Best practice injection technique for children and young people with diabetes

It is important to assess regularly how young patients use injectables and care for injection sites to prevent the short- and long-term consequences of poor glycaemic control, says Carole Gelder

Abstract

Children and young people who manage diabetes with injection therapy are at risk of using a poor technique. This may have serious consequences, including poor glycaemic control, leading to the longer term complications of diabetes. The Forum for Injection Technique (FIT) is an international body that promotes best practice in injection technique. This article summarises the forum's UK-specific guidance, with particular reference to the nursing care of children and young people with diabetes. The FIT UK board, of which the author is a member, consists of experienced diabetes specialist nurses.

Keywords
Adolescents, children, diabetes, health promotion, injection technique, nursing

THIS ARTICLE details the main guidance from the second edition of The First UK Injection Technique Recommendations document, produced by the Forum for Injection Technique (FIT) (Hicks et al 2011) (Box 1). In this document, particular reference is made to advice for the care of children and young people who manage diabetes with injectable therapies. Each statement in the main body of text, where not explicitly referenced, is supported by the FIT recommendations.

FIT’s mission is to support people with diabetes using injectable therapies to achieve the best possible health outcomes by adhering to best practice injection technique. There are three million people with diabetes in the UK, equivalent to 4.6% of the population (Diabetes UK 2013). About 26,500 children and young people in the UK now have type 1 diabetes, and a further 500 have type 2 diabetes (Royal College of Nursing 2014) - in my experience, the vast majority are insulin dependent.

It is intended that, by establishing best practice injection technique, lipohypertrophy (or fatty lumps caused by repeated injections at the same site) and lesions under the skin that affect absorption rates will be reduced. There is strong evidence to suggest that those who suffer from lipohypertrophy tend to engage in one or more of the following: needle reuse, injection into small injection zones and failure to rotate sites on a regular basis (Strauss et al 2002).

Teaching best practice to patients and carers should reduce not only the occurrence of lipohypertrophy, but the number of acute hospital stays related to severe hypoglycaemia, diabetic ketoacidosis and, in the longer term, diabetes-associated complications.

The aim of the FIT recommendations is to raise awareness of existing and emerging research relating to injection technique and how technique affects health outcomes for people with diabetes who require subcutaneous injection therapy. FIT is committed to supporting the implementation of its recommendations by all those involved in diabetes care and developing them further. Current recommendations cover the following topics:

- Psychological challenges of injections.
- Therapeutic education.
- Injection sites and injection site care.
- Insulin storage and suspension.
- Injecting process.
Correct use of pen devices.
Absorption rates.
Needle length and lifted skin folds.
Lipohypertrophy and rotation of injection sites.
Safety and disposal of injecting material.
The FIT recommendations provide best practice injection technique advice applicable to people of all ages with diabetes. This article focuses on areas of relevance to children and young people with diabetes, to educate, inform and provide best practice information for all those involved in paediatrics and diabetes care.

Pain management
The FIT recommendations note that children and young people are likely to have a lower pain threshold than adults and that they can sometimes find injecting uncomfortable. It is strongly recommended that healthcare professionals actively enquire about pain, because many children and young people with diabetes may not voluntarily admit experiencing pain from injecting.

FIT’s tips for helping make injections less painful are:
- Store the injectable therapy at room temperature.
- Use needles of shorter length and smaller diameter, such as 4mm.
- Use a new needle for each injection.
- Insert the needle in a quick, smooth movement through the skin.
- Inject slowly and ensure that the plunger (syringe) or thumb button (pen) has been fully depressed.
- If using alcohol swabs, inject only when the alcohol has fully dried.
Distraction techniques may be beneficial, as long as they are not intended to trick the patient. Play therapy - injecting into a soft toy for example - may be used to show technique to younger children, whereas cognitive behavioural therapies (CBT) may prompt a better response from older children (Cocoman and Barron 2008). CBTs include relaxation training, guided imagery, graded exposure, active behavioural rehearsal, modelling and reinforcement. When communicating with children and young people, careful use of language is advised so as not to cause alarm or imply that injectable therapy is a form of punishment or a threat.

Glucose management
The goals of professionals working in diabetes clinics should include effectively communicating the advantages of good glucose management and establishing the right combination of therapies, including injectables. Time should be dedicated to exploring any anxieties a young patient may have about the injecting process, as well as the therapy itself. The FIT recommendations advise that care plans should include initial education on injection technique, followed by regular review and keeping a record of sites used and presence of any lipohypertrophic tissue.

