This Handbook contains the protocols and procedures in use for the care of Diabetes Mellitus in South Tipperary General Hospital and is designed for the staff and students of the hospital and was compiled by:

Leona Guinan
Sam Kingston
Anne Leamy
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First Edition 2005
Revised 2007, 2011
Diabetes Handbook

Diabetes Day Centre
South Tipperary General Hospital
Clonmel
Diabetes Centre Mission Statement

Our vision is to provide a quality service to our patients that will improve and enhance their life.

In pursuit of this goal we are guided by the following beliefs:

The patient is the most important person in the management of his/her disease,
We must recognize our patients’ individual needs and try to exceed their expectations,
We must maximise our potential and enthusiastically embrace change,
We must provide our team with a working environment conducive to excellence,
We must be conscious of our responsibility to maintain the highest standard of integrity and ethics.
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### Personnel

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<thead>
<tr>
<th>Diabetes Centre</th>
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<tbody>
<tr>
<td>Margaret O’Connor</td>
<td>225</td>
<td>7034</td>
<td><a href="mailto:margaret.oconnor2@hse.ie">margaret.oconnor2@hse.ie</a></td>
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<tr>
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<tr>
<td>Leona Guinan</td>
<td>305</td>
<td>6214</td>
<td><a href="mailto:leona.guinan@hse.ie">leona.guinan@hse.ie</a></td>
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<tr>
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<tr>
<td>Anne Leamy</td>
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<td>6213</td>
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<tr>
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<tr>
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<td>7377</td>
<td></td>
<td><a href="mailto:mary.taylor1@hse.ie">mary.taylor1@hse.ie</a></td>
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### Department of Nutrition and Dietetics

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<td>Sareen Walsh</td>
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<td>7304</td>
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<tr>
<td>Dietetics Manager</td>
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<tr>
<td>Barbara Johnson</td>
<td>288</td>
<td>7365</td>
<td><a href="mailto:barbara.johnson@hse.ie">barbara.johnson@hse.ie</a></td>
</tr>
<tr>
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<tr>
<td>Sinead O’Sullivan</td>
<td>289</td>
<td>7365</td>
<td><a href="mailto:sineadeileen.osullivan@hse.ie">sineadeileen.osullivan@hse.ie</a></td>
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<tr>
<td>Viva Phelan</td>
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<tr>
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### Ophthalmologist

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<tr>
<td>Dr Bernie McCarthy</td>
<td>7061</td>
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<tr>
<td>Medical Ophthalmologist</td>
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### Podiatry Department

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<td>Lisa Johnson</td>
<td>6215</td>
<td></td>
<td><a href="mailto:lisa.johnson@hse.ie">lisa.johnson@hse.ie</a></td>
</tr>
<tr>
<td>Podiatrist</td>
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### Consultant in Diabetes

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<tr>
<td>Geraldine Fagan</td>
<td>7023</td>
<td></td>
<td><a href="mailto:geraldine.fagan@hse.ie">geraldine.fagan@hse.ie</a></td>
</tr>
<tr>
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Services Provided

Diabetes Day Centre

The Diabetes Day Centre organizes and coordinates the care of the patient with Diabetes Mellitus. The work carried out encompasses organization, education and adjustment of treatment.

Many patients referred to the diabetes service are seen initially by the diabetes nurse specialists (DNS) and, if required, are also seen at that time, or within a few days, by the consultant. Our service is patient led making good use of inadequate resources.

Telephone Contact: An increasing amount of time is spent giving telephone advice. The diabetes nurses receive in excess of 600 telephone contacts in a monthly period. Telephone contact assists patients in the management of their diabetes and prevent the potential admission to hospital. We provide extensive education and support for paediatric patients, those with diabetes in pregnancy and those commencing on pump therapy.

As well as the ongoing work of the nurses in seeing individual patients there are specific areas covered. In the centre patients can be seen from 8 am on, and there is a late clinic every Wednesday from 5 pm to 8 pm, to facilitate those who would have difficulty in attending during the working day. On the first Wednesday of the month a group education session for newly diagnosed type 2 patients is held and is attended by the DNS, Dietitian, Podiatrist and a company representative who instructs on the use of blood glucose meters.

Tuesday (DKTU): On the first and third Tuesday afternoons a clinic is held in the Diabetes Day Centre for patients with type 2 DM who require rapid adjustment of treatment. These patients are in turn followed up as required.

“Transition Clinic”: This is designed for paediatric patients and those progressing to the young adult clinic and is held in conjunction with Dr I Shann’a, Consultant Paediatrician, DNS and the Consultant in Diabetes eight times a year at the Diabetes Day Centre. These patients and their families return to the Diabetes Day Centre for ongoing education, management and support.

Gestational Diabetes: National guidelines for the screening and diagnosis for GDM were launched in August 2010. On referral pregnant women are seen urgently at the Diabetes Day Centre within 24-48 hours.

On Thursdays a nurse led “sub-optimal clinic” provides an opportunity for re-education and rapid review of patients with a significantly elevated HbA1c.

A new development is a Diabesity Clinic with Anne Leamy as Lead Nurse, and Sareen Walsh, Dietetics Manager, as Dietitian. The Diabesity Clinic is an innovative 12 week programme for individual and group education for patients of STGH, who fit the following criteria:

a) Very obese (BMI>35)
b) Type 2 Diabetes Mellitus

Key areas of education will focus on individual eating plans, personal exercise programmes, appetite suppressant medication and medications to control their diabetes.

The aim of the clinic is to achieve at least 10% weight reduction by six months, a target to reduce HbA1c IFCC < 53mmol/mol (<7%), thus improving our management of these patients with a consequence reduction on morbidity, mortality and economic costs.

If you wish to avail of this service please contact Mary Taylor secretary of the Diabetes Day Centre @ ext 7377.
Clinics in Out-Patient Department

**Tuesday:** (DCTU) on every Tuesday morning a clinic is held for those who require rapid adjustment of treatment. This targets pregnant women, those with newly diagnosed type 1 diabetics and type 2 diabetics needing insulin therapy, which we try to initiate as an outpatient.

Some pregnant patients are seen for the first time at these clinics. The first Tuesday morning of the month is designated a “Young Adult Clinic” catering for 15 year to 24 year olds. Three Diabetes Nurse Specialists (DNS) and a Consultant staff these clinics.

**Wednesday:** (MBDC) the first and third Wednesday mornings of a month are control and complication clinics, designed mainly for more long-term review. Three Diabetes Nurse Specialists, a Consultant and Registrar staff these clinics which are also attended by Dr. Bernadette McCarthy, Medical Ophthalmologist, and a representative from a blood glucose meter company. It is our policy to discharge well controlled type 2 diabetics who are not insulin requiring back to the care of their family doctor.

**Friday:** (MDFR) newly referred diabetics are seen at the medical new patients clinic, and are then followed up at the appropriate diabetic clinic. Many of these may have been seen previously and educated by the DNS and Dietitian.

Wards

A DNS is available Monday to Friday to attend the wards. The DNS is contactable by phone, bleep, and referral form.

Nutrition & Dietetic Service

The diabetes dietitian provides a dietetic service to type 1, type 2, gestational and paediatric diabetes patients in South Tipperary General Hospital.

Patients are referred, assessed and advised for general diabetes dietary advice, and/or advice on:

- Weight management,
- Impaired Glucose Tolerance
- Polycystic Ovarian Syndrome
- Hyperlipidaemia
- Hypertension
- Food labels
- Carbohydrate counting
- Pregnancy
- Other medical conditions, e.g. renal/coeliac disease
- Lifestyle advise exercise, smoking cessation,
- Continuous subcutaneous insulin pump therapy

Inpatient:
Any inpatients referred by diabetes team will be assessed by the diabetes dietitian.

All other diabetes patients will be seen by dietitian attached to respective team, i.e. care of the elderly, cardiac, and surgical.

**Paediatrics:**

The diabetes dietitian also sees all paediatric diabetes patients. Newly diagnosed patients are provided intensive education as an inpatient and up to 6 months post diagnosis.

