients using injectable therapies, and the healthcare professionals who care for them. For over 65 years Owen Mumford has delivered innovative medical device solutions designed to help medical professionals improve the delivery and management of treatments for a variety of therapy areas and conditions, and which in turn help patients to better self-manage these conditions. We recognise the role that initiatives such as Injection Technique Matters have in facilitating optimum injection techniques, promoting good routines and enhancing the care of patients with diabetes. It is important that patients receive the benefits of treatment, avoid long-term complications and achieve favourable clinical outcomes. Our aim is to improve lives and reduce healthcare costs, and Owen Mumford appreciates that the added-value of best practice guidelines, ongoing education and support programmes can all contribute to achieving positive health outcomes. We are delighted to support the Injection Technique Matters initiative.

Endorsements

AstraZeneca are pleased to support the ITM initiative. We strive to provide medicines which can provide better outcomes for people with Type 2 diabetes but this can only be achieved when administered correctly. Adoption of the ITM guidelines in clinical practice will help ensure that the best outcome is obtained from all injectable medicines.

Richard Gotting,
Head of Marketing, Diabetes, AstraZeneca

Diabetes UK both welcomes and supports the Injection Technique Matters - Best Practice in Diabetes Care initiative. Injection technique leads to good blood glucose control which is vital in preventing the long term complications of diabetes. as so many people with diabetes are now being prescribed injectable medication, this is a timely and important enterprise which will bring great benefit to them.

Simon O'Neill,
Director of Health Intelligence. DIABETES UK

Advances in the treatment of diabetes have led to an increase in the number of injectable therapies available. Correct technique is of paramount importance in order to ensure the patients benefit from injectable therapies such as insulin and GLP-1 receptor agonists. The Injection Technique Matters - Best Practice in Diabetes Care initiative provides comprehensive evidenced based guideline to improve the process and education of self-injection technique for people with diabetes. As a company committed to improving the care of patients, Lilly UK welcomes the Injection Technique Matters initiative as an important step in supporting diabetes care in the UK.

Dr Elemer Balogh,
Medical Director Diabetes, UK, RoI and the Nordics Eli Lilly and Company Limited

Novo Nordisk fully endorse the Injection Technique Matters – Best Practice in Diabetes Care (ITM) initiative. The benefits of modern injectable medications for the treatment of diabetes can only be fully realised through the use of correct injection technique. Novo Nordisk believes it is imperative that Healthcare Professionals understand the importance of good injection technique and convey this to people with diabetes under their care. ITM is a superb initiative, whereby leading professionals in diabetes care review and update the evidence to bring relevant developments in this area

Dr Avideh Nazeri,
Director of Clinical, Medical & Regulatory, Novo Nordisk

Sanofi UK is committed to improving the care for people with diabetes who are using insulin and GLP-1 therapy by providing a range of injectables. We are proud to support the 'Injection Technique Matters - Best Practice in Diabetes Care' initiative which aims to improve current practice through the sharing of scientific evidence and demonstration of best practice. At Sanofi our mission is 'to help our customers help their patients enjoy a better life' and we appreciate the importance of good injection technique to ensure that people with diabetes who are using injectable therapy achieve the most benefit from their medication and wish Injection Technique Matters every success with this initiative.

Tunde Falode,
General Manager for the Diabetes and Cardiovascular Business Unit in the UK and Ireland at Sanofi.

SECTION 1
The delivery of insulin and GLP-1 RA therapy

WHAT IS THE PROBLEM?

Insulin and Glucagon-like peptide-1 Receptor Agonists (GLP-1 RAs) are designed to be delivered into subcutaneous tissue i.e. the fatty layer that lies just below the skin but above the muscle layer (See Figure 1). Poor injection technique can result in these agents not being injected into the right place.

