

# Diabetes Management Guidelines

◆ Third Edition ◆



# **DIABETES MANAGEMENT GUIDELINES**

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**Third Edition 2012**

**MINISTRY OF HEALTH  
Government of Fiji  
2012**

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The authors do not warrant the accuracy of the information contained in these guidelines and do not take responsibility for any deaths, loss, damage or injury caused by using the information contained herein.

While every effort has been made to ensure that the information contained in these guidelines is correct and in accordance with current evidence-based clinical practice, the dynamic nature of medicine requires that users exercise in all cases independent professional judgment when using these guidelines.

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# GUIDELINES FOR MANAGEMENT OF DIABETES

Third Edition 2012

The second Edition was revised and updated by a sub-committee of the National Medicines and Therapeutics Committee.

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## PREFACE

There was a need to update the Diabetes Management Guidelines in the light of recent developments and the previous guidelines being seven (7) years old. The prevalence of Diabetes has been on the increase in adults in Fiji (from 10% in 1980 to 16% in 2002), hence the added reason to make the guidelines more current, standardized, detailed and user-friendly and available to all health practitioners at all health facilities including the private sector.

The revised Guidelines have been endorsed by the Diabetes Clinical Services Networks which comprises of representatives from all the other eleven clinical services networks.

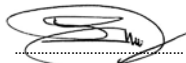
The plan is to distribute the guidelines to all health facilities and also use it as a tool to create case-discussion especially for difficult to manage patients. It will also help de-centralize basic Diabetes management to rural and remote areas and reduce referrals to base hospitals to difficult to manage, serious and complicated cases only. The guidelines are expected to create a network amongst all clinical practitioners for better management and enhanced communication.

The sub-committee has taken pride in presenting the guidelines in a very simple and comprehensible manner taking into account the drugs that are readily available in Fiji. All recommended drug therapies are evidence – based or have universally accepted standards.

These guidelines are produced for all practicing health professional for their use in managing people with diabetes in their everyday provision of care.

The goal is to help people with diabetes control their conditions, avoid or delay complications while enjoying a better quality of life, being able to contribute positively to the community/nation and prevent them dying prematurely.

I hereby acknowledge AusAID support for the production of these guidelines through the Fiji Health Sector Support Program.



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# DIABETES MANAGEMENT GUIDELINES

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# 1. NATIONAL NCD PROGRAMME

## National Non-Communicable Diseases (NCD) Prevention and Control Strategic Plan 2010-2014

The MOH National NCD Strategic Plan proposes intervention “from womb to tomb with a double edged sword” and making NCDs everyone’s business.

**The Goal:** Fiji with a healthy lifestyle population

**Aim:** Improve Fiji’s National NCD status by 5% in 2014

**Objectives:**

- Reduce the prevalence of common NCD risk factors by 5% in 2014
- Reduce the prevalence of intermediate risk factors by 5% in 2014
- Reduce the prevalence of major NCDs in Fiji by 5% in 2014
- Improve early detection and 3M (Mouth, Muscle, Medication) management of NCDs in 80% of primary health care facilities in Fiji by 2014
- Improve 3M management of NCD admissions in 80% of Sub-divisional and Divisional hospitals in Fiji by 2014

### Goals of the National Diabetes Plan

The National commitment to Diabetes is to reduce prevalence by 5% by 2014 and improve the delivery of Diabetes services. To be able to deliver this, the health system needs to:

- Promote the Health and Welfare of people with Diabetes and provide support for their families.
- Promote a better understanding and awareness of Diabetes in the general community.
- Develop and implement innovative and cost effective ambulatory care services that complement the work of other health care professionals.
- Develop and maintain high standards of care through a range of quality improvement activities.
- Conduct high quality clinical and educational research.
- Provide up to date and innovative training of health professionals.
- Maintain a comprehensive database to support all the activities of the health facilities including screening high risk persons and supporting planning and research on Diabetes care in our community.

**The aim of the diabetes management guidelines is to:**

- Recognize early, diagnose and manage Diabetes effectively.
- Help defer or delay the onset of complications.
- Manage complications effectively with the available resources.
- Have an effective referral system for optimum intervention at every level.

*(See Annex 3: Key interventions and checklist of tasks)*

## 2. INTRODUCTION

Diabetes mellitus is defined as a metabolic disorder of multiple aetiology, characterized by chronic hyperglycaemia with disturbance of carbohydrate, protein and fat metabolism resulting from defects in insulin secretion, insulin action, or both. However while insulin defects mentioned are critical abnormalities, several other factors contribute to the hyperglycaemic state.