Thereafter, paediatric diabetes patients are followed up on request of consultant or DNS for patients with:
- Poor control
- Changing insulin
- Carbohydrate counting
- General diet review & update
- Weight management
- Exercise

**New Developments 2011**

**Carbohydrate Counting:**
These appointments will be changed from individual to group sessions due to an increasing number of patients requesting this form of treatment. Dietitian will see patients for education on carbohydrates and then joint follow-up appointments organised with Dietitian and DNS for insulin: carbohydrate ratios, corrections bolus, exercise etc.

**Diabesity Clinic:**
This 3 month pilot programme commenced in November 2010 with Diabetic Nurse Specialist and includes 5 visits with Dietitian. Patients are seen in both group and individual sessions, with emphasis on the following:
- Weight management – education on kcals, fats and carbohydrates
- Blood sugars – carbohydrates
- Food labels
- Exercise

Plan to continue Diabesity clinic in 2011.
Format to be decided on evaluation of pilot group.

**Gestational Diabetes:**
Aim to provide a more timely service to these patients. Commence group education sessions 1 clinic per month on a Tuesday when patients attending their medical clinic. Individual new/follow-up appointments will also continue to be offered at Wednesday clinics.

**Expert:**
Patients can be referred by the diabetes team to community dietitian for 6 this week programme.
Education includes overview of diabetes, complications, control, food labels, weight management and exercise.

**Outpatients Clinics:**
**Monday (AM)**  
1-2 clinics per month, group education sessions, e.g. diabetes & hyperlipidaemia

**Monday (PM)**  
Paediatric clinic

**Tues (AM)**  
Gestational diabetes clinic (1 per month)

**Wednesday (AM)**  
4-5 clinics per month individual sessions, e.g. newly diagnosed Type 1, carbohydrate counting, Type 2 poor control / overweight

**Wednesday (PM)**  
1 clinic per month group session for newly diagnosed Type 2 Diabetes. Patients will then be offered individual follow up appointments

**Friday**  
Diabesity clinic

**Referrals:**

Code 1 – Individual appointments

Code 2 – Gestational Clinic

Code 3 – Expert

Code 4 – Group Education Session

Code 5 – Carbohydrate Counting

*Please mark on referral card*

**Ophthalmology**

Patients are reviewed yearly, or more frequently if required, at the main Wednesday Diabetic Clinic and also a separate clinic on the first Monday of the month. Appointments are made at the outpatient reception desk (see under Personnel).

**Podiatry**

All diabetes patients should be screened annually for risk factors associated with diabetes and given tailored foot health education information.

The Podiatry Department is open Monday to Friday 9am to 4.30pm on an out-patient only basis by appointment. Urgent appointments for patients with active foot ulceration will be seen within 48 hours.

Referrals can be sent to Lisa Johnson-Senior Podiatrist at the Diabetes Day Centre. Please complete the green out patient referral form for **routine podiatry review**.

For **active foot ulceration** contact Lisa Johnson on extension 6215 for urgent podiatry review – inpatient or outpatient.
Please see Appendix 4 for diabetic foot referral pathway.
Introduction

Diabetes Mellitus is a common condition that is increasing in prevalence. It occurs when the body does not produce enough insulin to meet its requirements and therefore the sugar levels in the blood become elevated. This gives rise to the complications of diabetes, which can be devastating. Diabetes is conventionally divided into those who have absolute insulin deficiency and require insulin injections from diagnosis and those who have relative insulin deficiency and whose disease may be controlled with diet, or diet and tablets, and eventually may require insulin treatment. Diabetes may be part of a condition known as the metabolic syndrome or insulin resistance syndrome which encompasses truncal obesity, high blood pressure, elevated cholesterol, microalbuminuria, elevated uric acid and a prothrombotic state, and which predisposes the patient to heart attacks and strokes. The good news is that the complications of diabetes can be reduced through good control of blood sugar, blood pressure, cholesterol and other risk factors. This may require a complete change in lifestyle. To care for someone with diabetes requires a dedicated team drawn from different disciplines. The most important person however is the patient with diabetes, who plays the major role in controlling his or her own disease. The only way this can be achieved is through education.

Types of Diabetes

Type 1
Type 2 which may be further defined if insulin treated as Insulin Dependent Diabetes Mellitus (IDDM) or Insulin Requiring

Gestational: see definition in Diabetes and Pregnancy

Drugs  i.e. steroids

Pancreatic disease i.e.
Cystic Fibrosis, pancreatitis,
Haemochromatosis

Endocrine disease i.e.
Cushing’s disease, thyrotoxicosis,
Acromegaly

Abnormal insulin receptors,

Genetic disorders,

Malnutrition related.

Consider:
Slow onset forms such as Latent Autoimmune Diabetes in Adults (LADA); Maturity Onset Diabetes of the Young (MODY) and Early Onset Type 2 Diabetes associated with obesity (EOAD). Remember type 2 DM is presenting younger and younger.
The Diagnosis of Diabetes Mellitus (DM)

Random Plasma Glucose Levels (WHO Definition)

<table>
<thead>
<tr>
<th>DM</th>
<th>Likely</th>
<th>Uncertain</th>
<th>Unlikely</th>
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<tr>
<td></td>
<td>&gt; 11.1 mmol/L</td>
<td>5.5 to 11.0 mmol/L</td>
<td>&lt;5.5 mmol/L</td>
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</table>

Diabetes suspected

Classical symptoms or signs.
Random venous plasma glucose: ≥ 11.1 mmol/L ➔ DM confirmed

Without classical symptoms or signs.
Random venous plasma glucose: ≥ 11.1 mmol/L repeat random sugar, if ≥ 11.1 mmol/L ➔ DM confirmed
Random venous plasma glucose: > 5.5, <11.1 mmol/L go to Fasting plasma glucose: if ≥7 mmol/L on two consecutive occasions ➔ DM confirmed, if > 6 mmol/L go to OGTT

OGTT

Indication: To confirm Diabetes/IGT/IFG. Make sure test is required, as the diagnosis may have already been made on random glucose levels and symptoms.

Preparation: 1. Patient should be prepared with a diet rich in carbohydrates for 3 days
2. Patient must fast for 12 hours prior to the test.

Dose: 75gm glucose - 410mls Lucozade

Sampling:

<table>
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<th>Time mins</th>
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<th>30</th>
<th>60</th>
<th>90</th>
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<tr>
<td>Plasma glucose</td>
<td>X</td>
<td></td>
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We now only require fasting and 120-minute levels except in pregnancy: in pregnancy check at 0, 60 and 120 minutes.

Complication: Nausea

Requirement: Lucozade: large bottle

If not able to tolerate Lucozade use Polycal Liquid 113ml made up to a volume of 200ml with water.

Please see appendix 1 for instructions for patients.
What levels should be taken as normal on the OGTT? (glucose mmol/L)

<table>
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<tr>
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<th>one-hour</th>
<th>two hours</th>
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<tr>
<td>Normal</td>
<td>&lt; 6.1</td>
<td>&lt; 7.8</td>
<td></td>
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<tr>
<td>Impaired fasting glucose</td>
<td>6.1 to 6.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impaired glucose tolerance</td>
<td></td>
<td>7.8 to &lt;11.1</td>
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<tr>
<td>D. M.</td>
<td>≥ 7.0</td>
<td>and/or</td>
<td>≥ 11.1</td>
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In the absence of symptoms the diagnosis must be confirmed by a second diagnostic value on a separate day.

Gestational

<p>| | | | |</p>
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<td>D. M.</td>
<td>&gt; 5.1</td>
<td>&gt; 10.0</td>
<td>&gt; 8.5</td>
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Gestational DM is diagnosed if any of these levels are exceeded.

