

**GUIDELINES FOR
INPATIENT
MANAGEMENT OF
DIABETES MELLITUS**

**WOLVERHAMPTON
DIABETES OUTREACH TEAM**

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INTRODUCTION

This book is intended to be used as a guide in the management of hospital inpatients with diabetes. The book should be used in conjunction with other agreed trust diabetes protocols and guidelines produced by Wolverhampton Diabetes service, e.g. pre-surgical management, management of acute myocardial infarction, management of DKA/HONKH

It is the aim of the Diabetes Team that this book will help you to deliver the highest, most effective care to your patients with diabetes, whilst supporting the self- management of their own condition. With the increasing prevalence of diabetes, more and more inpatients are now likely to be affected by the condition. To this end, these guidelines are an attempt to ensure consistent quality of care throughout Royal Wolverhampton Hospitals NHS Trust.

It must be remembered, however, that guidelines are advisory and not intended as rules and regulations for all diabetic patients. Care should always be tailored to the individual needs of your patients.

The contents of this book should assist you with the everyday considerations for hospital care of patients with diabetes. Should further assistance be necessary, or advice on care of inpatients, the Diabetes Outreach Team will be happy to assist you with your enquiries. They can be contacted on Ext: 8200/5649 or bleeps 7461, 7639, 1129 Monday to Friday, 09:00 to 17:00.

For more detailed information on diabetes management visit the website:

<http://www.wdconline.org.uk>

Diabetes Outreach Team

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Diabetes Outreach Team Objectives.

To ensure high quality of diabetes care is available to all patients admitted to the trust in accordance with the National Service Framework for Diabetes.

The team will visit the EAU and ESS daily, and with the help of various IT systems and ward nurse information will actively search out all patients with diabetes. The medical wards and 'high risk' (renal, vascular, cardiology) areas will also be searched daily for patients with diabetes regardless of diabetes type or treatment modality. All other areas of the trust, or those patients admitted out of hours and therefore missed by the daily ward 'sweeps' should be referred to the team using the referral form below.

Admission:

- To be seen by the Outreach Team within 24 hours (Mon to Fri).
- To be triaged by the Outreach Team during first assessment.
- Expected discharge date set and agreed with the patient.
- Management plan set for inpatient duration.
- During management plan, the following is to be checked and documented:
Retinal screening/foot care/renal function/CV risks/HbA1c

During Admission:

- To improve patients' own diabetes management by ensuring they receive the education they require.
- Management plan to be reviewed and updated as necessary during inpatient stay.
- Ward team to be responsible for following the admission plan.

Discharge:

- A follow-up plan to be laid down prior to discharge.
- GP's to be made aware of the admission/ treatment/ discharge/ follow-up plan.
- Expected discharge date from admission to be met and documented when extended due to diabetes related problems.

Diabetes Outreach Team Referral Form.
Please fax to ext 8200.

Please ensure referrals are made as soon as possible.

Date: _____	Patient Label
Ward: _____	
Need Interpreter: Y/N	
Language: _____	

Admission Date: _____

Expected Discharge Date: _____

Patient with a new diagnosis of diabetes (i.e. random glucose >11mmols, Fasting glucose <7mmols.	
Known diabetic with erratic control or blood glucose frequently >10mmols.	
Patient with frequent hypoglycaemia <4mmols.	
Patient suspected of being in ketosis DKA or HONK.	
Patient has had a change in treatment (i.e. tablets to insulin). Please state:	
Patient who requires education about diabetes (note diet advice is provided by the dietician).	
Pre-op patient requiring review prior to surgery, please state date of planned admission, ward and procedure:	
Patient whose ability to self-care has changed.	
Patient who requires diabetes follow-up.	

Is patient ready for discharge after review : Y/N

Any other information:

Team bleeps: 7639, 7461, 1129.

