DIABETES HANDBOOK FOR THE ADMINISTRATION & SAFE USE OF INSULIN

To provide all staff at University Hospitals Plymouth NHS Trust (UHPNT) involved with the management of patients using INSULIN therapy with a clear framework of how to safely administer insulin at ward level.

NHS
University Hospitals Plymouth
NHS Trust

Diabetes Handbook for the Administration & Safe Use of Insulin

Issue Date	Review Date	Version
November 2019	November 2024	1.0

Purpose

To provide all staff at University Hospitals Plymouth NHS Trust (UHPNT) involved with the management of patients using INSULIN therapy with a clear framework of how to safely administer insulin at ward level.

To outline the rationale and principles for the safe administration of insulin.
Insulin represents one of the medications generally considered high risk. The incorrect dosing of insulin can result in harm to the patient and requires immediate intervention
The aim of this policy is to eliminate harm caused by improper use of insulin.
It should be used in conjunction with the Procedures for Administering Injectable Drugs and the Medicines Management Policy.

Who should read this document?

All health professionals working within UHPNT where prescribing or administration of insulin is being implemented.

Key Messages

In the UK, diabetes affects approximately 4 million people. Many people with diabetes require insulin on a daily basis. In general, using insulin is safe. However, there is a potential for serious harm if it is not administered and handled correctly.
Insulin is frequently included in the list of top 10 high-alert medicines worldwide. A high-alert medicine is defined as a medicine that has the highest risk of causing patient injury when misused.
Deaths and severe harm incidents have resulted from administration errors with insulin products.
Insulin represents one of the medications generally considered high risk. The incorrect dosing of insulin can result in harm to the patient and requires immediate intervention. *(Patient Safety First 2008)*
Good metabolic control is associated with improved hospital outcomes.
This document will refer to other UHPNT policies and protocols for specific areas and is intended to cover the additional practical issues relating to insulin management.

Relevant policies and procedures

- PHNT Medicines Management Policy
- SOP for setting up & maintaining an intravenous insulin infusion
- Procedures for Administering Injectable Drugs
- Medicines Reconciliation in Adults
- Diabetic KetoAcidosis (DKA)
- Variable Rate Intravenous Insulin Infusion (VRIII)
- Hyperosmolar Hyperglycaemic Syndrome (HHS)
- Management of Hyperglycaemia in Acute Coronary Syndrome (ACS)
- Management of Hyperglycaemia in Adults
- Hyperglycaemia in Adults on Steroid Therapy
- Hyperglycaemia with Enteral Feeding over 24 hours
- Emergency Treatment of Severe Hyperkalaemia
- Humulin R guideline
- Insulin Stress Tests – see Appendix 4
- Guidelines for managing insulin pumps in hospitalised patients
- Management of Diabetes in the Last Few Days of Life
- Management of Hyperglycaemia in TPN
- Unknown Insulin Regimen in Adult Patients
- Self-administration of Insulin

Guideline for Administration and Safe Use of Insulin

1 Introduction

This guideline applies to all employees of University Hospitals Plymouth NHS Trust including bank staff and agency staff working in the Trust; it also covers members of staff who are not directly employed by the Trust but who act in a professional capacity within the Trust through a service level agreement or honorary contract.

All NHS contractors registered with the Trust should also be compliant with this policy.

This guideline is a supplement to the Trust Medicines Policy and is to be read in conjunction with that policy.

This document will refer to other UHPNT policies and protocols for specific areas and is intended to cover the additional practical issues relating to insulin management

2 Definitions

Analogue insulin: An insulin analogue is an altered form of insulin, different from any occurring in nature, but still available to the human body for performing the same action as human insulin in terms of glycaemic control.

Biphasic insulin: are pre-mixed insulin preparations containing various combinations of short-acting insulin (soluble insulin or rapid-acting analogue insulin) and an intermediate-acting insulin.
The percentage of short-acting insulin varies from 15% to 50%. These preparations should be administered by subcutaneous injection immediately before a meal.

CBG: capillary blood glucose, should generally be tested QDS, before meals and bed

Concentrated insulins: Insulin generally comes in U100 strength, however newer concentrated insulins are now more widely used such as:
Tresiba 200 units/ml via FLEXTOUCH pen
Humalog 200 units/ml via KWIKPEN
Toujeo 300 units/ml via SOLOSTAR pen
Humulin R 500 units/ml via KWIKPEN.
These insulins deliver the same dose but at a reduced volume, meaning patients on high doses of insulin can inject less volume resulting in better absorption. Patients can therefore use 100 units/ml pens without any adjustment required to the dose injected, as a dose conversion is not required

CSII: Continuous Subcutaneous Insulin Infusion (insulin pump)

DAFNE (PASTIE): **D**ose **A**djustment for **N**ormal **E**ating (**P**lymouth **A**djustment **S**ystem **T**hrough **I**nsulin & **E**ating): a course designed specifically to teach patients with type 1 diabetes how to alter their insulin doses in relation to their carbohydrate intake (PASTIE is our local version of DAFNE)

Diabetes UK (DUK): the leading charity for people living with diabetes in the UK, and for Health Care Professionals. A reliable source of information. https://www.diabetes.org.uk/

Glucagon: a peptide hormone secreted by the pancreas which raises blood glucose levels. Its effect is opposite to that of insulin, which lowers blood glucose levels. It is also available as a drug and is used to treat severe hypoglycaemia in people with diabetes.

HCP: health care professional (registered nurse, doctor, pharmacist, etc)

Hypoglycaemia: Hypoglycaemia in a person with diabetes is defined as a capillary or venous glucose of less than 4mmol/L with or without symptoms.

Hyperglycaemia: Hyperglycaemia in a person with diabetes is defined as a capillary or venous glucose persistently > 12mmol/L, over a 24 hour period, before meals, with or without symptoms.

Insulin: a naturally secreted hormone which the body needs for correct function and plays a key role in the regulation of protein, fat and carbohydrate metabolism. It facilitates glucose circulating in blood to be absorbed by cells. Injecting insulin is an essential part of the daily regimen for many diabetics.

Insulin Passport: a patient held document which documents the patient's current insulin product(s) and enables a safety check for prescribing, dispensing and administration of insulin. It provides essential information when patients transfer across healthcare sectors, if the details are kept up to date

Lipohypertrophy: a lump under the skin caused by accumulation of extra fat at the site of many subcutaneous injections of insulin. It may be unsightly, mildly painful, and may change the timing or completeness of insulin action. It is a common, chronic complication of diabetes mellitus which may cause erratic absorption of insulin and unstable, erratic blood glucose levels. The prevalence of insulin induced lipohypertrophy is approximately 25-30% in patients with Type 1 diabetes and <5% in patients with Type 2 diabetes on insulin.

Ultra long-lasting basal insulin: Tresiba (Degludec) has a duration of action that lasts up to 42 hours (compared to 18 to 26 hours provided by other marketed long-acting insulins (Levemir or Lantus). It is less likely to cause hypoglycaemia and less day to day variability. Toujeo has a duration of action that lasts up to 24-36 hours and is currently cheaper than Tresiba.

3 Regulatory Background

This guideline aims to support the implementation of the National Patient Safety Agency (NPSA) guidance on the safer administration of insulin, and Health and Safety (Sharps Instruments in Healthcare) Regulations 2013.

4 Key Duties

The aim of this guideline is to ensure that:

- The right patient receives the right insulin, at the right dose and at the right time.
- The most appropriate insulin syringe is used to prepare and administer insulin
- The most appropriate technique is used to administer insulin with an insulin syringe.
- The most appropriate technique to inject insulin using the most commonly used pens.
- To be aware of other delivery systems used to administer insulin.
- Adult patients on insulin therapy receive a patient information booklet when insulin is started and an insulin passport.
- Patients who use a continuous subcutaneous insulin infusion pump (CSII) are safely supported when in hospital.
- Staff are aware of all insulin protocols:

  Diabetic KetoAcidosis (DKA)

  Variable Rate Intravenous Insulin Infusion (VRIII)

  Hyperosmolar Hyperglycaemic Syndrome (HHS)

  Management of Hyperglycaemia in Acute Coronary Syndrome (ACS)

  Management of Hyperglycaemia in Adults

  Hyperglycaemia in Adults on Steroid Therapy

  Hyperglycaemia with Enteral Feeding over 24 hours

  Emergency Treatment of Severe Hyperkalaemia

  Humulin R guideline

  Insulin Stress Tests – see Appendix 4

  Guidelines for managing insulin pumps in hospitalised patients

  Management of Diabetes in the Last Few Days of Life

  Management of Hyperglycaemia in TPN

  Unknown Insulin Regimen in Adult Patients

  Self-administration of Insulin

5 Procedures and Guidance for the Safe Use of Insulin

General principles and procedures for Insulin use

Errors with insulin administration can occur in any setting as a result of:

- Use of abbreviations.
  The British National Formulary specifies that the word ‘unit’ should not be abbreviated. The use of ‘U’ or I.U. for units has led to errors of 10 times the correct dose. This is because when the letter ‘U’ or ‘I.U’ is written next to the intended insulin dose it may be read as an extra ‘0’ and an overdose administered in error.