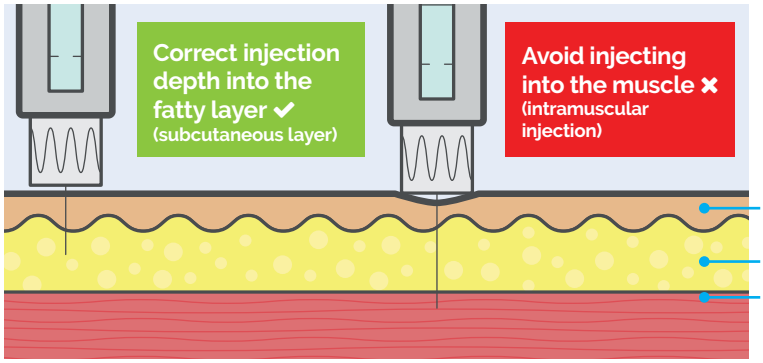


Figure 1

WHY IS IT A PROBLEM?

Unpredictable blood glucose control leading to unexplained hypoglycaemia, glycaemic variation and above target HbA1c may be caused by:

- Incorrectly stored injectable agents, allowed to freeze or become too hot >30°C
- Failure to perform correct test dose before injection
- Failure to correctly mix cloudy insulin
- Using needle length longer than 4mm
- Failure to use correct lifted skinfold when required
- Not rotating or incorrect rotation of injection sites
- Withdrawing the needle from the skin before full dose is administered i.e. not counting to 10
- Needle reuse
- Time site rules not known

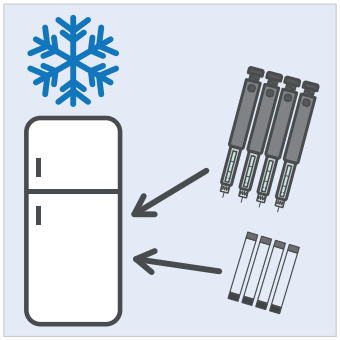


Figure 2

1. If insulin or GLP-1 RA is frozen, kept in direct sunlight or stored in temperature greater than 86F or 30°C it will result in loss of efficacy (See Figure 2)
2. Intermediate-acting Neutral Protamine Hagedorn (NPH) insulin (also known as isophane insulin) and premixed insulins are in a suspension and need to be properly mixed before injecting (See page 7)
3. If insulin is injected into a muscle (which can occur when longer needles are used or a lifted skin fold is not performed correctly) it will be absorbed more quickly and could cause hypoglycaemia
4. Repeatedly injecting into a particular area or site can damage the tissue and result in a condition known as lipohypertrophy (see section 2.). Insulin injected into lipohypertrophic tissue ("lipos") is poorly absorbed and can lead to hypoglycaemia or hyperglycaemia and the need for increasing doses of the medication
5. If the needle is withdrawn too quickly then the full dose of medication will not be delivered and may lead to hyperglycaemia
6. If used repeatedly needles become distorted, lose lubrication and cause damage to the skin (as well as more painful injections) (See Figure 3)
7. Insulin is absorbed at different rates from different injection sites (See How to get it right, No 4 Site Selection)

Figure 3

HOW TO GET IT RIGHT?

Health professionals must teach best practice injection technique when insulin and GLP-1 RAs are initiated including:

1. **Storage:** Store unopened insulin and GLP-1 RA in the fridge, as per manufacturer's instructions at 4-8 degrees.

2. **Re-suspending Cloudy Insulins:** Resuspend cloudy or premixed insulin by rolling 10 times in palms of hands (Figure 4) and inverting 10 times (Figure 5)

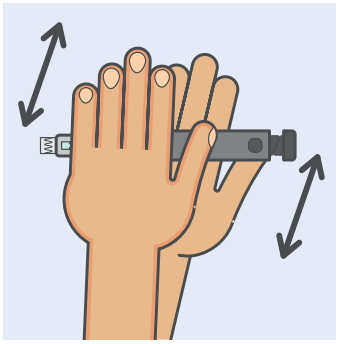


Figure 4

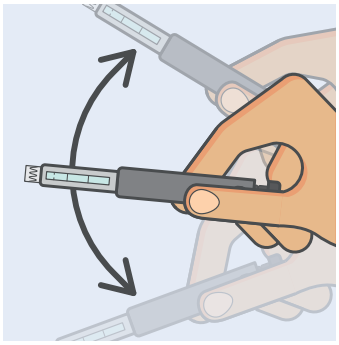


Figure 5

3. **Needle Length:** Use 4mm or 5mm needles at 90 degrees to the skin (Figure 6). Only use 4mm needles for children, young people or very slim adults. A lifted skin fold may be required for this group, even when using 4mm needle, to prevent giving an intramuscular injection

