



Royal College
of Nursing

Starting injectable treatment in adults with Type 2 diabetes

RCN guidance for nurses



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Acknowledgements

Original contributors to starting insulin therapy in Type 2 diabetes

Paul Dromgoole

Marilyn Gallichan

Becky Nute

Sarah O'Brien

Fiona Preston

Margaret Tipson

Original reviewers

Vivian Barraclough

Phyllis Bushby

Jo Butler

Jacqui Charlton

Julie Farrar

Roger Gadsby

Simon O'Neill

Eileen Padmore

Lindsey Reid

Maggie Shepherd

Christopher Soper

Rosemary Walker

Maureen Wallymahmed

Peter Winocour

Sally Wylie

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Disclaimer

It has not been feasible to avoid making reference to individual product names or manufacturers in this text. However, in such instances the appearance of any such name should not be taken as a recommendation.

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Starting injectable treatment in adults with Type 2 diabetes

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4. A step-by-step guide to starting injectable therapies	12	Intended as a resource for nurses new to injectable therapy, this guide includes an overview of the underlying principles for starting insulin and GLP 1s along with practical tips on education, adjustment of doses and dealing with difficult situations. There is also a glossary of terms associated with diabetes and its treatment.
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Useful contacts	29	This guidance does not aim to be a complete or definitive resource and is designed to be used in conjunction with <i>An integrated career and competency framework for diabetes nursing</i> (TREND-UK, 2011), the Skills for Health competencies for starting insulin therapy (www.skillsforhealth.org.uk), as well as the local protocols, support, training and facilitation offered by your local specialist diabetes team. Please note that the guidance is intended for nurses working with adults only.

Foreword

Original foreword

More than 90 per cent of people with diabetes have Type 2 diabetes. Their risk of heart disease and stroke is two to four times higher than in the general population and their life expectancy five to ten years shorter. Despite major efforts to improve management of the condition, diabetes remains the leading cause of blindness, end stage renal disease and lower extremity amputations in industrialised nations. The problem is growing – estimates suggest that by 2025 more than 300 million people worldwide will have diabetes (King et al., 1998).

In 1998, the UK Prospective Diabetes Study (UKPDS) showed that the intensive control of blood glucose using sulphonylurea or insulin – and, for overweight people, metformin – could reduce the risk of diabetic complications substantially. As a result, modern guidance for the management of Type 2 diabetes stresses the need to achieve and maintain the best possible glycaemic control.

The study also showed that Type 2 diabetes is characterised by a steady decline in beta cell function that leads to progressive hyperglycaemia, despite continued therapy with sulphonylurea or metformin. To offset this, most people with Type 2 diabetes will, in time, need insulin therapy.

Starting insulin poses considerable challenges. It can be hard to convince people it is necessary, and that the time to start injecting has arrived. The sheer number of people who need to be shown how to take insulin and how to adjust their insulin dose means the wider health care community will need to get involved.

Insulin resistance means that most people with Type 2 diabetes will need larger doses of insulin than those with Type 1 diabetes, so understanding how to find the right dose is vital if good glycaemic control is to be achieved as soon as possible. Although hypoglycaemia is less common in Type 2 diabetes, it does occur and people need to be reassured that the risk has been minimised as far as possible.

I welcome this RCN initiative, which will provide a much needed and valuable resource for nurses new to insulin therapy. The emphasis on insulin therapy in Type 2 diabetes is particularly welcome. I would like to thank all the contributors for their hard work. I believe that their efforts will be of great benefit to many people with Type 2 diabetes.

Professor Rury Holman FRCP

Diabetes Trials Unit, Oxford Centre for Diabetes, Endocrinology and Metabolism

Foreword to the 2012 edition

The introduction of GLP 1 therapies in recent years has further increased the challenge of identifying the appropriate injectable therapy to commence, and how to explain that decision to the individual with diabetes.

Insulin choices continue to change, and health care professionals need to base their decisions not only on what is the most appropriate treatment for the individual but also must take account of the cost implications of the therapy chosen and work with locally agreed formularies.

In 2012, this publication was updated to provide information relating to GLP 1 therapy action – including the implications for use and the aspects of education that need to be addressed with users.

Mags Bannister-Clelland

Nurse Consultant, Vice Chair RCN Diabetes Forum

1

How injectable therapies work

Put simply, insulin unlocks the 'doors' of cells to let the glucose in and also suppresses liver glucose production. People with Type 2 diabetes may need supplementary injected insulin if they are insulin deficient and/or insulin resistant as a result of obesity or taking certain drugs (such as steroids) and where diet, physical activity and oral hypoglycaemic agents (OHAs) are no longer sufficiently effective in lowering blood glucose.

Normal insulin production

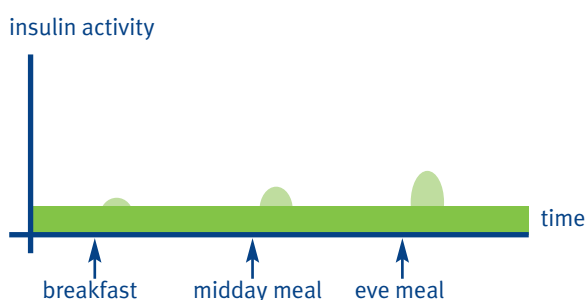
Normal basal insulin secretion

The liver releases glucose at a relatively constant rate all the time, with a slight dip during the night and a surge before dawn. A steady release of insulin is therefore needed to maintain normal blood glucose levels.



Normal meal-time insulin

In addition to the 24-hour background insulin secretion, there is a burst of insulin at every meal – often called the meal-time bolus. Whenever glucose is released into the bloodstream from food, a matching release of insulin is required for up to two hours in order to move the glucose into the cells. How long this increased insulin level is needed depends on the type of carbohydrate, its glycaemic index, and the fat content of the meal.



Manufactured insulin

Manufactured insulin aims to mimic these natural patterns. Preparations available in the UK are produced by four companies:

- Aventis
- CP Pharmaceuticals
- Lilly
- Novo Nordisk.

Manufactured insulin can be either synthetic (human) or animal in origin, and falls into five main categories:

- rapid-acting
- short-acting
- intermediate-acting (also called isophane insulin)
- fixed mixtures (of rapid- or short-acting and intermediate-acting insulin)
- long-acting.

Time action profiles of manufactured insulin

The following diagrams illustrate how the different types of insulin work. Up-to-date charts showing the characteristics of all manufactured insulin preparations available in the UK are published regularly in MIMS and by Diabetes UK (see www.diabetes.org.uk/products/insulin).

1.2 How GLP 1 therapy works

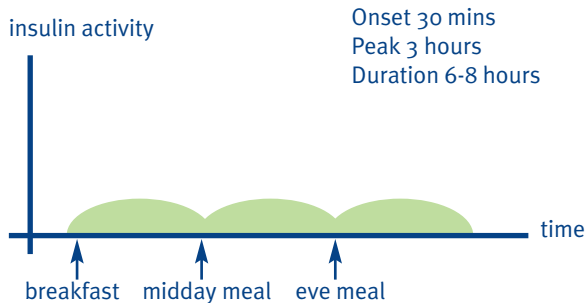
Incretin hormones are produced by the gastrointestinal tract in response to nutrient entry and are necessary for the maintenance of glucose homeostasis. There are two incretin hormones:

- GLP 1 (glucagon like peptide 1) whose secretion is diminished, but its action is preserved in individuals with Type 2 diabetes
- GIP (glucose dependent insulinotropic polypeptide) whose secretion is normal but action diminished in individuals with Type 2 diabetes.

Synthetic GLP 1 is now available that mimics the action of naturally secreted GLP 1. The GLP 1 hormone has numerous physiological effects on the body (see illustration over the page) but the action of most relevance in glucose management of Type 2 diabetes is its enhancement of glucose dependent insulin secretion.