**NB** The diagnosis of DM should not be made only on meter readings.

### Screening for Type 2 Diabetes

**Who to test?**

Those aged over 40 years with a first degree family history of diabetes
All minority ethnic groups aged over 25 years
People who were overweight (BMI 25-30 kg/m2 and above) aged over 40 years and who have a sedentary lifestyle
All people with ischemic heart disease, cerebro-vascular disease, peripheral vascular disease or hypertension.
Women who have had gestational diabetes (screen at 6 weeks post delivery and then yearly)
Women with polycystic ovarian syndrome who are obese
Those known to have impaired glucose tolerance or impaired fasting glycaemia

**How to Test?**

Fasting plasma glucose.
The Metabolic Syndrome

There have been four different definitions of the Metabolic Syndrome (ATP III, WHO, and IDF 2005), and the latest is reproduced below: (The Lancet, Volume 375, Issue 9710, Pages 181 - 183, 16 January 2010)

Criteria for clinical diagnosis of metabolic syndrome

<table>
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<tr>
<td>Increased waist circumference</td>
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<td>Population-specific and Country-specific definitions</td>
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<td>Increased TGs or treatment for this</td>
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<tr>
<td>&gt;1.7 mmol/L</td>
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<tr>
<td>Reduced HDL or treatment for this</td>
</tr>
<tr>
<td>&lt;1.0 mmol/L Men</td>
</tr>
<tr>
<td>&lt;1.3 mmol/L Women</td>
</tr>
<tr>
<td>Increased BP or treatment for this</td>
</tr>
<tr>
<td>&gt;/=130 systolic and/or &gt;/=85 diastolic</td>
</tr>
<tr>
<td>Increased fasting glucose or treatment of elevated glucose</td>
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<td>&gt;5.5 mmol/L</td>
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The metabolic syndrome: useful concept or clinical tool?

Conclusions
“The metabolic syndrome is a concept that focuses attention on complex multifactorial health problems. While it may be considered useful as an educational concept, it has limited practical utility as a diagnostic or management tool. Further efforts to redefine it are inappropriate in the light of current knowledge and understanding, and epidemiological studies in which different definitions of the metabolic syndrome are compared are of limited utility.”

We do not think it appropriate to abandon use of this definition of a cluster of features as it requires clinicians to search for other components if they find one component.
Diabetes and Pregnancy

This section includes the management of known Type 1 and Type 2 Diabetes, and Gestational Diabetes pre, during and post-pregnancy and are adapted from the Guidelines for the Management of Pre-gestational and Gestational Diabetes Mellitus from Pre-conception to the Postnatal period. (ISBN 978-1-906218-33-1, Health Service Executive, July 2010)

Gestational diabetes mellitus (GDM)

Defined as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy. This definition includes women with newly diagnosed type 1 diabetes mellitus presenting in pregnancy, previously undiagnosed type 2 diabetes mellitus or impaired glucose tolerance. The definition is independent of the severity of hyperglycaemia and the method of treatment required.

The number of younger patients with Type 2 DM is increasing and the possibility of pregnancy must always be kept in mind.

Type 1 and Type 2 Diabetes

Pre-conception Care

The possibility of pregnancy should be identified, by direct questioning, at each diabetes consultation, in all women of child-bearing age with diabetes.
Women with diabetes who wish to conceive should be informed of the need to establish tight glycaemic control prior to conception.
All women planning pregnancy should be screened for complications of diabetes.
Medications with known teratogenic effects should be substituted with appropriate medication prior to conception.
High dose folic acid (5mgs) should be prescribed as part of pre-pregnancy care, and continued for the first trimester.
In type 2 DM Insulin therapy may need to be prescribed together with non teratogenic oral hypoglycaemic (OHA) medication in order to achieve optimal glycaemic control.
Women with diabetes who are planning to become pregnant should be offered individualised dietary advice by a dietitian.
Assessment of self care ability should be undertaken and any shortcomings addressed.

Blood glucose targets in the pre-conception period.

Expected glycaemic targets should be discussed with the woman and realistic individualised goals should be agreed.
The following capillary glucose targets are recommended in the pre-conception period:
Fasting 3.5 – 5.0mmols/L
1 hr post prandial < 7.0mmols/L.
HbA1c levels should be as low as possible, without excessive hypoglycaemia, before conception is attempted.
Frequent assessment by the healthcare team is required as hypoglycaemia can occur and should be avoided.
HbA1c levels should be measured monthly during the pre-conception period.
Woman with an HbA1c level above the target level should be strongly advised to avoid conception.
Retinal assessment in the pre-conception period.

Retinal assessment by an ophthalmologist should be conducted prior to pregnancy. The risk of advancement of retinopathy during pregnancy should be discussed. The risk of advancement of diabetic retinopathy can be reduced through gradual improvement of metabolic control.

Thyroid assessment in the pre-conception period.

Thyroid function should be measured at initial physical assessment as both hypothyroidism and hyperthyroidism can adversely affect pregnancy outcomes if left untreated. Repeat thyroid function tests should be carried out in the pre-conception period as necessary.

Renal assessment is required in those with nephropathy.

Blood glucose targets during pregnancy.

The following capillary glucose levels are recommended for pregnancy:
- Pre-prandial and pre-bed: 3.5-5.0mmol/L
- 1 hour post prandial: <7.0mmol/L
- HbA 1c levels should be as low as possible during pregnancy, without excessive hypoglycaemia.

Blood glucose and ketone testing during pregnancy.

Self Monitored Blood Glucose (SMBG) should be performed 7 times a day – pre-meals plus one hour post all meals plus once before bed.

Insulin requirements and regimens during pregnancy in type 2 DM.

Women with type 2 diabetes are characteristically insulin resistant and may require large doses of insulin to achieve good glycaemic control. If food intake is altered through excess hunger or nausea, insulin requirements will increase or decrease accordingly. As pregnancy progresses, insulin requirements increase in the second trimester, while most women experience a reduction in insulin requirements in the latter part of the third trimester.

Glycaemic control during the postnatal period.

In type 1 DM following delivery, insulin requirements decline rapidly. Prevention of maternal hypoglycaemia is essential. A postpartum insulin regime (similar to but initially slightly less than, the pre-pregnancy dose of insulin) should be prescribed prior to delivery if possible and this should commence immediately following the third stage of labour. Frequent measurement of capillary blood glucose should be performed and the post partum insulin regime prescribed by an endocrinologist should be employed to maintain blood glucose between 4-7mmol/L. Close contact with the diabetes team is essential in the postpartum period to allow for assessment of glycaemic control and adjustment of insulin dose.

In type 2 DM if not on insulin pre-pregnancy stop insulin post delivery and assess.
For Gestational Diabetes stop treatment post-delivery and repeat OGTT using non-pregnant WHO criteria at 6 weeks and, if normal, yearly thereafter. Warn of the risk of developing type 2 DM.

**Screening for Gestational Diabetes**

At the booking antenatal visit, all patients should be screened for recognised risk factors for gestational diabetes. Identification of any of the following risk factors should prompt a 75g OGTT at 24-28 weeks’ gestational age:

- Family history of diabetes in a first degree relative
- Body mass index ≥30kg/m2
- Maternal age ≥ 40years
- Previous unexplained perinatal death
- Current glycosuria
- Women on long term steroids
- Previous delivery of a baby weighing ≥4.5kg
- Polycystic Ovary Syndrome
- Polyhydramnios and/or macrosomia in existing pregnancy
- Ethnicity associated with a high prevalence of diabetes: (India/ Pakistan/ Bangladesh/ Black Caribbean/ Saudi Arabia/ United Arab Emirates/ Iraq/ Jordan/ Syria/ Oman/ Qatar/ Kuwait/Lebanon/Egypt.

If GDM is suspected at an earlier or later gestation than 24-28 weeks, on the basis of fetal macrosomia, polyhydramnios or glycosuria, a 75g OGTT should be performed. If negative at an early gestation, the OGTT should be repeated between 24-28 weeks gestation. Post partum a 75g OGTT should be performed at 6 weeks postpartum and yearly thereafter

**OGTT in pregnancy: see previous section on OGTT (glucose mmol/L)**

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<tr>
<th></th>
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<th>60 mins</th>
<th>120 mins</th>
<th>2hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestational D. M.</td>
<td>&gt; 5.1</td>
<td>&gt; 10.0</td>
<td>&gt; 8.5</td>
<td></td>
</tr>
</tbody>
</table>

Gestational DM is diagnosed if any of these levels are exceeded.