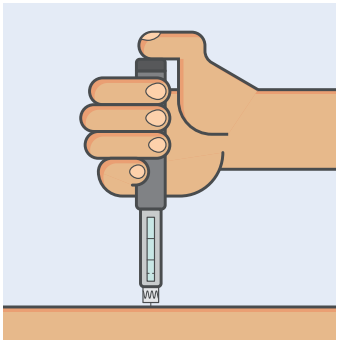


Figure 6

4. **Site Selection:** The four preferred sites are the abdomen, outer aspect of the thighs, buttocks and upper arms (See Figure 7).

   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 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.

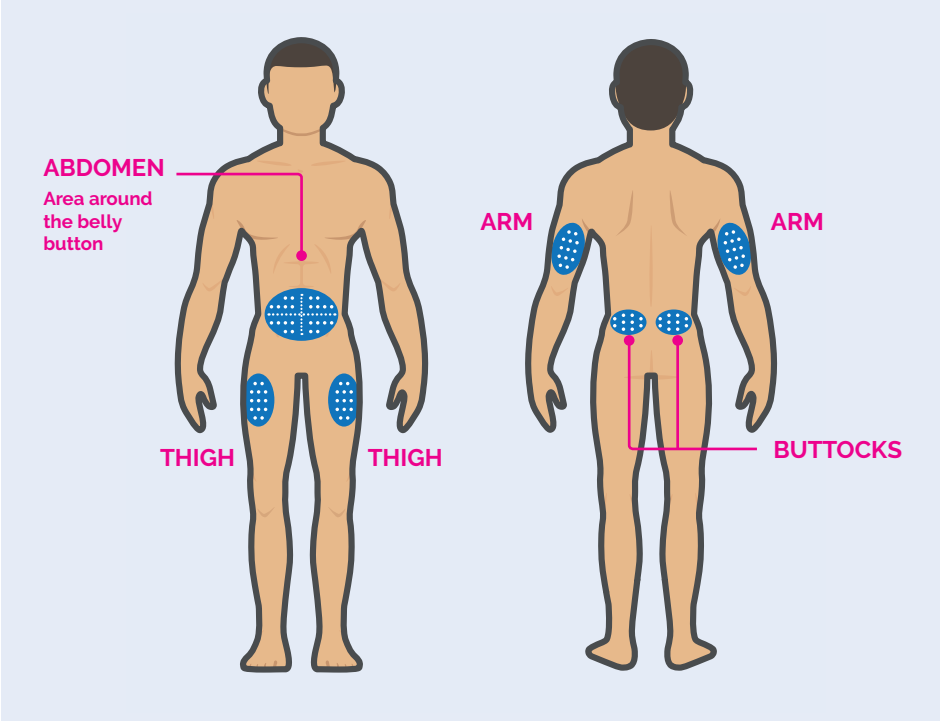


Figure 7

5. **Site Rotation:** To reduce the risk of developing lipohypertrophy each injection site (abdomen, thighs, buttocks and arms) should be divided into sections which are rotated on a weekly basis (Figure 8) with injections given within a section moving in the same direction, clockwise or anticlockwise and at least 1 cm apart (Figure 9).