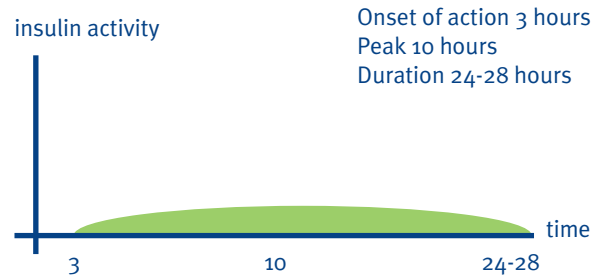
Short-acting meal-time insulin

Product names include Actrapid, Humulin S and Insuman Rapid.



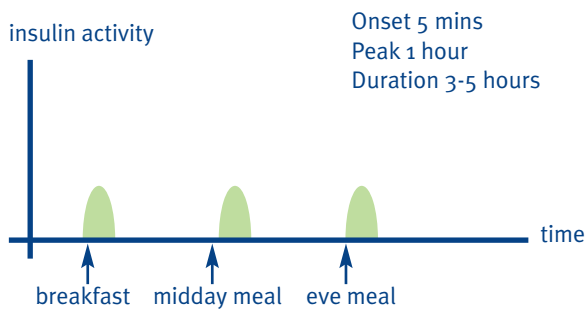
Long-acting basal insulin with peak

Product names include Hypurin Bovine Lente



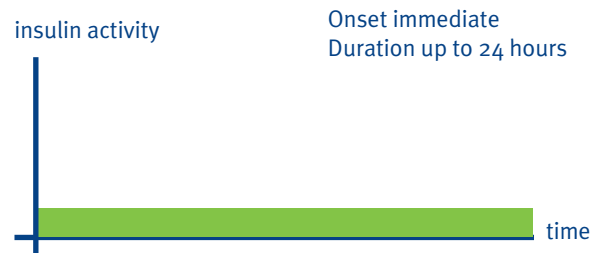
Rapid-acting meal-time insulin (analogues)

Product names include NovoRapid and Humalog (insulin lispro).



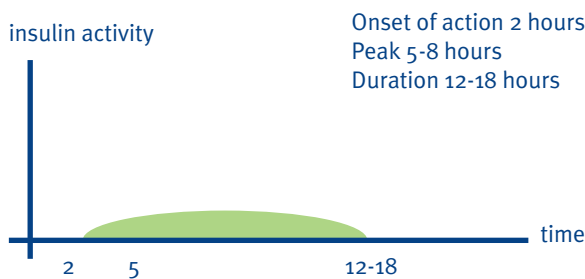
Long-acting peakless basal analogues

Lantus and Levemir are currently the only products in this category.

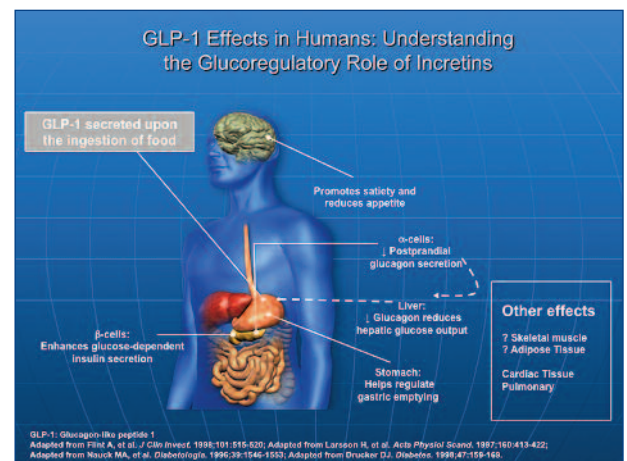


Intermediate-acting basal insulin with peak

Product names include Insulatard, Humulin I and Insuman Basal



GLP-1 effects in humans



2

Indications for injectable therapy

Who can benefit from insulin treatment?

Potentially anyone with Type 2 diabetes stands to benefit from insulin treatment.

Strong indications for insulin therapy include:

- symptoms of hyperglycaemia such as polyuria, thirst, recurrent fungal infections (especially genital thrush) or bacterial infections (especially urine infections)
- pregnancy or planning pregnancy
- oral hypoglycaemic treatments not tolerated/ contra-indicated
- weight loss without dieting in someone of low or normal weight.

Possible indications for insulin therapy include:

- unsatisfactory glycaemic control even with the maximum tolerated dose of oral hypoglycaemic agents (OHAs) (HbA1c higher than 59mmol/mol (7.5 per cent), self blood glucose monitoring results higher than 7mmols before meals or 9mmols two hours after meals)
- personal preference
- painful neuropathy
- foot ulceration and infection.

Who may not benefit from insulin treatment?

- Some obese people with type 2 diabetes – insulin treatment can lead to further weight gain, with little or no improvement in HbA1c. Could the person change their diet, take more exercise, use weight-reducing agent orlistat or meet the NICE (2009) recommendations for GLP 1 injectable therapy?
- People whose oral hypoglycaemic treatment regimen could be improved – would they prefer to change to a more effective oral treatment regimen?

- Elderly people with a short duration of diabetes and no symptoms of hyperglycaemia – are disabling long-term diabetic complications likely to develop in their lifetime?
- People with other physical or mental health problems – do the potential benefits of insulin treatment outweigh the potential risks, especially the risk of hypoglycaemia?

Who may benefit from GLP 1 therapy?

Indications for GLP 1 therapy

NICE (2009) recommend GLP 1 therapy as a third line option in patients with an HbA1c >59mmol/mol (7.5%) if BMI >35 (ethnically adjusted) and there are problems associated with high weight or BMI <35 but there are occupational issues or weight loss would benefit co-morbidities.

Starting insulin treatment

When should insulin treatment be started?

Insulin therapy should be discussed as a treatment option at the time of diagnosis. It should not be used as a threatened punishment for poor compliance.

Treatment should start:

- as soon as there is evidence of deteriorating glycaemic control
- after exploring whether the person could change their lifestyle or current medication
- following a full discussion of all the pros and cons of insulin therapy.

When people don't want insulin therapy

Bear in mind that there will be some situations or factors that may put people off starting insulin therapy:

- driving restrictions – people using insulin have previously been banned from holding a LGV or PCV licence. From October 2011, Class 2 license holders were required to undertake an annual individual assessment. Patients commencing insulin cannot reapply for their license until their blood glucose control has been stable for one month and they can provide three months evidence of blood glucose monitoring. People using insulin who wish to hold a C1 (vehicles between 3.5 and 7.5 tonnes) licence must undergo a medical assessment
- fear of needles – accurate information can help with this; for example, many people think they need to find a vein to inject into, or that the needles will be large
- misconceptions – some people overestimate the risk of hypoglycaemia, while others may be basing their ideas on stories about outdated treatments and equipment
- 'live for today' – some people may prefer to live with the increased risk of complications, particularly if they do not currently have any symptoms
- employment – people may fear discrimination and/or employment restrictions; for example, some local authorities will not license taxi drivers treated with insulin
- fear of weight gain – often justifiable, so it may be worth exploring ways to improve diet and increase activity first and/or consider GLP 1 therapy.

3

Choosing the right injectable therapy and regimen

“Insulin is rarely, if ever, given at the right time, in the right way or in the right amount. It is therefore amazing that anyone with diabetes has any semblance of good blood glucose control.”

*Professor Edwin Gale,
Medical School Unit, Southmead Hospital, Bristol*

Which regimen?

There is no one right choice, and one regimen is not necessarily forever. If unsuitable, it should be changed.

Who decides?

Your role is to explain the options and present all the pros and cons. The final decision must be made by the person themselves.

To carry out your role, you will need to understand:

- how insulin works
- why insulin is needed
- the principles of normal insulin production
- the types of insulin available
- the benefits and disadvantages of the various delivery devices
- common insulin regimens
- how GLP 1 works
- the indications for GLP 1 therapy.