Blood glucose targets during pregnancy.

The following target values are recommended for optimum maternal and fetal outcome:
- Fasting capillary glucose level: 3.5-5.0 mmol/L
- 1 hour post-prandial capillary glucose level: <7.0 mmol/L

If these targets cannot be met with diet and physical activity alone, insulin therapy must be considered.

**Insulin therapy during pregnancy.**

Insulin therapy must be considered when the glycaemic target values are exceeded on two or more occasions within a 1 to 2 week interval, especially in the presence of suspected or confirmed macrosomia.

A clinical decision regarding insulin therapy should be based on gestational age, fetal size and glycaemic control.

Insulin given four times a day has been proven to improve glycaemic control and pregnancy outcomes.

The flexibility of a basal bolus regime allows for easier adjustment of insulin doses.
When diabetes is diagnosed

After the diagnosis of DM is made consideration should be given to the following features.

Enquire as to family history of DM, IGT, also of personal or FH of cardiovascular disease including hypertension hyperlipidaemia, gout and of obstetric history in females including birthweights of babies.

Try to define the type of diabetes present.

Consider possible secondary causes of DM in patients with no family history of DM and where clinical situation suggestive (i.e. haemochromatosis, pancreatic carcinoma, glucocorticoid therapy etc.).

Microvascular, and macrovascular disease.

Retinopathy (dilated fundoscopic exam, visual acuity and ophthalmology referral).

Nephropathy (renal profile, estimated GFR, urinary albumin/creatinine ratio).

Cardiovascular (angina pectoris, claudication, BP, fasting lipids, peripheral pulses, carotid bruits, CXR, ECG).

Neuropathy (examination of monofilament sensation, vibration and position sense, and reflexes).

Foot examination (neuropathy as above) dorsalis pedis and posterior tibial pulses, and the state of hygiene, nail care and inter-digital areas, and pressure areas.

Investigations to include:

HbA1c%, Cholesterol, HDL cholesterol, LDL cholesterol, Triglycerides, U&E, Creatinine, LFTs, TFTs, Ca, PO4, FBC

Urine Albumin/Creatinine Ratio. Estimated GFR

CXR, ECG

To try to confirm Type of DM: GAD, Insulin, Islet Cell Antibodies and may consider fasting glucose and C-peptide level.

In type 1 DM: Coeliac Disease, Thyroid Peroxidase, and other endocrine autoantibodies
**Monofilament testing**

1. Use 10g monofilament

2. Ask patient to close eyes and say “yes” when he/she feels something

3. Press with enough force to make monofilament buckle 1mm on 10 sites on each foot

**Sites to test**

If patient cannot feel \( \geq 4/10 \) consistent with Neuropathy
Treatment of Type 2 DM

Site of Action of Hypoglycaemic Agents

Brain

- Decrease Appetite

Adipose

- Decrease FFA

Muscle

- Decrease Insulin Resistance

Tissue

- ACARBOSE
  - Decrease Absorption

- METFORMIN
  - Slow Gastric Emptying

- THIOZOLIDINEDIONES
  - Decrease FFA

- DPP4-INHIBITORS
  - Decrease Glucose Output

- GLP-1 AGONISTS
  - Decrease Glucose Output

- SULPHONYLUREAS
  - Increase Production

- GLINIDES

Insulin

- Increase Production

Liver

- Decrease Glucose Output

Glucose

- EXOGENOUS INSULIN
Treatment of Type 2 DM

There have been several statements and algorithms over the past few years from various groups such as the ADA/EASD and the AACE/ACE but disagreement with these positions has also been expressed. It would seem sensible to follow the view as expressed by Professor John Nolan “How these decisions are best made in the real world may ultimately be through a pragmatic individual patient plan, taking account of the best available evidence, the stage in life of the patient, the biological stage of progression of their diabetes and the relative priorities of the competing targets and goals in diabetes care.” (Nolan JJ (2010) Consensus guidelines, algorithms and care of the individual patient with type 2 diabetes. Diabetologia 53:1247–1249; erratum 53:2078). Please also see the section on “Monitoring and Goals of Treatment” page 34.

Approach to treatment

We therefore suggest the following approach.

Tailor the treatment to the individual taking into account age, lifestyle, risks of treatment such as hypoglycaemia, the cardiovascular status, lipid status, and make sure to assess and treat risk factors. We have not included thiazolidinediones in this algorithm in view of the problems associated with rosiglitazone and we feel that more evidence of safety is required before using pioglitazone, but it may have a role in selected individuals.

Step 1

Lifestyle + Metformin

Step 2

<table>
<thead>
<tr>
<th>Not Obese</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider glinide, DPP4 inhibitor, sulphonylurea</td>
<td>Consider DPP-4 inhibitor, GLP-1 analogue and referral to diabesity clinic</td>
</tr>
</tbody>
</table>

Step 3

Insulin Treatment

Who? Assess suitability, do not refuse because of age

When? Don’t delay

What type of insulin? Tailor to individual

What do you do with the oral agents?
Continue, especially metformin, reduce secretagogues
Usually start with insulin long acting insulin analogues. Suggest starting at 10 units, usually at night, and increase depending on the fasting blood sugar level. Increase by two units at a time to try and get the fasting plasma glucose in the range of 5.5 to 8 depending on agreed target. The next most effective step is to add prandial insulin. Tailor the treatment to the patient: just because a patient has Type 2 DM it should not be an excuse not to use intensive insulin treatment. Consider what would you do with a Type 1 patient of similar age? Some patients may be more suited to premixed insulin combinations.

Reassess the diagnosis of Type 2 DM if there is a rapid progression to insulin requirement. Consider possible LADA.

**Metformin and renal function.**

Metformin therapy may be associated with lactic acidosis and this is more likely to occur in patients with renal impairment. Do not use if creatinine >200mmol/L. Consider also the presence of other diseases which may be contraindications such as cardiac disease.

**Metformin and Vitamin B12**

There is an association between Metformin usage and Vitamin B12 deficiency increasing over the length of time Metformin has been used. Check Vitamin B12 levels in all existing patients on Metformin and try to get levels to the higher end of the normal range with supplementation. Check levels before starting Metformin and consider supplementation.

**Other Risk Factors**

Consider other concomitant cardiovascular risk factors and treat appropriately. Consider use of aspirin, statins and antihypertensive medication (see page 35).
Algorithm
Lifestyle (Diet + Exercise). Consider risk factors, and level of control to be achieved.

Metformin start 500mg od for one week then b.d. for one week then t.i.d. and increase as required.
Treatment of Type 1 DM

Insulin Regimes Type 1 DM and Insulin Requiring Type 2 DM

Tailor the regime to suit the patient taking into account age, lifestyle, and the degree of control necessary. The types of the regime include: b.d. short and intermediate acting insulins either separately or as premixed solutions. Basal bolus regimes can be used with either b.d intermediate, o.d. intermediate or b.d. or o.d. long acting combined with t.i.d. short-acting insulin with meals.

Two or Three Injections Daily
Insulin requirement c. 0.5u/kg body weight/24 hours

Two Injections

2/3 of the total dose is given in the a.m. (pre-breakfast) and 1/3 given in the p.m. (pre-evening meal). 2/3 of each dose (a.m. and p.m.) is given as intermediate acting insulin and 1/3 as short acting insulin.

e.g. Total Calculated 36 units (72kg) i.e.

24u am
12 u pm

Given as

8u short acting am
16u intermediate acting am

4u short acting pm
8u intermediate pm

Three Injections

Take 1/3 of total daily dose for PM and 2/3 to be divided for AM and MD. Of this fraction take 2/3 in AM and 1/3 as MD.