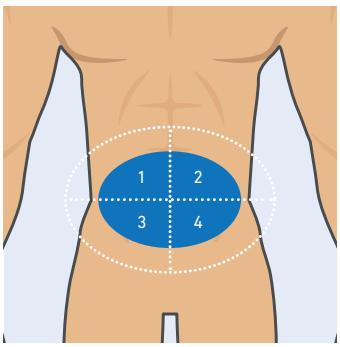


Figure 8

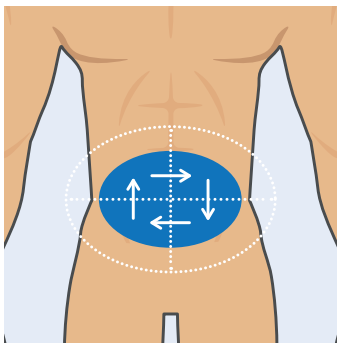


Figure 9

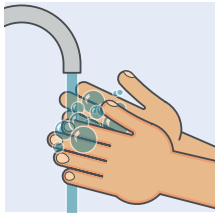
6. **Ensuring full dose is delivered:** Press dose button until dose fully injected and before removing the needle from the skin count to 10 before withdrawal to ensure the full dose is given (refer to step 9 below).

7. **Needle Reuse:** Never reuse needles, reuse is linked to lipohypertrophy formation.

CORRECT 10 STEP INJECTION PROCESS

The correct 10 step injection process to teach your patients is illustrated below:

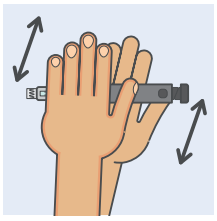
1



Firstly wash hands with warm water and soap

Dry thoroughly

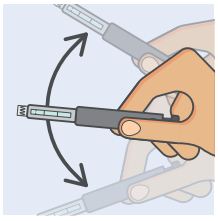
2



Remove pen cap

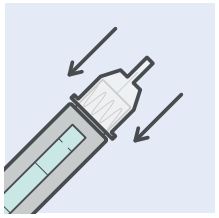
For cloudy insulins roll pen 10 times between the palms

3



Next, gently invert the pen 10 times to achieve an even milky appearance

4

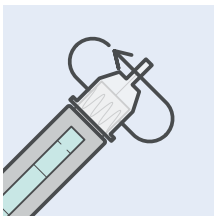


Select a new needle

Peel off paper seal

Apply new needle in line with pen

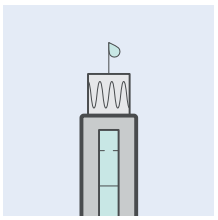
5



Screw on needle

Pull off protective caps

6



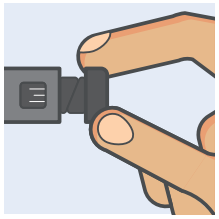
To ensure needle and pen are working correctly select 2 units on dose button

Hold pen with needle pointing upwards

Fully depress dose button looking for insulin to appear from needle tip

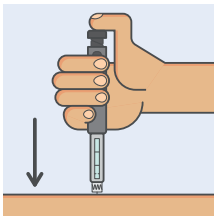
If not seen, repeat steps until insulin seen at needle tip

7



Dial the required dose

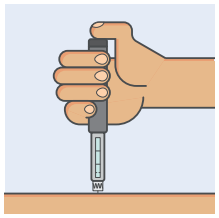
8



Fully insert the needle into the skin at 90 degrees, keeping the pen stable

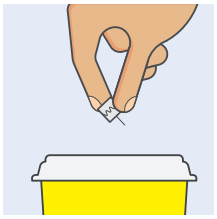
Press dose button until dose fully injected

9



Before removing the needle from the skin, count to 10 to ensure the full dose is given

10



Safely remove the needle from the pen

Dispose of the needle into a sharps bin

Psychological and Educational issues

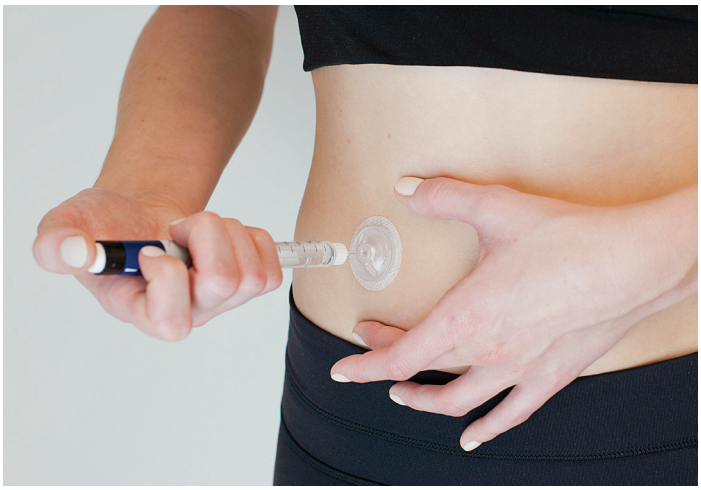
Health care professionals (HCP) should discuss the individuals' psychological and emotional concerns and encourage them to express their feelings and fears. All people who are commencing injectable therapies should be clear that this therapy is neither a punishment, nor a sign of failure to manage type 2 diabetes. Individuals 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, 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.