GLP 1 treatment options

GLP 1 injectable therapy is available in three formats:

- exenatide twice daily (BD) 5 or 10mcg
- liraglutide once daily (OD) 1.2mg maximum dose (NICE, 2010)
- exenatide once weekly 2mg.

GLP 1 treatment is increasingly being considered as a treatment option as an alternative to insulin in people with Type 2 diabetes with significant weight problems. GLP 1 treatment is used in combination with oral medication, (NICE, 2009).

The summary of product characteristics for all prescription-only medicines can be found in the Electronic Medicines Compendium at www.medicines.org.uk/emc

Case study: Mrs B

“My weight has always been an issue and people I know who have gone onto insulin have said they have put on weight”. Mrs B’s BMI had always been greater than 35, her HbA1c was 74 mmol/mol (8.9 per cent) on metformin 1g bd and glimepiride 4mg od. A six month trial with Exenatide bd in addition to her current medication was agreed. An initial dose of 5mcg bd was commenced which was increased to 10mcg bd after four weeks. Mrs B did experience some mild nausea for the first 10 days but the problem resolved. After six months her HbA1c had fallen to 61 mmol/mol (7.7 per cent) and her weight was gradually falling and her BMI was down to 33. Mrs B reported that she had managed to reduce her portion sizes without feeling hungry.

Common insulin regimens

Historically people with Type 2 diabetes transferring to insulin therapy would stop taking their oral hypoglycaemic medication, however this is no longer current clinical practice (NICE, 2009). There are many advantages to combining insulin with oral agents and this is now much more common.

The advantages include:

- less risk of weight gain
- less risk of hypoglycaemia
- a simpler treatment regimen
- better glycaemic control while insulin is being introduced and the dosage adjusted.

Here are some examples of combination treatments and when they can be used:

- daily intermediate-acting insulin at bedtime plus OHAs can be effective for people who are insulin resistant due to obesity; it is particularly appropriate where the person's blood glucose is high overnight and in the morning, but comes down once they start their daily activities
- twice-daily pre-mixed insulin plus OHAs can be effective for people with significant hyperglycaemia after meals
- long-acting peakless insulin in the morning (or whenever is convenient, provided it is taken at the same time each day) plus OHAs can be used where the person has high blood glucose during the day and at night and 'would otherwise need twice-daily basal insulin injections in combination with oral anti-diabetic drugs' (NICE, 2009).

The NICE (2009) guidance clearly states that the criteria for continuing and withdrawing OHAs when insulin is introduced. These should be utilised alongside this document to aid clinically appropriate decision making.

Case study: Mr W

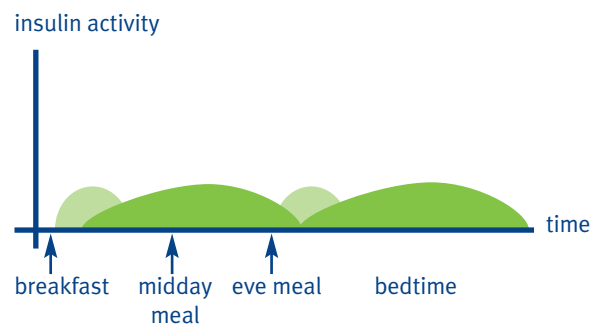
'I've been dreading this day for the past 20 years', said Mr W as he came through the door of the nurse's office. His GP's referral spelled it out: 'Mr W has a strong aversion to, or even phobia of, hospitals. Knowing that I might be suggesting insulin therapy, he has had at least two sleepless nights.'

Mr W was tired and taking little exercise. He could hardly walk upstairs. However, he was eating well and so had become overweight. His HbA1c was 124mmol/mol/13.5 per cent, and the results of his home glucose blood tests were consistently between 17 and 28 mmols. He was on maximum doses of OHAs. The nurse explained that he didn't have to find a vein in order to inject insulin and that the needles were tiny, and persuaded him to do a 'dry' injection. Mr W was amazed – not only did it not hurt, but he could hardly feel it at all.

Mr W decided to start using once-daily intermediate acting insulin in combination with his OHAs. Within two months his HbA1c had fallen by 33 mmol/mol three per cent). Because he felt so much better, Mr W was able to take more exercise and started eating healthily. As a result, he lost 12lbs.

Twice-daily pre-mixed insulin

The manufacturer mixes rapid or short-acting insulin with intermediate-acting basal insulin with a peak. The person then injects the mixture before breakfast and again before their evening meal. Typical mixes include Humulin M3 (30 per cent Humulin S and 70 per cent Humulin I) and Humalog Mix 25 (25 per cent Humalog with 75 per cent intermediate acting insulin). The human insulin mixtures should be injected approximately 30 minutes prior to meals; the analogue mixtures should be injected immediately before eating.



Twice daily insulin regimes using human insulin mixes are suited to individuals who have a regular eating pattern, especially if they have inter-meal snacks and supper. The short acting insulin will cover the first meal and snack after the injection, while the intermediate acting insulin will cover the second meal and snack. In patients that only eat three meals a day and do not snack or have supper, a switch to an analogue mixture maybe required if hypoglycaemia between meals becomes an issue.

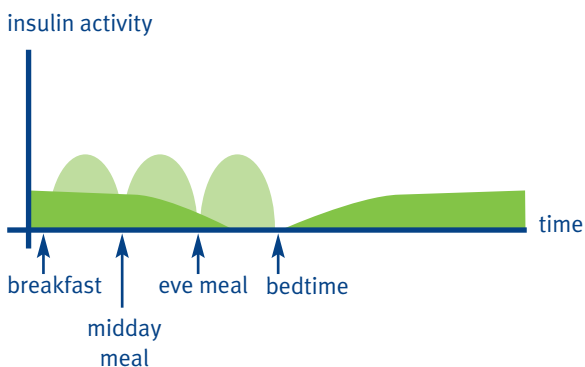
Case study: Rosemary

Rosemary, 66, has had Type 2 diabetes for 16 years. She is extremely overweight, with a BMI of 42. She has coronary heart disease and renal failure. Her HbA1c is 69mmol/mol (8.5 per cent). She takes 320 mg of Gliclazide a day, but has stopped taking Metformin because of her renal disease. Rosemary is trying hard to keep her weight steady, so she doesn't want to have to eat too many snacks.

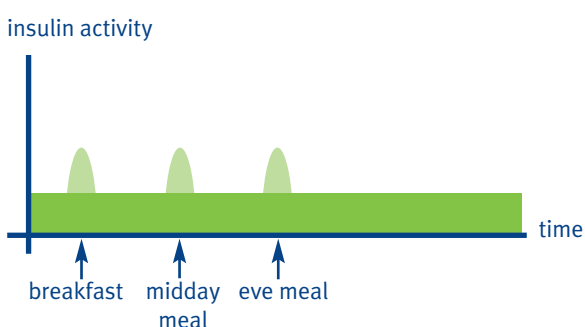
She therefore chooses NovoMix 30 before breakfast and her evening meal. She likes the FlexPen and the convenience of being able to 'jab and eat'. She has had no 'hypos' and her HbA1c is the lowest it's been for a long time at 56 mmol/mol (7.3 per cent). Rosemary needs 56 units in the morning and 64 in the evening: the pen can deliver up to 60 units at a time.

Multiple-injection therapy (basal/bolus)

This regimen is closer to the way the body works naturally. The person uses 'basal' insulin once a day, at the same time each day, with a 'bolus' at meal-times. This gives people much greater flexibility over when and what they can eat. Taking intermediate basal insulin with peaks, such as Insulatard or Humulin I at bedtime, in combination with a short-acting bolus such as Actrapid or Humulin S 30 minutes before meals, is usually effective in Type 2 diabetes.



