DIABETES CARE IN THE UK

The First UK Injection Technique Recommendations
The Forum for Injection Technique (FIT) was developed to establish and promote best practice in injection technique for all involved in diabetes care and the founding members are experienced diabetes specialist nurses.

These recommendations aim to raise awareness of existing and emerging research relating to injection technique and the impact this may have on health outcomes for those with diabetes that require subcutaneous injection therapy.

FIT was established following the 3rd International Injection Technique meeting (Athens 2009). From this meeting a consensus was reached to establish the international injection technique recommendations. Following a very successful inaugural symposium held in London on 4th June 2010, attended by over 40 experienced diabetes specialist nurses from across the United Kingdom (UK) and Ireland, the international injection technique recommendations have been adapted for use in the UK.

These are the first UK recommendations for Injection Technique and these will be revised on an annual basis to include new research evidence as it emerges.

FIT is an autonomous organisation whose overarching mission is to support people with diabetes using injectable therapies to achieve the best possible health outcomes that can be influenced by correct injection technique. There are now nearly 3 million people in the UK with diabetes and of these approximately 800,000 are on injectable therapies.*

FIT is committed to supporting the implementation of the recommendations by all those involved in diabetes care and to developing the recommendations further. We welcome any comments, suggestions and active participation in ensuring that the recommendations remain relevant and useful for now and the future.

Debbie Hicks
Nurse Consultant – Diabetes (Chair)
Sheila Burmiston
Diabetes Nurse Specialist (Former Co-Chair)
Mani Basi
Nurse Consultant – Diabetes
Fiona Kirkland
Nurse Consultant – Diabetes
Julia Pledger
Nurse Consultant – Diabetes

The development of FIT and the subsequent UK recommendations for injection technique have been supported by BD Europe and endorsed by the pharmaceutical companies whose therapies include subcutaneous injections of insulin and GLP-1 agonists.

Thus each recommendation is followed by both a letter and number (i.e. A2). The letter indicates the weight a recommendation should have in daily practice and the number, its degree of support in the medical literature. The most relevant publications bearing on a recommendation are also cited. There are comparably few randomised clinical trials in the field of injection technique (compared, for example, with blood pressure control) so judgements such as ‘strongly recommended’ versus ‘recommended’ are based on a combination of the weight of clinical evidence, the implications for patient therapy and the judgement of the group of experts.

These recommendations apply to the majority of people with diabetes using injectable therapy, but there will inevitably be individual exceptions for which these rules must be adjusted.

The New Injection Recommendations for Patients with Diabetes: Diabetes & Metabolism 2010. Vol 36. informed these recommendations and we thank the editors of Diabetes & Metabolism for permission to use material from this article.
1.0 Psychological Challenges of Injections

1.1 Children
1. Children have a lower threshold for pain than adults and sometimes find injecting uncomfortable. The Healthcare Professional (HCP) should ask about pain, since many young people with diabetes will not bring it up spontaneously. (18, 20)

2. Younger children may be helped by distraction techniques (as long as they do not involve trickery) or play therapy (e.g. injecting into a stuffed animal) while older children may respond better to Cognitive Behavioural Therapies (CBT) where available. (19)

3. CBT includes relaxation training, guided imagery, graduated exposure, active behavioural rehearsal, modelling and reinforcement as well as incentive scheduling. (19)

1.2 Adults
1. The HCP should prepare all people with type 2 diabetes for likely future injectable therapy early in the disease pathway, by explaining the natural, progressive nature of the disease, stating that it includes injectable therapy and making clear that injectable therapy treatment is not a sign of patient failure. (30)

2. Both the short-term and long-term advantages of good glucose management should be emphasised. Finding the right combination of therapies including injectables leading to good glucose management should be the goal. (31,32)

3. Through culturally-appropriate pictures and stories, HCPs should show how injectable therapy could enhance both the duration and quality of life. (31)

4. HCPs should reflect on their own perceptions of injectable therapy and avoid using any terms which imply that such therapy is a sign of failure, a form of punishment or a threat. (33,34)