During clinics, it is beneficial to discuss with young people their current injection technique and, if possible, observe them performing it. Examination and palpation of injection sites should take place every three months (National Institute for Health and Care Excellence 2014). It is important to emphasise the crucial of using best practice injection site, because this can reduce lipohypertrophic tissue formation and, therefore, assist stable glycaemic control.

It is also important to explain about the care of injection sites, which should be kept clean, inspected and palpated to check for signs of lipohypertrophic tissue before injection. Any sites showing signs of lipohypertrophy, inflammation, oedema or infection should be avoided until the tissue has healed to prevent poor and irregular insulin absorption.

Use of devices and syringes
Children and young people should be educated and be given reinforcing messages that pen devices and cartridges are for the sole use of one person, because sharing introduces the risk of cross-infection. Pen needles and syringes are for single use only and should be disposed of safely immediately after use. Safe disposal is discussed in a separate section of the recommendations.

Reusing pen needles and syringes is strongly discouraged, because this increases the risk of air - or

Box 1 The Forum for Injection Technique

The Forum for Injection Technique (FIT) was founded in 2009 following the Third International Injection Technique summit in Athens, Greece, at which it was agreed to establish new injection recommendations for patients with diabetes (Frid et al 2010).

The inaugural symposium of the forum was held in London in 2010, which was attended by more than 40 experienced diabetes specialist nurses from the UK and Ireland. Following this, FIT adapted its international injection technique recommendations for use in the UK (Hicks et al 2011). The UK-specific guidance can be downloaded from the FIT website at www.fit4diabetes.com/united-kingdom

The FIT board welcomes comments, suggestions and participation from nurses involved in diabetes care.
other contaminants – entering the cartridge, as well as medication leaking out of it, both of which can affect dose accuracy. Use of a new needle for each injection can reduce the risk of damage to the needle, damage to the skin as the needle becomes blunted, dosage inaccuracies and any subsequent associated treatment costs, such as to treat abscesses (Torrance 2001).

Injections through clothing are to be avoided, because this could increase the risk of intradermal injection as 4mm needles may not be able to reach sufficient depth, and bend or break on insertion. Other issues include intramuscular injection, which poses a risk of hypoglycaemia or erratic glycaemic control, and massaging a site before or after injection, which may speed up absorption rates.

Needle length and lifted skin folds
In most cases, a 4mm pen needle is suitable for insertion at a 90° angle without a lifted skin fold. Children and adolescents using a 5mm or 6mm pen needle should use a lifted skin fold to avoid the risk of intramuscular injection. The FIT recommendations strongly advise that needles no longer than 6mm should be used for children and adolescents (Lo Presti et al 2012). If children have only an 8mm pen needle available, it is essential to lift a skin fold.

The FIT recommendations suggest that the arms rarely have enough subcutaneous tissue, so should be considered as injection sites as a last resort only. If arm sites are to be used, a third party should perform the procedure, using a lifted skin fold. The pen device

Case study

JACK IS ten years old. He is slim and a keen footballer. He was diagnosed with diabetes one year ago. His injection sites are inspected at clinics every three months, and today is his annual review. The diabetes nurse explains that the annual review provides an opportunity to refresh his knowledge, practise the skills he has gained since diagnosis and jointly agree goals for the coming year.

The nurse asks Jack to demonstrate on a soft toy how he prepares to give an injection. Jack states that he uses a 6mm pen needle and injects in the abdomen without a lifted skin fold. The nurse then explains the risk of intramuscular injection when using a 6mm pen needle without a lifted skin fold, and suggests that he need to amend his technique.

The family is interested in finding out about research that suggests that shorter pen needles (4mm) are less painful (Hirsch et al 2010), and can be used for insulin therapy in children and adolescents (Lo Presti et al 2012). They also reduce risk of intramuscular injection (Gibney et al 2010) and tissue injury and, therefore, glycaemic variability and severe hypoglycaemia.

The nurse explains the importance of palpating and visually checking injection sites for lipohypertrophy (lumpy areas) before injection, as injecting into these areas could cause erratic insulin absorption.