The peak of intermediate-acting insulin activity during the night and the long duration of the older short-acting insulin taken before the evening meal can cause hypoglycaemia in some people. It may be appropriate to switch to the newer insulin analogues, which are physiologically more suitable, if bedtime snacks fail to prevent night hypos or if blood glucose levels are too high before the evening meal because the bedtime dose of intermediate insulin has run out. Intermediate-acting insulin could be replaced with one of the newer long-acting peakless insulins once daily and/or the short-acting insulin could be replaced with a rapid-acting bolus such as Humalog or NovoRapid just before eating.



Case study: Barry

Barry, 38, has had Type 2 diabetes for three years. He is quite slim, with a BMI of 23, and is starting to lose weight. He is on maximum OHAs, and his HbA1c is 92 mmol/mol (10.6 per cent). Barry works shifts in a bakery, and is scared of hypos, as he often works alone at night with extremely hot ovens.

Barry knows he needs to start insulin, but he is concerned about whether a twice-a-day pre-mixed insulin would fit into his erratic lifestyle. He would therefore prefer a more flexible multiple-injection regimen, with long-acting peakless insulin at 6pm every evening, and a rapid-acting insulin analogue when he eats.

Matching the regimen to the person

For every person, there will be a range of possible treatments and no one right choice. Whichever option is chosen, there must always be a clear rationale behind the decision. Here are some considerations:

Basal with OHAs may be a good choice for people:

- who are overweight and insulin resistant
- who are reluctant to start insulin (for example, due to needle phobia)
- who are unable to inject themselves
- for whom optimising control is not vital (for example, an older person with no complications or undue symptoms) but hypoglycaemia is unacceptable.

Twice-daily pre-mixed insulin may be a good choice for people:

- with fairly regular lifestyles, who eat similar amounts at similar times each day
- who are becoming insulin-depleted, and where OHAs are no longer stimulating efficient insulin production leading to high blood glucose after meals.

Multiple injection therapy may be a good choice for people:

- who need flexibility because of an erratic lifestyle, shiftwork, regular travelling across time zones, or regular sport
- who need to optimise blood glucose control because of complications, illness or a wound.

The brand of insulin will usually depend on what kind of injection device the person prefers. A complete up to date list of insulin injection devices available in the UK, with full colour illustrations, is published regularly in *MIMS for nurses*.

4

A step-by-step guide to starting injectable therapies

This section provides a practical guide to starting insulin, from choosing the most appropriate course of treatment to managing supplies of medication and equipment.

Prepare yourself

Don't jump in with both feet. Check the *Integrated career and competency framework for diabetes nursing* (TREND-UK, 2011) to identify the competences required for starting insulin. Make sure you understand exactly what's involved. Is this within the scope of your professional practice? If not, seek help and supervision. Spend time with a diabetes specialist nurse and observe some insulin starts.

You should also complete the relevant e-learning modules on the safe use of insulin, which are available on the NHS diabetes website at www.diabetes.nhs.uk

Some key questions

Is there a clear need for injectable therapy? Does the patient fully understand and agree with the injectable therapy that has been chosen? If they are still reluctant to start injectable therapy, suggest a three-month trial period; experience shows that very few people want to stop insulin once they have started but the idea of using it 'for life' can be daunting. If they refuse outright, you must respect their choice. It may be worth encouraging them to talk to someone who has already started insulin or GLP 1 and is doing well.

Have you done a dummy injection? Many people think they will have to use a large needle, and inject into a vein. It's important to allay their fears, and show them how easy and painless injecting can be. They will then be able to concentrate on the rest of the discussion.

Dealing with dummy injections

Get it over with as soon as possible! Ask the person to simply insert the needle for a 'dry run'. It can be very reassuring for people to try this soon after diagnosis, long before injectable treatment is actually required.

Note: it is important when performing a dummy injection with a pen device that one of the reloadable devices without a cartridge in it is used to avoid cross-patient contamination.

Have you checked that the person already knows how to monitor their own blood glucose?

First appointment, first injection

As a general guide, you should allow between 30 and 60 minutes for the first appointment. The amount of time you need will depend on the complexity of the chosen regimen and the person's mental alertness. You will need to cover the following points:

- agree a date and time for the first injection – ask the person to choose a convenient time, preferably when they will not need to drive for a few days; some may wish to postpone it, for example, until after a holiday, or after Ramadan
- agree a place – injectable therapy starts can take place in an outpatient clinic, on a hospital ward, at a GP surgery, or in the person's home; you can start people individually, or in groups
- encourage them to bring a partner or friend – two heads are better than one when it comes to remembering what to do when alone at home; most people will manage their injections themselves but some will need support from a partner, carer or district nurse
- discuss whether or not they plan to carry on taking OHAs – NICE recommends continuing metformin and sulphonylureas if tolerated (NICE, 2009)

- think about re-referring them to a dietician for a full dietetic appraisal; this will increase understanding of where carbohydrates are found, how different carbohydrates affect blood glucose levels, and how to eat similar amounts at the same time each day
- provide a contact number for advice.

Follow-up appointments

Ideally, the first injection should be near the beginning of the week so the person is fairly confident before the weekend. Telephone them the day after their first injection, and see them as often as necessary, gradually spacing out the appointments as their confidence grows.

Choosing a delivery device

Injection devices for GLP 1

All GLP 1 therapies are dispensed in disposable devices; the BD and OD preparations in disposable pen devices which contain 2-4 weeks treatment, and the once monthly preparation in a single use syringe and vial combination. The once weekly preparation of exenatide needs to be reconstituted prior to administration and it is therefore essential that this process is clearly explained to the patient. Demonstration packs are available to facilitate this process.

Insulin injectable devices

There are two main types of injection devices on the market. Some 'pens' come pre-loaded with insulin and are disposable. Others use cartridges of insulin that are inserted into a re-usable device. Pre-loaded injection devices can be easier to use, but are more expensive. All cartridge pens are available on prescription. See the BNF (under hypodermic equipment) or MIMS for nurses (under diabetes) to check the compatibility of pens and cartridges.

Give people the chance to try out different devices and involve them in the final decision. You must take into account the person's manual dexterity – how heavy is the pen and how easy it is to push in the insulin – and the size of dose they are likely to need. Some devices will deliver a bigger maximum dose than others.

If the person is visually impaired, you should also consider:

- whether the pen has an audible click on dialling
- the size of the numbers on the dial
- whether appropriate magnifiers are available.

People with a fear of needles may prefer to use needles

such as the auto shield safety needle, where the needle is not exposed during the injection.

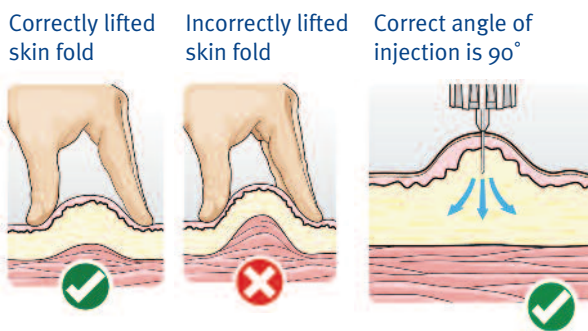
Traditional insulin syringes with 8mm needle and vials are still available if a person prefers these.

Teaching injection technique

- Make sure the person assembles the pen, attaches the needle, dials the dose and gives the injection themselves. You may need to guide them – but don't do it for them. Use the product information leaflet which comes with the pen device as a tool to guide the teaching process.
- Don't forget to do an air shot before each injection, especially if a new cartridge and/or needle has been fitted. An air shot will make sure the plunger is connecting and expel air from the pen.
- If using intermediate or pre-mixed insulin, invert or rotate the pen at least 20 times to mix the insulin.
- Inject into clean skin with clean hands. Alcohol wipes are not recommended. Alcohol is an astringent and can make the injection more painful, as well as hardening the skin.
- To raise a skin fold or not to raise a skin fold? Insulin should be injected into subcutaneous fat, not muscle. To avoid intramuscular injection, slim people, or those using injection sites without much subcutaneous fat should use short needle length but may also need to raise a skin fold.
- Inject at a 90° angle.
- Push the needle in all the way.
- Needles come in 4mm, 5mm, 6mm and 8mm lengths. Shorter needles reduce the fear of injections and suit most people regardless of age or weight. A few people prefer longer needles, but they may need to raise a skin fold to avoid injecting into a muscle; 12mm and 12.7mm needles are available but they are no longer indicated in routine clinical use (FIT, 2010).
- After the injection, leave the needle in the skin for 5-10 seconds to avoid leakage. With large doses, it may need to be left in for longer.
- Occasionally there may be bleeding after the needle is withdrawn. Reassure the person, and advise them to apply gentle pressure for a couple of minutes to minimise bruising. They should not rub the area, as deep massage for several minutes may increase the rate of insulin absorption.