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

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.

SECTION 2
Insulin and GLP-1 RA delivery challenges

This section addresses three important delivery issues including lipohypertrophy, bleeding and bruising, and injecting during pregnancy.

LIPOHYPERTROPHY

WHAT IS THE PROBLEM?

If correct injection technique is not taught or performed at every injection then lipohypertrophy can occur. Lipohypertrophy has been found at injection sites of many people who inject insulin. Lipohypertrophy is sometimes referred to as a 'lipo', This is a thickened, rubbery area of fatty tissue that develops in the subcutaneous layer where injections of insulin are given. Areas of lipohypertrophy vary greatly in size and shape, and are often difficult to see or palpate.

Figure 2.1 See examples below (permission for use given by Linda Clapham, DSN)

The primary causative factors of lipohypertrophy are:

- Incorrect injection site rotation technique
- Duration of insulin use
- Frequency of injections
- Needle reuse

WHY IS IT A PROBLEM?

If insulin is injected into areas of lipohypertrophy the absorption of the injected medication can be severely affected. Injecting into lipohypertrophic tissue can cause huge 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 have seen in Section 1, 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)

HOW TO GET IT RIGHT?

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:

- Better 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:

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

HOW TO EXAMINE FOR LIPOS

- Always inspect for lipohypertrophy in good light
- Gain consent to examine
- Look for changes in contour of skin
- Warm, clean hands
- Use water soluble gel
- Use tips of fingers
- 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
- Advise avoid using area for at least 3-6 months
- Re-examine at next visit

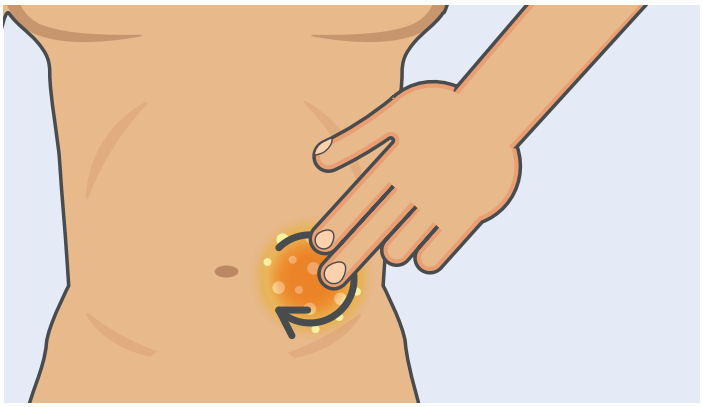


Figure 10

BLEEDING AND BRUISING

WHAT IS THE PROBLEM?

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 damage. This is more likely to occur in those people who are taking anti-coagulant or anti-platelet therapies.

WHY IS IT A PROBLEM?

Actually it is not a problem. Evidence has shown that neither bleeding nor bruising has any negative impact on blood glucose levels,

HOW TO GET IT RIGHT?

Bleeding or bruising can be minimised by:

- Review injection technique
- Using a new needle for every injection to prevent distortion of needle (Figure 11)
- Rotating injection sites, as well as within sites (Figures 12 and 13)
- Applying pressure with a cotton pad or tissue should stop any bleeding.