- Inaccurate dosing and administration

- Omitted or delayed administration

- Unfamiliarity with pen devices

- Use of incorrect syringe to measure insulin.
  This is classed as a NEVER EVENT (NHS Improvement, 2018)

- Failure to identify the correct patient

Insulin Passport

Adult patients on insulin therapy will receive a patient information booklet and an insulin passport on initiation of insulin.

On admission the prescriber will check the patient’s insulin passport as a source of information about their current prescription.

The prescriber must be aware that the insulin passport may not be up-to-date and must ensure they have accessed up to date records to establish the current dose of insulin. This can involve ringing the GP surgery (although very few GP’s have up-to-date records of insulin doses for their patients), or contacting carers/relatives. The Diabetes Centre, L6 (Tel: 30170) may also be able to confirm an up to date record of insulin doses if the patient has been seen recently either as an inpatient or outpatient.

If a replacement insulin passport is issued to a patient, the patient will be advised to destroy the previous copy.

6 PRESCRIBING OF INSULIN

Patients admitted to inpatient facilities will require a prescription for insulin to be written promptly.

6.1 In order to comply with the NPSA/2011/PSA003 on insulin safety, all staff must refer to the Countywide Standard Operating Procedure for Implementing Insulin Passports/Insulin Safety Cards and the Patient Information Booklet.

6.2 The insulin dose must be prescribed with the word 'unit' circled on the drug chart, and not abbreviated to 'u' or 'iu'. The use of the abbreviation can lead to the incorrect dose being given, as with handwriting the 'u' can be mistaken for a zero thereby giving ten times the intended dose (National Patient Safety Agency 2010).

6.3 The exact dose, or a lower and upper range for those patients able and competent to self-administer insulin, must be prescribed and not left 'as directed' for patients whilst in hospital or who require a health care professional to administer the insulin.

6.4 When prescribing, specify the exact brand name and if possible whether a vial, cartridge or pen is required. This is particularly important when an inpatient is discharged to ensure that the patient goes home with the correct means of administration.

6.5 On the prescription, the time of administration should co-ordinate with meal times as delayed availability of food may lead to hypoglycaemia. This only applies to mixed insulins, rapid acting, short acting and neutral insulins and not medium acting or long acting insulins.

6.6 Patients using CSII (insulin pump) should still have their insulin requirements prescribed on the drug chart. This will involve writing the name of the insulin used, the make and model of the insulin pump
Guidelines for managing insulin pumps in hospitalised patients

7 LABELLING & STORAGE OF INSULIN

7.1 For patients who are self-administering their insulin in hospital, all vials and devices must be clearly labelled with the patients name and details and ensure they are taken by the patient on discharge or disposed of appropriately.

7.2 Stock insulin must be stored in a fridge at between 4° and 8°C. Fridge temperatures should be maintained and recorded on a daily basis as per UHPNT policy.

7.3 Insulin cannot withstand temperatures of below 2°C.

7.4 Insulin for injection should be allowed to come up to room temperature before injecting.

7.5 In most hospital settings it is safer for patients own insulin vials or insulin pens in use to be kept with the patient's own drugs, or secure in the drug trolley, rather than separately in the fridge.

7.6 Shelf-Life after first use:

Insulin may be stored for a maximum of four weeks, out of the fridge, but not above 25°C, and away from direct heat or direct light. Keep the vial in the outer carton in order to protect from light.

7.7 If the insulin pen or vial has been out of the fridge for ≥28 days, it needs to be disposed of. Please return to Pharmacy for safe disposal.

7.8 The date of the first use from the vial or insulin pen should be recorded on the label.

8 USE OF SAFETY NEEDLES

UHPNT started using Becton Dickinson AutoShield Duo safety needles in 2017 to ensure compliance with Health and Safety (Sharps Instruments in Healthcare) Regulations 2013.

Prior to the use of safety needles staff were unable to inject patients using insulin pen devices. In some cases this meant that patients who may no longer be able to self-inject were unable to continue their usual insulin as it was only available in a pen device and not an insulin vial.

8.1 BD AutoShield Duo safety needles should be used by all staff who are injecting patients with any insulin pen device.

8.2 Staff using insulin pen devices must ensure they are competent to use them.

8.3 Patients should **NOT** be given BD Autoshield Duo safety needles to use.

8.4 Patients should always have access to Sharps Bins at their bedside.

8.5 Any staff who need to familiarise themselves with the BD safety needle should watch the following short clip YouTube video https://www.youtube.com/watch?v=mtzLM8-nX70

9 ADMINISTRATION OF INSULIN

Thousands of people with diabetes inject themselves one or more times a day with insulin. Insulin has the potential to trigger allergic reactions, however anaphylaxis to insulin injections is rare. Insulin-induced anaphylaxis may be more common in people whose treatment is interrupted or intermittent https://www.anaphylaxis.org.uk/our-factsheets/).

If an anaphylaxis reaction occurs then follow the Trust Resuscitation Protocol

If there is a reaction such as localised skin rashes, itching and urticaria, then a change of insulin may be needed and the Diabetes Inpatient Team should be contacted as soon as possible.

9.1 The UHPNT Medicines Policy must be adhered to at all times. In addition to which the following points with particular reference to insulin administration must be undertaken (please refer to the Medicines Policy).

9.2 Insulin is most commonly given via subcutaneous injection. If any other route is prescribed, this should be queried with medical staff immediately.

9.3 If a particular insulin pen device is not prescribed insulin **must** be drawn up using an **insulin safety syringe**. No other device should be used to measure insulin apart from one specifically designed to do so.
Failure to use a specific insulin administration device to measure or administer insulin is classed as a Never Event.
A list of all currently available insulin pen devices can be found at:
DUK Insulin Pens Wallchart Appendix 2

9.4 Prior to administering insulin the health care professional must have knowledge of the action of the particular insulin. A list of all insulins and their action can be found at:
DUK Action of Insulins Appendix 1

9.5 For insulin where the action is immediate, food must be available for the patient to eat as soon as the insulin has been administered.

9.6 Long acting insulin analogues should be given at the same time every day in order to provide the most consistent blood glucose profiles.

9.7 Insulin that is 'cloudy' must be correctly re-suspended prior to administration. If sediment is left in the bottle or cartridge before administration this will affect the action of the dose administered and may lead to erratic and unpredictable blood glucose control resulting in hypoglycaemia or hyperglycaemia. Re-suspension should be done by gently rolling and inverting as too vigorous shaking can destroy the insulin molecule.

9.8 Never use insulin that has become discoloured, has a frosty coating on the inside of the vial or has become cloudy when it should be clear. Insulin in this state is ineffective and if used may lead to hyperglycaemia.

9.9 Always check the expiry date on the vial or cartridge prior to administration.

9.10 Once drawn up insulin must be administered immediately. Syringes of insulin should not be drawn up in advance for use at a later date/time.

9.11 The type and dose of insulin should be double checked before administration to the patient.

9.12 If self-administration of insulin is to be considered for inpatients, a risk assessment must be undertaken to assess appropriateness and competence as per the Self-administration of Insulin Policy .
If the risk of self-harm/suicide is perceived to be present, self-administration is not appropriate.

10 INSULIN SITES & INJECTION TECHNIQUE

Procedure for administration of insulin via a pen device with safety needle, or an insulin safety syringe, on the ward

NB – The UHPNT Medicine Management policy clearly states that a second checker is needed for administration of injectables.