![Diagram showing division of injections for three injections daily]
Multiple Daily Injection (MDI) Regimes (Basal Bolus)

These generally allow smoother control with less erratic profiles and are superior in those individuals with problematic hypoglycaemia. A Basal Bolus regime demands that subjects ideally perform four home blood glucose tests daily, before meals and before bed. Insulin is given as short acting and long or intermediate acting insulin. The long or intermediate acting is given o.d or b.d. The total daily dose of insulin should be given as 50% short acting and 50% as long or intermediate insulin.

The dose of short acting insulin is given to a scale depending on:

1. Blood sugar
2. Anticipated exercise
3. Anticipated meal - either large or small

The scale could be for example -

= if blood sugar is 4 mmol/l give 4 units of insulin

+2 if blood sugar is 4 mmol/l give 6 units of insulin

Changing to Insulin Analogues

Reduce total daily dose by 20% initially and adjust accordingly.

The Assessment of Basal Insulin Requirements

It may be necessary to assess the basal insulin requirements in those patients in whom there is difficulty in achieving good control; for patients on short acting with bd intermediate, or long acting insulin.

Fast from midnight except water. Usual breakfast dose of intermediate acting or long acting. Keep fasting. Check blood sugars hourly and see if dose of intermediate / long acting is sufficient to maintain basal levels.
Insulin Infusion Protocols

Sliding scale for inpatient use via syringe driver

Many patients with new Type 1 DM or in poor control or with an undercurrent illness will be treated with an intravenous insulin infusion.

IV sliding scale: 50u Actrapid/50ml 0.9% Saline:

### Sliding Scale Regimen

<table>
<thead>
<tr>
<th>Blood Glucose mmol/L</th>
<th>Insulin Infusion Rate (units/hr·ml/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>0-3.9</td>
<td>0</td>
</tr>
<tr>
<td>4-6.9</td>
<td>1</td>
</tr>
<tr>
<td>7-8.9</td>
<td>2</td>
</tr>
<tr>
<td>9-10.9</td>
<td>3</td>
</tr>
<tr>
<td>11-12.9</td>
<td>4</td>
</tr>
<tr>
<td>13+</td>
<td>6</td>
</tr>
</tbody>
</table>

The long acting insulin may be continued if appropriate.

**What scale to start with?**

The first sliding scale regimen to be initiated by a doctor

Start with scale A, unless the patient is usually on a total daily dose of more than 100 units of insulin, in which case start with scale B

**How and when to adjust the sliding scale?**

A staff nurse can adjust the sliding scale regimen.

If blood glucose >9.0 mmol/l (>7.0 mmol/l in acute MI/Stroke) for three consecutive hourly tests blood glucose is either rising or has fallen by less than 25% in the last hour, step up to the next scale (e.g. if on scale A increase to B; if on scale B, increase to C)

If blood glucose <3.5 mmol/l, step down to the next scale (e.g. if on scale D, decrease to C; if on scale C, decrease to B)

**Target Blood Glucose**

Define according to the patient’s illness and status, but usually 6 - 10 mmol/L

**GKI regime for inpatient use**

500ml 10% Dextrose
+ starting with 12 units soluble insulin and increasing as required. Usually will require less than 24 units
+ 20 mmol KCL
To run at 80ml per hour

This regime can also be used instead of I.V. sliding scale in certain patients i.e. fasting patients, or hyperemesis gravidarum.
Diabetic Emergencies

Hypoglycaemia

Causes of hypoglycaemia

Insulin doses are excessive, or given at the wrong time, especially without food.

Insulin secretagogues, (ie sulphonylureas or glinides) are given in too large a dose. Be very cautious with sulphonylureas, especially the longer acting ones in the elderly.

Inadequate food intake such as missed meals, overnight fasting, or inadequate absorption such as gastroparesis or coeliac disease.

Increased glucose use as in exercise or after exercise. The effect of exercise in increasing insulin sensitivity may be apparent even at night.

Increased insulin sensitivity due to increased exercise, weight loss or improved control.

Decreased insulin clearance such as in increasing renal failure.

Alcohol can cause hypoglycaemia, often delayed and occurring at night, through reduced hepatic gluconeogenesis but alcohol can also reduce the counter-regulatory hormone response.

Treatment

The treatment of this common problem for patients with diabetes depends on whether the patient is conscious or unconscious.

Hypoglycaemia can be defined biochemically as a blood glucose level <3.1 mmol/1. However, people with diabetes experience symptoms at varying degrees of blood glucose concentration, and thus, many people accept Whipple’s triad as confirmation of hypoglycaemia. In hospital this means the patients complaining of ‘feeling low’ with adrenergic or neuroglycopaenic symptoms (confirm this by glucose meter reading <3.8 mmol/1 or the finding of an asymptomatic ‘Lo’ reading on the glucose meter). It is always better to treat when in doubt.

(N.B. If patient is not known to be diabetic or if only on oral agents take a venous plasma sample to confirm hypoglycaemia.)

In a conscious patient

Treatment: is one carbohydrate exchange (e.g. 60mls lucozade, 100mls fruit juice, 100mls coke, 200mls lemonade) if symptoms are mild or 2 carbohydrate exchanges if neuroglycopaenic symptoms. If symptoms persist repeat. Follow up with long acting carbohydrate i.e. snack

(N.B not ‘diet’ soft drinks in this situation)
Patient Unconscious (or not capable of oral intake)

**Intravenous Treatment:** 25mls of 50% dextrose, a further 25mls if no response. I.M. glucagen can also be given followed by 2 carbohydrate exchanges.

See also hypoglycaemia in Driving and Diabetes Appendix 2.

---

**Guidelines for Management of Diabetic Ketoacidosis**

**The therapeutic goals in the treatment of DKA are:**

To improve circulatory volume and tissue perfusion
Decrease serum glucose
Clear the serum and urine of ketones at a steady rate
Correct electrolyte imbalances
Ensure a successful outcome through careful attention, including coma care and regular clinical and laboratory assessment

**Management**

**Admit to CCU/ICU**

**Fluid replacement**

**Assess on an individual basis - suggestion**

1. Give 2 litres of isotonic, normal, saline (0.9 %) over the first 4 hours
2. Give 2 litres over the next 8 hours, then 1 litre every 8 hours
3. Consider colloid if systolic blood pressure <100mmHg after 2 hours
4. Use hypotonic saline only very cautiously (plasma Na+ >155mmol/l, 1 litre over 8 hours)
5. Monitor central venous pressure if cardiac disease
6. Be more cautious in elderly

**Insulin**

1. Infuse soluble insulin initially at 6u/hr
2. Check pump and infusion lines and double dose if no response in 2 hours

**Potassium**

1. Give 20mmol per litre from the time of initiation of insulin infusion
2. Discontinue temporarily if laboratory K+ >6.0 mmol/l
3. Check serum potassium every 2 hours as a routine
4. If potassium falls to <4.0 mmol/l, increase amount in I.V. fluids accordingly
5. Continuously monitor ECG

**Bicarbonate**

1. Only use if pH is 6.9 or less
2. If indicated, try to raise pH to 7.1 by giving 1 mmol Bicarbonate per kg with extra potassium over 30 minutes (8.4% sodium bicarbonate contains 1 mmol per ml)
3. Repeat pH and plasma K+ 60 minutes later.

**Ketones**

1. Check for reduction of ketones using Optium meter.
2. NB Continue IV insulin until Ketones reduce to normal

**Infection**

1. Arrange urinalysis, chest x-ray, blood culture
2. Do not rely on temperature and leucocytosis
3. Use antibiotics even if uncertain

**General Care**

Treat as DKA until Ketones normal

1. When glucose <12.0 mmol/l and especially if ketones present
2. Start Dextrose 10% + 20mmol KCL at 80 ml per hour. Rate may be adjusted. The danger is in reducing the insulin requirements when ketoacidosis is present allowing the ketosis to get worse.
3. Some patients may present with a normal or even low normal blood glucose level and high ketones. Make sure adequate 10% Dextrose is given to allow for adequate insulin to be given.
5. Do not rush to stop IV sliding scale IV on first negative ketone level and stable sugar. Can give long acting insulin when rehydrated and more stable on IV sliding scale. Start short acting S.C. insulin therapy when able to eat but continue I.V. sliding scale for 2 hours post starting S.C. insulin
6. Insert nasogastric tube if patient is in coma
7. Insert a urinary catheter if no urine is passed for 2 hours post admission.
8. Consider heparinization
9. Cardiac monitor: watch for hypokalaemia.
10. Check ECG ?MI to precipitate acidosis.