5. Pen devices may have psychological advantages over syringes and therefore maybe more acceptable. (31,35-37)

1.3 Summary

- Children have a lower threshold for pain than adults and sometimes find injecting uncomfortable. The HCP should ask about pain.
- Younger children may be helped by distraction techniques, while older children may respond better to CBT.
- CBT includes various techniques such as relaxation training, guided imagery, graduated exposure, active behavioural rehearsal, modelling and reinforcement, as well as incentive scheduling.
- Adults should be prepared for injectable therapy early in the disease pathway, explaining the natural, progressive nature of the disease and its treatment with injectable therapy.
- Both short-term and long-term advantages of good glucose management should be emphasised.
- HCPs should reflect on their own perceptions of injectable therapy and avoid using any terms which imply that such therapy is a sign of failure, a form of punishment or a threat.
- Pen devices may have psychological advantages over syringes.

By understanding and addressing these psychological challenges, HCPs can support their patients in managing diabetes more effectively and confidently.
2.0 Therapeutic Education

Adult

1. The HCP should spend time exploring the individual’s anxieties about the injecting process and the injectable therapy itself. (33,40) 

2. At the beginning of injection therapy (and at least every year thereafter) the HCP should discuss:

   - Injecting regimen
   - Choice and management of the devices used
   - Choice, care and self-examination of injection sites
   - Correct injection techniques (including site rotation, injection angle and possible use of skin folds)
   - Injection complications and how to avoid them
   - Optimal needle length
   - Safe disposal of used sharps (32-35, 38-41)

   Ensure that each of these topics have been fully understood. (34) 

3. Injection technique education should be put in place and regularly reviewed and recorded in the individuals care plan. 

4. Current injection practice should be discussed and if possible observed. Injection sites should be examined and palpated, if possible at each visit but at least once a year. (38,40,41) 

3.0 Injection Sites

The diagram shows the current recommended injection sites for injectable therapy.

4.0 Injection Site Care

1. The site should be inspected and palpated by the individual prior to injection. (5,6) 

2. Avoid using a site showing signs of lipohypertrophy, inflammation, oedema or infection until the problem has been resolved. (15,49,50 – 55) 

3. Injections should be given into a clean site using clean hands. (56) 

4. The site should be cleansed with soap and water when found to be unclean. (56) 

5. Disinfection of the site is usually not required; however, alcohol swabs may be used prior to injections given in the hospital or care home setting. (6, 57-60)
5.0 Insulin Storage and Suspension

1. Store injectable medication in current use at room temperature (for a maximum of one month after initial use, and within expiry date). Avoid direct sunlight and areas of temperature extremes. Store unopened injectable medication in an area of the refrigerator where freezing is unlikely to occur. (66,67)

2. Cloudy insulin (e.g. NPH and pre-mixed insulin) must be gently rolled ten times and inverted ten times (not shaken) until the crystals go back into suspension and the solution becomes milky white. (61-65)

6.0 Injecting Process

Tips for making injections less painful include:

- Keeping injectable therapy in use, at room temperature (66,67)
- Using needles of shorter length and smaller diameter (157)
- Using a new needle at each injection (5,6,17,36,68)
- Insert the needle in a quick smooth movement through the skin (69)
- Inject slowly and ensure that the plunger (syringe) or thumb button (pen) has been fully depressed (69)
- If using alcohol swabs, inject only when the alcohol has fully dried

7.0 The Correct Use of Pen Devices

1. Pen devices should be primed (observing at least a drop at the needle tip) according to the manufacturer’s instructions before each injection. Once flow is verified, the desired dose should be dialled and the injection administered. (36,68)

2. Pen devices and cartridges are for single person use only and should never be shared due to the risk of cross contamination. (37,57)

3. Pen needles should be used only once. (3,5,6,17,59,76,77)

4. Using a new needle each time may reduce the risk of needle breakage in the skin, ‘clogging’ of the needle, inaccurate dosing and indirect costs (e.g Abscess). (77)

5. After pushing the thumb button in completely, the individual should count slowly for 10 seconds before withdrawing the needle in order to deliver the full dose and prevent the leakage of medication. Counting past 10 seconds may be necessary for higher doses. (61,69,71,78,79)

6. Needles should be safely disposed of immediately after use and not left attached to the pen. This prevents the entry of air (or other contaminants) into the cartridge as well as the leakage of medication out of the cartridge, which can affect subsequent dose accuracy. (71-75)

7. Injecting through clothing should be discouraged. As needle lengths are becoming shorter there is increased risk of intradermal injection.