It is also the responsibility of this person to check the correct injection device and needle is used.

Gather the following equipment
Correct pen device (either prefilled or cartridge) with safety needle for pen device BD Autoshield Duo safety needle video, or insulin safety syringe.
Prescription chart(s)
Sharps bin

10.1 Explain and discuss the procedure with the patient

10.2 Read the prescription chart and ascertain the following;

- Correct identity of the patient
- Insulin type and brand - These must match the current prescription
- Correct injection device
- Dose
- Date and time of administration
- Validity of prescription.
- Check administration section to ensure the dose has not already been given

10.3 When drawing up insulin from an insulin vial, the air equivalent to the dose should be drawn up first and injected into the vial to facilitate easier withdrawal. 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. Draw up the required amount of insulin by pulling the plunger down slowly.

10.4 Insulin pens can be pre-filled with insulin or require insulin cartridges.

10.5 NEVER withdraw insulin from pen cartridges or prefilled pens with a syringe https://improvement.nhs.uk/news-alerts/risk-severe-harm-and-death-withdrawing-insulin-pen-devices/ These pens measure the required dose but training is required to ensure the devices are used safely.

10.6 Incorrect use of insulin pens may result in omitted or delayed doses or an incorrect dose being administered.

10.7 There is a range of different pen devices and these must be used in accordance with the manufacturers guidelines provided.

10.8 These pens must be used with appropriate safety needles if being administered by staff.

10.9 Patients should **not** use pen safety needles if they are administering their own insulin

10.10 Pen devices and cartridges are for single person use only and should never be shared due to the risk of contamination

10.11 Pen device must have a patient label applied with date of first use specified clearly

10.12 Dispose of sharps and non-sharps waste in accordance with the safe disposal of sharps policy

10.13 It is the responsibility of the health care professional to be familiar with the insulin device used.

10.14 It is important to vary the injection sites as continually injecting into one area can lead to lipohypertrophy and subsequent unpredictable absorption of insulin. This unpredictability may lead to either hypoglycaemia or hyperglycaemia. Staff must however be aware of cultural and gender sensitivities to certain injection sites, particularly if the staff member is a different gender to the patient.

The following recommendations have been taken from Forum for Injection Technique [The UK Injection and Infusion Technique Recommendations 4th Edition]

3.1 Injection Site Care

3.1.1 The site should be inspected by the patient prior to injection. Injections should then be given in a clean site using clean hands.

3.1.2 Soiled skin should be cleaned according to basic common standards with soap and water. If alcohol is used to clean the site, the skin must be allowed to dry completely before the injection is administered.

3.1.3 Disinfection of the site is usually not required although local decisions may be taken in a clinical setting to do so.

3.1.4 Patients should never inject into sites of lipohypertrophy, inflammation, oedema,ulceration or infection, nodules, scar tissue, tattoos, hernias and stomas.

3.1.5 Patients should not inject through clothing.

3.2 Re-suspension of Cloudy Insulin

3.2.1 Cloudy insulins (e.g. NPH and pre-mixed insulins) must be gently rolled and inverted ten times each but not shaken, until the crystals go back into suspension and the solution becomes milky white.

3.2.2 Invert the pen or vial and roll (a full rotation cycle between the palms). Inversion and/or rolling should be performed a total of 20 times immediately before every injection with cloudy insulin.

3.2.3 Visually confirm that the resuspended insulin is sufficiently mixed after each rolling and inversion, and repeat the procedure if crystal mass remains in the cartridge.

3.2.4 Vigorous shaking should be avoided since this produces bubbles which reduce accurate dosing.

3.2.5 Store unopened insulin in a refrigerator where freezing is unlikely to occur, as per manufacturer's instructions.

3.2.6 After initial use, insulin (in pen, cartridge or vial) should be stored at room temperature for up to 30 days or according to manufactures recommendations and within expiry date. Premixed insulin pens and some of the newer insulins may vary – check individual manufacturer's recommendations.

3.2.7 Storage of Insulin - Insulin IN USE should be stored below thirty degrees Celsius but do not refrigerate. However, Insulin NOT IN USE should be stored in a refrigerator (two to eight degrees Celsius), do not freeze, do not expose to direct sunlight. It should be allowed to warm up for approximately fifteen minutes prior to use for the first time.

3.3 Needle Length

3.3.1 The 4mm pen needle inserted perpendicularly (at ninety degrees) is long enough to penetrate the skin and enter the subcutaneous tissue, with little risk of intramuscular (or intradermal) injection. Therefore it should be considered the safest pen needle for adults and children regardless of age, gender and Body Mass Index (BMI).

3.3.2 The 4mm pen needle may be used safely and effectively in all obese patients. Although it is the needle of choice for these patients, a 5mm needle may be acceptable.

3.3.3 The 4mm pen needle should be inserted perpendicular (at ninety degrees) to the skin surface and not at an angle, regardless of whether a skin fold is raised.

3.3.4 Very young children (6-years old and under) and extremely thin adults (BMI <19) should use the 4mm needle by lifting a skin fold and inserting the needle perpendicularly into it. Others may inject using the 4 mm needle without lifting a skin fold.

3.3.5 When any syringe needle is used in children, adolescents or slim to normal weight adults (BMI 19-25), injections should always be administered into a lifted skin fold.

3.3.6 Use of syringe needles in very young children (less than 6 years old) and extremely thin adults (BMI<19) is not recommended, even if they use a raised skin fold, because of the excessively high risk of intramuscular (IM) injections.

3.3.8 If arms are used for injections with needles ≥6mm long, a skinfold must be lifted, which requires injection by a third party.

3.3.9 Avoid indenting the skin by excessive pressure during injection, as the needle may penetrate deeper than intended and enter the muscle.

3.4 Lifting a Skin Fold

3.4.1 Each injection site should be examined individually and a decision made as to whether lifting a skin fold is required, taking into account the needle length used. The recommendation should be provided to the patient in writing and documented in their care plan.

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

3.4.3 The optimal sequence should be:
• Lift a skin fold;
• Inject insulin slowly at ninety degrees to the surface of the skin fold;
• Leave the needle in the skin for a count of 10 after the plunger is fully depressed (when injecting with a pen);
• Withdraw needle from the skin at the same angle it was inserted;
• Release skin fold;
• Dispose of used needle safely.

3.5 Needle Reuse

3.5.1 Syringe or pen needles should only be used once. Reusing insulin needles is not optimal injection practice and patients should be discouraged from doing so.

3.5.2 There is an association between needle reuse and the presence of lipohypertrophy, although a causal relationship has not been proven. Patients should be made aware of this association (and also the association between reuse and pain or bleeding).

3.6 Rotation of Injecting Sites

3.6.1 Injections should be systematically rotated in such a way that they are spaced at least 1cm from each other in order to avoid repeat tissue trauma.

3.6.2 One scheme with proven effectiveness involves dividing the injection site into quadrants using one per week and moving quadrant to quadrant in a consistent direction (e.g. clockwise).

3.6.3 Patients should be taught an easy-to-follow rotation scheme from the onset of injection therapy. This may be adjusted as needed while therapy progresses. The HCP should review the site rotation scheme with the patient at least once a year.

3.7 Correct Use of Pens

3.7.1 Pens should be primed (observing at least a drop at the needle tip) according to the manufacturer's instructions before the injection in order to ensure there is unobstructed flow and to clear needle dead space. Once flow is verified, the desired dose should be dialled and the injection administered.

3.7.2 Pens and cartridges are for a single patient and should never be shared between patients due to the risk of biological material from one patient being drawn into the cartridge and then injected into another person.

3.7.3 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, either of which can affect dose accuracy.

3.7.4 Pen needles should be used only once.

3.7.5 The thumb button should only be touched once the pen needle is fully inserted. After that the button should be pressed along the axis of the pen, not at an angle.

3.7.6 After pushing the thumb button completely in, patients should count slowly to 10 before withdrawing the needle in order to get the full dose and prevent the leakage of medication.

3.7.7 Pressure should be maintained on the thumb button until the needle is withdrawn from the skin in order to prevent aspiration of patient tissue into the cartridge.