Review
Identify cause to reduce risk of recurrence and regular review by medical team during course of ketosis.

Guidelines for the Management of Diabetic Hyperglycaemic Hyperosmolar State (HHS) also known as Hyperosmolar Non-Ketotic State (HONK)

Establish Diagnosis

1. Hyperglycaemia: blood glucose frequently >40 mmol/l
2. Hyperosmolarity: usually >340 mOsmol/l
3. Exclude ketosis: N.B patients may have concurrent lactic acidosis secondary to sepsis. Use meter to check.
4. Clinical picture is usually one of insidious onset unlike the acute presentation of DKA
5. Neurological features including seizures may be present

General

1. Mortality is 30-35% and increases with age, medical co-morbidity, severity of metabolic derangement and degree of impairment of consciousness. N.B Coma is present in <10% of HHS at presentation.
2. Seek senior help early and consider appropriate environment in which to manage patient e.g. CCU/ICU.

Investigations

1. Laboratory glucose
2. Plasma osmolarity*
3. FBC, U&E’s, CRP, CK, troponin I.
4. Blood cultures, MSU and additional microbiology as indicated
5. Arterial blood gases
6. ECG and CXR

*Osmolarity can be calculated using the formula (all in mmol/L)
Plasma osmolarity = 2[Na+] + 2[K+] + [Urea] + [glucose]

Treatment

Fluid regimen

1. Rehydrate with normal saline. Half normal saline is dangerous and contra-indicated – rapid lowering of the osmolality may result in cerebral oedema.
2. Fluid replacement will often need to be guided using CVP line and monitoring urine output as these patients frequently have significant medical co-morbidity. Careful assessment as to clinical state of rehydration including monitoring of intake/output balance is necessary
3. The aim is usually to replace the fluid deficit (average 10 litres) over approximately 48 hours.

**Insulin**

1. The aim is to reduce glucose levels by 3-5 mmol/hr. These patients can be very sensitive to insulin and require much lower doses than patients in DKA.
2. 50u soluble insulin (e.g. Actrapid) in 50mls N Saline to run via IV syringe driver starting at 4u/hr.
3. Measure glucose hourly and alter insulin infusion accordingly.

This is a guide and the insulin infusion rate may need to be adjusted on an individual patient basis.

(N.B. In the first hour or two sugars may fall more rapidly, than anticipated due to rehydration/dilution).

**Potassium Replacement**

1. As for DKA, regular electrolyte monitoring should guide potassium replacement
2. Check U&E’s at baseline, 2hrs, 4hrs and 6hrs and further as indicated

**Anticoagulation**

Formal anticoagulation with low molecular weight heparin is indicated in the absence of contraindications in view of the increased risk of thromboembolism

**Identify Underlying Cause**

1. Consider cause of HHS: infection (in 50%), new diagnosis (in 50%), MI, drugs (e.g. diuretics).
2. Consider antibiotics (WCC invariably raised in HONK and does not confirm infection. History and examination, presence of pyrexia and elevated CRP are more helpful markers. Urinary tract and respiratory tract infections are common precipitants)

**Long-term Management**

1. Most HHS patients will not need insulin in the long-term
2. Once stable the patient can be commenced on either an appropriate oral hypoglycaemic agent or insulin if necessary.
General illness on Wards/ICU

There is no place for SC sliding scales. If there is any difficulty in controlling glucose levels for whatever reason go to IV sliding scale until the situation can be reassessed (may also use G.K.I regime), see page 26.

Acute MI

If known diabetic or newly diagnosed on presentation go to IV sliding scale (see page 26) until the situation is stabilised. Aim for sugars between 6 and 10 mmol/L. Be careful of hypoglycaemia exacerbating the underlying condition.

Acute CVA

Follow guidelines for MI above

Endoscopy and other procedures involving fasting

This applies to outpatients and in-patients. As a general rule if the procedure or period of fasting is prolonged or if diabetes is poorly controlled will require to go on I.V. insulin via syringe driver or G.K.I infusion (see page 17). It is preferable that procedures should be carried out as early as possible on list. Regular monitoring of finger-prick plasma glucose by the patient and/or unit staff is required.

OGD

Oral Hypoglycaemic Agents.
Omit tablets until eating.

Oral Hypoglycaemic Agents and long acting insulin.
If insulin taken in a.m. take insulin when eating.
If insulin taken in p.m. omit previous evening’s insulin and take ½ dose on eating and ½ that p.m. and full dose following evening
Omit tablets until eating.

GLP-1 Analogues
Omit until eating

Insulin treated.

B.D. insulin.
No a.m. insulin. Take 2/3 of morning dose when eating. Usual evening dose.

T.I.D. insulin.
No a.m. insulin. Take ½ of morning dose when eating. Usual mid-day and evening dose.

**Basal-Bolus insulin.**  
No short acting insulin in am.

**Basal o.d.**
- If basal taken in am: take ½ dose in am. and take short acting insulin when eating. Usual pm dose.
- If basal taken mid-day: no am insulin and take usual insulins when eating.
- If basal taken in pm: take usual dose previous pm and resume short acting when eating. Normal basal that evening.

**Basal b.d.**
- If basal taken in am: take ½ dose in am. and take short acting insulin when eating. Usual p.m. dose.
- If basal taken mid-day: no a.m. insulin and take usual insulins when eating.
- If basal taken in pm: take usual dose previous pm and resume short acting when eating. Normal basal that p.m.

**Insulin pump.**  
Keep running at basal level. Resume boluses when eating.

**N.B.** If DM not controlled i.e. in in-patients, G.K.I infusion (see page 17) can be used. If endoscopy being done as an emergency and full dose if insulin has already been given go to: 500 ml 10% Dextrose at 100 ml/hr.

**Colonoscopy.**
The preparation in this hospital uses Fleet Phospho-soda oral preparation also involves taking clear liquid only on the day before the procedure. Fluids such as 50ml Lucozade or 100ml unsweetened fruit juice can be taken 3 hourly during the daytime to substitute calories.

**Oral hypoglycaemic agents.**
On the clear fluids day, take normal tablets and regime as above and monitor sugars closely. On day of procedure no tablets until procedure completed and eating.

**Oral Hypoglycaemic Agents and long acting insulin.**
On the clear fluids day take normal tablets and fluid regime as above and monitor sugars closely. On day of procedure no tablets until procedure completed and eating.  
If insulin taken in a.m. take insulin when eating. 
If insulin taken in p.m. omit previous evening’s insulin and take ½ dose on eating and ½ that p.m. and full dose following evening.
Insulin
On the clear fluids day take normal insulin and fluid regime as above and monitor sugars closely.
On day of procedure follow guidelines for OGD above.

Metformin and contrast material
The problem relating to metformin and contrast material is not an interaction between the two agents but the danger of developing renal failure following the use of contrast material and as the kidneys clear metformin the levels may rise and cause lactic acidosis. The literature from the manufacturers of metformin and contrast material suggest discontinuing at the time of, or before a study, and withholding for 48 hours and checking that there has not been a deterioration in renal function before restarting. There are recommendations in some guidelines to withhold metformin for 48 hours prior to the procedure which is the policy followed here.

Monitoring and Goals of Treatment

Monitoring
Hospital monitors only to be used.

Glucose meter readings are checked in all hospitalised diabetics at the following times, fasting, before meals, 1 or 2 hours post-prandial and before bed, depending on regime. Glucose meter readings should be reviewed daily by the medical team and appropriate adjustments made in treatment regime.