CLASSIFICATION AND SYMPTOMS

Type 1 diabetes mellitus

Previously known as insulin dependent diabetes mellitus or juvenile onset DM

- Usually occurs at young age (< 35 yrs) but can occur at age
- Significant weight loss over a short period of time
- Non – fasting ketonuria usually found
- Usually of normal / low body weight
- Excessive thirst
- Excessive urine output
- Blurred vision
- Hyperglycaemia

Type 2 diabetes mellitus

Previously known as non-insulin dependent diabetes mellitus or mature onset DM

- Usually occurs at > 40 yrs
- Most common type of diabetes (85%)
- Usually obese, but not always
- Lethargy
- Tendency for repeat infections eg. UTI, thrush.
- Blurred vision
- Hyperglycaemia

Other types

- Gestational diabetes mellitus
- Diabetes associated with genetic syndromes e.g. cystic fibrosis
- Diabetes due to drugs and chemicals e.g. steroid induced

DIAGNOSIS

A definitive diagnosis of diabetes mellitus can be made if clinical symptoms are present (e.g. polyuria, polydipsia etc.) PLUS:

- laboratory fasting venous plasma glucose of > 7.0 mmol/l OR
- laboratory random venous plasma glucose of > 11.1 mmol/l

If clinical symptoms are not present, then it is advisable to have two separate tests to confirm diagnosis.

Diabetes mellitus can also be confirmed by an oral glucose tolerance test (OGTT). This is performed by testing fasting venous plasma glucose, and again 2 hours after a 75gm glucose load.

Results of this test indicate as follows:

- Fasting > 7.0 mmol/l and 2 hr post OGTT > 11.1 mmol/l = **Diabetes Mellitus**
- Fasting > 6.1 mmol/l and < 7.0 mmol/l = **Impaired Fasting Glucose**
- 2 hr post OGTT > 7.8 mmol/l and < 11.1 mmol/l = **Impaired Glucose Tolerance**

Patients with both impaired glucose tolerance and fasting glucose are at higher risks for developing future diabetes and cardiovascular disease. Such patients should have annual fasting glucose checked and cardiovascular risk factors treated aggressively.

DIABETES AND DIET

All people who have diabetes are encouraged to follow a healthy eating plan. Weight control is also important. A good diet is fundamental to good control of diabetes. Some patients with long-standing diabetes may still use the carbohydrate 'portion' diet. If this method works well for them, do not discourage. Alternatively, current advice to patients with diabetes is to:

- Eat regular meals
- Cut out sugary foods
- Reduce fat intake
- Increase fibre intake
- Include carbohydrate foods at each mealtime
- Eat plenty of fruit and vegetables (aim 5 portions per day)
- Reduce salt intake
- Drink alcohol only in moderation
- Keep weight under control

Bedtime snack

All people on insulin or sulphonylurea tablets should have a bedtime snack in order to prevent nocturnal hypoglycaemia. If the patient has their own supply of plain biscuits, this will suffice. If not, sandwiches can be ordered from the main kitchen.

Illness or poor appetite

If the patient is unable to eat a meal, offer a lighter alternative e.g. soup and bread. If the patient cannot (or will not) eat a meal, offer a Meal alternative i.e. Build-up fortijuice/sip etc. A food chart should also be kept for all patients with poor appetite. Help of the ward dietitian should be sought.

If even fluids are not tolerated then those on sulphonylurea or insulin treatment should be treated with intravenous insulin until they are ready to eat and drink again. Usual treatment should be resumed as soon as possible.

All food supplements, although needed nutritionally, may cause blood sugar levels to rise. In view of this, any patient with diabetes requiring a food supplement should have their blood sugar levels monitored pre-meal and nocte, as medication may need to be adjusted accordingly.

Acceptable foods that may be brought in by patients or relatives

Drinks

- Diet drinks, e.g. Diet Coke, Diet Lemonade, Diet Lilt etc, or any drink that is labelled 'No added sugar', 'Low calorie' or 'Diet' is suitable.
- Pure fruit juice in large quantities is not suitable, as it is very high in natural sugar. One small glass per day, only, is recommended.

Fruit

- All types of fruit are suitable, although grapes should be restricted to approx 10 – 12 per day.
- All fruit has natural sugar and will cause high blood glucose if taken in excess.

Biscuits

- Plain biscuits, such as Rich Tea, Digestives, and Garibaldi etc are recommended.
- Too many biscuits will raise blood glucose and cause weight gain, so should be restricted to only 3 or 4 biscuits per day.