The major types of primary diabetes mellitus are:

- Type 1 diabetes
- Type 2 diabetes
- Gestational diabetes

### 2.1 RECOGNITION

**Type 1 diabetes** is characterized by progressive beta cell destruction, severe insulin deficiency, and the urgent need for insulin replacement therapy because of the risk of ketoacidosis and death. Patients are usually less than 30 years but it can present in older patients. The onset of symptoms is more rapid and ketones are usually present.

At presentation, the patient with suspected Type 1 diabetes should be immediately assessed to determine appropriate management. It is advisable to refer all such cases to the nearest hospital for the initial management.

**Type 2 diabetes** is common and is the predominant form of diabetes. It often goes undiagnosed for many years because the hyperglycaemia develops gradually and at early stages of the disease process it is often not severe enough for the patient to notice any of the classic symptoms of diabetes and indeed may have evidence of complications at diagnosis.

There are a number of factors known to be associated with a higher risk of developing type 2 diabetes and any person with any of these factors should be screened for the diagnosis of diabetes.

#### ***Population at Risk includes:***

- |   |                                 |
|---|---------------------------------|
| • >30 year olds   | • Physical Inactivity           |
| • High Risk Ethnicity                                     | • Macro-vascular Disease        |
| • Previous history of Gestational Diabetes Mellitus (GDM) | • Hypertension or Dyslipidaemia |
| • Family history of Diabetes Mellitus                     | • Obesity                       |

A person, not known to have diabetes, presenting with the following symptoms (which are typical symptoms of diabetes) needs to have blood sugar tests done to establish the diagnosis of diabetes:

- |               |                   |
|---------------|-------------------|
| • weight loss | • lethargy        |
| • polyuria    | • pruritus vulvae |
| • polydipsia  | • Balanitis       |



Conditions listed below may suggest underlying diabetes which requires confirmation with the appropriate blood sugar studies:

Foot sepsis, multiple abscesses, delayed wound healing, neuropathy, visual impairment
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**Gestational diabetes** is diabetes developing for the first time in pregnancy. Its pathophysiology is similar to Type 2 diabetes. The interpretation of blood glucose levels for diagnosis is more stringent compared to that of other types of diabetes. It may disappear after delivery but signals a high risk of developing diabetes in later life. Hence a close monitoring of such clients or patients is essential.

## 2.2 DIAGNOSIS OF DIABETES MELLITUS

A firm diagnosis of diabetes is based on blood sugar levels. Urine testing is not reliable. **Capillary blood glucose testing if used should be confirmed by venous blood testing.** An overnight fasting blood sugar level is often preferred though random blood sugars can be used. **Two positive results** on two different days are recommended. **A single positive result** is significant if there is unequivocal hyperglycaemia with metabolic decompensation or is accompanied with symptoms of diabetes.

The diagnosis of diabetes is based on the following blood results:

Venous Blood Sugar	Fasting Blood Sugar (FBS)	Random Blood Sugar (RBS)
Normal	< 6.1 mmols/l	<6.5 mmol/l
Impaired Fasting Glucose	Between 6.1 to 7.0 mmol/l	
Impaired Glucose Tolerance		Between 6.5 to 11.0 mmol/l
Diabetes Mellitus	>7.0 mmol/l	>11.0 mmol/l

**The values above do not apply to pregnant mothers.**

The **HbA1c** result of 6.5% or more is now considered to be useful in the initial diagnosis of diabetes, however its greatest value in Fiji at present is for monitoring the control of blood sugar levels.

Blood glucose levels above the normal but below that, which is diagnostic of diabetes, are not to be neglected as they constitute two very important entities called **Impaired Fasting Glucose (IFG)** and **Impaired Glucose tolerance (IGT)**, the management of which requires active lifestyle changes (SNAP Intervention – see section 3.3) to prevent the development of diabetes later in life. These individuals must be closely monitored with further blood glucose test results in 6 months' time.

### 3. THE MANAGEMENT OF DIABETES IN ADULTS

Diabetes in adults is mainly Type 2 but Type 1 diabetes can also occur. In a person known to have diabetes or one who has been newly diagnosed, the management aspect should not only focus on the control of blood sugars alone but be viewed as a package. The overall diabetic management requires a multifactorial approach to prevent the development of cardiovascular and microvascular disease. A practical approach to the management of type 2 diabetes in adults is considered below.

