



**Guidelines for Insulin Initiation and
Adjustment in Primary Care in Patients
with Type 2 Diabetes:
for the Guidance of Diabetes Specialist
Nurses**

**NHS Greater Glasgow & Clyde
Managed Clinical Network for
Diabetes**

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1. INTRODUCTION

These guidelines were first produced in 2003 by a group of community diabetes specialist nurses to support insulin initiation in primary care.

This latest revision was carried out by community diabetes specialist nurses working on behalf of the Primary/Secondary Interface sub group of the Glasgow Diabetes Managed Clinical Network.

Peer review and ratification takes place every 2 years or sooner as new evidence becomes available.

- These guidelines are intended for use in primary care, however they have been written in consultation with local multidisciplinary colleagues from both Primary and Secondary Care. This version of the guidelines represents a consensus view based on evidence and best practice.^{5 & 6}
- These guidelines are not meant to be exhaustive, but are meant to be practical and an easy to use guide for the initiation and adjustment of insulin therapy in Type 2 diabetes.
- This can be read as a stand-alone guideline. However additional guidelines that may be developed in the future will dovetail with this document.
- These guidelines are designed to assist staff in meeting CSBS Standards for Diabetes.¹

2. GLYCAEMIC TARGETS IN TYPE 1 AND TYPE 2 DIABETES

Target HbA1c for intensive insulin therapy derived from the UKPDS and DCCT study is 53 mmol/mol or below in Type 1 and Type 2 patients. In elderly patients symptom control and freedom from hypoglycaemia are priorities; however it is unclear if the HbA1c data from the UKPDS study can be transferred to the elderly.^{3 & 4}

SIGN 116 states an HbA1c target of 53 mmol/mol for people living with type 2 diabetes is reasonable to reduce the risk of microvascular disease and macrovascular disease. A target of 48 mmol/mol may be appropriate at diagnosis. Targets should be set for individuals in order to balance benefits with harms, in particular hypoglycaemia and weight gain.¹³

The aim of drug and insulin therapy is to achieve the best possible glycaemic control without frequent or severe hypoglycaemia or hyperglycaemia.

Elderly patients should avoid hypoglycaemia and symptomatic hyperglycaemia and should aim for an HbA1c of below 69 mmol/mol bearing in mind co-morbidities, life expectancy and biological age.

The incidence of hypoglycaemia and/or hyperglycaemia should be monitored and documented, and the results discussed with the patient.

3. INITIATING INSULIN THERAPY IN PRIMARY CARE IN TYPE 2 DIABETES

The UKPDS ⁴ demonstrated that;

- Beta cell function declines with time.
- Good glycaemic control reduces the complications of diabetes.
- Optimum glycaemic control becomes more difficult with time and at least 1 in every 25 patients per year need to be transferred to insulin to achieve this.

The decision to start the Type 2 patient on insulin is usually precipitated by

- Worsening symptoms of hyperglycaemia.
- A persistently elevated HbA1c level despite maximal or near maximal doses of oral glucose lowering agents and / or GLP-1 receptor agonist.
- Intercurrent illness or patient commenced on steroid therapy.

It is essential to review the patient's diet and compliance with medication prior to making the decision to commence insulin (CSBS standard 2, 3, 4 & 8).¹

It is best practice that a registered dietician should undertake the dietary review.

Step 1

Discuss with the GP or a consultant diabetologist and agree on the appropriate glycaemic target and insulin for the individual patient.

Clarify continuing use or discontinuation of oral glucose lowering agents.

Involve the patient in the choice of how often he/she will administer insulin (CSBS standard 2).¹

Step 2

Ensure patient understands the broad principle of insulin treatment and is proficient at blood glucose monitoring (CSBS standard 3 & 4).¹

Identify patients who may be unable to blood monitor or self administer insulin and involve District Nurses to initially supervise practical skills or continue to visit long term.

Step 3

Ideally instruct the patient on the use of an insulin delivery device about a week prior to commencing insulin. It is important that they overcome their fears at an early stage as this may hamper further education (CSBS standard 3 & 4).¹

Step 4

Choose the appropriate regimen and calculate a 'safe' dose of insulin using the following **tables A - C**, for guidance. Ensure a relevant prescription is available (CSBS standard 2).¹

Step 5

If oral glucose lowering agents are to be discontinued instruct patients to take final dose the evening before starting insulin.¹

Step 6

Commence Insulin Management Plan/Patient Specific Directive (IMP/PSD) if patient is community nurse dependant, once they are established on their insulin regimen.

4. INSULIN TREATMENT OPTIONS FOR CONVERSION FROM DIET AND ORAL HYPOGLYCAEMIC AGENTS TO INSULIN

For detailed guidance on the insulin treatment options for conversion from diet and oral hypoglycaemic agents to insulin, please refer to the *NHS GGC Management of Diabetes Guideline 2012*⁸. This is available on StaffNet.

The direct link to the relevant chapter is:

<http://www.staffnet.ggc.scot.nhs.uk/Info%20Centre/PoliciesProcedures/GGCClinicalGuidelines/GGC%20Clinical%20Guidelines%20Electronic%20Resource%20Direct/Diabetes%20Guidelines%202012%20Insulin%20Therapy.pdf>

The link to the full guideline is:

<http://www.staffnet.ggc.scot.nhs.uk/Info%20Centre/PoliciesProcedures/GGCClinicalGuidelines/GGC%20Clinical%20Guidelines%20Electronic%20Resource%20Direct/Diabetes%20Guidelines%202012.pdf>

Human insulatard is recommended for use as a background insulin. There is no evidence for improved diabetes control with analogue insulins in patients with type 2 diabetes. Insulin Glargine or insulin Detemir should only be considered in patients with type 2 diabetes who are troubled with recurrent hypoglycaemia. Where patients require assistance with their insulin injections Insulin Glargine could be considered.