Cakes

- Plain cakes such as scones, teacakes, and oat cakes are suitable
- Again, too many will cause high blood glucose and weight gain, so only 1 small cake per day should be recommended.

Referrals

For patients with poor appetites or on feeds, refer to your ward dietitian or the Dietetic Dept in the usual way.

TREATMENT TYPE 1

All newly diagnosed Type 1 patients should be immediately referred to the Diabetes Outreach Team for new diagnosis assessment, treatment plan and counselling

- Insulin is the only current therapy for Type 1
- For details of types of insulin please see page 15
- Patient should self inject from the outset under supervision from ward staff (see clinical practice GNCP D2)

Education prior to release from hospital must include:

- Importance of lifestyle changes, e.g. diet and smoking cessation
- Insulin administration
- Management of hypos and 'sick day rules'
- Blood sugar monitoring
- Testing for ketones
- Legal aspect with regard to driving.

Follow-on care should be arranged within a few days of discharge via the Diabetes Outreach Team

TREATMENT TYPE 2

Diet and exercise underpins any medication regimen for patients with Type 2 diabetes. All newly diagnosed patients should be referred to the Diabetes Dietitian and Diabetes Outreach team for advice on appropriate diet and lifestyle changes.

Oral medications should be considered in Type 2 patients with inadequate control after at most 3 months of appropriate diet and lifestyle adjustments. This should be started sooner in symptomatic patients, or those with concurrent illness which is likely to be the case with inpatients.

NB. Oral hypoglycaemic agents are not suitable in pregnant patients or those planning pregnancy.

Metformin

- Particularly suitable for overweight Type 2 patients.
- Not suitable in acute hyperglycaemia i.e. BG persistently >20 mmol/l

- Standard dose 500mg tds (titrated to tolerance over a 3 week period starting with 500mg od with main meal)
- Gastrointestinal side effects common – reduced by starting at low dose and increasing slowly, as above.
- Should not be used in renal impairment (creatinine > 150), liver impairment or severe CCF/COPD, as there is a risk of developing lactic acidosis
- Can be used in conjunction with a sulphonylurea

Sulphonylurea

Suitable as starting or add agent on for patients with Type 2 diabetes

Recommended drugs are:

- Gliclazide (start dose 40-80mg od - maximum dose of 160mgs bd)
- Glipizide
- Glimepiride (start dose 1mg od - max dose 6mg od)
- Tolbutamide- short acting particularly useful with those prone to hypoglycaemia and those with mild to moderate renal impairment. (start dose 500mg od max dose 500mg tds)
- Can be used in conjunction with Metformin
- Patients taking sulphonylurea should be warned and educated about the risk of hypoglycaemia. They should also be advised to check own blood glucose.

Thiazolidinediones

These drugs work by improving sensitivity. The long term safety and efficacy remains to be determined. The following two drugs are licensed in this country:

- Rosiglitazone
- Pioglitazone

Both are licensed to be used as monotherapy or in conjunction with either Metformin or a sulphonylurea. Both drugs can cause weight gain.

Meglitinides

- These are insulin stimulants with fast onset of action.
- Usually taken with meals and have a short duration of action.
- Used mainly when post –meal hyperglycaemia is a predominant problem and where patients’ lifestyle make meal times unpredictable
- Repaglinide or
- Nateglinide (Starlix)
- Patients taking metaglinides should be warned and educated about the risk of hypoglycaemia. They should also be advised to check own blood glucose.

- Both can be used in conjunction with Metformin

Acarbose

- Works by delaying carbohydrate absorption in the gut
- GI side effects are common and limit its use
- Can be used in combination with Metformin and/or a sulphonylurea

WHEN SHOULD INSULIN BE USED IN TYPE 2 PATIENTS?

Insulin treatment should be considered in the following:

- Suboptimal glycaemic control despite adequate diet and combined maximum oral hypoglycaemic agents
- Suboptimal glycaemic control and inability to tolerate oral hypoglycaemic agents
- Significant renal/hepatic impairment (creatinine >150 micromols/l)
- After acute myocardial infarction
- Special circumstances such as pregnancy, coexisting treatment with high dose corticosteroids, or significant infection.