#### 3.1 CLINICAL ASSESSMENT

All diabetic patients require a thorough clinical assessment on initial visit, which includes a review of history, physical examination and relevant investigations as outlined below. Any further assessment thereafter will be less intensive but will depend on the clinical status of the patient at that stage.

Review of History	Physical examination	Relevant investigations
Severity of Symptoms	Alertness and hydration	Order & review investigations as indicated
General health and inter-current illness	Height and Weight (BMI calculated)	Full Blood Count: A low Hb may indicate an underlying chronic kidney disease
Family history of diabetes	Pallor	Blood biochemistry: urea, electrolytes, creatinine, lipid profile, FBS or RBS, HbA1c
Social history	Vitals: Pulse and blood pressure (BP), respiration and temperature (if indicated). BP measurement should include any postural drop.	Urine for micro-albuminuria (if test not possible, do proteinuria)
Current medications and history of drug allergy	Heart and lung examination	
	Examination of the extremities for oedema, peripheral pulsation and neuropathy	
	Visual acuity and fundoscopy	
	Capillary blood glucose	
	Ketones - if warranted.	

### 3.2 CATEGORIES AND REFERRAL RECOMMENDATIONS

Category	Definition	Recommended Action
0	People at Risk of Diabetes	Managed at Health Centres and Nursing Stations
1	Newly diagnosed	Refer to the health centre/subdivisional hospital
2	Established and well controlled	Managed at health Centres/subdivisional level
3	Established and poorly controlled*	Refer to the Hub Centre/Subdivisional Hospital
4	Established with complications	Refer to the Hub Centre/ divisional Hospital
5	Established with complications and other conditions/complicated issues	Refer to Divisional Hospital

\* See table for targets for control on page 30

*On initial assessment, patients should be screened for complications. If no complications exist, perform 6 monthly screening. If complications exist then refer to appropriate chapters in the guideline for management.*

### 3.3 NON-PHARMACOLOGICAL INTERVENTION (LIFESTYLE MANAGEMENT or SNAP)

Modification of adverse lifestyle factors is an integral part in the management of all types of diabetes and in the prevention of diabetes. The important factors requiring attention include smoking, nutrition, alcohol and physical inactivity (SNAP).

**Smoking:** In patients with diabetes smoking is an independent risk factor for cardiovascular disease. There is no safe level of smoking. Passive smoking is also detrimental. All patients who smoke and are suffering from diabetes must be encouraged to stop smoking or provided assistance to quit smoking.

#### Important advice to people wanting to Quit Smoking:

- Tell your family, friends and co-workers that you are quitting
- Ask friends who smoke not to smoke around you or offer you a cigarette
- Follow the 4 D's:
  - Delay
  - Deep breathing
  - Drink water
  - Do something else
- Avoid alcohol and grog which can lead to smoking

**Nutrition** (Diet and weight control): Type 2 diabetes is associated with obesity. Weight management is an integral part of diabetes care. Studies have shown that weight reduction improves hyperglycaemia. It can also assist in reducing the dose or in stopping the anti diabetic medications and in the control of hyperlipidaemia and blood pressure. There are many ways for achieving weight reduction. It can be through the individual's diet and physical activities and these can be targeted easily. A healthy recommended diet is to be pursued. The diet should be rich in fibre, whole grains, and legumes; contain less than 7% saturated fat and no trans fats. The diet should also be limited in calories and include foods with low glycaemic index.

The Body Mass Index is calculated using the following formula:

$$\text{Body Mass Index (BMI)} = \frac{\text{weight (kg)}}{\text{Height} \times \text{height (in meters)}}$$

➤ For risk levels – refer to Annex 1

**The following advice is for managing diabetes through healthy eating:**

A healthy diet will help people with diabetes control blood glucose levels and reduce the risk of complications. All starchy and sugary (carbohydrate) foods are broken down in the stomach to sugar (glucose) and absorbed into the blood.

People with diabetes should avoid eating too much carbohydrate foods which increase blood glucose levels.