Treatment Goals

Glucose and HbA1c
Although strict glucose control has been proven to decrease the risk of complications of DM, glucose goals should be individualised to be realistic and safe. Tailor to the individual, including factors such as Type of diabetes, pregnancy (see section on Pregnancy and Diabetes), age, cardiovascular status, awareness of hypoglycaemia and social circumstances. Be careful of trying for too great a drop too quickly in type 2 Diabetes. (See Affirm, Advance, Accord, and VADT trial results.) HbA1c recommendations vary from <47 mmol/mol to < 53mmol/mol and especially for younger age groups we should try to achieve the best control possible, but we must set individual targets rather than blanket recommendations.

Suggested goals are:

<table>
<thead>
<tr>
<th>Type 1 and 2 DM</th>
<th>Pre-meals</th>
<th>2 hour post meal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.5-6.6 mmol/L</td>
<td>&lt;7.8 mmol/L</td>
</tr>
</tbody>
</table>
**HbA1c**

**Younger age:** <47 mmol/mol (6.5%) but < 53 mmol/mol (7.0%) may be ideal in some circumstances.

**Other age groups:** Depends on circumstances outlined above, but < 53 mmol/mol (7.0%) or 53 mmol/mol (7.0%) to 59 (7.5%) may be ideal.

**HbA1c conversion table**

From 2009, over a two year period, HbA1c will be reported in mmol/mol and as a %. The dual reporting will then stop.

Definitions:

- Old unit = NGSP unit = %HbA1c
- New unit = IFCC unit = mmol/mol

Conversion Formulae:

- IFCC unit (mmol/mol) = 10.93 x NGSP unit (%) - 23.5
- NGSP unit (%) = 0.09148 x IFCC unit (mmol/mol) + 2.152

**Conversion Table: Comparison of HbA1c results**

<table>
<thead>
<tr>
<th>HbA1c mmol/mol</th>
<th>20</th>
<th>31</th>
<th>42</th>
<th>48</th>
<th>53</th>
<th>59</th>
<th>64</th>
<th>69</th>
<th>75</th>
<th>80</th>
<th>86</th>
<th>97</th>
<th>108</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA1c %</td>
<td>4.0</td>
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<td>6.0</td>
<td>6.5</td>
<td>7.0</td>
<td>7.5</td>
<td>8.0</td>
<td>8.5</td>
<td>9.0</td>
<td>9.5</td>
<td>10.0</td>
<td>11.0</td>
<td>12.0</td>
</tr>
</tbody>
</table>

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**Other risk factors for Cardiovascular Disease**

The importance in the management of diabetes lies not only in blood sugar control and control of its complications but also in the control of the other risk factors for cardiovascular disease. These cannot be neglected.

**Lipids (mmol/L)**

Suggested guidelines.

- Total Cholesterol <4.5
- LDL Cholesterol <2.0
- HDL Cholesterol >1.0 for men
  >1.3 for women
- Triglycerides <1.7

**Treatment**

- If total cholesterol or LDL cholesterol elevated: Statin / may also require ezetimibe
- If triglycerides elevated: Fibrate i.e. fenofibrate
- If not controlled: Both, but monitor CPK closely

**Beware of rhabdomyolysis especially in patients admitted to hospital and started on other medication: check for interactions**
Blood Pressure

Strict control of BP is important in DM especially if macrovascular disease or risk factors exist or where there is retinopathy or nephropathy.

Suggested guidelines
No Nephropathy  <130/80 mm Hg
Nephropathy  <120/80 mm Hg

There is some evidence that there may not be a greater benefit in having a systolic pressure <130 compared with 130 – 139.

Prothrombotic state and antiplatelet agents

Aspirin

Cardiovascular disease is a major component of diabetes, and indeed it is said that diabetes is a cardiovascular disease accompanied by a high blood sugar! The recommendations on the use of aspirin in diabetes, however, have recently been questioned because of the increased risk of bleeding. This must also be balanced by recent evidence showing a reduction in neoplasm in those on aspirin.

The following is an adaptation of a consensus statement from the American Diabetes Association, the American Heart Association, and the American College of Cardiology Foundation and can be followed until we get further guidelines.

1) Aspirin (75 mg) should be given to diabetic patients with established cardiovascular disease.
2) Aspirin therapy is recommended for most men over age 50 and women over 60 with diabetes who have one or more additional heart disease risk factors (a family history of heart disease, cigarette smoking, hypertension, micro, or macro-albuminuria, or lipid abnormalities).
3) Aspirin should not be recommended for heart disease prevention for men under 50 and women under 60 without the above mentioned risk factors, because the potential adverse effects from gastrointestinal bleeding offset the potential benefits of treatment.
**FOLLOW UP CHECK LIST**

**All Diabetics**

<table>
<thead>
<tr>
<th>Test</th>
<th>Type 1</th>
<th>Type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye screening</td>
<td>after circa 5 years and then yearly</td>
<td>on diagnosis and yearly</td>
</tr>
<tr>
<td>Feet examination</td>
<td>yearly and more frequently if “at risk”</td>
<td>See guidelines Appendix 4</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>on every visit</td>
<td></td>
</tr>
<tr>
<td>HbA1c</td>
<td>every visit, unless being seen very frequently then 2 monthly will suffice</td>
<td></td>
</tr>
<tr>
<td>Total Chol/HDL/LDL/Triglycerides</td>
<td>yearly unless indication for more frequently</td>
<td></td>
</tr>
<tr>
<td>TSH</td>
<td>yearly unless indication for more frequently</td>
<td></td>
</tr>
<tr>
<td>Thyroid Peroxidase Antibodies</td>
<td>if pregnant or trying to get pregnant</td>
<td></td>
</tr>
<tr>
<td>U &amp; E, Creatinine</td>
<td>yearly unless indication for more frequently</td>
<td></td>
</tr>
<tr>
<td>Urine albumin / creatinine ratio</td>
<td>yearly unless indication for more frequently</td>
<td></td>
</tr>
<tr>
<td>Vitamin B12 Level.</td>
<td>If on Metformin check yearly, see section on Metformin and Vitamin B12</td>
<td></td>
</tr>
</tbody>
</table>

**Dietary Review**

**Drug Checklist**

- Aspirin
- Statin
- ACE inhibitor, Angiotensin 2 receptor blocker, rennin antagonist or combinations of these.
Labour Ward

Regime for insulin dependent diabetics

For delivery - induction
- C / S
- spontaneous

(1) No long acting insulin on previous evening – give extra short acting to cover this.

(2) On morning of delivery no S.C. Insulin
At 8 a.m. start I.V. line
500 ml 10% Dextrose
+ 10 units of soluble insulin
+ 10 mmol KCL.
To run at 100ml/hr. (34 drops)

This regime may be continued until eating

(4) Blood sugar meter to be checked.
- fasting and hourly thereafter, until stable.

(5) In the case of spontaneous labour where Insulin has already been given, start 500ml. 10%. Dextrose to run at 100ml./hour and continue checking meter

(6) Post Delivery
1. Gestational diabetics: stop insulin on delivery.

2. Known type 1: reduce insulin regime on delivery and then reduce routine insulin to below pre-pregnancy levels
Appendix 1

OGTT

Instructions which may be given to the patient having an OGTT

3 Days before the OGTT

Plan on eating three healthy meals and snacks for 3 days before the test. You do not need to buy anything "special" but you do need to make sure you have healthy foods to eat. Your meals should be balanced with plenty of carbohydrates. Foods containing carbohydrates include:

- Fruits
- Breads, Cereals and Grains
- Rice
- Crackers
- Starchy Vegetables (corn/peas/carrots)

12 Hours before the OGTT

Do not eat, smoke or do heavy exercise 12 hours before the test. (For example: If your test is scheduled for first thing in the morning, for example at 8 AM - do not eat, smoke or do heavy exercise after 8pm the night before). You may drink plain, not flavoured water.

What happens on the morning of the test?
When you are ready to leave your home to have your test done, be sure to remember to bring:

- Your Lucozade drink
- Reading material/book/magazine or music with headphones

First- A fasting blood glucose test is done. This is a simple blood test that checks your blood sugar before you drink the glucose beverage.