If patients are likely to be discharged home on newly instigated insulin therapy, please refer to the Diabetes Outreach Team. Patients will then be taught how to administer their own insulin and other aspects of diabetes management. Follow-up arrangements will also be made by the Diabetes Team.

(See GNCP D2 & GNCP D3)

INSULIN REGIMENS

Twice daily regimen e.g. Novomix 30, Humalog Mix 25, Mixtard 30

- This regimen is suited to people who have a regular lifestyle and are able to well control their blood sugars over a 12hr period

- Usually a pre-mixed insulin given at breakfast and evening meal times

Four times daily (basal bolus insulin) e.g. Novorapid + Glargine

- This regimen is suited to people who would benefit from dividing their daily diabetes management into short segments of time, e.g. people who have a busy or irregular lifestyle, or patients who have erratic glucose control over a 24hr period.
- Usually comprises of a short acting insulin with each meal and a medium / long acting insulin at bedtime

Most people now use insulin via a pen injector device, although some prefer to still give via a syringe. Individual preference should always be respected.

Human insulin is available in vials for syringe use, and 3ml cartridges which fit into pen injector devices. Some varieties of insulin are available in pre-filled, disposable pens which can make administration of insulin easier for some people.

Mixtard 30 and Insulatard are also available in an Innolet device. This has an enlarged clock face design, making it easier for the visually impaired or frail elderly to use independently.

Please contact the Diabetes Outreach Team for further information on pen devices.

TYPES OF INSULIN

Short acting (approx 4 – 6 hrs duration)

The following insulin's should be given 20 – 30 mins before meals

- Actrapid
- Humulin S

The following are insulin analogues and have an immediate effect once given. They should, therefore, be given at the same time as a meal is taken.

- Novorapid
- Humalog Lispro

Medium acting insulin's (approx 12 – 14 hrs duration)

- Insulatard
- Humulin I

Long acting insulin (24hr peakless profile)

Usually given at bedtime

- Insulin Glargine / Lantus
- Detemir / Levemir (may need to be given in divided doses)

Pre-mixed insulin's (short and medium acting with a cumulative duration of 12 – 14hrs)

Should be taken 20 – 30 mins before food

- Insuman Comb 15, 25 and 50
- Humulin M3 (30% short acting etc.)

Pre-mixed analogues. The following have an immediate effect, so should be given at the same time as food.

- Novomix 30 (30% short acting, 70% medium)
- Humalog Mix 25 (25% short acting, 75% medium)
- Humalog Mix 50 (50% short acting etc)

Modern insulin's are now defined as human insulin, although manufactured synthetically. However, some patients with long-standing diabetes may still be using animal insulin e.g.

- bovine neutral or
- porcine neutral.

If the patient is not experiencing any problems with animal insulin and does not wish to change, it is acceptable to continue with this therapy. Supplies of animal insulin are still available from hospital and commercial pharmacies.

INTRAVENOUS INSULIN

(SLIDING SCALE) See diabetes IV insulin chart

When to use:

- Peri-operatively
- Periods of acute illness, i.e. Septicaemia
- Periods of acute, severe glycaemic imbalance

Blood sugar readings must be monitored and charted 1 hourly if unstable or 2 hourly if stable. You must not extend this period.

How to use:

- Short acting insulin i.e Actrapid should always be used as per prescription chart

- IV insulin should be delivered via a syringe driver
- Insulin should be administered in conjunction with IV fluids, as per prescription chart
- IV cannula should not be used for any other medications, i.e. antibiotics
- Syringe driver should **not** be temporarily disconnected, i.e. whilst patient bathing etc.
- In periods of prolonged use (>24hrs), electrolytes should be checked daily for sodium and potassium abnormalities
- Before discontinuing intravenous insulin, give first dose of patient's usual insulin at the next appropriate mealtime, and then discontinue sliding scale 1 hour later.
- Long acting analogs (Lantus or Levemir) should be continued throughout treatment with IV insulin.
- Consider titrating subsequent insulin doses to take into account the amount of IV insulin required over last 24hrs.
- BG readings and insulin infusion rate should be recorded on the Intravenous Prescription/Monitoring chart.