Relevant recommendations from the **Food and Health Guidelines** for Fiji (*Appendix 2*) are:

- Eat a variety of foods from the 3 Food Groups in each meal. Go Local!
- Choose and prepare food and drinks with less salt, sugar, fat and oil.
- Stop smoking. If you take kava &/or alcohol – Drink responsibly and avoid binge drinking.
- Eat more local fruits and vegetables.
- Be physically active to maintain a healthy weight

In addition to the above:

- Eating regular meals
- Aim to eat low Glycemic Index (GI) foods such as wholemeal products and leafy vegetables
- Try to include at least 2 portions of fish per week, if possible.

The diet recommended for diabetic people is the same as a healthy diet recommended for the general population. The proportion of food from each food group eaten over a whole day needs to be made up of:

- About half from the health and protective group (fruits and vegetables);
- About one third from the energy group (starchy foods); and
- The remainder from the body-building group (protein) such as meat, fish and dhal.

**People with diabetes also need to avoid taking sugar and sugary foods.**

**Alcohol** – all diabetic patients must be aware of high caloric value of alcohol and the effect of excess consumption on body weight. If consumed, alcohol intake should be no more than two standard drinks daily. There is a risk of severe hypoglycaemia if excess alcohol is consumed.

**The following advice is for diabetic patients who take alcohol:**

People with diabetes are advised to avoid or limit alcohol intake because:

- Alcoholic drinks contain sugar and will cause the blood glucose level to rise quickly
- Extra energy (calories) can increase body weight
- It can interact with diabetes medications
- It can mask symptoms of hypoglycaemia
- Other medical conditions may be worsened

It is good to adhere to the recommended guidelines for alcohol.

Guidelines:
Men 1-2 standard drinks per day
Women 1 standard drink per day

One standard drink contains 10 g of alcohol. Examples of standard drinks are:

- ♣ 285 millilitres (ml) full-strength beer, or
- ♣ 375 ml light beer (average can)
- ♣ 100 ml wine (small glass)
- ♣ 30 ml spirit (bar measure)

**AVOID BINGE DRINKING (KEEP TO 2 or LESS STANDARD DRINKS PER DAY)**

## Physical inactivity

Regular physical activity is important in diabetic patients. It is important to get the patient's view on physical activities, the current activities pursued, the activities possible and how to accommodate relevant activities in daily routine. Patients are to be advised to keep themselves active in their own ways daily and if possible to pursue at least 30 minutes of moderate intensity physical activity such as brisk walking, cycling and gardening. Patients who have not been physically active previously should be advised to start slow and go slow. Those on anti-diabetic medications, especially insulin therapy, should be advised to take some carbohydrate intake prior to moderate intensity physical activity to avoid the risk of hypoglycaemic attacks.

### **The following advice is for diabetic patients who are physically active:**

- Adopt the type of physical activity that you can do
- Drink water before, during and after exercise
- Do not exercise immediately after taking insulin
- Be alert for signs of low sugar and take appropriate measures if low sugar condition arises
- Be active 1-2 hours after you have eaten
- Wear comfortable and well-fitting shoes
- Seek advice from your nearest health worker whenever needed.

*Patients with end organ damage (complications) will need specialized diet & physical activity plans.*

## Stress

During stress, there is an increased demand for energy mainly from the body's stored fat and glucose. People under stress tend to neglect looking after themselves. They may forget to take their medications or fail to monitor their food choices or intake. Some people cope with stress by taking alcohol or decrease their physical activities.

### **People with diabetes should be counseled to:**

- Handle stress more positively
- Replace bad or negative thoughts with good or positive ones.
- Control the body's reactions to stress through
  - Relaxation techniques: like breathing exercises, meditation, yoga,
  - Exercising or dancing
  - Listening to calming music
- Talk to someone and share worries. It helps to see things in a different light. They may not be really as bad as we think.
- Start a hobby, learn new things!  
Practice the 12 S's (refer to Annex 2 for the list)

*Through relaxation, they decrease the body's need for energy, consequently decreasing blood glucose levels.*

### 3.4 MANAGEMENT OF HYPERGLYCAEMIA

The overall aim of glycaemic management is to minimize long term complications while avoiding severe hypoglycaemic events. Results of various randomized trials in diabetic patients have shown that control of hyperglycaemia delays the onset and slows the progression of microvascular complications. However its effect on macrovascular disease remains uncertain.

The first step in the control of hyperglycemia is setting an appropriate glycaemic target in each individual. In younger patients with no complications of diabetes a near normal glycaemic target can be aimed for, while in older patients with cardiovascular disease and multiple vascular risk factors, a higher glycaemic target should be the goal. Intensive glucose control in the latter poses adverse effects from the multiple drugs used and the risk of hypoglycaemia. This can be documented in the personal Diabetes Record Book issued to diabetic patients attending SOPD clinics.