8.0 The Correct Use of Syringes

1. A syringe should be used only once and disposed of safely. (3,5,6,17,59,76,77)

2. When drawing up insulin, the air equivalent to the dose should be drawn up first and injected into the vial to facilitate easier withdrawal.

3. If air bubbles are seen in the syringe, hold syringe with needle uppermost, tap the barrel to bring them to the top and then remove the bubbles by pushing the plunger to expel the air.

4. When drawing up insulin, draw up the air equivalent to the dose first and then inject it into the vial to facilitate easier withdrawal.
9.0 Absorption Rates

9.1 Human Insulin
1 IM injection of all human insulin should be avoided since rapid absorption and serious hypoglycaemia can result. (95,96) 9
2 The thigh and buttocks are the preferred injection sites when using NPH (intermediate-acting) as the basal insulin, since absorption is slowest from these sites. (43,97) 9
3 The abdomen is the preferred site for soluble human insulin, since absorption is fastest there. (16,44,46,98-100) 9
4 The absorption of soluble (short acting) human insulin in the elderly can be slow and this insulin should not be used when a rapid effect is needed. (14,101) 9
5 For those people who require very large doses of insulin U-500 insulin may be an option instead of U-100. U-500 is only available as soluble insulin. However it has a pharmacokinetic profile more closely simulating NPH human intermediary insulin than soluble short acting human. U-100. (5,6,158) 9
6 Massaging the site before or after injection may speed up absorption and is not generally recommended. (5,6,70) 9

9.2 Premixed Insulin
1 Premixed insulin (human or analogue) should be given in the abdomen in the morning to increase the speed of absorption of the short-acting insulin in order to cover post-breakfast glycaemic excursions. (12) 9
2 Premixed insulin should be given in the thigh or buttck before evening meal as this leads to slower absorption and decreases the risk of nocturnal hypoglycaemia. (93,97) 9
3 Massaging the site before or after injection may speed up absorption and is not generally recommended. (5,6,70) 9

9.3 Insulin Analogues
1 Rapid-acting insulin analogues may be given at any of the injection sites, as absorption rates do not appear to be site-specific. (81-85) 9
2 Rapid-acting analogues should not be given intramuscularly (IM). (82,83,86) 9
3 Long-acting insulin analogues may be given at any of the injection sites, as absorption rates do not appear to be site-specific. (87,88) 9
4 IM injections of long-acting analogues must be avoided due to the risk of severe hypoglycaemia or erratic control. (89,90) 9
5 When injecting rapid and long acting analogue insulin these should be given in different sites even if given at different times during the day. (5,6) 9
6 Larger doses may cause a delay in the peak and increase the duration of action. (5,6) 9
7 Massaging the site before or after injection may speed up absorption and is not generally recommended. (5,6,70) 9

9.4 GLP-1 Agonists
1 Pending further studies, people with diabetes who inject GLP-1 agents (e.g. exenatide - Byetta®, liraglutide - Victoza®) should follow the manufacturers instructions. (72) 9
10.0 Needle Length

10.1 Children and Adolescents

1. There is no clinical reason for recommending needles longer than 6mm for children and adolescents. (118) A 2

2. Children and adolescents using a 5/6mm needle should lift a skin fold with each injection. (9,83,86,110,112-117,156,157) A 1

3. In the majority of cases a 4mm needle may be inserted at 90 degrees without a lifted skin fold. (9) A 2

4. If children have only an 8 mm needle available (as is currently the case with syringe users), it is essential to use a lifted skin fold or give injections into the buttocks. (111,118,119) A 1

5. Arms should only be used for injections if administered by a third party and using a lifted skin fold. A 2

6. Avoid pushing the pen device in to the skin thus indenting the skin during the injection, as the needle may penetrate deeper than intended and enter the muscle. A 2

10.2 Adults

1. There is no clinical reason for recommending needles longer than 8mm. (105,119,132) A 2

2. 4, 5 and 6 mm needles are suitable for all people with diabetes regardless of BMI; they may not require a lifted skin fold; particularly if using 4 mm needles. (9,74,104,106 – 108,156,157) A 1

3. Injections with shorter needles (4, 5, 6 mm) should be given in adults at 90 degrees to the skin surface. (9,74,106 – 108,130) A 1