DIABETES AND SURGERY (SEE TRUST GUIDELINES)

Potential problems

- Surgical stress may cause a rise in blood sugars
- This may result in dangerous hyperglycaemia or ketosis in patients with unstable blood sugars, particularly in those with Type 1 diabetes.
- Hypoglycaemia, through pre-operative fasting, is another major risk of surgery in diabetic patients
- Expect erratic blood sugars in the post-operative period, even in those normally well controlled.

Preventative action

- Liaise with anaesthetist

- Ensure satisfactory pre-operative control
- Operate in the morning first on list, if possible
- Omit breakfast, and insulin or oral hypoglycaemic drugs, on morning of surgery
- Well controlled, non- insulin treated Type 2 patients undergoing minor surgery require observation only.
- Monitor blood glucose 1-2 hourly in the peri-operative period for these patients
- Recommence diabetic tablets with the next meal
- All insulin treated patients and tablet-controlled Type 2s undergoing major surgery should have a insulin IV infusion to maintain metabolic control (**see trust protocol**)
- Continue IV insulin regime until patient eats, then revert to usual treatment
- If IV insulin use is prolonged (over 24hrs) check U/Es daily for possible sodium or potassium abnormalities.

UNSTABLE BLOOD SUGARS.

Normal blood sugar values are considered to be within the ranges of 4 – 7 mmol/l pre-meal, and 6 – 11 mmol /l post-meal. These are the target values most people with diabetes can be expected to aim for. Those who experience hypos without any warning should aim for slightly higher levels, as would patients who have a history of cerebral vascular events or other risk.

Even the most well controlled patients can experience problems with their diabetes when admitted to hospital. Diabetes medication is tailored to the patient's usual lifestyle pattern and this is obviously disrupted upon admission to hospital. Admission usually involves illness, surgery, stress, change of diet or reduced activity levels, and can all contribute to unstable blood sugars.

A referral should be made to the Diabetes Outreach Team if it is evident that the patient has been living with unstable blood sugars prior to admission, so that further advice on self-management can be given.

Patients with diabetes often have too low (**hypoglycaemia**) or too high (**hyperglycaemia**) blood sugars whilst in hospital. There are many reasons for this, which may be overcome. The following pages should assist in determining the causes for blood sugar deviations.

HYPOGLYCAEMIA

Classed as a blood sugar reading below 4.0 mmols/l.

Signs and symptoms.

Symptoms can vary, but include:

- Sweating
- Shaking
- Drowsiness
- Blurred vision
- Tingling around the mouth
- Vagueness
- Mood changes.

If you are unsure, do a blood sugar test. Confirm with laboratory sample.

NB. Some people do not have warning signs of hypos. For these patients, a slightly more relaxed glycaemic control should be considered e.g. range of 7 – 9 mmols/l pre-meal. The same should be observed for those who have had a cerebral vascular event.

Causes

It is important to consider the cause of low blood sugar in order to rectify the problem.

Possible causes can include:

- Late meals (e.g. an analogue insulin should be taken with food)
- Insufficient carbohydrate content within a meal, or no bedtime snack.
- Insulin dose too high
- Lipodystrophy (areas of hard, lumpy subcutaneous tissue caused by overuse of injection sites – prevents correct insulin absorption)
- Inappropriate dose of oral hypoglycemic medication.
- Increased exercise/activity without having extra carbohydrate snack
- Alcohol

NB. Patients using insulin require a bedtime snack; this can include sandwiches, cereal or plain biscuits.

Treatment

- If the patient is able to swallow, offer 100-110 mls Lucozade, or 3 -5 glucose tablets
- If the patient is unconscious or unable to swallow contact doctor to administer IV glucose (must be prescribed)

- If unable to gain venous access administer IM/SC Glucagon (must be prescribed)
- Ensure that a carbohydrate snack is taken when the patient is alert, to maintain the blood sugar level. Offer sandwiches, toast or a bowl of cereal if a meal is not readily available.
- Continue to check the patient's blood sugars every half hour until they have stabilized.
- Expect slightly higher blood sugars that day as a result of extra carbohydrate and glucose taken.
- Consider possible causes of the hypo event and address the problem.