Correct technique to raise a skin fold

Use the thumb and index finger to raise up the subcutaneous fat, leaving the muscle behind; using the whole hand tends to pull up the muscle.



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Choosing an injection site

There are a number of alternatives:

- abdomen – fastest absorption, usually plenty of subcutaneous fat, making it easy to raise a skin fold; a good option for fast-acting insulin
- thighs – slower absorption, best with intermediate acting insulin or the evening dose of a twice-daily insulin regimen; very little subcutaneous fat laterally, so use a raised skin fold and/or short needles
- back of arms – medium to fast absorption, make sure there is sufficient fat and use short needles; not recommended for self injection
- buttocks – slowest absorption, use for intermediate or long-acting insulins; plenty of subcutaneous fat, so no skin fold is needed.

The above information applies only to human insulin, the absorption of analogue insulin is not affected by the injection site used (FIT, 2010).

Rotating injection sites

Repeatedly injecting into the same small area will cause lumps (lipohypertrophy) which hinder insulin absorption resulting in unstable blood glucose levels, and can be unsightly. Alternate between the left and right side on a weekly basis, and rotate sites within the same area. Each injection should be at least a finger's breadth away from the last one. Check for lumps on a regular basis. If lipohypertrophy is found, that area should not be used for injection until it has become soft again. This may take weeks or even months, depending on the severity of the lipohypertrophy.

Examples of lipohypertrophy



Lipohypertrophy of thighs



Lipohypertrophy of lower abdomen

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Correct administration of GLP 1 therapy

Timing of injections

- Exenatide once weekly should be administered on the same day each week.
- Liraglutide once daily should be administered at the same time each day.
- Exenatide twice daily should be administered up to a maximum of one hour prior to a meal with a minimum of six hours between injections.

Injection technique

All GLP 1 are injected into the subcutaneous fat layer in the same way as insulin is administered. See the injection technique section on page 13.

Hypoglycaemic risk

GLP 1 treatment does not induced hypoglycaemia, but when used in combination with sulphonylurea therapy the risk of hypoglycaemia secondary to sulphonylurea treatment will be increased. The essential education (which is covered in section 5 (Stage 1) on page 17) should therefore be covered for patients commencing GLP 1 therapy in combination with a sulphonylurea.

Side effects

The common side effects of GLP 1 therapy are nausea and vomiting which should resolve after 7-10 days. Side effects can be minimised by starting at a low dose (5mcg or 0.6mg) and titrating the dose after 2-4 weeks and injecting immediately prior to food. Patients using the once weekly preparation of exenatide may complain of pea size lumps at the site of their injection; these

lumps should resolve spontaneously after approximately six weeks.

Discontinuation of treatment with GLP 1

GLP 1 therapy should be discontinued and alternative treatment options explored if after six months a HbA1c reduction of 11mmol/mol (one per cent) and weight loss of three per cent has not been noted (NICE, 2009) or sooner if side effects do not resolve.

Insulin doses, storage and checklists

Getting the insulin dose right

Once-daily insulin regimens often start with 10 units. Most twice-daily insulin regimens start with 6-10 units twice daily, depending upon the person's weight. Starting low and giving clear insulin titration guidance over the following months will build the person's confidence and your own.

You should aim for a gradual improvement in blood glucose levels. Sudden normalisation of long-standing high blood glucose can sometimes cause rapid progression of diabetic retinopathy, insulin neuritis or 'pseudo hypos' (hypo symptoms at normal glucose levels).

See section 6 on page 20 for detailed guidance on adjusting insulin dosage.

Some points to remember

- Exercise – insulin will be absorbed faster by an exercising muscle. Advise the person not to inject into their arm if they're about to do the ironing, or into the thigh if planning to walk the dog or go shopping. Ensure skin folds are raised or use a short needle if required to ensure the insulin is injected subcutaneously.
- Temperature – If insulin is injected subcutaneously and at an ambient temperature then insulin absorption will not be affected (FIT, 2010)
- Injecting through clothing – people sometimes feel they need to do this, for example while travelling or in social situations, but it should be discouraged. In addition, with the increased use of shorter needles, injecting through clothes may result in a subdermal rather than a subcutaneous injection.

Injecting through the clothes affects the lubrication of the needle and makes it difficult to raise a skin fold and/or check for bleeding.

Storing insulin

- Spare insulin and GLP 1 should be kept in the fridge at between 4°C and 8°C.
- Cold insulin may take longer to absorb, and cause stinging. Give the insulin at least 30 minutes at room temperature before injecting.
- Insulated pouches will keep insulin cool in hot weather. Contact FRIO on 01437 741 700 or visit www.friouk.com
- The insulin device or cartridge in use can be kept at normal room temperature for one month.
- Keep insulin away from children.
- Always check the expiry date.

Supplies checklist

People must have:

- enough insulin or GLP 1 (cartridges or pre-filled pens)
- an injection device and a spare (for people not using pre-filled devices)
- a box of needles
- a sharps bin
- Insulin colour coded ID card and *Safe use of Insulin and you or Insulin passport* leaflet
- written information including:
 - how to use the injection device
 - how to deal with hypoglycaemia
 - the name of the insulin/GLP 1 product and doses advised
 - contact numbers
 - how to manage diabetes when unwell.
- a blood glucose monitoring diary.

Finally, make sure the person knows how, when and where to get another prescription.

Disposing of sharps

One-litre sharps bins are available on prescription. See the BNF under 'Sharpsguard or sharpsafe'.

Check your local policy for disposing of full bins. In some locations bins can be returned to GP surgeries or pharmacists, provided the premises are licensed with the Environment Agency.

Needle clipping devices which cut off used needles are available on prescription (see the BNF under 'Needle clipping device').

For further information on the safe disposal of sharps please see the *RCN's guidance on Sharps safety*, publication code 004 135 which is available to download from www.rcn.org.uk/publications

Reusing needles

Manufacturers recommend that needles should be used once only. People with diabetes should be informed that after use:

- the needle will no longer be sterile
- insulin may block the needle
- the needle may be blunt or damaged – and that damaged needles can bend or break
- extremes of temperature can cause insulin to leak from the needle if it is not removed from the pen; this could change the relative concentrations of short- or intermediate-acting insulin in a mixture
- air may enter the device through the needle, which can lower the dose.

Note: it is important that the person is informed of the risk of sharps injury to family members, household visitors and refuse collectors. Careful and appropriate handling and disposal of sharps is of paramount importance.

5

Essential education

“Structured education can improve knowledge, blood glucose control, weight and dietary management, physical activity and psychological wellbeing, particularly when this is tailored to the needs of the individual, and includes skills-based approaches to education.”

*National Service Framework for Diabetes:
Standards 2001*

Most people starting injectable therapy should be aiming for self-management. The National Service Framework for Diabetes encourages the use of patient-held records and personal care plans. Understanding their condition – and taking responsibility for their own treatment – helps people maintain their independence, minimises the impact of their condition on their everyday life and equips them to deal with any problems or complications that may arise.

Effective education is therefore essential. This can be broken down into three stages:

Stage 1 – immediate education that takes place when starting injectable therapy

Stage 2 – topics that need to be covered within the first few weeks of starting injectable therapy

Stage 3 – topics to be covered once the person is feeling more confident.