4. To prevent possible IM injections when injecting into slim limbs and abdomens, even with short needles (4,5 and 6mm) may warrant use of a lifted skin fold. (9, 105, 106,131) A 2

5. Individuals using >8mm needles should ensure they are using a lifted skin fold to avoid IM injections. (105,131) A 2

11.0 Lifted Skin Folds

1. All people with diabetes/carers should be taught the correct technique for lifting a skin fold from the onset of injectable therapy. (see Fig 2) A 1

2. The lifted skin fold should not be squeezed so tightly that it causes skin blanching or pain. A 1

3. The optimal sequence should be:
   1) Make a lifted skin fold
   2) Insert needle into skin at 90% angle (see Figure 3)
   3) Administer therapy
   4) Leave the needle in the skin for at least 10 seconds after the thumb button plunger is fully depressed
   5) Withdraw needle from the skin
   6) Release lifted skin fold
   7) Dispose of used needle safely (see section 17)

Figure 2: Correct (left) and incorrect (right) ways of performing the skin fold.

Figure 3: The correct angle of injection when lifting a skin fold is 90°.
12.0 Lipohypertrophy

1. Sites should be inspected and any abnormalities documented by the HCP within the individual’s care plan. At a minimum, each site should be examined annually (preferably at each visit for children). If lipohypertrophy is already present the sites should be monitored at every review. (41,138)

2. Individuals should be taught to examine their own injection sites and how to detect lipohypertrophy. (41,138)

3. Using various available tools such as making two ink marks at opposite edges of the lipohypertrophy allows the lipo to be measured and its size recorded for long-term follow up. If visible the area of lipohypertrophy could also be photographed for the same purpose. (50,140)

4. Individuals should be advised (and rationale explained) not to inject into areas of lipohypertrophy until abnormal tissue returns to normal (which can take months to years). (139,140)

5. Switching injections from areas of lipohypertrophy to normal tissue often requires a decrease of the dose of insulin injected. The amount of change varies from one individual to another and should be guided by frequent blood glucose measurements. (50,140)

6. Caution is needed; too great a reduction in dose could lead to an increased risk of Diabetic Ketoacidosis in people with Type 1 Diabetes. However, too small a reduction could result in hypoglycaemia. (50,140)

7. The best current preventative and therapeutic strategies for lipohypertrophy include rotation of injection sites with each injection, and non-reuse of needles. (136,137,139,141-143)

Lipoatrophy, although very rare, is a wasting of the subcutaneous tissue at injection sites. Injecting into these sites should be avoided.

13.0 Rotation of Injecting Sites

1. Individuals should be taught an easy-to-follow rotation scheme from the onset of injection therapy. (146,147)

2. One scheme with proven effectiveness involves dividing the injection site into quadrants (or halves when using the thighs or buttocks); using one quadrant per week and moving always in the same direction, either clockwise or anti-clockwise (see Figures 4 and 5). (148)

3. Injections within any quadrant or half should be spaced at least 1cm from each other in order to avoid repeat tissue trauma.

4. HCP should verify that the rotation scheme is being followed at each visit and should provide advice where needed.

5. Use a variation of educational approaches and available tools to inform how to detect for lipohypertrophy.

---

**Notes:**

- **29 year old man said:** “it hurts less there”.
- **52 year old man injected in his thigh for 25 years, began to rotate his daily insulin requirement fell from 66 units to 30.”
- **29 year old man said:** “it hurts less there”.
- **Figure 4:** Abdominal rotation pattern by quadrants. Diagram adapted from Lourdes Saez-de Ibarra and Ruth Gaspar, Diabetes Nurses and Specialist Educators from La Paz Hospital, Madrid, Spain.
- **Figure 5:** Thigh and Buttocks rotational pattern by halves. Diagram adapted from Lourdes Saez-de Ibarra and Ruth Gaspar, Diabetes Nurses and Specialist Educators from La Paz Hospital, Madrid, Spain.
THE FIRST INJECTION TECHNIQUE RECOMMENDATIONS

14.0 Bleeding and Bruising

1 Individuals should be reassured that bleeding and bruising do not appear to have adverse clinical consequences for the absorption or action of injectable therapies. (149,150)