NB. Discretion should be given to individual patient circumstances e.g. if pre-meal blood sugar is only slightly below normal range and patient is asymptomatic and about to eat, oral glucose may not be necessary – check with patient.

If hypos are a regular occurrence for the patient, with no obvious cause, please refer to Diabetes Outreach Team

DO NOT OMIT INSULIN – Treat the hypo and then give insulin. Omitting insulin will result in high blood sugars and potential ketoacidosis in Type 1 patients.

CONSIDER DOSE REDUCTION, NOT CESSATION!

HYPERGLYCEMIA

Hospital admissions or illness can often result in a temporary elevation of blood sugars.

Constant blood sugar readings of over 10 mmols/l can be considered too high, and will delay recovery.

Possible causes.

- Inappropriate diet or changes in diet
- Overuse of injection sites causing Lipodystrophy
- Reduced exercise and mobility
- Infections/infarction/trauma
- Steroid medication

Carefully consider the causes - your patient may require a temporary increase or adjustment in their diabetes medication.

DIABETIC KETOACIDOSIS (DKA) SEE TRUST PROTOCOL

- DKA is a serious condition with a mortality rate of 5 – 10% in Western countries
- It is particularly dangerous to children and the elderly
- Diabetic ketoacidosis is a state of severe, uncontrolled diabetes due to insulin deficiency.
- It is characterized by high blood glucose levels, the presence of ketones and acidosis.
- Usually associated with Type 1 diabetes.
- It requires immediate treatment by intravenous insulin and fluids

Common precipitating causes are:

- Infection
- Wrong doses of insulin taken
- Failing to increase insulin dosage during illness
- Newly presenting Type 1 Diabetes Mellitus
- No obvious cause with some patients

Symptoms include:

Polyuria
Thirst
Weight loss
Weakness
Nausea / vomiting
Drowsiness and coma
Abdominal pain

Clinical signs include:

Dehydration
Hypotension
Tachycardia
Hyperventilation (Kussmauls)
Hypothermia

Treatment should include:

IV insulin	IV fluids	U/Es	Blood gasses
Full blood count	ECG	CXR	Blood/Urine/Sputum for culture

Urine should be tested for ketones every 6 hrs until clear.

Any patient admitted with Diabetic Ketoacidosis should be referred to the Diabetes Outreach Team at the earliest opportunity.

HYPEROSMOLAR NON-KETOTIC COMA (HONK)

- Characterized by marked hyperglycaemia (usually > 50 mmols/l) and dehydration (calculated osmolality $2 \times \text{Na} + 2 \times \text{K} + \text{glucose} + \text{urea} > 320$)
- No significant ketosis or acidosis
- Usually occurs in patients with Type 2 diabetes
- Usually middle-aged or elderly patients
- Often undiagnosed diabetes.

Precipitating causes:

- Infection
- Diuretic treatment
- Dehydration
- Undiagnosed Type 2 diabetes

Treatment:

IV fluids, IV insulin infusion, Potassium replacement as per regimen for Ketoacidosis

After recovery, patients should be treated with subcutaneous insulin for a few months. Treatment can then be reviewed as oral hypoglycaemic agents or diet therapy alone may be all that is required, once recovery is complete. Patients should be referred to the Diabetes Outreach Team for instruction on self-management of diabetes and insulin.

BLOOD SUGAR TESTING.

Patients with diabetes

All patients with diabetes should have their blood sugar tested and documented on admission. Thereafter, the following is recommended:

- Type 2 patients on diet or tablets only, who are well controlled (between 4 – 7 mmols/l) should be tested once or twice a day at random times, pre-meal or nocte.
- Type 2 patients on diet or tablets who are poorly managed require four times a day testing, pre-meals and nocte.
- Patients on insulin who are well controlled (between 4 – 7 mmols/l) require twice a day testing at random times, pre-meal or nocte.

- Patients on insulin with poorly managed blood sugars (constantly above 11 or below 4 mmols/l) require at least four times a day blood tests. Test pre-meal and nocte, and during the night if nocturnal hypoglycemia is suspected.

NB. Testing blood sugars any more frequently than pre-meal and nocte is usually unnecessary in patients who are eating and drinking. Results of 4 or 6 hourly testing in such patients can be misleading, as the timing often occurs immediately after food has been taken. If 4 or 6 hourly testing is deemed necessary because of erratic blood sugar control, consider intravenous insulin until control is stabilized.