*Active lifestyle intervention (SNAP) should be pursued prior to introducing drug therapy as some Type 2 diabetic patients may achieve satisfactory glycaemic target without the use of drugs.*

#### When to start Pharmacological Intervention for hyperglycemia

- Uncomplicated newly diagnosed diabetic patients who are unable to control blood sugars with lifestyle intervention within 6 weeks.
- Newly diagnosed patients with diabetic complications.

The commonly used glucose lowering drugs in the management of diabetes are discussed below:

#### 3.4.1. Biguanides

*Metformin* is the only drug of the biguanide group available on the Fiji Essential Medicine Formulary (EMF). It lowers blood glucose by suppressing hepatic glucose production and increasing tissue sensitivity to insulin. It should be considered as the first line treatment for all patients suffering from diabetes and is the preferred drug in obese type 2 diabetic patients.

It is cleared from the body predominantly by renal excretion. It accumulates in renal impairment and should be used with caution in patients with serum creatinine of more than 200  $\mu\text{mol/L}$  or eGFR of <45ml/min. Patients receiving long-term metformin should have regular (at least 6-monthly) monitoring of their renal function. Its role in pregnancy and breastfeeding mothers is discussed under gestational diabetes.

It can cause **lactic acidosis** in situations such as ischemic heart disease, congestive heart failure and renal impairment. It should be stopped for 48 hours before surgery or administration of contrast radiography and only resumed once urine output and renal function have returned to acceptable level as stated above. There is no risk of hypoglycaemia when used alone.

Its major adverse effects are: anorexia, nausea, abdominal discomfort and diarrhoea.

Metformin is given orally 2-3 times a day and taken with or after meals to avoid gastric intolerance. The dose varies from 500 mg daily to a maximum of 3 g/day in divided doses. Most

physicians limit the dose to 2 grams daily because, at higher doses, gastrointestinal side effects are more common. **It is advisable to begin with a smaller dose to start with and increase the dose gradually to facilitate compliance;** otherwise the development of gastrointestinal side effects will stop the patient from taking the drug.

### 3.4.2. Sulphonylureas

Two of these compounds, *glibenclamide* and *glipizide*, are available on the Fiji EMF. They act on the pancreatic beta-cells and induce insulin secretion. *Glibenclamide* is predominantly cleared by the kidneys and it is recommended in younger patients. In contrast, *glipizide* is cleared by the liver and the kidneys and it is the recommended drug in older patients and in patients with renal impairment. Sulphonylureas are used in lean type 2 diabetic patients. They can be combined with metformin if the diabetes control is inadequate.

***These drugs are not recommended in pregnancy and for lactating mothers.***

Hypoglycaemia is the major adverse effect especially when there is significant renal impairment. This is less likely with shorter-acting drugs (i.e. *glipizide*) but much more likely with longer-acting compounds (i.e. *glibenclamide*). **Glipizide** can be given as a single dose up to 15 mg/day orally with meals and in two divided doses above 15 mg up to a maximum of 40 mg/day. The dosage of **glibenclamide** varies from 2.5 mg to 20 mg daily orally with meals and in two divided doses above 10 mg up to a maximum of 20 mg/day.

**Glizalide** is an oral hypoglycaemic drug and is classified under sulphonylurea group of drugs. It is used when diabetes is not controlled with lifestyle modifications or when insulin therapy is not required. It is metabolized by the liver and is contraindicated in severe hepatic and renal dysfunction. It is available as immediate release tablet, 80 mg strength, or as a Modified Release (MR) formulations, 30mg and 60 mg strength. The initial dose is 40-80 mg daily and is adjusted according to response up to 160 mg as a single dose; higher doses are divided and given as twice daily. The maximum dose is 320 mg daily. The MR preparation dosage varies from 30- 120 mg once daily at breakfast. (Note: 30mg of MR product is equivalent to 80mg of conventional tablet).

**Glimepiride** is a sulphonylurea anti diabetic medication. It may be used alone or with other anti diabetic medications. The usual dose is 1-2 mg with breakfast, it is given once daily. Further dosage adjustments are made every two weeks as required. The maximum dose per day is 8 mg.

*Glizalide* and *Glimepiride* are not available on Fiji EMF but can be obtained from the retail pharmacies.