3.8 Correct Use of Syringes

3.8.1 When drawing up insulin from an insulin vial, the air equivalent to the dose (or slightly greater) should be drawn up first and injected into the vial to facilitate insulin withdrawal. Ensure that the syringe to be used is an INSULIN syringe. Use of any other type of syringe can cause serious harm. "All regular and single insulin (bolus) doses are measured and administered using an insulin syringe or commercial insulin pen device. Intravenous syringes must never be used for insulin administration"(Rapid Response Report Safer Administration of Insulin 2010)

3.8.2 If air bubbles are seen in the syringe, patients should tap the barrel to bring them to the surface and then remove the bubbles by pushing up the plunger

3.8.3 Unlike pens, it is not necessary to hold the syringe needle under the skin for a count of 10 after the plunger has been depressed.

3.8.4 Syringes must be used only once.

11 MAGELLAN INSULIN SAFETY SYRINGE INSTRUCTIONS

Insulin safety syringes should be stored in a separate area to any other syringes to avoid the risk of a non-insulin syringe being used in error

Magellan™ Insulin and Tuberculin Safety Syringe

Instructions For Use

1

Select the appropriate Magellan™ Insulin or Tuberculin Safety Syringe for your procedure.

2

Open package by peeling back paper tabs and remove syringe.

3

Remove protective needle sheath.

4

Draw up medication and administer injection using an aseptic technique in accordance with your facility's protocol.

5

Lock the safety shield using your thumb

or

...your finger.

6

Verify locked position through audible and tactile "click". Locked position will completely encase needle.

7

Once the shield is locked, immediately dispose of syringe in an approved sharps disposal container.

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12 INSULIN TYPES & REGIMENS

12.1 Insulin regimens must give 24 hour coverage of insulin. This can be achieved in a variety of ways. The most common regimens are:

- Twice daily doses of short and intermediate acting insulin. These are given before breakfast and evening meal:

• the short-acting doses cover the insulin needs of the morning and evening
• the intermediate-acting doses cover the afternoon and overnight
• premixed or biphasic insulin injections are convenient for this regimen

- Background insulin (basal insulin) in addition to diabetes oral medications.

• this regimen is usually suitable for people with type 2 diabetes

- Multiple daily doses.

• short-acting insulin is used before each main meal
• an intermediate or long-acting insulin is to give coverage over 24 hours

- CSII – continuous subcutaneous insulin infusion (Insulin pump). See Section 13 for more information.

- Dose Adjustment For Normal Eating (DAFNE) or PASTIE (Plymouth Adjustment System Through Insulin & Eating)

• A risk assessment should be considered for any inpatients on this regimen as they must be able to calculate the carbohydrate content of food. Please obtain a list of carbohydrate values from SERCO staff if needed by patient.

12.2 A list of all currently available insulin and their action can be found at: DUK Insulin actions Appendix 1

12.3 The type of insulin is usually either Human, Analogue or Animal.
Porcine and Bovine insulin are still currently available but being phased out. All insulin types have different modes of action and the health care professional must be familiar with the action of the insulin prescribed.

13 CONTINUOUS SUBCUTANEOUS INSULIN INFUSION (CSII - Insulin pump)

Essential information

- **Staff must NEVER alter anything on a patient's pump unless they are trained in the use of the pump.**

- **Rapid, or short-acting insulin is infused continuously subcutaneously at a pre-programmed rate set by the patient or the Diabetes Specialist Team.**
- **Bolus doses are taken to cover food**
- **If the pump is discontinued for any reason without an alternative provision of insulin, diabetic ketoacidosis (DKA) is likely to develop in a short space of time because there is no reservoir of long-acting insulin**
- **ALL PATIENTS ON A CSII MUST BE REFERRED TO THE DIABETES INPATIENT TEAM VIA SALUS.**

13.1 Patients in hospital may only continue to use their insulin pump if they are alert, knowledgeable and competent to manage the insulin pump, and are mentally and physically competent to assume complete responsibility for their own pump management.

13.2 Contraindications for inpatient use of an insulin pump include **any** of the following: altered or changes to state of consciousness and/or cognitive status, critically ill (sepsis, trauma) and needs intensive care, persistent unexplained hyperglycaemia, refusal or unwillingness to participate in self-care, caregiver support/assistance required to manage insulin pump.

13.3 Relatives/carers/friends should be asked as soon as possible after admission to bring supplies in for the patient if needed. The following equipment should be provided by the patient:
insulin pump
cannulas (enough to be changed every 3 days minimum)
cartridges, reservoirs, or syringes for the insulin
infusion sets, tubing (enough to be changed every 3 days minimum)
extra batteries for the pump if needed
charging equipment for the pump if needed
dressings (if applicable)
insulin
blood glucose meter if required

13.4 Each patient using a pump will require a minimum of 4 blood glucose tests a day, before meals and bed, using a hospital glucose meter and documented on the observation chart according to hospital policy. **The only exception to this will be patients using pumps that require a specific blood glucose meter to be used.**

13.5 Should the patient lose consciousness or become mentally or physically unable to manage their pump then the pump must be disconnected and stored in a safe place. This safe place must be documented in the Hospital Notes.

13.6 The patient needs to change the infusion set and reservoir at least every three days or earlier. More frequent changes may be needed if bleeding is noted at the site; the site is red, swollen, or warm to touch; there is pain at the delivery site; a “no delivery” alarm occurs; or if two blood glucose readings are above

17mmol/L in a four hour period after a correction bolus has been given by the patient.

13.7 Disconnection from the pump or discontinuation of insulin infusion for more than one hour will require an alternative insulin delivery. Contact the Diabetes Inpatient Specialist Nurses for advice.

13.8 The majority of insulin pumps are not waterproof, therefore the insulin pump should be temporarily disconnected from the patient for showering/bathing.

13.9 The insulin pump should be temporarily removed for MRI and CAT scan tests. For plain x-rays, there is no need to remove the pump, unless its position obscures the area of interest. The patient should reconnect the pump immediately following any radiological investigation. Pumps can be safely suspended/removed for up to an hour at a time without needing alternative insulin. A correction bolus may be needed on reconnecting the pump If the procedure will last more than an hour or the pump must be temporarily removed for more than an hour, alternative insulin delivery should be considered.

13.10 Please look at the Guidelines for Managing Insulin Pumps in Hospitalised Patients for more detailed information.

14 HUMULIN R® U500 INSULIN GUIDELINE

Please note that as of the 1st September 2018 vials of Humulin R 500 units per ml will no longer be available.

As of the 1st September 2018 Humulin R 500 units per ml will only be available as a pre-loaded pen (Kwikpen). As the pre-loaded pen dials the correct dose of insulin this section will no longer be relevant.

Humulin R® U500 insulin contains 500 units of insulin in each millilitre (5-times more concentrated than regular human insulin 100units/ml). For Humulin R® U500 insulin, extreme caution must be observed in the measurement of dosage because inadvertent overdose may result in severe or life-threatening hypoglycaemia. It is for subcutaneous injection only; it should NOT be used intravenously or intramuscularly. It is usually given 2-3 times daily 20-30 minutes before meals.

It is now a licensed medication in the UK, but not on our Formulary, and is supplied on a named patient basis for a small number of very insulin resistant patients.
It can only be prescribed by a Diabetes Specialist (Consultant).

If a patient on Humulin R U 500 is admitted:

- Patient's case note will have an alert saying they are on Humulin R U-500

 Inform the inpatient diabetes team and activate on Salus

 For any dose changes please contact the diabetes team.

15 OBTAINING INSULIN SUPPLIES

The Medicines Management Policy v10.4 (March 2019) includes insulin in the list of Critical Medicines (9.2.1.5) This means that:

15.1 The doctor who is clerking the patient on admission should ascertain the insulin usually used by the patient and prescribe it immediately and appropriately.

15.2 If the patient does not have their own insulin with them then the nurse who is responsible for the patient needs to obtain the insulin from Pharmacy as a matter of urgency.

15.3 Insulin needs to be obtained from Pharmacy and available for administration within 4 hours of admission.

15.4 Omission of insulin (or any other diabetes medication) because it is “not available on the ward” is not acceptable and is unsafe practice. Efforts must be made to obtain insulin/diabetes medication from other ward areas as a matter of priority if required.

15.5 Pharmacy will prioritise drug charts sent down to them requiring insulin.

15.6 Consideration needs to be given to the ward transfer of patients on the less commonly used insulins. Wards must consider if the insulin used should travel with the patient, and handovers to receiving wards need to be done in time for the receiving ward to obtain their own supply from Pharmacy if needed.