5. INITIATING INSULIN REGIMENS

Table A

5.1. Once Daily - Basal Regimen

A basal regimen involves the use of a Neutral Protamine Hagedorn (NPH) or analogue insulin. Use an intermediate acting insulin, which provides a low background level of insulin. This may be used to supplement the daytime oral glucose lowering agents.

Daily insulin requirements = 0.5 units / kg body weight approximately
e.g. $0.5 \times 72\text{kg} = 36$ units

Of which 50% will be basal requirement $36 \times 50\% = 18$ units

Take 60% of this daily dose for 'safety' $18 \times 60\% = 11$ units
Rounded up to 12 units for ease of administration

A safe starting dose would be e.g. 12 units of intermediate acting insulin, usually given at bedtime.

If a District Nurse is administering the insulin it is usually more convenient to give it in the morning.

For titration of insulin dose refer to Table 1

Table B

5.2. Twice Daily Regimen

For twice daily regimen the most frequently used option is a premixed fixed combination of short and intermediate acting insulin or a rapid acting insulin lispro or aspart mix¹¹.

A twice-daily basal insulin is an alternative choice and may be appropriate in the elderly where there is a concern regarding the risk of hypoglycaemia.

Daily insulin requirements = 0.5 units / kg body weight approximately

e.g. $0.5 \times 72\text{kg} = 36$ units

Take e.g. 60% 'for safety' $36 \text{ units} \times 60\% = 22$ units

Split the dose 50% : 50% before breakfast and evening meal. i.e. 11 units twice daily.
Rounded up to 12 units for ease of administration.

Generally the final insulin dose required will be nearer to 60% : 40% divide but this would become apparent when titrating insulin against Table 2 & 3

Table C

5.3. Basal Bolus Regimen

This is the most intensive regimen with three pre-prandial doses of short /rapid acting insulin and a bedtime dose of intermediate or long acting insulin. While this regimen offers no improvement in metabolic control compared to any other insulin regimen, this may be the most suitable regimen for people who do not have a stable daily routine as the time and dose of insulin can be varied according to when the meal is taken and its carbohydrate content.

Generally 30 - 50% of the total daily insulin requirements should be given as intermediate or long acting insulin at bedtime with the remaining insulin being given as short / rapid acting before breakfast, lunch and evening meal depending on the needs of the individual.

Daily Insulin requirements = 0.5 units / kg body weight approximately

e.g. $0.5 \times 72\text{kg} = 36$ units

Take e.g. 60% 'for safety' $36 \text{ units} \times 60\% = 22$ units

When commencing a basal bolus regimen where three pre-prandial doses of short/rapid acting insulin are to be taken prior to breakfast, lunch and evening meal and intermediate acting/ long acting analogue insulin at bedtime the total daily dose may be calculated as follows;

22 units as above. -50% of the total daily dose is basal = 11 units

e.g. 'rounding down' for ease of administration = 10 units

Daily bolus insulin dose therefore is $22 - 10$ (basal dose) = 12 units of short acting insulin.

This is divided into 3 for pre breakfast, lunch and evening meal = 4 units each meal.

10 units of intermediate/long acting analogue are given prior to bed.

The insulin can then be increased to the requirement of the individual using Table 6.

It is generally beneficial to commence the individual with Type 2 diabetes on a twice-daily insulin regimen initially until they feel comfortable with injections.

For titration of insulin dose refer to Table 4

6. INSULIN DOSE ADJUSTMENT

6.1. Once Daily – Basal Regimes

Table 1

Blood Testing Times	Blood Glucose <4mmol/l or Hypo	Blood Glucose 4 – 7 mmol/l	Blood Glucose 7.1 – 14 mmol/l	Blood Glucose ≥14.1mmol/l
Before Breakfast	Reduce insulin by 4 units	Optimal	Increase insulin by 2 units	Increase insulin by 4 units

Blood glucose monitoring should be carried out in accordance with GGC Blood Glucose Monitoring Guidelines recommended once daily if not experiencing hypoglycaemia.⁸

Refer to General Advice on Insulin Dose Adjustment, page 10.

6.2. Switching to insulin Glargine or Detemir for patients suffering from recurrent episodes of hypoglycaemia

The GGC Formulary (<http://www.ggcprescribing.org.uk/formulary/endocrine-system/drugs-used-diabetes/>) advises that insulin glargine or detemir are not for routine use in type 2 patients unless the patient is suffering from recurrent episodes of hypoglycaemia. These insulins should only be initiated following discussion with the consultant diabetologist or GP. Patients with more than one episode of severe hypoglycaemia (i.e. requiring third party assistance) will require specialist secondary care input.

Although current evidence suggests no dose change is required when converting from a once daily Neutral Protamine Hagedorn (NPH) regime, common custom and practice would be to reduce the insulin glargine / detemir dose by 20%. This is to ensure patient safety and maintain patient confidence in the new regime / therapy. Adjustment thereafter is to titrate the dose, if required, at no sooner than 3 day intervals to assess effect on blood glucose.