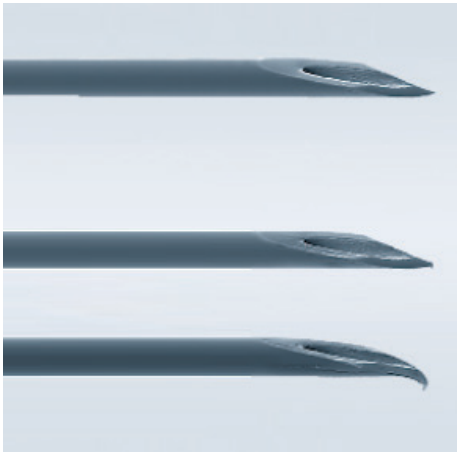


Figure 11

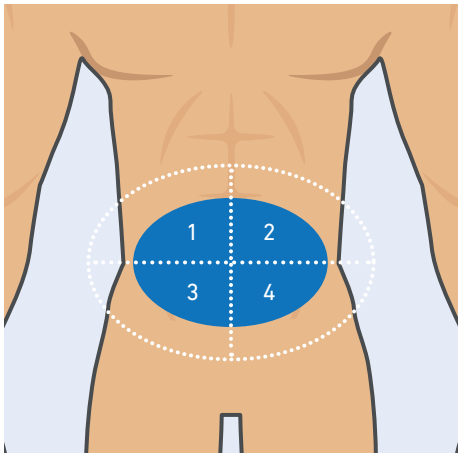


Figure 12

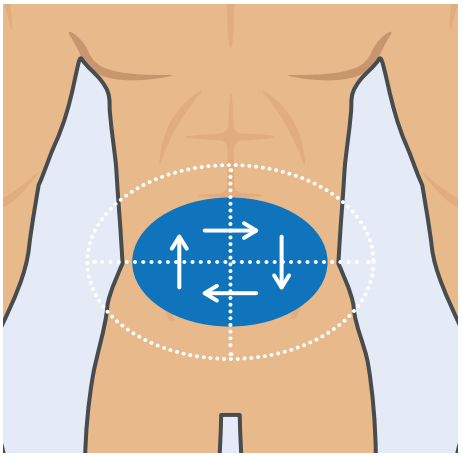


Figure 13

PREGNANCY

WHAT IS THE PROBLEM?

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

WHY IS IT A PROBLEM?

Many women who inject insulin are concerned that the injection may penetrate into the womb.

HOW TO GET IT RIGHT?

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 14) or into the outer upper thighs, or upper outer arms.

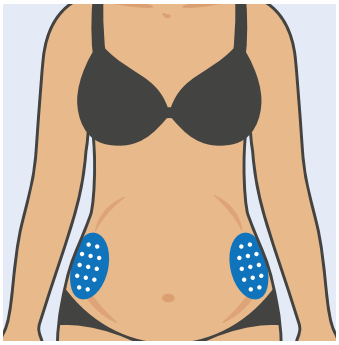


Figure 14

SECTION 3
Sharps Safety

WHAT IS THE PROBLEM?

All HCPs are at risk of sharps/needlestick injury (NSI).

WHY IS IT A PROBLEM?

Sharp medical devices present a potential risk for both injury and transmission of disease e.g. hepatitis/HIV.

HOW TO GET IT RIGHT?

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 minimize 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 available safety 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 Devices:

- Attention must be paid to the use of safety devices. 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.
- Safety devices should be considered first-line choice if injections are given by a:
  - Community nurses
  - 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

Specific References

- NICE Clinical Guideline CG139: Healthcare-associated infections: prevention and control in primary and community care (2012).
- Health and Safety (Sharp Instruments in Healthcare) Regulations 2013: A guide for employers and employees.

APPENDIX: INJECTION TECHNIQUE ASSESSMENT 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. Where do you store your insulin?
2. Show me how you mix your insulin before giving your injection (only if this is required).
3. Show me where you inject your insulin?
4. Do you check for lumps under the skin, have you identified any and if so do you avoid injecting into these areas?
5. How often do you change the sites where you inject?
6. How far apart do you space injections?
7. How often do you change your needles?
8. What angle do you insert the needle into the skin?
9. How long do you leave the needle in the skin after pressing down the dose button?
10. How do you dispose of used “sharps”?

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