Intravenous insulin.

Patients receiving insulin by this route require close observation to maintain their safety. **All patients must have blood sugars recorded at least every two hours.**

HOW TO TAKE A BLOOD SUGAR.

Remember that testing of blood sugar levels is only effective if performed correctly, and if the results are acted upon!

- Refer to clinical practice GNCP 22 Blood glucose monitoring.
- Always wash your patient's hands (and your own!).
- Always use the approved hospital monitor, ensuring that it has been calibrated and maintained according to hospital guidelines. The standard meter currently available to all wards and units is Accu-Chek Inform. The meters should be quality controlled and calibrated by each ward/unit regularly. Combined Labs will request confirmation of this each month, and all wards/units should adhere to this by returning the appropriate completed paperwork.
- If the patient's blood sugar levels are not well controlled and adjustments to diabetes medication may be needed, then a hospital glucose meter must be used. These are more likely to be accurate as they are regularly calibrated and quality control checked.

If you have any concerns about the blood sugar results obtained, please report them to the medical team involved.

NB. All nurses should attend a glucose meter training session yearly. These are held regularly and are organized by clinical chemistry

GLYCAEMIC TARGETS (HbA1C)

Glycated haemoglobin (HbA1c) is the measure of integrated blood glucose control over the preceding few weeks (1-3 months). It is taken from a venous blood plasma sample and is laboratory tested.

Although daily blood sugar monitoring alerts the patient to any imbalances of their diabetic control, periodic measurement of their HbA1c is necessary to provide a more accurate way of assessing long - term glycaemic control.

This blood test is usually taken at the time of a diabetes review by the GP or the Diabetes Team, but would also be a useful marker for assessment of general condition when the patient is admitted to hospital.

HbA1c targets

GOOD CONTROL	POOR CONTROL	VERY POOR CONTROL
< 7 %	7 –9 %	> 9 %

Ideally, all patients should be aiming for HbA1c < 7 %. However, glycaemic targets should be tailored to each individual (e.g. more relaxed control if significantly diminished hypoglycaemic awareness, or elderly with no microvascular complications).

If HbA1c taken as inpatient, and results show patient has poor control, please refer to the Diabetes Outreach Team for advice and follow-up arrangements.

URINE TESTNG.

- Urine testing is a very informative procedure.
- For this reason, all patients on admission should have a urinalysis including ketones performed.
- All diabetes patients require a daily urine test, particularly those who are unwell, have significant hyperglycaemia and/or have had insulin stopped or reduced
- Ensure that the urine sample is fresh and use an in-date supply of hospital approved urinalysis sticks
- Always record your result in the appropriate documentation.
- If protein is detected in a diabetic patient's urine sample, liaise with their medical team as it may indicate renal disease or urinary tract infection.
- It is always advisable to send an MSU for further analysis if proteinuria has been found.

NB. Any signs of urinary ketones must be reported to the medical team urgently. If ketones are present, repeat urinary testing every 6 – 12 hours until a clear result is achieved.

DIABETES COMPLICATIONS.

Patients with diabetes have a higher risk of developing associated medical complications. All diabetic patients should have an annual medical review by their GP to ensure that complications are not left undetected and untreated. The development of macrovascular and microvascular disease can impose severe health and lifestyle restrictions to the patient, and should be prevented at all costs. These can include:

MACROVASCULAR

Cardiovascular disease

- Myocardial infarcts
- Hypertension
- Hyperlipidaemia
- Hypercholesteraemia

Cerebral Infarct and Transient Ischaemic Attacks

Peripheral Vascular Disease

Neuropathy

Neuropathic foot

Ischaemic foot

MICROVASCULAR

Retinopathy

- Glaucoma
- Cataracts
- Blindness

Nephropathy

- Diabetic nephropathy

It is important for healthcare professionals to be aware of these risks and how to recognize their possible onset. Hospital inpatients can be referred to the Diabetes Outreach Team for advice or follow-up care, if appropriate, by their ward medical team.