6.3. Twice Daily Basal Regimen – NPH or Detemir

Patients who do not achieve an agreed HbA1c target may be considered for an additional injection (morning & evening).⁸

Adjustment thereafter:

Table 2

Blood Testing Times	Blood Glucose <4mmol/l or Hypo	Blood Glucose 4 – 7 mmol/l	Blood Glucose 7.1 – 14 mmol/l	Blood Glucose ≥14.1mmol/l
Before Bed <u>and / or</u> Before Breakfast	Reduce evening meal insulin by 4 units	Optimal	Increase evening meal insulin by 2 units	Increase evening meal insulin by 4 units
Before Lunch <u>and / or</u> Before Evening Meal	Reduce morning insulin by 4 units	Optimal	Increase morning insulin by 2 units	Increase morning insulin by 4 units

Refer to General Advice on Insulin Dose Adjustment, page 10.

6.4. Pre-Mixed Insulin

Table 3

Blood Testing Times	Blood Glucose <4mmol/l or Hypo	Blood Glucose 4 – 7 mmol/l	Blood Glucose 7.1 – 14 mmol/l	Blood Glucose ≥14.1mmol/l
Before Bed <u>and / or</u> Before Breakfast	Reduce Evening meal insulin by 4 units	Optimal	Increase Evening meal insulin by 2 units	Increase Evening meal insulin by 4 units
Before Lunch <u>and / or</u> Before Evening Meal	Reduce morning insulin by 4 units	Optimal	Increase morning insulin by 2 units	Increase morning insulin by 4 units

Refer to General Advice on Insulin Dose Adjustment, page 10.

6.5. Basal Bolus Regimen

Table 4 (example of 4 injections daily adjustments)

Blood Testing Times	Blood Glucose <4mmol/l or Hypo	Blood Glucose 4 – 7 mmol/l	Blood Glucose 7.1 – 14 mmol/l	Blood Glucose ≥14.1mmol/l
Before Breakfast	Reduce bedtime intermediate insulin by 4 units	OPTIMAL	Increase bedtime intermediate insulin by 2 units	Increase bedtime intermediate insulin by 4 units
Before Lunch	Reduce morning short acting insulin by 2-4 units	OPTIMAL	Increase morning short acting insulin by 2 units	Increase morning short acting insulin by 4 units
Before Evening Meal	Reduce lunchtime short acting insulin by 2-4 units	OPTIMAL	Increase lunchtime short acting insulin by 2 units	Increase lunchtime short acting insulin by 4 units
Before Supper/ Bedtime	Reduce Evening meal short acting insulin by 2-4 units	OPTIMAL	Increase evening meal short acting insulin by 2 units	Increase Evening meal short acting insulin by 4 units

6.6. General Advice on Insulin Dose Adjustment

- Insulin may need adjusting for exercise, meal composition, patterns in blood sugar levels, during illness and weight loss or gain episodes.
- **Do NOT adjust dose on a SINGLE raised blood glucose.**
- Adjust according to the chart above and monitor for at least 72 hours to judge the effect before further adjustment
- In the event of hypoglycaemia review the insulin adjustment after 48 hours.
- Blood glucose target range should be set Individually for each patient.
- Dose adjustment is **individual** and needs to be monitored closely.
- Patients should be educated to adjust their own insulin
- Document change of insulin dose in the nursing notes.
- If problems persist in controlling the blood glucose level seek advice from the General Practitioner or link Diabetologist.

7. AVAILABLE INSULIN

Please refer to the most recent BNF for up to date list of preparations
Human and Analogue Insulin Preparation

Long-acting insulin analogues		Pack of 5
Insulin detemir (Levemir®) (Novo Nordisk)	3 ml cartridge (for NovoPen® 4 or NovoPen Echo® devices)	£42.00
Insulin glargine (Lantus®) (Sanofi-Aventis)	3 ml cartridge (for ClickSTAR® and Autopen 24®)	£41.50
Insulin degludec (Tresiba®) (Novo Nordisk)	3 ml cartridge (Penfill®, for NovoPen® 4 or NovoPen Echo® devices)	£72.00
Isophane insulins (intermediate-acting insulins)		
Insuman Basal® (Sanofi-Aventis)	3 ml cartridge (for Autopen 24® and ClickSTAR®)	£17.50
Humulin I® (Lilly)	3 ml cartridge (for Autopen Classic® and HumaPen®)	£19.08
Insulatard® (Novo Nordisk)	3 ml cartridge (Penfill®, for NovoPen® 4 or NovoPen Echo® devices)	£22.90
Soluble insulin (short-acting insulin)		
Actrapid® (Novo Nordisk)	10ml vial	1 vial - £7.48
Humulin S® (Lilly)	3ml cartridge (for Autopen Classic® and HumaPen®)	£19.08
Insuman Rapid® (Sanofi-Aventis)	3ml cartridge	£17.05
Rapid-acting analogues (short-acting insulin)		
Insulin aspart (Novorapid®) (Novo Nordisk)	3ml cartridge (Penfill®, for NovoPen® devices)	£28.31
Insulin glulisine (Apidra®) (Sanofi-Aventis)	3ml cartridge (for Autopen 24® and ClikSTAR)	£28.30
Insulin lispro (Humalog®) (Lilly)	3ml cartridge (for Autopen Classic® or Humapen® ranges)	£28.31
Biphasic isophane preparations		
Humulin M3® (Lilly)	3ml cartridge (for Autopen Classic® and HumaPen®)	£19.08
Insulin Comb 15®, 25® and 50® (Novo Nordisk)	3ml cartridge (for Autopen 24® and ClikSTAR®)	£17.50
Biphasic insulin aspart preparations		
Novomix 30® (Novo Nordisk)	3ml cartridge (Penfill® for Novopen® devices)	£28.79
Biphasic insulin lispro preparations		
Humalog Mix 25® and 50® (Lilly)	3ml cartridge (for Autopen Classic® or Humapen®)	£29.46

Animal Insulins **Please note:** Animal insulin is no longer used to initiate insulin therapy.