The subjects to be covered at each stage are outlined below. If you feel you are not qualified to teach any of these topics, ask your local diabetes specialist team for advice or consider referring your patient on.

Stage 1 – immediate education

- Doses and timing – write it down!
- Injection technique, including rotating sites and disposing of sharps.
- Titration of doses, if appropriate at this stage. Some diabetes units use algorithms – ask at your local unit.
- Carbohydrates – regular intake of starchy carbohydrates will help stabilise blood glucose

levels. People may need to be reminded which food groups these are.

- Hypoglycaemia – signs and symptoms, treatment and prevention (see below). Give the person an ID card showing that they are treated with insulin.
- Driving – people having insulin treatment must tell DVLA and their insurance company. Explain the dangers of hypoglycaemia while driving, as well as the driving restrictions that apply. See the Diabetes UK website at www.diabetes.org.uk for more information.
- Blood glucose monitoring – timing and frequency of tests, and interpreting the results.
- Weight gain/loss – many people put on weight when they start insulin. They may need to cut their food intake if they want to maintain their current weight. If a patient is using GLP 1 hoping to lose weight this will only happen if their calorific intake is reduced in response to the potential impact GLP 1 therapy may have on their appetite.
- Follow up and contact numbers – arrange a further appointment, and provide both a routine contact and an emergency number; for example the NHS Direct number (0845 4647) or a helpline run by the insulin or GLP 1 manufacturer.

The symptoms of hypoglycaemia

Hypoglycaemia is the main potential side effect of insulin therapy or a GLP1 in combination with a sulfonylurea and it is essential that the person starting insulin and their immediate family know what symptoms to expect, how to reduce the risks of hypos and how to treat them.

Hypoglycaemia occurs when blood glucose levels are too low. Technically, hypoglycaemia occurs when blood glucose levels fall below 4 mmols, but many people experience hypo symptoms at higher levels depending on their own usual blood glucose levels. Too many hypos can lead to loss of hypo awareness.

Symptoms vary between individuals. Early symptoms may include:

- pallor
- sweating

- fast heart rate
- trembling
- anxiety
- irritability
- hunger
- and tingling lips.

Late hypo symptoms include:

- headache
- poor concentration
- poor co-ordination
- glazed eyes
- slurred speech
- confusion
- aggressive behaviour
- double vision
- weak legs
- drowsiness
- loss of consciousness
- and seizures.

Information is not enough

Providing information is not enough. Understanding hypoglycaemia and knowing how to deal with it is essential, so you will need to repeat the information several times and reinforce it in writing. Ask the person to repeat key facts and instructions back to you to check their understanding.

Treating hypoglycaemia

Treat mild hypoglycaemia with 15-20g of fast-acting carbohydrate; for example, four to six glucose tablets; 100 to 180 ml of a fizzy drink or squash (not the diet version); two teaspoons of sugar added to a cup of drink; or 50-100 ml of Lucozade.

This should cause the blood glucose to rise rapidly. Wait ten minutes for this to happen and, if it's a while before the next meal, this should be followed by some longer-acting, starchy carbohydrate – for example, a sandwich or some biscuits. If a meal is due, add some extra carbohydrate – for example bread, potatoes or pasta – to the meal. Chocolate has a low glycaemic index (because of its fat content) and is therefore not a good choice for treating hypoglycaemia.

In moderate hypoglycaemia, the patient may not be able to treat themselves, so their carer, partner, family and friends will need to know what to do. Glucochek dextrose gel may be useful, but it must not be given to someone who is unconscious.

Severe hypoglycaemia with loss of consciousness and where the patient needs glucagon is extremely unlikely in Type 2 diabetes, but can happen in cases of renal failure, or when people are trying to keep their glucose levels as close to normal as possible, for example, during pregnancy.

Identifying the causes of hypoglycaemia

- Did the person take their insulin at the appropriate time?
- Are they missing insulin doses, then overcompensating later?
- Are they missing meals?
- Are they changing the quality/quantity of food they eat – for example, in order to lose weight – without changing their insulin dose or in response to the GLP 1 impact on their appetite?
- Are hypos occurring on particular days of the week, for example, at weekends?
- Was alcohol a contributory factor?
- Was exercise a contributory factor?
- Was the hypo related to pre- or post-menstrual changes in blood glucose levels?
- Have the injection sites been checked for signs of lipohypertrophy?
- Does the person rotate injection sites frequently enough?
- If using pre-mixed or intermediate insulin, are they mixing it properly by inverting the pen at least 20 times?
- Is their blood glucose monitoring technique reliable?
- Do they need to review their diet?
- Are blood glucose levels being affected by hot weather, or by the person taking a hot bath or shower before their insulin injection?
- Is the person's insulin regimen right for them?
- Are they taking the right oral hypoglycaemic medication, and are they taking it as prescribed? Does their sulphonylurea dose need reducing or stopping?

A word of warning

A 75 year old gentleman, new to insulin, had a hypoglycaemic coma in the doctor's waiting room. He had injected his morning insulin, but didn't stop for breakfast before driving to the surgery in case he was late for his appointment. The nurse, who had explained the risk of hypo many times, was enormously relieved that his journey to the surgery had been without incident.

The trend for more people to be treated with insulin has led to increased frequency and severity of hypoglycaemia. This means the importance of checking a patient's understanding of hypo, especially in relation to driving, cannot be over estimated.

Stage 2 – the first few weeks

- Repetition – keep going over the information you covered in Stage 1.
- Use the person's own experiences to demonstrate the effects of food, exercise and treatment on blood glucose levels. If they've had a hypo, try to work out how it could have been prevented, and what they can do differently in the future. See the checklist above.
- Adjusting the dose – discuss blood glucose levels, and teach dose titration.
- Sick day rules – make sure the person knows they must not stop taking insulin, even when unwell. They should test their blood more frequently, as a higher insulin dose may be required during illness. Suggest food substitutes they can use when suffering from nausea or vomiting. If blood glucose levels remain high, they should seek medical advice.
- Alcohol – explain that alcohol increases the risk of delayed hypoglycaemia, and that they should therefore eat while drinking alcohol. Extra insulin is not required.
- Eating out – advise the person on adjusting doses or altering the timing of their injections for special occasions.

Stage 3 – ongoing education

Later on, people may need advice and guidance on the following areas.

- Forgotten injections – in Type 2 diabetes, missing the occasional injection should not cause any problems.
- Travel advice (see the holidays and travel section on page 25).
- Fasting – for example, during Ramadan, will have a significant effect on blood glucose levels.
- The possible long-term complications of diabetes and how to reduce the risks.
- Screening and annual reviews.
- Contraception and pregnancy, where appropriate.
- Progression of the disease – people with Type 2 diabetes can expect a slow decline in glycaemic control over time and will therefore need to keep reviewing their treatment regimen.

“The provision of information, education and psychological support that facilitates self-management is the cornerstone of diabetes care.”

*National Service Framework
for Diabetes (DH, 2001)*

6

Adjusting the dose

Insulin dose adjustment

Remember:

- high glucose levels – a higher insulin dose is needed
- low glucose levels – a lower insulin dose is needed.