15.7 All staff should be aware that omission of basal insulin in a patient with Type 1 diabetes could result in Diabetic KetoAcidosis (DKA) within hours.

16 BLOOD GLUCOSE MONITORING

16.1 Glucose levels must be checked QDS, before every meal and at bedtime.

16.2 Clinical assessment by the healthcare professional suggesting signs of hypoglycaemia/hyperglycaemia should be confirmed by a CBG test.

16.3 All blood glucose readings will be documented accurately and appropriately, and results should be recorded in accordance with local protocols.

16.4 Each entry should clearly show the time of the reading and the result.

16.5 All Health Care Professionals within UHPNT must refer to the Point of Care Testing Policy

16.6 All Health Care Professionals within UHPNT must use the glucose meters recommended for use by the trust when testing a patients' blood glucose and ensure that glucose meters are calibrated and serviced as directed.

16.7 All Health Care Professionals must be trained in usage of the meter and have regular updates as stated in the Medical Devices policy.

16.8 Incorrect usage of the meters may lead to inaccurate results and these results may lead to inappropriate and potentially unsafe insulin dose alterations.

16.9 Patients may use their own blood glucose meters whilst in hospital, however only the blood glucose readings obtained from the UHPNT meters should be recorded on the observation charts.

17 HYPOGLYCAEMIA MANAGEMENT

17.1 For the treatment of hypoglycaemia please see the current UPHNT Hypoglycaemia Protocol. Appendix 3

17.2 Hypoglycaemia is the most feared complication of insulin therapy, presenting an increasingly important problem for both community and hospital services. A growing prevalence of diabetes in the community has been accompanied by an even greater increase of diabetes in hospitalised patients such that one in seven inpatients has diabetes. Furthermore, more than half of these are being treated with insulin or an oral agent that may cause hypoglycaemia. JBDS hypoglycaemia guidelines (2018)

17.3 Approximately one in five people with diabetes suffers a hypoglycaemic episode during their hospital stay (NaDIA 2016).This has serious consequences as inpatient hypoglycaemia not only increases length of stay but is associated with an increased mortality (NHS Diabetes, March 2010).

17.4 Hypoglycaemia is determined by a patient capillary blood glucose measurement of less than 4.0mmol/l, regardless of whether the patient has symptoms or not, performed by staff trained in the procedure.
The following may indicate a hypoglycaemic episode and should prompt confirmation by capillary blood glucose measurement as above:
• Autonomic symptoms – pallor, sweating, tremor, tachycardia
• Neuroglycopaenic symptoms – loss of concentration, behavioural changes, fits, transient neurological deficits, reduced level of consciousness
• Some patients especially with long standing Type 1 diabetes may lose their awareness of hypoglycaemia
• Symptoms may be more nebulous in the elderly

Risk Factors for Hypoglycaemia

Medical Issues	Lifestyle Issues
Tight glycaemic control	Increased exercise (relative to usual, e.g. physiotherapy)
Patients who are NBM	Less food intake than normal
Steroids omitted or stopped	Irregular lifestyle
Previous history of severe hypoglycaemia	Increasing age
Undetected nocturnal hypoglycaemia	Alcohol
Long duration of diabetes	Early pregnancy
Poor injection technique	Breast feeding
Impaired awareness of hypoglycaemia	Injection into areas of lipohypertrophy (lumpy injection sites)
Preceding hypoglycaemia (<3.5mmol/l)	Inadequate blood glucose monitoring
Impaired renal function	Reduced carbohydrate intake - e.g., coeliac disease, gastroenteritis, missed meals
Severe hepatic dysfunction	
Renal dialysis therapy	
Inadequate treatment of previous hypoglycaemia	
Terminal illness	

17.5 Dose titration for hypoglycaemia

- Consider the reason for the hypoglycaemia, if it is unavoidable then consider reducing the preceding insulin dose by 20%
- Hypoglycaemia is often avoidable eg missed meal, less carbohydrates than usual, steroids stopped, reduced, or omitted, TPN, NG or PEG feeding stopped either intermittently or permanently, increase in exercise eg physiotherapy especially after a long period of bed rest, injecting into areas of lipohypertrophy, inadequate blood glucose monitoring, inadequate treatment of previous hypoglycaemic episode.
- Consider if a bedtime snack might be appropriate, especially in patients on insulin who usually eat something before bed at home.

18 HYPERGLYCAEMIA MANAGEMENT

Hyperglycaemia is defined as a blood glucose level of greater than **7.0 mmol/L** when fasting, or blood glucose levels greater than **12.0 mmol/L** pre-meal, or at least 2 hours after meals. Please refer to Management of Hyperglycaemia in Adults guideline. Ensure ketone levels are tested for any CBG >14 mmol/L

However whilst unwell and in hospital the target range for blood glucose levels is generally 6 – 12mmol/L, however all targets should be considered on an individual basis and in some patients higher target levels may be justified.
Management of hyperglycaemia should be instigated if blood glucose is above 12mmol/L on 2 successive **pre**-meal readings

Blood glucose levels will generally rise as a result of:

Non-concordance with insulin regimen

Faulty injection technique
Cloudy insulin not being mixed adequately prior to injection
The needle not being held in place subcutaneously for at least 10 seconds after administration of insulin
Insufficient doses of insulin or other diabetes medication
Delay or omission of a dose of diabetic medication, tablets or insulin
Increased diet in hospital and/or supplements (in particular Fresubin Jucy or Fortijuice)
Being mentally or emotionally stressed (injury, surgery or anxiety)
Contracting an infection
Being on steroids
CBG readings taken shortly after eating
Enteral feed or TPN
Reduced mobility
Pain
In order to treat hyperglycaemia safely and appropriately some of the following questions need to be considered:

1) Has the patient missed a dose of insulin or other diabetes medication?
   YES - consider if this was appropriate
2) Has insulin been given more than an hour after eating a meal?
   YES - insulin should be given before, during, or immediately after a meal. It is likely that blood glucose levels will settle therefore no immediate action required
3) Is there a pattern to the hyperglycaemia eg at the same time each day? YES - consider increasing the insulin dose by 10% at the preceding mealtime
4) Is the patient considered to be in Last Days of Life?
   YES – refer to the UHPNT Management of Diabetes in the Last Few Days of Life Guideline
5) Is the patient on steroids?
   YES - refer to the UHPNT Steroid Guidelines
6) Is the patient in pain?
   YES - consider reviewing the pain medication before increasing insulin or other diabetes medication
7) Has the patient eaten more than usual prior to the hyperglycaemia?
   ********** DO NOT RELY ON THE FOOD CHART! **********
   YES - consider increasing the preceding mealtime insulin by 10%
8) Are the blood glucose levels elevated but stable (i.e. no more than a 5 mmol/L difference between pre-meal and bedtime blood glucose levels)? YES - consider increasing the basal insulin only by 20%

Dose adjustments to insulin should be made every 24 hours while in hospital until target blood glucose levels are reached.

PRN doses of Actrapid or Novorapid insulin should be avoided

If it is considered necessary to give a STAT dose it should not be prescribed again for at least 6 hours, otherwise there will be a risk of hypoglycaemia.

STAT doses should only be given at mealtimes to avoid risk of hypoglycaemia.

If ketone levels are >3mmol/L then an urgent referral should be made to the Diabetes Team or Medical SpR if out of hours. Consider DKA whenever ketone levels are >3

To calculate a STAT dose it is generally recommended that only 1 unit of insulin should be used to reduce the blood glucose level by 3 mmol/L to a target of 10 - 12mmol/L.

Eg a blood glucose level of 20 mmol/L would require 3 units of Novorapid (preferable to Actrapid insulin) to reduce blood glucose level to around 10 -12 mmol/L

19 Document Ratification Process

The review period for this document is set as five years from the date it was last ratified, or earlier if developments within or external to the Trust indicate the need for a significant revision to the procedures described.

This document will be reviewed by the Safe Use of Insulin Steering Group and ratified by the Diabetes Service Line Director.

Non-significant amendments to this document may be made, under delegated authority from the Diabetes Service Line Director, by the nominated author. These must be ratified by the Diabetes Service Line Director and should be reported, retrospectively, to the Safe Use of Insulin Steering Group.