Animal insulin short acting		
Hypurin Bovine Neutral (Wockhardt)	3ml cartridge (for Autopen Classic®)	£41.58
Hypurin Porcine Neutral (Wockhardt)	3ml cartridge (for Autopen Classic®)	£37.80
Animal insulin intermediate acting		
Hypurin Bovine Isophane (Wockhardt)	3ml cartridge (for Autopen Classic®)	£41.58
Hypurine Porcine Isophane (Wockhardt)	3ml cartridge (for Autopen Classic®)	£37.80
Animal insulin premixed		
Hypurin Porcine 30/70 Mix (Wockhardt)	3ml cartridge (for Autopen Classic®)	£37.80
Animal insulin long acting		
Hypurin Bovine Lente (Wockhardt)	1 x 10ml vial	10ml vial £27.72
Hypurin Bovine Protamine Zinc Insulin (PZI)	1 x 10ml vial	10ml vial £27.72
All prices from MIMS June 2013		

8. CARE PRE AND POST INITIATION OF INSULIN THERAPY

Before insulin conversion, patients should be seen by a registered dietician for dietary education.

Patients starting insulin should be given contact numbers and details of the individual nurse initiating therapy, together with back up contact numbers, numbers for out of hours services (i.e. NHS 24) and staff names.

Patients starting insulin will be contacted/ reviewed by the nurse initiating therapy, or a colleague, within 24 hours of commencing insulin.

Generally insulin initiation in people with Type 2 diabetes is a planned procedure, therefore, **patients should not be started on insulin on a Friday unless absolutely essential.**

Education is a continuing process and should be given as and when necessary.

8.1. Education prior to commencing insulin should include the following and be documented in the patient's DSN notes:

- Proposed benefits and aims of treatment, including definition of good glucose control.
- Ensure proficiency in blood glucose monitoring. This may include the patient, family member or carer or district nurse.
- Pen device choice / suitability.
- Advice on recognition, treatment and causes of hypoglycaemia.
- Dietetic review.
- Implications for employment should be discussed (e.g. taxi drivers, emergency services employees, armed forces personnel, train drivers, airline pilots etc.)
- Advise patient they are legally required to inform the Driver and Vehicle Licensing Agency (DVLA) and insurance company. It is their responsibility to do so. Legal implications of not doing so should be emphasised.
- Drivers with a Group 2 entitlement license may continue to hold this as long as qualifying conditions are met. (see DVLA website: <http://www.dft.gov.uk/dvla//medical.aspx>)
- Contact numbers of appropriate healthcare professionals.

8.2. Education on initiating therapy should include the above points plus:

- Injection techniques, rotation of sites to prevent lipohypertrophy, times of insulin administration, storage of insulin, disposal of equipment and items available on prescription. Emphasise the need to invert, rock and roll the vial/pen device for cloudy insulin at least 20 times in order to mix the insulin completely.
- Sick day rules, illness at home and alternative fluid or diet measures. Awareness of the need to ketone test, if appropriate, and action to take if ketonuria present.
- Glucagon administration should be taught to carers/family where appropriate.
- Eating out and appropriate information for adjusting insulin times.
- ID cards.
- Cultural considerations e.g. Ramadan

8.3. Continuing Education

- **Refer to secondary care, all women requiring pre-conceptual and pregnancy advice**
- Cardiovascular risk education.
- Smoking.
- Exercise.
- Holidays and travel.
- Retinopathy screening and eye care.
- Information about annual review.
- Dental care
- Foot care.

8.4. Blood Glucose Monitoring

1. It would be reasonable for Type 2 patients to be carrying out blood glucose monitoring for at least 2 – 4 weeks prior to the initiation of insulin therapy.
2. Clearly this needs to take into account age, other illnesses, physical and mental dexterity etc. Although blood glucose monitoring gives a quantitative measurement that bears some relation to HbA1c, there is no evidence that it improves overall blood glucose control. However many patients welcome the opportunity to know more clearly what their blood glucose control is. Blood glucose monitoring can detect worsening trends in glycaemic control.

Guidelines For Insulin Adjustment In Primary Care.

3. The pattern of blood glucose monitoring in insulin treated patients depends on the individual patient and the insulin regimen they are using. The timing of blood glucose measurements depends on the insulin regimen. See NHSGGC Guidelines for The Self Monitoring of Blood Glucose (<http://www.staffnet.ggc.scot.nhs.uk/Info%20Centre/PoliciesProcedures/GGCClinicalGuidelines/GGC%20Clinical%20Guidelines%20Electronic%20Resource%20Direct/Diabetes%20Guidelines%202012%20Guidelines%20for%20the%20Self%20Monitoring%20of%20Blood%20Glucose.pdf>) for suggested times to monitor. Measurements of between 4.0 and 7.0 mmol/l pre-prandially and rarely above 8.5 mmol/l two hours post-prandially are reasonable⁹. Targets need to be individualised, taking into account age, co-morbidities and aims of insulin therapy.
4. Patients should be warned against making insulin adjustments on a daily basis and should be helped to understand that the HbA1c measurement is by far the most useful assessment of overall glycaemic control.
5. During the initiation of insulin therapy it is necessary for blood glucose measurements to be carried out more frequently to enable the Diabetes Specialist Nurse to suggest the necessary adjustments to insulin doses.
6. It is reasonable to suggest that during periods of illness the person with diabetes should carry out blood glucose monitoring more often.