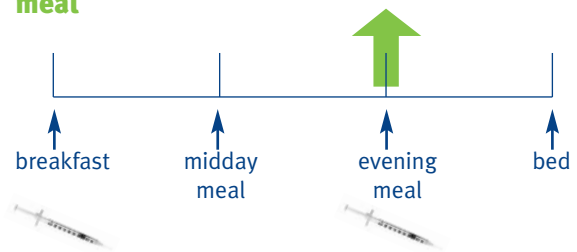
Some basic principles

- Individual blood glucose target ranges should be agreed with the person.
- Don't adjust the dose in response to a single high result, look for patterns. Use the person's blood glucose monitoring diary to get the overall picture. The individual columns will show what's happening at different times of the day. You should also check the comments column: is there a connection between blood glucose levels and the person's comments?
- Consider the person's insulin type and doses. Does this have a bearing on their results? A large rise or fall in blood glucose over a short period of time, for example, between breakfast and lunch, may be related to diet, but it may also indicate that the insulin type or mixture is not appropriate for that person.
- Ask the person what they think of the results, and what action they think is needed. This will help them build up the confidence to adjust their own insulin doses.
- Generally, insulin doses are increased in 10 per cent increments.
- Preventing hypoglycaemia should always take precedence over correcting hyperglycaemia. Where hypoglycaemia has been a problem, insulin doses should be reduced by at least 20 per cent. Hypoglycaemia is potentially dangerous, and can seriously knock the person's confidence. If the reduction is too great, you can always cautiously increase the dose again.
- After considering what action is required (and before giving advice) think about the knock-on effect of your proposed action. Are you solving one problem only to create another?

Adjusting twice-daily insulin

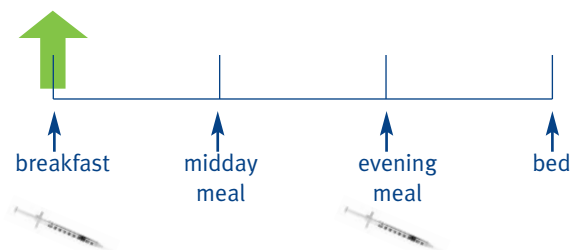
The morning dose controls blood glucose levels throughout the day, while the evening dose controls glucose levels after the evening meal and throughout the night. Twice-daily insulin doses can be adjusted from day-to-day, according to the person's planned level of physical activity.

Raised glucose levels before the evening meal



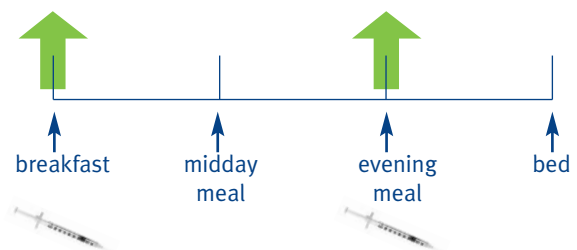
Increase morning insulin by 10 per cent: for example, if the usual morning dose is 20 units, increase it to 22 units.

Raised glucose levels before breakfast



Increase evening insulin by 10 per cent: for example, if the usual evening dose is 18 units, increase it to 20 units.

Raised glucose levels before breakfast and the evening meal



Increase both doses of insulin by 10 per cent: for example, a morning dose of 44 units would be increased to 48 units, and an evening dose of 36 units would be increased to 40 units.

Adjusting once-daily insulin

Once-daily insulins, such as Lantus or Levemir, are designed to work throughout a 24-hour period and once-daily Isophane insulin is usually given on an evening and predominately targets blood glucose control overnight. Pre-breakfast (fasting) blood glucose levels give a good indication of the effectiveness of these insulins. After starting insulin treatment (usually with about 10 units daily) the dose should be titrated every 3-7 days according to a simple schedule, until the target is achieved. For example:

Average fasting blood glucose	Insulin dose increase per day
More than 10 mmol	4 units
8-10 mmol	2 units

Later on the insulin dose can be increased by 10 per cent if three consecutive fasting blood glucose results are higher than the individual target level agreed.

When fasting glucose levels are satisfactory, monitor blood glucose levels later in the day. 'Peakless' insulins will not usually lower meal-time (prandial) rises in blood glucose. If these rises cannot be adequately controlled with a combination of long-acting insulin and OHAs (generally sulphonylureas) the person will need to add short-or rapid-acting insulin to their regimen.

Adjusting multiple injection therapy

People who add short-or rapid-acting meal-time insulin to their once-daily insulin regimen can continue their current dose of long-acting insulin, and simply include a dose of fast-acting insulin before each main meal.

For those choosing a multiple injection regimen from the start of insulin treatment, try starting with one-third of the daily total insulin dose as long-acting insulin. Divide the remaining two-thirds – the fast-acting insulin – between the three main meals.

Adjust the long-acting insulin to achieve satisfactory pre-breakfast blood glucose levels: reduce the dose if the blood glucose is too low during the night or before breakfast, and increase the dose if glucose levels are too high before breakfast.

Adjust the short-acting insulin to achieve satisfactory glucose levels after meals.

Dose adjustment in practice

This is John's chart. He is taking 22 units of Humulin M3 in the morning and 18 units in the evening. He feels tired. What would you advise?

John's chart

Date	Breakfast	Lunch	Evening meal	Bed	Comment
May 1	12.4				
2		14.3			
3			11.7		
4				15.7	
5	13.0				
6		15.1			
7	15.4		14.4		
8				18.9	
9	11.2				
10		14.6			
11			14.8		
12				15.6	
13	15.5				
14		14.9			
15			14.1		

Suggested advice: increase both insulin doses by 10 per cent and review weekly.

Mrs Stevenson has been on insulin for five weeks. She takes 16 units of Insuman Combi 25 in the morning and 16 in the evening. Looking at her chart, can you see what the problem is? What should she do about it?

Mrs Stevenson's chart

Date	Breakfast	Lunch	Evening meal	Bed	Comment
July 1	7.1				
2		9.3			
3			12.6		
4				12.2	
5	8.4				
6		10.1			
7			14.4		
8				13.9	
9	6.2				
10		9.7			
11			11.1		
12				15.0	
13	7.0				
14		11.1			
15			14.9		

Suggested advice: Mrs Stevenson is not taking enough insulin before breakfast, so her blood glucose levels are rising throughout the morning and afternoon. She should increase her morning dose by 10 per cent. Later, when her blood glucose level is improved (lower) before her evening meal, she may need to reduce her evening dose to prevent early morning hypos.

Mrs Reynolds has been on insulin for 18 years. She takes 64 units of Humulin M3 in the morning and 48 units in the evening. She is feeling poorly, and thinks it might be her diabetes. What advice would you give her?

Mrs Reynolds' chart

Date	Breakfast	Lunch	Evening meal	Bed	Comment
Jan 11	12.9				
12					
13					
14					
15	13.8				
16					
17				7.1	
18					
19					
20					
21					
22					
23					
24					
25			10.1		

Suggested advice: increase the number of tests to get a clearer picture of Mrs Reynold's blood glucose profile. She may need to see her GP in the meantime if she continues to feel unwell.

Jason is on 30 units of Humulin M3 in the morning and 20 units in the evening. He is worried about his high blood glucose levels. What should he do about it?

Jason's chart

Date	Breakfast	Lunch	Evening meal	Bed	Comment
Dec 1			7.4		
2				12.2	
3	10.6				
4		5.3			
5			8.1		
6				13.3	
7	11.0				
8		6.1			
9			7.9		
10				10.9	
11	14.9				
12		8.6			
13			8.2		
14				11.6	
15	16.3				

Suggested advice: increase the evening dose by 10 per cent. Once his pre-breakfast readings have improved, Jason may also need to make a corresponding reduction to the morning dose to prevent late morning hypos.

Jane has lost weight recently, and started taking regular exercise. She takes 40 units of Humulin M3 in the morning and 36 units in the evening. Would you change anything?

Jane's chart

Date	Breakfast	Lunch	Evening meal	Bed	Comment
May 7	4.4				
8		3.3	14.6		Hypo lunch
9			7.1		
10				4.7	
11	3.2				
12		4.1			
13			4.3		
14				8.2	
15	4.0				
16		4.9			
17			hypo		
18				3.7	
19	5.1				
20		3.6			
21			2.9		

Suggested advice: reduce both doses by 20 per cent. Jane is currently likely to be feeling tired, and possibly worried about hypos. Her diabetes control is too tight. You should reiterate the principles of hypo prevention and management. In the light of recent changes to her lifestyle, Jane may also want to consider a different insulin regimen.