Next- nurse will tell you to drink the glucose beverage. It will taste very sweet. It is important to drink the whole amount fairly quickly.

Waiting- After you finish drinking all of the glucose beverage, you will be asked to sit quietly until it is time (1-2 hours) for your next blood test. You may read, listen to music, talk or do another quiet activity while you're waiting.

Important –do not eat or drink anything while you are waiting.

The patient is instructed not to restrict carbohydrate intake in the days or weeks before the test. The test should not be done during an illness, as results may not reflect the patient's glucose metabolism when healthy. A full adult dose should not be given to a person weighing less than 43 kg, or exaggerated glucoses may produce a false positive result.
Appendix 2

Driving and Diabetes

This patient information leaflet is available from the Diabetes Day Centre.

Checklist When Driving with Diabetes

- Have you informed your insurance company of your diagnosis.
- Is your family doctor & Diabetes Team aware of your intention to start driving with diabetes.
- Test your blood glucose before driving and every two hours on a long journey.
- Have you adequate supply of glucose sweets, humidads, sweet drinks (not diet) plus a snack in the car.
- Having a ‘Hypo’ means your blood sugar is too low.
- Are you aware of the warning signs of a ‘Hypo’.
- If you are having a ‘Hypo’ pull over and treat immediately (sugary drink plus a snack).
- Wait 45 mins after the ‘Hypo’ and ensure blood glucose is above 3.9mmol/L before take off.

Safe Driving With Diabetes

Diabetes Day Centre
South Tipperary General Hospital

Essential Advice for People with Diabetes

Safe Driving

Diabetes Day Centre
South Tipperary General Hospital
Diabetes and
Effects of the Blood

You must:
- Inform your insurance company of your condition if you are treated with tablets or insulin.
- Inform your insurance company immediately if circumstances change at any stage.
- Inform your Diabetes Team of your intention to start driving.
- Check your blood sugar (if possible) if you are involved in a road traffic accident.

Diabetes and
Driving Essentials

- Check blood glucose level in above 6mmol/L before taking off.
- Test blood glucose level every time honour when driving long distances.
- Always carry insulin, syringes, and needles, and a spare supply of a quick-acting carbohydrate.
- Make sure you bring your blood glucose meter on the journey.
- Drivers who have lost their warning signs of hypoglycaemia should stop driving.

What is a Hype?

"Danger Ahead!"

- "Hype" refers to hypoglycaemia in the medical term for low blood glucose i.e., less than 4mmol/L.
- Early awareness of a hype when driving is crucial in preventing accidents.

Warning signs
of a Hype!

- Headache
- Hunger
- Dry Mouth
- Feelings of weakness or faint
- Blurred vision

What to do when having a Hype while driving?

- You must treat the Hype immediately.
- Move over to the side of the road.
- Keep the door and remove the keys from the ignition.
- Move to a passenger seat and take fast-acting glucose such as 衔果ten, honey, sweet drinks fast down, follow up with a long-acting carbohydrate snack.
- Test your blood glucose levels and test again after 15 minutes.
- If your blood glucose level has not improved, take another dose of glucose as described above. Test your blood glucose again after 15 minutes.
- You must wait 45 minutes to drive after having a Hype and measure your blood glucose in above 4mmol/L.

Please also see section on hypoglycaemia page.

For the regulations concerning driving and diabetes go to: www.rsa.ie

MEDICAL ASPECTS OF DRIVER LICENSING
A Guide for Registered Medical Practitioners 2010

Road Safety Authority,
Moy Valley Business Park,
Primrose Hill,
Dublin Road,
Ballina,
Co. Mayo
Appendix 3

Insulin Pump Therapy
Appendix 4

Sick Day Rules

Insulin Management

Never omit insulin

More insulin is often required during illness

Increase routine insulin if the trend of recent blood glucose levels are elevated

During illness extra insulin can be administered 2-4 hourly to address elevated blood glucose levels (in addition to routine insulin doses)

Insulin is required to correct ketosis

Fluids at least 250mls hourly to avoid dehydration

If ketosis is evident with low or normal blood glucose levels (e.g. in patients who are vomiting) IV fluid and insulin is indicated and patient should be admitted to hospital

Always recheck blood glucose and ketones within two hours to assess improvements or deterioration

Rest

Guidance for calculation of extra rapid acting insulin between meals

<table>
<thead>
<tr>
<th>Blood glucose levels in absence of ketones</th>
<th>Blood glucose levels with ketones present</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-10 mmol/L take 2 units of rapid acting insulin</td>
<td>← Continue to use this scale with the addition of the following:</td>
</tr>
<tr>
<td>10 –13 mmol/L take 4 units of rapid acting insulin</td>
<td>Ketones</td>
</tr>
<tr>
<td>13-16 mmol/L take 5 units of rapid acting insulin</td>
<td>0.0 – 0.6 mmol/L normal range</td>
</tr>
<tr>
<td>16-20 mmol/L take 6 units of rapid acting insulin</td>
<td>0.6 – 1.5 mmol/L with a bsl of &gt; 14mmol/L take an extra 2 units of rapid acting insulin.</td>
</tr>
<tr>
<td>Over 20 take 8 units of rapid acting insulin</td>
<td>1.5 – 2.5 mmol/L take an extra 4 units of rapid acting insulin.</td>
</tr>
<tr>
<td>Every 2 Hours</td>
<td></td>
</tr>
</tbody>
</table>

Test blood for ketones. If ketones are present extra insulin is required in addition to the scale above.

If vomiting continues and you are unable to tolerate fluids go to your nearest A&E Department.

Guidance for calculation of extra rapid insulin at meal times i.e. correctional insulin doses;

100 divided by Total Daily insulin dose for eg. Assume TDD = 50 units
100 \div 50 = 2

Therefore 1 unit of a rapid acting insulin will reduce / correct bsl by 2 mmol/L.

Aim to correct bsl to 10 mmol/L so if bsl = 20 mmol/L then 5 units of rapid acting insulin will reduce / correct to 10 mmol/L.

**NB.** These extra 5 units should be in addition to the person’s regular dose of insulin for that meal.

A patient information is available from the Diabetes Day Centre.
South Tipperary General Hospital Diabetic Foot Referral Pathway

**Low Risk**
- Normal sensation
- AND
- good pulses
- AND
- no previous ulcer
- AND
- no foot deformity
- AND
- normal vision

**Moderate Risk**
- Loss of sensation
  - OR
- Absent pulses (or previous vascular surgery)
  - OR
- Significant visual impairment
  - OR
- Physical disability (e.g., stroke, gross obesity)

**High Risk**
- Previous ulcer due to neuropathy/ischaemia
  - OR
- Absent pulses and neuropathy
  - OR
- Significant visual impairment
- Callous with risk factor (neuropathy, absent pulses, foot deformity)
  - OR
- Previous amputation

**Active Foot Ulceration**
- Phone podiatry department for urgent review telephone extension 6215 Lisa Johnson - Podiatrist Diabetes Day Centre.

**No Specific Regular Podiatry Input Needed**
- Exempt in exceptional circumstances.
- Patients can undertake own nail care after appropriate education.
- Annual foot check can be completed by any healthcare professional.

**Regular (4-12 weekly) General Podiatry Input Advised**
- For patients with visual impairment or physical disability, who otherwise fit into the low risk category.
- Complete green out-patient podiatry referral form for podiatry review within Diabetes Day Centre.

**Refer to Diabetic Foot Clinic for Regular Podiatry Review**
- Complete green out-patient podiatry referral form for podiatry review within Diabetes Day Centre.

**Active Foot Disease**
- Phone podiatry department for urgent review telephone extension 6215 Lisa Johnson - Podiatrist Diabetes Day Centre.
Acknowledgements

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Maimonides

As long as a person exercises and exerts himself a lot, takes care not to eat to the point of being completely full, illness will not come upon him and his strength will increase......And whoever sits comfortably and takes no exercise.....even if he eats the best foods and follows healthcare principles in other areas of his life, all his days will be full of pain and his strength will decline.

*Hilchot Deot 4:15*