INSULIN CONVERSION EDUCATION CHECKLIST

Patient Name _____ CHI _____

DIABETES	Date	Sign	Date	Sign	HYPOGLYCAEMIA	Date	Sign	Date	Sign
Discuss Transfer to insulin					What is a hypo				
Risk to health of poor control					Signs, symptoms and treatment of mild, moderate and severe hypo's				
Discuss HbA1c & Complications					Causes of hypo				
Contraception					Glucagon administration				
Blood monitoring					Driving and hypo's				
Seen by dietitian					ILLNESS / SICK DAY RULES				
Oral Agents Continue Y/N					Effects of illness on blood sugar				
INJECTIONS/INSULIN					Test blood sugar x 4 day				
Demonstration of insulin device					Insulin dose adjustment				
Injection technique					Who to contact for advice				
Injection sites					Never Stop Insulin				
Time of injections					Alternative Foods				
Safe disposal of needles					Miscellaneous				
Storage of insulin					Exercise				
Type & action of insulin					Missed meals				
Dose adjustment					Alcohol				
Discuss work pattern					Inform DVLA / Insurance				
ID cards given					Travel Advice				
DUK					Relevant Company Helpline				
Cultural considerations					Out of hours contact - NHS 24 - 08454 242424				
					REFER TO GP / PN				
					REFER TO DN				

9. HYPOGLYCAEMIA

9.1. Recognising Hypoglycaemia

Hypoglycaemia is defined as a blood glucose level of **less than 4 mmol/l**.⁸

Individuals with diabetes may experience hypoglycaemia due to the side effects of treatment with Insulin, Glitazones or Sulphonylureas.

Severe hypoglycaemia is defined as any episode requiring external assistance for recovery.¹⁴

The United Kingdom Prospective Diabetes Study (UKPDS)⁴ and the Diabetes Control and Complications Trial (DCCT)³ have conclusively shown that intensive glucose lowering therapy significantly reduces the risk of diabetes related complications.

However, intensive glucose-lowering therapy can also lead to an increased incidence of hypoglycaemia.

9.2. Symptoms

Autonomic	Neuroglycopenic	Others
Activating sympathetic or para-sympathetic nervous system	Caused by glucose deprivation to the brain	Non Specific
Sweating	Confusion	Weakness
Tremor/Shaking	Lack of Concentration	Dry Mouth
Palpitations	Drowsiness	Headaches
Hunger	Atypical behaviour	
	Inco-ordination	
	Speech Difficulty	
	Diplopia	

Hypoglycaemia unawareness increases with duration of diabetes.⁸

Severe hypoglycaemia may adversely affect quality of life in patients treated with insulin. Improvements in blood glucose control are associated with improvements in quality of life, providing there is no increase in hypoglycaemic symptoms.²

9.3. Prevention of Hypoglycaemia

The individual should be informed of the following:

- Blood glucose should be monitored where possible to confirm hypoglycaemia.
- If taking Sulphonylureas, Glitazones or Insulin, carry some form of glucose e.g. dextrose tablets, and a diabetes identification card at all times.
- The importance of eating regular meals.

- Observation and rotation of injections sites.
- Appropriate dosage adjustment and administration of insulin.
- Effects of any external temperature changes.
- Hypoglycaemia risk during and after exercising, including sex
- The risks involved if hypoglycaemic while driving or operating machinery.
- The significance of alcohol related hypoglycaemia.

9.4. Identifying the Cause of Hypoglycaemia

Most patients are more frightened of hypoglycaemia, than mild hyperglycaemia and nothing causes more loss of confidence than a severe hypoglycaemic episode after a doctor or nurse has suggested a change in tablet or insulin regimen.¹⁵

According to Clinical Standards Board for Scotland 2001 acute complications of diabetes can cause distress, disability and death. Therefore appropriate initial management of diabetic emergencies including severe hypoglycaemia can improve the outcome of the event (CSBS standard 3, 4, 8 & 10).¹

If there is an explanation for a severe hypoglycaemic episode(s), or for recurrent near hypoglycaemia then appropriate action can usually be taken. Protecting the patients from further severe hypoglycaemia takes precedence over achieving “good” glycaemic control in the short term. Patients who have sustained an episode of severe hypoglycaemia have an increased risk of a further episode of severe hypoglycaemia in the future. **Patients experiencing more than one episode of severe hypoglycaemia (i.e. requiring third party assistance) should be referred to secondary care.**⁸

The following points should be considered:

- Is the injection device working properly?
- Was insulin given at the appropriate time before meals?
- Are insulin dosages being missed and overcompensated for later?
- Is extra insulin being taken to reduce high blood glucose?
- Are tablets being missed and overcompensated for later?
- Are meals being missed?
- Are meals changing in quantity/quality without a planned change in insulin?
- Are hypoglycaemic events occurring at the weekend rather than weekdays?
- Was alcohol responsible?
- Was exercise/increased activity responsible?
- Was the hypoglycaemia related to pre or postmenstrual blood glucose changes?
- Have the injection sites been checked?
- Does the patient rotate injection sites?
- Does the patient have Lipohypertrophy/Lipoatrophy?
- Is the blood glucose monitoring machine working properly?
- Is blood glucose monitoring technique acceptable?
- Does the patient need a dietary review?
- Does hot weather, bath or showers pre injection affect control?
- Is this insulin regime suitable for this patient?
- Is this oral hypoglycaemic agent suitable for this patient?
- Has the patient recently started taking their tablets?