DIABETIC RETINOPATHY

Diabetic eye disease, or retinopathy, is one of the main complications of diabetes and can lead to blindness if undetected. It is more common in patients that have poor control of blood sugars and/or blood pressure, although it is likely that it will develop eventually in patients that have had diabetes for many years. Regular screening is, therefore, essential for early detection of diabetic changes and commencement of treatment, as necessary.

In Wolverhampton, the digital eye screening service operates on a 12 month call and recall system. Patients can be screened at a select number of optometrists (those with specific training and a digital camera or at the diabetes centre. Patients that have had retinopathy detected will be seen more regularly, according to severity. Patients with gestational diabetes will be seen every 3 months during their pregnancy.

With the increasing prevalence of diabetes, more and more people are being diagnosed whilst as an inpatient. The eye screening service is available to these patients, should there be concerns about their visual acuity. The patient can attend the diabetes centre any morning as long as prior notice is given before the patient arrives.

To refer a patient to this service please observe the following:

- Contact the Diabetes Centre directly (ext.5649) to inform the clinic staff that the patient will be visiting. The patient should be able to self care and be able comply with instructions from the retinal screener/photographer.
- Patients will have their pupils dilated with Tropicamide and may suffer from blurred or light sensitive vision for up to 4 hours after the procedure. The should not drive whilst affected.
- Ward staff must arrange for any portering services needed. The patient must bring their hospital notes with them.

A report will be completed at the time that the patient is screened, and a copy will be sent to the GP.

DIABETIC NEPHROPATHY

Both Type 1 and Type 2 diabetes are common causes of renal failure; up to 30% of patients needing renal dialysis have diabetes. Early detection is, therefore, essential in order to identify nephropathy in its first stages, and slow down its progression by implementing effective treatment.

Several studies have shown that early treatment with ACE inhibitors, even in patients with normal blood pressure, will delay and possibly prevent the development of diabetic nephropathy.

Screening for nephropathy is undertaken at the patient's annual diabetes review with their GP, and at any other opportunistic time that a urinalysis is required. The presence of microalbuminuria is used as a marker for early diabetic nephropathy, although it can also be an indication of other non-diabetic renal disease.

Microalbuminuria is defined as 20 – 200 mg/l albumin or 50 – 500 mg/l proteinuria. There are other causes of proteinuria in patients with diabetes, e.g. infection, hypertension, and cardiac failure. An MSU is always advisable to rule out possible infective causes.

Patients with established proteinuria have a X 40 greater mortality rate from cardiovascular disease compared to those with no proteinuria. **In this group of patients it is vital to achieve good blood pressure and blood sugar control.**

RECOMMENDED READING – BOOKS

- Campbell I W, Lebovitz H (1996) *Fast Facts – Diabetes Mellitus*, Oxford: Health Press
- Davy H, Clarke P, Field J *Diabetes Care – A Problem Solving Approach*
- Diabetes UK (2000) *Recommendations for the Management of Diabetes in Primary Care*
- Feher M (1993) *Hypertension in Diabetes Mellitus*. London: Martin Dunitz
- Fox C, Pickering A (1995) *Diabetes in the Real World*. London: Class Publishing
- Fox C, MacKinnon M (1999) *Vital Diabetes*. London: Class Health
- Gatling W, Hill R, Kirby M (1997) *Shared Care for Diabetes*. Oxford: Isis Medical Media Ltd.
- Hillson R (1996) *Practical Diabetes Care*. Oxford: Oxford Medical Publications
- Kesson C, Knight P *Diabetes in the Elderly – A Guide for the Health Care Team*. London: Chapman & Hall
- Kinson J, Natrass M *Caring for the Diabetic Patient*. Churchill Livingstone
- Marks L (1996) *Counting the Cost: The Real Impact of Non-Insulin Dependent Diabetes*. London: Kings Fund / BDA
- Snoek F J, Skinner T C (2000) *Psychology in Diabetes Care*. John Wiley and Sons Ltd
- Sonkson P, Fox C, Judd S (1995) *Diabetes at Your Fingertips*. 4th ed. Harper and Rowe
- Williams G, Pickup J (2000) *Handbook of Diabetes*. 2nd ed. Blackwell Science

RECOMMENDED READING – JOURNALS

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