20 Monitoring and Assurance

Overall monitoring will be by the Safe Use of Insulin Steering Group and by reviewing trends in incident reporting via DATIX reports

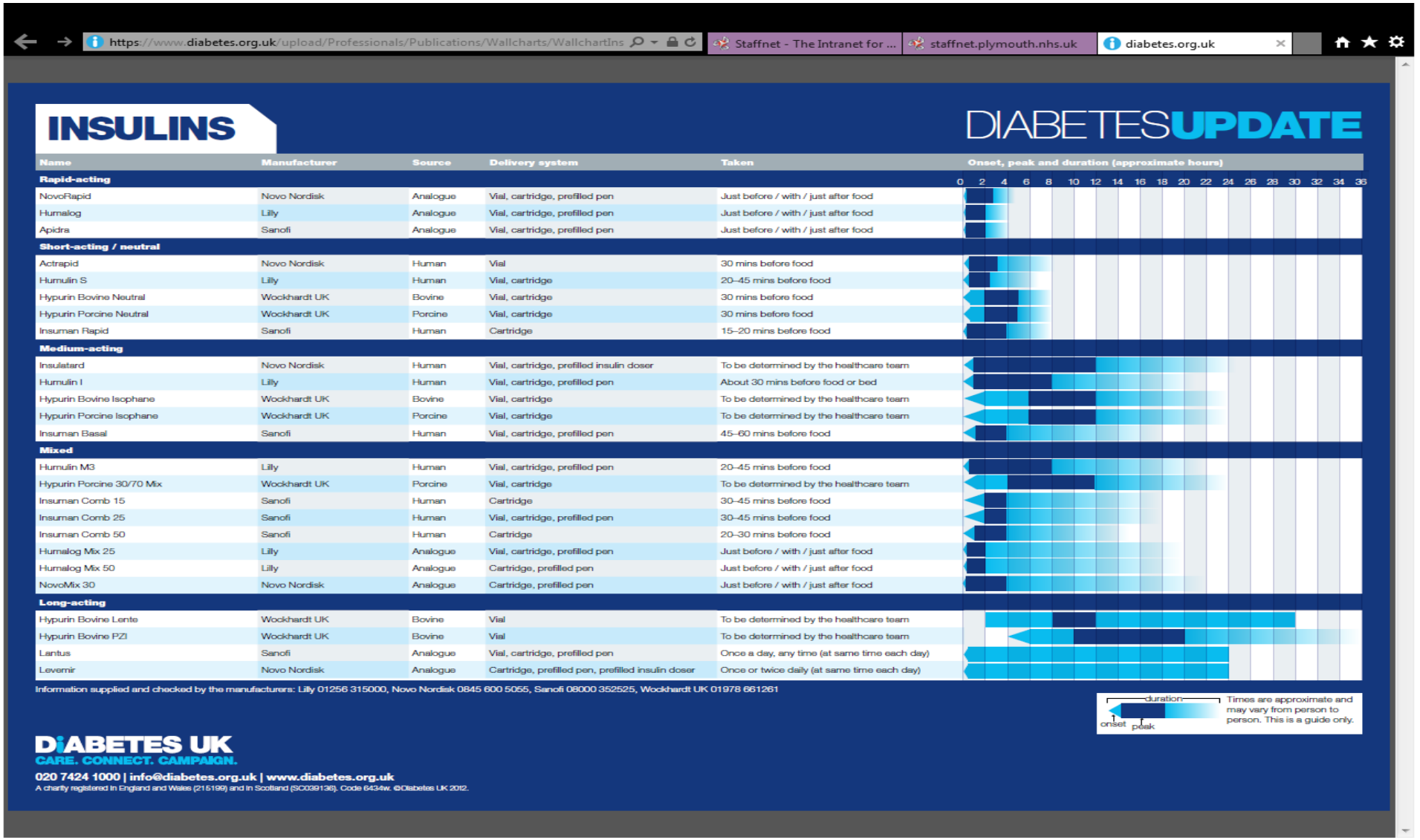
Incidents will be reported to the Safe Use of Insulin Steering Group for consideration, identifying any shortfalls, action points and lessons learnt. This Group will be responsible for ensuring improvements, where necessary, are implemented.
Monthly reporting to the Matrons, Ward Managers, and Quality Manager. These reports will be fed back to staff in the relevant areas via Safety Brief

Quarterly reporting of incident themes are also made to the Safe Use of Insulin Steering Group identifying areas of concern and areas that need additional training &/or support

21 Reference Material

- National Patient Safety Agency – safer administration of insulin, June 2010
- http://www.hse.gov.uk/healthservices/needlesticks/eu-directive.htm
- JBDS Inpatient Guidelines
- Anaphylaxis Campaign, version 8 Anaphylaxis

- British Journal of Diabetes, Vol 16, No.1 (2016)
- Hospital Management of Hypoglycaemia in Adults with Diabetes Mellitus, NHS Diabetes 2010
- NPSA/2011/PSA003
- https://improvement.nhs.uk/news-alerts/risk-severe-harm-and-death-withdrawing-insulin-pen-devices/
- DiAppbetes mobile phone app
- NHS Improvement, Never Events List (January 2018)
- Leicester Diabetes Centre website



https://www.diabetes.org.uk/upload/Professionals/Publications/Wallcharts/WallchartIns

Staffnet - The Intranet for ... | staffnet.plymouth.nhs.uk | diabetes.org.uk

INSULINS

DIABETESUPDATE

Name	Manufacturer	Source	Delivery system	Taken	Onset, peak and duration (approximate hours)
Rapid-acting					0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36
NovoRapid	Novo Nordisk	Analogue	Vial, cartridge, prefilled pen	Just before / with / just after food	
Humalog	Lilly	Analogue	Vial, cartridge, prefilled pen	Just before / with / just after food	
Apidra	Sanofi	Analogue	Vial, cartridge, prefilled pen	Just before / with / just after food	
Short-acting / neutral					
Actrapid	Novo Nordisk	Human	Vial	30 mins before food	
Humulin S	Lilly	Human	Vial, cartridge	20–45 mins before food	
Hypurin Bovine Neutral	Wockhardt UK	Bovine	Vial, cartridge	30 mins before food	
Hypurin Porcine Neutral	Wockhardt UK	Porcine	Vial, cartridge	30 mins before food	
Insuman Rapid	Sanofi	Human	Cartridge	15–20 mins before food	
Medium-acting					
Insulatard	Novo Nordisk	Human	Vial, cartridge, prefilled insulin doser	To be determined by the healthcare team	
Humulin I	Lilly	Human	Vial, cartridge, prefilled pen	About 30 mins before food or bed	
Hypurin Bovine Isophane	Wockhardt UK	Bovine	Vial, cartridge	To be determined by the healthcare team	
Hypurin Porcine Isophane	Wockhardt UK	Porcine	Vial, cartridge	To be determined by the healthcare team	
Insuman Basal	Sanofi	Human	Vial, cartridge, prefilled pen	45–60 mins before food	
Mixed					
Humulin M3	Lilly	Human	Vial, cartridge, prefilled pen	20–45 mins before food	
Hypurin Porcine 30/70 Mix	Wockhardt UK	Porcine	Vial, cartridge	To be determined by the healthcare team	
Insuman Comb 15	Sanofi	Human	Cartridge	30–45 mins before food	
Insuman Comb 25	Sanofi	Human	Vial, cartridge, prefilled pen	30–45 mins before food	
Insuman Comb 50	Sanofi	Human	Cartridge	20–30 mins before food	
Humalog Mix 25	Lilly	Analogue	Vial, cartridge, prefilled pen	Just before / with / just after food	
Humalog Mix 50	Lilly	Analogue	Cartridge, prefilled pen	Just before / with / just after food	
NovoMix 30	Novo Nordisk	Analogue	Cartridge, prefilled pen	Just before / with / just after food	
Long-acting					
Hypurin Bovine Lente	Wockhardt UK	Bovine	Vial	To be determined by the healthcare team	
Hypurin Bovine PZI	Wockhardt UK	Bovine	Vial	To be determined by the healthcare team	
Lantus	Sanofi	Analogue	Vial, cartridge, prefilled pen	Once a day, any time (at same time each day)	
Levemir	Novo Nordisk	Analogue	Cartridge, prefilled pen, prefilled insulin doser	Once or twice daily (at same time each day)	

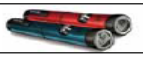
Information supplied and checked by the manufacturers: Lilly 01256 315000, Novo Nordisk 0845 600 5055, Sanofi 08000 352525, Wockhardt UK 01978 661261

duration
onset peak
Times are approximate and may vary from person to person. This is a guide only.