GLP 1 dose adjustment

Exenatide twice daily therapy is initiated at a 5mcg BD, increasing to 10mcg BD after four weeks if tolerated.

Liraglutide is commenced at 0.6mg OD for two weeks increasing to 1.2mg if tolerated. The 1.8 mg dose is not recommended due to cost a minimal additional impact on glycaemic control (NICE, 2010).

Exenatide once weekly is commenced as a weekly dose of 2mg, no dose titration is required.

If hypoglycaemia develops when a GLP1 is used in combination with a sulfonylurea then the sulfonylurea dose should be reduced.

Discontinuation of treatment with GLP 1

GLP 1 therapy should be discontinued and alternative treatment options explored if after six months a HbA1c reduction of 11mmol/mol (one per cent) and weight loss of three per cent has not been noted (NICE, 2009) or sooner if side effects do not resolve.

7

Dealing with problems and challenges

Needle phobia

The device Autoinject 2 hides the syringe; a single press of the button pushes the needle through the skin and delivers the insulin dose.

AutoShield Duo Safety Needles (5mm) can be used with any pen device and are available on prescription.

The Novo Autocover needle can be used on Novo Nordisk pen devices.

Insulin allergy

Occasionally people may have a localised allergic reaction to injected insulin. The usual cause is sensitivity to a particular preservative. Different insulin manufacturers use different preservatives, so the problem can usually be solved by switching products. Ask your local specialist team for advice.

Insulin neuritis

‘You told me insulin would make me feel better, but the pains in my legs are unbearable. I feel worse than before.’

Rapid improvement of glycaemic control following the initiation of insulin can trigger acute symptomatic neuropathy. Fortunately, this will only be temporary.

Insulin oedema

Salt and water retention can cause temporary oedema after starting insulin treatment.

Insulin treatment in palliative care

The aim of the insulin treatment should be to control the symptoms only. Consider simplifying the insulin regimen, for example replacing multiple injections with once or twice-daily insulin. If there is no history of

ketosis, you could consider discontinuing insulin treatment altogether.

Altered vision

Changes in blood glucose can lead to altered vision. Again, this should only be temporary. You should advise people against changing their glasses until their blood glucose levels have settled down.

Religious and cultural considerations

Although people with health problems are usually exempt from religious fasts, some people who are on insulin nevertheless prefer to observe them. People who are fasting all day and eating in the evening, for example during Ramadan, will need specific advice on how to manage their insulin therapy during this period of fasting.

Steroid-induced hyperglycaemia

Insulin doses will usually need to be significantly increased during steroid treatment. Likewise, to avoid hypoglycaemia when steroid treatment is discontinued insulin doses should be reduced.

Holidays and travel

Aiming for perfect control is unrealistic. Remember to take into account time differences, particularly when travelling from east to west. Injections taken further apart than usual are unlikely to cause problems, but injections taken too close together could lead to hypoglycaemia.

Insulin must not be stored in the aircraft's baggage hold, where it would be denatured by the freezing temperatures. It's a good idea to carry some spare

insulin and equipment in a separate bag in case luggage is lost or stolen. A FRIIO bag (with cooling gel activated by cold water) may be useful for insulin storage in hot countries.

The person should carry an ID card – such as a Diabetes UK card – with their photo and their doctor's signature. Some airlines require a doctor's letter.

People should carry some extra snacks. Advise against ordering 'diabetic' meals, which often don't have enough carbohydrate.

Travel insurance should cover diabetes and insulin treatment. However, some companies will not cover people for the first six months after they start insulin.

Shift work

A once-daily injection of one of a long-acting insulin analogues (Lantus or Levemir) given at the same time each day can be supplemented with rapid-acting insulin prior to meals or once-daily sulphonylurea taken before the first meal on waking.

Diabetes and other conditions

The specialist team will usually get involved when diabetes is complicated by other conditions such as renal impairment, coeliac disease or thyroid disease. Ante-natal care for pregnant women with diabetes will be provided by the secondary care team usually at joint clinics staffed by a consultant diabetologist, a consultant obstetrician, a diabetes specialist nurse and a specialist midwife.

8

Conclusions

The shift of responsibility for the routine management of diabetes brings exciting new challenges and opportunities for nurses.

Throughout this guide, we have encouraged readers to seek specialist advice at every opportunity, in order both to ensure the highest possible standards of patient care, and to develop their own knowledge and expertise.

Patients should also be encouraged to take responsibility for their own care as far as possible. A good understanding of their own condition and how to treat it increases the chances of effective control of blood glucose levels, which will minimise the risk of complications. Educating people with diabetes, their carers, partners and families is therefore a vitally important part of the nurse's role.

We hope that reference to this booklet – in conjunction with local guidance and input from diabetes specialists – will lead to increased knowledge and expertise for both nurses and patients, and improved health and wellbeing for people with Type 2 diabetes requiring insulin treatment.

Glossary

BNF

British National Formulary

Glucagon

A hormone produced by the alpha cells in the islets of Langerhans in the pancreas. Glucagon stimulates the conversion of liver glycogen to glucose. Injecting a manufactured preparation of glucagon can treat severe hypoglycaemia.

Glycaemic index (GI)

A method of measuring the effect of particular foods on blood glucose levels. Slowly absorbed foods have a low GI rating, while quickly absorbed foods have a high rating.

HbA1c (Glycated haemoglobin)

An indicator of glycaemic control during the previous six to eight weeks. The lowest risk of long-term diabetic complications is in people whose average HbA1c is closest to the normal range (below 42mmol/ 6.0 per cent).

Glucogel

A dextrose gel, which is available on prescription, for the treatment of hypoglycaemia.

GLP 1

Glucagon like peptide 1 a hormone produced by the gut following the ingestion of food that acts in the pancreas to enhance glucose dependent insulin release.

Insulin analogue

A modern insulin preparation genetically engineered (by changing the nucleic acid sequence of the insulin gene) so that its action more closely resembles the normal physiological action of insulin in a person without diabetes.

Ketosis

A state of severe insulin deficiency. Untreated, ketosis can lead to coma and death.

Metformin

First line oral treatment for Type 2 diabetes, especially for overweight people. It reduces insulin resistance. Glucophage (metformin) SR has the advantage of being a once-daily dose and may also be less likely to cause gastro-intestinal side effects.

MIMS

The Monthly Index of Medical Specialties (MIMS). MIMS and MIMS for nurses are available free of charge to individuals meeting the publisher's criteria. Call 0800 626387 for details.

Sulphonylurea

A class of common oral medication for Type 2 diabetes derived from sulphonamides. Drugs in this group stimulate insulin secretion. Gliclazide and Glimepiride are examples.

Type 1 diabetes

Raised blood glucose levels caused by insulin deficiency. People with Type 1 diabetes are dependent on injections of insulin to survive.

Type 2 diabetes

Raised blood glucose probably due to a combination of impaired insulin secretion and resistance to the action of insulin on the target cells. Type 2 diabetes is usually a progressive disease, which often eventually requires treatment with insulin to achieve optimal glucose control. However, insulin is not essential for survival.

References

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Useful contacts

Aventis Pharma Ltd

Telephone: 01732 584000

BD Medical – Diabetes Care

www.bddiabetes.co.uk
Telephone: 01865 748844

CP Pharmaceuticals Ltd

Telephone: 01978 661261

Diabetes UK

www.diabetes.org.uk
Telephone: 020 7424 1000

Lilly and Co Ltd

Telephone: 01256 315999

NHS Diabetes

www.diabetes.nhs.uk

National Institute for Clinical Excellence (NICE)

www.nice.org.uk

Novo Nordisk Pharmaceuticals Ltd

Telephone: 0845 6005055

RCN Diabetes Nursing Forum

www.rcn.org.uk/diabetes

RCN Direct

24-hour information and advice for RCN members
Telephone: 0345 772 6100



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