- If oral hypoglycaemic agents still being taken in conjunction with insulin ensure they are being taken at the appropriate time and dose.

9.5. Reduction in Awareness of Hypoglycaemia

Some people, especially with diabetes of long duration, may lose the early warning signs of falling blood glucose and thus be at greater risk of more severe hypoglycaemia.⁸ On average patients with reduced hypoglycaemia awareness are six times more likely to experience severe hypoglycaemia.

9.6. Hypoglycaemia Unawareness and Driving

If a patient has reduced warning symptoms of hypoglycaemia, they are a risk to themselves and other road users. In accordance with current driving regulations, patients experiencing hypoglycaemia unawareness should notify DVLA.¹⁰

9.7. Hypoglycaemia and Driving

For full information refer to DVLA website. <http://www.dft.gov.uk/dvla//medical.aspx>

Advise patients to avoid low blood sugars while driving by:

- Checking blood sugar levels before and during the car journey.
- Using a blood glucose meter with memory for holders of Group 2 license.
- Not driving if blood glucose <5.0 mmol/l.
- Not driving for more than 2 hours without checking blood glucose and eating a snack if necessary.
- Not missing, or delaying, a meal or snack.
- Always carrying some form of fast and long acting carbohydrate food, within reach, in the car.

If hypoglycaemia occurs while driving advise patient to:

- Stop driving as soon as it is safe to do so.
- Remove key from ignition and move into the passenger seat if safe to do so. This is not advisable if motorway driving.
- Check blood glucose if possible.
- Treat hypo with fast acting carbohydrate.
- Follow that up with a long acting carbohydrate.
- Check blood glucose every 15 minutes.
- Wait at least 45 minutes after blood glucose returns to normal, before driving again.¹⁰

Severe Hypoglycaemia means the assistance of another person is required. By law a Group 2 license holder must inform the DVLA if they experience one episode of severe hypoglycaemia while driving. A Group 1 license holder must inform the DVLA if they experience more than one episode of severe hypoglycaemia in the last 12 months.¹⁰

9.8. Hypoglycaemia and Alcohol

Individuals with diabetes should be made aware of hypoglycaemia risk following significant ingestion of alcohol. Alcohol inhibits the process of gluconeogenesis and blood glucose levels may fall dangerously low. Alcohol can impair hypoglycaemia awareness.

To reduce the risk of hypoglycaemia, give the following advice:

- Do not drink more than 3 units of alcohol (men) per day
Do not drink more than 2 units of alcohol (women) per day
- Ensure some form of long acting carbohydrate is taken along with alcohol
- Have a long acting carbohydrate snack before bed

9.9. Nocturnal Hypoglycaemia

Hypoglycaemia can happen during the night, while sleeping, just as it can during the day. How someone reacts to hypoglycaemia during sleep can vary from person to person. It may

- wake them from sleep
- cause vivid dreams
- cause sweating and confusion

Treat it as you would advise for any hypoglycaemic episode.

Others may sleep right through hypoglycaemia, waking in the morning with

- a headache
- a hangover sensation
- a high blood glucose.

This is a result of the body releasing stores of glucose as a response to hypoglycaemia. Family members may recognise symptoms, if person becomes restless, noisy or non-responsive. In these cases it is best to wake the person and get them to treat the hypoglycaemia.

9.10. Hypoglycaemia and Exercise

The acute effects of exercise on blood glucose are variable, with some people experiencing a rise in blood glucose (perhaps mediated by catecholamine excretion) while others note a fall in blood glucose, presumably due to increased utilisation of glucose as a metabolic fuel. Most people on insulin therapy are aware of the effects of their own usual exercise pattern and can take steps to avoid hypoglycaemia, either by increasing food ingestion before or during exercise, or reducing insulin doses prior to exercise.

Relevance of using appropriate injection sites prior to exercise should be discussed with the individual patient.

Significant exercise (sustained and/or vigorous) has an effect on the sensitivity of target tissues to the action of insulin, producing increased insulin sensitivity, which lasts for several hours after the exercise and may need to alter food ingestion or insulin dose post exercise as well as pre-exercise. As exercise is often taken during the early evening there is possibility of significant post-exercise hypoglycaemia occurring while in bed, a time when many subjects are at risk of severe hypoglycaemia.

9.11. Recommendations for Glucagon Administration (Adults)

For use only by registered first level Nurses.

Hypoglycaemia which causes unconsciousness is considered an acute medical emergency and must be dealt with promptly. Glucagon should be available for all Type 1 patients and for those patients who have been identified by their healthcare professional as requiring glucagon.