DIABETES UK
CARE. CONNECT. CAMPAIGN.
020 7424 1000 | info@diabetes.org.uk | www.diabetes.org.uk
A charity registered in England and Wales (215199) and in Scotland (SC039136). Code 6434w. ©Diabetes UK 2012.

INSULIN PENS

DIABETESUPDATE

Manufacturer	Name	Dosage (min-max)	Insulin used in pen	Pen needles used	Appearance	Colour	Material	Cartridge or prefilled	Redial dose?	Carrying case
Eli Lilly www.lilly.co.uk 01256 315000	KwikPen	1–60 units	Humalog, Humalog Mix25, Humalog Mix50	BD Micro-Fine +, Penfine universal click, Unifine Pentips, Unifine Pentips Plus		Slate blue	Plastic	Prefilled	Yes	Soft case available from manufacturer
	Humulin I KwikPen	1–60 units	Humulin I	BD Micro-Fine +, Unifine Pentips, Unifine Pentips Plus		Beige	Plastic	Prefilled	Yes	Soft case available from manufacturer
	Humulin M3 KwikPen	1–60 units	Humulin M3	BD Micro-Fine +, Unifine Pentips, Unifine Pentips Plus		Beige	Plastic	Prefilled	Yes	Soft case available from manufacturer
	HumaPen Luxura	1–60 units	Lilly 3ml cartridges from Humalog and Humulin ranges	BD Micro-Fine +, Penfine universal click, Unifine Pentips, Unifine Pentips Plus		Burgundy or champagne	Metal	Cartridge	Yes	Hard case, dark brown or burgundy
	HumaPen Luxura HD	0.5–30 units (½-unit increments)	Lilly 3ml cartridges from Humalog and Humulin ranges	BD Micro-Fine +, Penfine universal click, Unifine Pentips, Unifine Pentips Plus		Rainforest green	Metal	Cartridge	Yes	Hard case, burgundy
European Pharma Group www.insujet.com +31(0) 20 3160140	InsuJet	4–40 units	All 3ml and 10ml UK insulin cartridges	None. Insulin administered by needle-free jet injections using compressed air through a precision nozzle		Green & white, blue & white or grey & white	Plastic and steel	Cartridge	No	Hard case with zipper
Novo Nordisk www.novonordisk.com 0845 600 5055	FlexPen	1–60 units	NovoRapid, Levemir, NovoMix 30	NovoFine, NovoFine Autocover, NovoTwist, Unifine Pentips, Unifine Pentips Plus		Orange, green or blue	Plastic	Prefilled	Yes	Available from manufacturer
	InnoLet	1–50 units	Insulatard, Levemir	NovoFine, NovoFine Autocover, NovoTwist, Unifine Pentips		Cream	Plastic	Prefilled	Yes	None
	NovoPen 4	1–60 units	All Novo Nordisk 3ml penfill cartridges	NovoFine, NovoFine Autocover, NovoTwist, Unifine Pentips, Unifine Pentips Plus		Blue or silver	Metal	Cartridge	Yes	Novo blue zip case
	NovoPen 3 Demi	1–35 units (½-unit increments)	All Novo Nordisk 3ml penfill cartridges	NovoFine, NovoFine Autocover, NovoTwist, Unifine Pentips, Unifine Pentips Plus		Blue with orange trim	Metal	Cartridge	Yes	Soft pouch, dark blue
	NovoPen Junior	1–35 units (½-unit increments)	All Novo Nordisk 3ml penfill cartridges	NovoFine, NovoFine Autocover, NovoTwist, Unifine Pentips, Unifine Pentips Plus		Blue with green or yellow trim	Metal	Cartridge	Yes	Soft pouch, dark blue
	PenMate	A pen device that automatically inserts the needle when a button is pushed. Fits all Novo Nordisk half-unit pens, except the NovoPen Echo.				Blue	Plastic	N/A	N/A	Soft pouch
	NovoPen Echo	0.5–30 units (½-unit increments)	All Novo Nordisk 3ml penfill cartridges	NovoFine, NovoFine Autocover, NovoTwist		Red or blue	Metal	Cartridge	Yes	Soft blue pouch
	NovoRapid FlexTouch	1–80 units	NovoRapid	NovoFine, NovoFine Autocover, NovoTwist		Blue with orange trim	Plastic	Prefilled	Yes	Available from manufacturer
Owen Mumford www.owenmumford.com 01993 812021	Autopen Classic 3ml	1–21 units (green) 2–42 units (blue)	Eli Lilly or Wockhardt UK 3ml cartridges	BD Micro-Fine +, NovoFine, Penfine universal click, Unifine Pentips, Unifine Pentips Plus		Green & white or blue & white	Plastic	Cartridge	No	Soft pouch
	*Autopen 24 3ml	1–21 units (green) 2–42 units (blue)	Sanofi 3ml ClikSTAR cartridges	BD Micro-Fine +, NovoFine, Penfine universal click, Unifine Pentips, Unifine Pentips Plus		Green or blue	Plastic	Cartridge	No	Soft pouch
Sanofi www.sanofi.co.uk 01483 505515	SoloSTAR	1–80 units	Lantus, Apidra, Insuman Comb 25, Insuman Basal	BD Micro-Fine +, Penfine universal click, Unifine Pentips, Unifine Pentips Plus		Lantus: grey; Apidra: purple; Insuman Comb 25: white & blue; Insuman Basal: white & green	Plastic	Prefilled	Yes	Soft case available from manufacturer
	ClikSTAR	1–80 units	Insuman, Lantus, Apidra	BD Micro-Fine +, Penfine universal click, Unifine Pentips, Unifine Pentips Plus		Blue or silver	Plastic	Cartridge	Yes	Black zip case

Code: 6436w

Information supplied and checked by the manufacturers. *The Autopen 24 continues to be available on prescription and direct from Owen Mumford Ltd but is no longer distributed by Sanofi-Aventis.

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All pens take 3ml (300 units) cartridges. All pens available on prescription, but not PenMate
BD Micro-Fine + Length: 4mm, 5mm, 8mm, 12.7mm. Gauge: 32G (4mm); 31G (5mm, 8mm); 29G (12.7mm)
NovoFine Length: 6mm, 8mm, 12mm. Gauge: 31G (6mm); 30G (8mm); 28G (12mm) **NovoFine Autocover** Length: 8mm. Gauge: 30G
Penfine universal click Length: 6mm, 8mm, 10mm, 12mm. Gauge: 31G (6mm, 8mm); 29G (10mm, 12mm)
Unifine Pentips Length: 5mm, 6mm, 8mm, 12mm. Gauge: 31G (5mm, 6mm, 8mm); 29G (12mm)
Unifine Pentips Plus Length: 5mm, 6mm, 8mm, 12mm. Gauge: 31G (5mm, 6mm, 8mm); 29G (12mm)

Appendix	Appendix 3

Plymouth Hospitals NHS
NHS Trust

HYPOGLYCAEMIA (HYPO) GUIDELINES FOR ADULTS WITH DIABETES

Treatment of a blood glucose less than 4 mmols/l

In the event of a Hypo treat IMMEDIATELY and give ONE of the following…..depending on the severity of the Hypo

MILD HYPO
PT IS CONSCIOUS, ORIENTATED AND ABLE TO SWALLOW
Give ONE 15-20g quick acting Carbohydrate:
5-7 DEXTROSE or 4-5 GLUCO TABLETS
1.5-2 tubes of GLUCOGEL or DEXTROGEL
25-35 mls of POLYCAL
4-5 heaped teaspoons of SUGAR dissolved in warm water

Recheck blood glucose after 10-15 mins
If blood glucose <4 REPEAT TREATMENT above up to 3 times. If ineffective fast bleep Dr and give 10% Dextrose at 150-200 mls/hr over 15 mins OR 1mg Glucagon IM (once only) not if NBM, hepatic failure, malnourished