2 If persistent bruising occurs review injection technique.

15.0 Pregnancy

1 Pregnant women with diabetes (of any type) who continue to inject into the abdomen should give all injections using a raised skin fold. (151)

2 Massaging the site before or after injection may speed up absorption and is not generally recommended. (5,6,70)

16.0 Safety Issues

1 Under no circumstances should any HCP re-sheath needles, therefore either syringes or safety needles should be used. (153)

2 Any HCP who is required to use a lifted skin fold must exhibit caution to avoid needle stick injury.

17.0 Disposal of injecting material

1 All HCPs and individuals/carers should be aware of local regulations regarding sharps disposal. HCPs individuals/carers should be made aware of the consequences of inappropriate disposal of sharps (e.g. needle stick injuries to others such as refuse workers). (154)

2 Correct disposal should be taught to people with diabetes from the beginning of injection therapy and reinforced throughout.

3 Where available, a needle clipping device could be used. It can be carried in the injection kit.

4 Sharps guard (sharps box) is available on FP10. However, disposal is according to local policy.

5 Under no circumstance should sharps material be disposed of into the public rubbish or household refuse system.

6 Empty pen devices can be disposed of in the normal household refuse when the needle is removed.

Under no circumstance should any HCP re-sheath needles, therefore either syringes or safety needles should be used.

At least one non-randomised (or non-controlled or epidemiologic) study

Consensus expert opinion based on extensive patient experience.
References


24. Davidson M. No need for the needle (at least). Diabetes Care 2008;31 2070-2071.
THE FIRST INJECTION TECHNIQUE RECOMMENDATIONS

JACKIE STEDMAN
SUE GREENHALGH
MARY TRIMBLE
ANGELA COOK
CLAIRE BUSHNALL
MEL GRAY
GAYNOR HARRISON
ANNA MARIA WISHER
DEBORAH/BROWN
KAREN JONES
CHARLOTTE SIMPSON
JULIA BUNDOCK
LINDA GOLDEI
CLAIRE VICK
CAROL SELLER
RAZIA AMIN
HILARY WHITTY
LISA CLARKE
VICKY WHITE
ELLE HANKS
LE KAMPS
JEAN DUFFELL
ERICA FIGURIE
LEANNE JENKINS
SAUL ROY
DEVENADAN RAMKHELAWON

SURAYA KOHLIL
INIE WALKER
STEPHANIE SHAW
ROSALEEN MCHUGH
KAREN DANIELS
CATHY BROOKER
JUDITH NELSON
NICOLA HEATH
VAL BALL
HALEY BENNET
VICKY BUZCZAK
NORA COLLINS
JO LEOW
VALERIE DAWKINS
GILLIAN BOAST
JAYNE REED
JUNE WALLACE
HELEN ATKINS
JACKIE TRIMBLE
AMY BARRIDGE
MARY TRIMBLE
LINDA CLAPHAM
JUDE CAMPBELL
REBECCA THOMPSON
CHRISTINE DOWLING

Contributors


135 Photographs courtesy of Lourdes Saez-de Ibarra and Ruth Gaspar, Diabetes Nurses and Specialist Educators from La Paz Hospital, Madrid, Spain.

136 Nielsen BB, Mousseau L, Gaarde P. Sterile Diabetes Center, Copenhagen, Denmark. Attention to injection technique is associated with a lower frequency of lipohypertrophy in injectable therapy-treated type 2 diabetes. Abstract EASO, Barcelona, Spain, 1998.


145 Davis BD, Cheonky P. Site rotation... taking injectable therapy. Diabetes Forecast 1992;45:54-56.

146 Lumber T. Tips for site rotation. When it comes to injectable therapy where you inject is just as important as how much and when. Diabetes Forecast 2004;57:68-70.


148 Diagrams courtesy of Lourdes Saez-de Ibarra and Ruth Gaspar, Diabetes Nurses and Specialist Educators from La Paz Hospital, Madrid, Spain.


CONTACT DETAILS

DEBBIE HICKS  debbie.hicks@enfield.nhs.uk
SHEILA BURMISTON
MANI BASI  Mani.basi@nhs.net
FIONA KIRKLAND  Fiona.kirkland@nhs.net
JULIA PLEDGER  Julia.Pledger@bedfordhospital.nhs.uk