Glucagon (Glucagen Hypo Kit 1mg) should be kept at home for hypoglycaemic emergencies ideally stored in a fridge. Glucagon 1mg/1ml can be injected either subcutaneously or intramuscularly for acute **insulin** induced hypoglycaemia. It increases plasma glucose concentration by mobilising glycogen stored in the liver.¹ **Do not use in oral induced hypoglycaemia. Can be given only once.**

Situations where Glucagon should be administered

When a patient has a blood glucose level recorded at less than 4 mmol/L, including one or both below:

- The patient is displaying signs and symptoms of moderate to severe hypoglycaemia e.g. cold, clammy and confused and where encouraging oral intake of fast acting carbohydrate is considered unsafe.
- The patient cannot swallow, is uncooperative, unconscious, or is having convulsions.

Contraindications

- Pheochromocytoma
- Chronic alcohol abuse¹
- Where the person can safely swallow fast acting carbohydrate (e.g. 4-5 glucotabs, 90-120mls lucozade, 100-150mls cola or 1.5-2 tubes of Glucogel) followed by a long acting carbohydrate (e.g. slice of bread, 2 plain biscuits or next meal)²
- Oral hypoglycaemic agent-induced hypoglycaemia³

Side effects

Nausea, vomiting, diarrhoea, headache and hypokalaemia may occur following administration of Glucagon.¹

Action to be taken following Glucagon administration

- Glucagon can sometimes cause vomiting. Ensure the patient is alert and orientated before sitting them upright.
- Encourage patient to take fast acting carbohydrate. 20gm of carbohydrates should be given (e.g. 4-5 glucotabs, 90-120mls lucozade, 100-150mls cola or 1.5-2 tubes of Glucogel). This should be followed up with 40gm long acting carbohydrate (e.g. 2 slices of bread, 4 plain biscuits or next meal) as soon as they are able.
- Check blood glucose levels every 10-15 minutes until patient recovered. Record results in nursing notes/diary.
- Capillary blood glucose levels should be monitored regularly over the next 24-48 hours.
- Do not withhold insulin but dose may need to be adjusted. Contact GP or DSN for advice.
- Blood glucose levels are likely to be high following administration of glucagon. Do not give additional correction doses of insulin.
- Identify where possible reasons for 'hypo' (e.g. check injection sites, change in insulin regimen, meal patterns, alcohol and general health).
- Severe episodes of hypoglycaemia requiring Glucagon should be reported to GP/DSN for further advice and investigation.³
- Ensure patient has a repeat prescription for Glucagen Hypo Kit.
- Ensure adequate supplies of food are available.

An ambulance MUST be called for anyone experiencing severe hypoglycaemic symptoms NOT responding to use of Glucagon within 10-15 minutes. Place patient in recovery position and check ABC. Give nil by mouth.

N.B. Glucagon may take up to 15 minutes to work and may be ineffective in patients who are undernourished, have severe liver disease and in repeated hypoglycaemia. In these circumstances, it is imperative that an ambulance is called without delay.

References

1 British National Formula 63 (2012), BMJ group and the Royal Pharmaceutical Society of Great Britain. BMJ Group and Pharmaceutical Press, London

2 The Hospital Management of Hypoglycaemia in Adults with Diabetes Mellitus (2010) NHS Diabetes www.diabetes.nhs.uk

3 Management of Diabetes (2010) SIGN, Edinburgh

10. SICK DAY RULES

People with diabetes do not get any more illnesses than other people, but if they get ill their glycaemic control may be upset. This includes common illnesses such as flu, sore throats or stomach trouble. Blood glucose levels will return to normal once the patient has recovered.

What Should the Patient Do if They Are Ill?

Blood glucose levels may rise even if the patient is unable to eat and drink normally. It is therefore important that they are advised to never stop taking their insulin or diabetes tablets. Patient should be further advised to:-

- Test their blood glucose levels every 2-4 hours and act on the result as discussed with their diabetes nurse or doctor
- Try to drink 3 litres (4-6 pints) of sugar free liquid throughout the day
- If they don't feel like eating, they should replace their meals with carbohydrate containing drinks such as soup, milk or fruit juice with sugar free drinks in between
- If they are being sick and cannot keep anything down, they should take regular sips of sugary drinks such as lemonade
- Consult their diabetes nurse or doctor if
 - they have ketones in their urine
 - they are vomiting and unable to keep their tablets down
 - their blood glucose levels remain high or low
 - they don't improve quickly or are worried

Ketones

If the patient's blood glucose is more than 17 mmol/l twice in a row or if they are vomiting, they should test their urine for ketones if they are able (if instructed to do so by the DSN).

Ketones are acid substances produced when the body is short of insulin. Shortage of insulin means the body cannot get sugar into the cells and starts to burn fat stores to provide energy. This is called ketoacidosis and is dangerous if not treated quickly. The patient should contact their diabetes nurse or doctor.

Can They Adjust Their Insulin?

If they are on insulin and have discussed this with your diabetes nurse or doctor, you should follow their guidelines.

If you are not sure, you should contact your diabetes nurse or doctor.

Be Prepared

- Flu & Pneumovac vaccines are recommended for people with diabetes, ask at your GP surgery
- Keep basic medicines in the house such as painkillers and cough medicines
- Keep a supply of test strips and sugary drinks at home for emergencies

11. MISSED INJECTIONS

Following a clinical assessment

Actions:

- Check blood glucose
- Check ketones if appropriate

For once daily basal

- If within 6 hours of usual time give normal dose
- If 6-12 hours late give 50% of normal dose
- If > 12 hours late consider omitting dose and monitor blood glucose

For twice daily regimen

- If within 2 hours of usual time, consider reducing dose by approximately 10%
- If 2-4 hours late, consider reducing dose by approximately 25%
- If 4-6 hours late, consider reducing dose by approximately 50%
- If > 6 hours late, omit dose and monitor BG until next injection
- If overslept, follow above advice

For basal bolus regimen

a) Bolus

- If within 30 minutes of food and on a rapid acting insulin, give normal dose
- If between 30 minutes and 2 hours individual patient assessment required
- If more time has elapsed consider taking next short/rapid acting injection early followed by food.

b) Basal

- If within 6 hours of usual time give normal dose.
- If 6-12 hours late give 50% of normal dose.
- If > 12 hours late consider omitting dose and monitor blood glucose.