MODERATE HYPO
PT IS CONFUSED, UNCOOPERATIVE OR AGGRESSIVE BUT CONSCIOUS AND ABLE TO SWALLOW
Give ONE 15-20g quick acting Carbohydrate:

1.5-2 tubes of GLUCOGEL or DEXTROGEL
25-35 mls of POLYCAL
4-5 heaped teaspoons of SUGAR dissolved in warm water

Recheck blood glucose as per MILD HYPO

SEVERE HYPO
PT IS CONFUSED, AGGRESSIVE, NBM, UNCONCIOUS OR FITTING

CHECK ABC
STOP ANY IV INSULIN INFUSION
FAST BLEEP DR 3333

Give 1 mg GLUCAGON IM (Once only)
(Not for pts NBM, hepatic failure or malnourished)
OR
10% Dextrose 150-200 mls/hr over 15 mins (If IV access)
Repeat blood glucose after 10-15 mins, if blood glucose <4 give further 10% Dextrose as above up to 3 times, if NBM consider 10% Dextrose infusion at 100mls/hr

WHEN THE HYPO HAS RESOLVED-BLOOD GLUCOSE >4 MMOLS/L
Give 20g LONG ACTING CARBOHDRATE (Not needed with an insulin pump) i.e. 2 biscuits OR 1 slice of bread OR a small glass of milk (200-300 mls) OR the next meal containing carbohydrates
If Glucagon IM given offer 40 g carbohydrate to replenish glucose stores
If on VRIII (IV insulin) prior to hypo, restart using the reduced rate and when blood glucose 4 or above
Promptly inform the Diabetes Team if any moderate/severe hypos occur. DO NOT OMIT INSULIN especially in Type 1 or long standing Type 2 diabetes and closely monitor blood glucose levels for up to 48hrs

ENTERAL FEEDS-IF BLOOD GLUCOSE <4 MMOLS/L
Give 150-200 mls fruit juice or 110-140 mls fresubin jucy (NOT fortisip) or 4-5 heaped teaspoons of sugar dissolved in 50 mls warm water via the NG tube. If able to swallow, consider oral hypo treatments as above. On resolution of a hypo restart feed and refer to Enteral Feeding full guidelines on the trust Intranet. If feed not restarted give 10% Dextrose at 100 mls/hr and refer to Dr/DSN for advice

SELF MANAGEMENT OF HYPOGLYCAEMIA
Other acceptable hypo treatments include;
150-200 mls of fruit juice / sugary fizzy drinks i.e Coke
200 mls of ORIGINAL Lucozade (not diet)
4 large Jelly babies
110-140 mls of Fresubin Jucy

INSULIN PUMPS
TREAT HYPOS AS ABOVE and consider removing insulin pump if hypo persists or if Pt is unable to self-manage insulin pump, then start a VRIII (insulin infusion) or a S/C insulin regime, with long/short acting insulin. See insulin pump full guidelines on the intranet and contact DSN URGENTLY

Diabetes Team, level 6, Derriford hospital
tel; 30170, bleep; 0989
Senior SPR/Cons; 85694

Authors; Donna Crowhurst, Diabetes Specialist Nurse, Department of Diabetes and Endocrine, Derriford hospital, version 3, update due may 2019

Plymouth Hospitals NHS
NHS Trust

Insulin Stress test

Eden unit

Consultant

INSULIN/HYPOGLYCAEMIA STRESS TEST:

To test the integrity of the hypothalamic-pituitary-adrenal axis for the assessment of Growth Hormone and ACTH/ Cortisol reserve. (This test may be performed simultaneously with the LHRH and TRH tests {Triple function test})

This test is potentially dangerous and must be undertaken with great care. Not to be performed on patients younger than 16yrs! A trained nurse must be in attendance at all times.

Date:
Welcome patient to unit and show to waiting area
Introduce to Endocrine Specialist Nurses
Orientate to ward layout/facilities
Confirm transport home-advise not to drive themselves
Organise transport if required
If patient has had pituitary surgery, ascertain whether patient has had perimetry with visual field analyser post operatively as per Pituitary Care Pathway.
If not, perform perimetry, photocopy results and file electronic copy in Endocrinology drive and hard copy in notes
Offer patient information. Pituitary Foundation Website and Support Group Information. Patient information sheet should have been sent to patient with admission offer

Ensure following instructions have been adhered to
Water only from midnight
Omit steroids on morning of test
The patient should not drive for at least 2 hours after the test. Confirm patient has arranged transport home. Organise transport if required
Review if any specific instructions were discussed at endocrine meeting: Refer to original referral letter for additional tests. Request any additional tests if required

Ensure patient has no history of
• **Ischaemic heart disease/MI**
• **Epilepsy/unexplained blackouts/CVE**
• **Ensure patient is not pregnant**
Explain procedure to patient ensuring patient is aware of potential side effects of hypoglycaemia. Obtain patient's verbal consent for procedure
Obtain patient's written consent for procedure
Patient allowed to drink water only during the test until symptomatic with a blood glucose of <2.5
Have anaphylaxis shock equipment /drugs ready in case of allergic response and hypoglycaemia recovery equipment prepared. Document allergies on prescription chart
Have patient's snack prepared
Record baseline observations
Temperature Pulse
Blood Pressure Weight
Cannulate with pink cannula
Record ECG
Junior Doctor Pager
Junior Doctor to clerk and take written consent, checking for contra indications such as: Ischaemic heart disease, MI on ECG, angina, CVE, pregnancy, epilepsy
Junior Doctor to sign ECG
If Junior Doctor agreeable to continue with test, to prescribe
50mls Glucose 25% IV
Hydrocortisone 100mg IV
Actrapid Insulin variable dose IV.
Prepare Glucose and Hydrocortisone (if hypoadrenal) and keep by bedside. Ensure expiry date is correct. 25mls of Glucose Intravenous Infusion 50% will require diluting with 25mls Sterile Water. This needs to be administered slowly if required, followed by an infusion of 5% Dextrose. (Refer to infusion guidelines.) Reconstitute Hydrocortisone with 2mls Sterile Water if required.
If patient requires Glucose or Hydrocortisone, continue to sample for test.
If a sensitive response is expected e.g. Addison's, underweight, hypopituitarism Administer 0.1iu/kg

If a normal response is expected, Administer 0.15 iu/kg
If resistance is expected e.g. Acromegaly, overweight, diabetic Administer 0.3 iu/kg. (If patient has treated acromegaly and is hypopit-administer 0.1iu/kg)
If this dose of Insulin does not achieve an adequate hypoglycaemia after 45 minutes, give the same dose again. (January 2007)
Preparation
5 SST (gold top) & 5 Fluoride Oxalate (grey top) vacutainers. Glucose Monitor equipment
After 30 min rest period, obtain blood samples from cannula:
1 gold top, 1 grey top and Blood Glucose recording
Ensure times are clearly recorded on Endocrine Investigation request form
Administer IV Insulin diluted to 1 ml with NaCl (local policy)
Time Insulin administered :
Observe for hypoglycaemic symptoms (sweating, tachycardia).
Test BG at 15 minutes post Insulin and repeat BG until hypoglycaemia reached.
Continue to sample blood at 30 min intervals following injection for 2 hours to measure Glucose, Growth Hormone and Cortisol, wasting 2mls of blood before each sample. Perform capillary BG blood tests with each sampling and record results on endocrinology form and care pathway.
Patients usually become hypoglycaemic (BM <2.5mls) approximately 15-45 mins following Insulin injection. Monitor closely, remaining by bedside whilst hypoglycaemic. Hypoglycaemia (BG 2.5) needs to be achieved: if not evident after 1 hour, more Insulin will need to be given in order to achieve this, (usually a second dose equivalent to the first dose given.) Discuss with Junior Doctor
Alternatively, repeat the test on another occasion using a higher dose of Insulin.
The test will begin again after second dose is given starting with 30 min sample.
Patient may be fed patient post hypoglycaemia.
If neuroglycopaenic i.e. unrousable, disorientated, give Glucose IV
Test can be continued with blood sampled via another route
Ensure all tubes are clearly labelled with times
Send to combined lab with Endocrine Request Form stating drugs taken and omitted
Remove cannula Signature
Offer a sandwich and remind patient to take any medication due, particularly if on steroid replacement.
Discharge patient

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