Jack is shown how to move two fingers smoothly over the area he routinely injects. He immediately recognises the change from soft to harder, more rubbery skin. He agrees to rotate his injection sites and include his buttocks until he returns to the clinic in three months’ time, when his technique can be reassessed.

He says he prefers to inject in the same place each time, because it is quick and easy when at school, and is less painful. The nurse accepts his thoughts and feelings, and responds that there are strategies and resources that he can apply to help reduce pain and discomfort, such as using shorter pen needles, distraction technique, cognitive behaviour therapy, relaxation and guided imagery.

Jack and his parents consider switching to a 4mm pen needle and express an interest in knowing more about a pain-relief device that desensitises pain nerves with a cold sensation and a vibrating massage effect.
should not be pushed into the skin so far that the skin is indented during injection, as the needle may penetrate deeper than intended and enter the muscle.

Children, young people and their carers should be taught the correct technique for lifting a skin fold from the onset of injectable therapy (Figure 1). The skin should not be squeezed too tightly or so hard as to cause blanching or pain.

**Lipohypertrophy and lipoatrophy**

Lipohypertrophy is a significant threat to people with diabetes and should not be accepted as normal. An individual’s care plan should make provision for inspection of injection sites, with documentation of abnormalities. Ideally, examination of a child or young person’s injection sites should occur at each clinic visit, and any evidence of lipohypertrophy be measured and recorded for long-term follow up. Individuals should also be taught to examine their own injection sites and how to detect lipohypertrophy (Teft 2002).

Lipoatrophy is a wasting of the subcutaneous tissue at injection sites. It is rarely seen, but injecting into such tissue should be avoided. It is advisable to inform patients and monitor their understanding that injection into areas of abnormal tissue should be avoided until the tissue recovers, and that return to normal may take months or years (Hambridge 2007).

Switching injections from areas of lipohypertrophy to those of normal tissue often necessitates decreasing the dose of insulin injected, as a patient may have increased their dose to compensate for poor or erratic absorption resulting from injecting into lipohypertrophic tissue. Frequent blood glucose measurements should be used to guide any change in insulin quantity, because such changes will vary between individuals.

The nurse should be aware that, in people with type 1 diabetes, too great a reduction in dose could increase the risk of diabetic ketoacidosis – a shortage of insulin that causes the body to switch to burning fatty acids and therefore produce acidic ketone bodies that cause potentially life-threatening symptoms such as vomiting and dehydration. Conversely, a reduction that is too small can increase the risk of hypoglycaemia, so caution is needed. Rotating injection sites with each injection and using needles once only are currently the best therapeutic strategies to prevent lipohypertrophy.

**Site rotation**

From the onset of injection therapy, children and young people should be taught an easy-to-follow rotation scheme (Lumber 2004). At each visit, healthcare practitioners should check that an individual is following a correct rotation scheme, and provide further advice and education where needed.

An effective injection site rotation scheme involves identifying the injection areas (abdomen, thighs and buttocks) and using each injection zone for up to one week, following a rotation guide and moving always in the same direction, clockwise or anti-clockwise. Injections in any zone should be spaced at least one centimetre apart to avoid repeat tissue trauma. Figure 2 illustrates such a scheme.

**Safety and disposal**

Children and young people with diabetes should be taught how to dispose of injecting materials correctly, and this information should be repeated regularly. Sharps injuries pose a serious threat, because they can pose the risk of contracting a blood-borne virus. Healthcare practitioners or others should never resheath a needle (Adams and Elliott 2006); syringes or safety needles should be used,
and particular caution should be exhibited when using a lifted skin fold.

All those involved in diabetes care should be made aware of local regulations about sharps disposal and the consequences of the inappropriate disposal – for example, to refuse workers. Sharps material should never be discarded into household or public refuse systems. Where possible, a sharps guard or needle clipping device may be used. Only once the needle has been removed can empty pen devices be disposed of in normal household refuse.

**Conclusion**

FIT highlights best practice injection technique guidelines for children and young people, and seeks continually to develop recommendations to support young patients with diabetes, as well as healthcare practitioners.

Instilling the benefits of best practice injection technique from early diagnosis will stand those with diabetes in good stead and help reduce frequent, unpredictable hypoglycaemic episodes and optimise glycaemic control. The FIT recommendations are of great relevance to nurses caring for children and young people, not only because they are a good source of best practice but also because they discuss age-appropriate advice and techniques including, for example, psychological approaches.

**References**


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