Reassure patient that they may take a couple of days to regain normal glucose control. Continue monitoring.

12. USEFUL CONTACTS

Full contact details and services including patient support groups, careline counsellor services, information services and booklets, should be given to the patient.

Contact details include:

Diabetes UK Scotland
Venlaw
349 Bath Street
Glasgow
G2 4AA
Telephone: 0141 245 6380 Careline Scotland: 0845 120 2960

Website: www.diabetes.org.uk
Email: scotland@diabetes.org.uk

Out of Hours Contact:- NHS 24 - 08454 242424

Websites

www.nhsggc.org.uk/myhsd

www.mydiabetesmyway.scot.nhs.uk

www.dft.gov.uk/dvla

www.runsweet.com (diabetes and sport)

<http://www.diabetes.co.uk/travel.html> (diabetes and travel)

Abbott Diabetes Care; www.abbottdiabetescare.co.uk
Patient helpline; 0500 467466 Health Care Professional helpline; 0800 032 1016

Apollo Mechanical Technologies Company
Super Check 2 – Talking Blood Glucose Meter
01636831201 www.supercheck2.co.uk

Bayer Diabetes Support; www.bayerdiabetes.co.uk
0845 600 6030

BD Medical – Diabetes Care; www.bd.com/uk/diabetes
01865 748844

CP Pharmaceuticals Ltd.; www.wockhardt.co.uk
Telephone 01978 661261

Diabetes UK; www.diabetes.org.uk
Careline Scotland 0845 120 2960 Glasgow Office 0141 245 6380

Eli Lilly; www.lilly.co.uk
The Lilly Portal for HCP; www.lillypro.co.uk
UK Headquarters 0125 631 5000

Guidelines For Insulin Adjustment In Primary Care

GlaxoSmithKline; www.gsk.com
0800 221441 UK Customer Contact Centre

Lifescan (One Touch); www.lifescan.co.uk
Customer Careline 0800 121200

Menarini Diagnostics; www.menarini.diag.co.uk
0118 944 4100

Medtronic; www.medtronic-diabetes.co.uk
01923 205167
24 Hour Technical Support 0192 320 5167

Novo Nordisk; www.novonordisk.co.uk
01293 613555
Patient Helpline 0845 600 5055

Pfizer Global Pharmaceuticals; www.pfizer.co.uk
0130 461 6161

Roche; www.rocheuk.com
0144 425 6000

Sanofi; www.sanofi.co.uk
01483 505515
Sanofi Diabetes Care Line 0800 035 2525
Medical 0845 606 6887

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 - ² Scottish Intercollegiate Guidelines Network (SIGN 55) (2001). *Management of Diabetes: a national clinical guideline*. Edinburgh <http://www.sign.ac.uk/pdf/sign55.pdf>
 - ³ *The Diabetes and Control and Complications Trial research Group(1993)*. New England J. Med. 329(14); 977-986.
 - ⁴ Stratton IM, et al. (2000) United Kingdom Prospective Diabetes Survey (UKPDS) 35. *BMJ* 321; 405-412.
 - ⁵ Norfolk Integrated Diabetes Management Group (NIDM). 2002 Diabetes Management Guidelines for Primary Care in Central Norfolk.
 - ⁶ Donard Commissioning Group (2002) Guidelines for the Care of Patients with Diabetes in the Donard Commissioning Group Area.
 - ⁷ Barnett T. *Future Prescriber* (2002)
 - ⁸ NHSGGC Management of Diabetes Guidelines(2012)
<http://library.nhs.org.uk/mediaAssets/My%20HSD/Diabetes%20Guidelines-2012.pdf>
 - ⁹ National Institute of Clinical Excellence Clinical Guideline 87. May 2009. Type 2 Diabetes. The management of type 2 diabetes. London. <http://guidance.nice.org.uk/CG87>
 - ¹⁰ Driver and Vehicle Licensing Agency. For Medical Practitioners. May 2012. At a glance Guide to the current Medical Standards of Fitness to Drive. Swansea.
<http://www.dft.gov.uk/dvla/medical/ataglance.aspx>
 - ¹¹ Heller S R (2001) 2 Insulin treatment in type 2 diabetes: P 18 Medical Education Partnership 2001. As reported in *Insulin Made Easy* edited by A H Barnett
 - ¹² Wallace T M, Mathews D R(2001) 4 *Intensive management of glycaemia*. P 41-42 Medical Education Partnership. As reported in *Insulin Made Easy* edited by A H Barnett.
 - ¹³ Scottish Intercollegiate Guidelines Network (SIGN 116) (2010). *Management of diabetes: a national clinical guideline*. Edinburgh <http://www.sign.ac.uk/pdf/sign116.pdf>
 - ¹⁴ McAuley V., Deary I. J., Frier, B. M. (2001) Symptoms of hypoglycaemia in people with diabetes. *Diabetic Medicine*, 18, 690-705.
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