### 3.4.3. Other Oral Anti Diabetic Drugs

**Thiozolidinediones** - Two commonly used drugs are *Pioglitazone* and *Rosiglitazone*, the former is preferred because of better side effect profile. The common side effect of these drugs include oedema, weight gain and precipitation of heart failure, hence these drugs are contraindicated in heart failure. Risk of fracture should be considered in the long term in females treated with *pioglitazone*. They increase tissue sensitivity to insulin. *Pioglitazone* can be used as monotherapy

but can be combined with dual or triple therapy in combination with *metformin*, *sulphonylurea* or *insulin*. The dose of *pioglitazone* is 15-30 mg as a single dose.

**Alpha glucosidase Inhibitors** – these are oral glucose lowering agents that inhibit alpha glucosidase enzymes in the brush border of the small intestine. These enzymes convert complex carbohydrate in the intestine to simple sugars for absorption. The drug available in this group is **Acarbose**. It can be used as monotherapy or combined with other oral anti diabetic medications including insulin. The common side effects include abdominal discomfort because of fermentation of undigested carbohydrate by colonic bacteria. Hypoglycaemia does not occur. It is not recommended in chronic intestinal disease, intestinal obstruction and cirrhosis. Smaller doses are recommended in renal and hepatic dysfunction. *Acarbose* comes as 25 mg, 50 mg and 100 mg tablets. Start the dose with 25 mg three times a day to 100 mg tds as required. It should be taken with the first bite of a meal. The maximum dose per day is 600mg.

There are other anti diabetic medications which are not available in Fiji. These include *Peptyl peptidase -4 Inhibitors*, *Meglitinides* and *Glucagon like Peptide- 1 Agonists (GLP-1)*.

#### 3.4.4. Insulins

There are three insulin preparations available on the Fiji EMF and are discussed below. The usage of these preparations is discussed later.

Insulin is given using conventional disposable insulin syringes. Insulin pens and pre-filled syringes are expensive options and are available only in the private sector.

The preferred sites of injection are the abdominal wall, the deltoids and the thighs. It is recommended that these sites be rotated regularly.

Characteristics of available Insulins			
Types	Onset of Effects (In Hours)	Maximum Effect (In Hours)	Duration (In Hours)
Short-acting soluble insulin (Actrapid HM, Humulin R)	0.5	2 – 5	6 – 8
Intermediate-acting isophane insulin (Protaphane HM, Humulin NPH)	1 – 2.5	4 – 12	16 – 24
Biphasic isophane insulin (Mixtard 70/30)	0.5 - 1	2- 12	16 – 24

**There are other types and brands of Insulin available outside of Fiji EMF such as the long acting preparations detemir and glargine.**

#### Insulin Pens

These are insulin delivery devices available in many different brands and models, mainly for personal use. They generally fall into two (2) groups: reusable pens and disposable pens.

**Reusable insulin pens** are loaded with an insulin-filled cartridge before use and replaced by another cartridge when empty. Set of five (5) replaceable cartridges are usually available with each cartridge containing either 150 or 300 units of soluble, intermediate or mixed insulin. Needles are available separately.



**Disposable insulin pens** come filled with insulin and are discarded when empty. Needles are available separately and disposable pens may be available in sets of five (5).

There are advantages and disadvantages of using the insulin pens:

Some **advantages** are that they are discreet, user friendly, insulin is pre-filled, pen is easily portable and convenient for injections away from home.

Some **disadvantages** are that the pens maybe more expensive, not all types of insulin maybe available and they do not allow mixing of insulin.

For more information refer to [www.bd.com/us/diabetes/page.aspx?cat=7001&id=7254](http://www.bd.com/us/diabetes/page.aspx?cat=7001&id=7254) & [www.insulinpens.com/](http://www.insulinpens.com/)



*Insulin pens are now available in great many styles.*

### **Insulin Pumps (also known as continuous subcutaneous insulin infusion therapy)**

These are small computerized insulin delivery devices which can be worn on the belt or kept in the pockets of patients. The pumps allow for a continuous flow of rapid-acting insulin into the body through a catheter inserted under the skin of the abdomen. The insulin pump is designed to deliver a continuous amount of insulin, 24-hours a day according to a programmed plan unique to each pump wearer. The amount of insulin delivered can be changed by the user. The insulin pump is an alternative to multiple daily injections for intensive insulin therapy (which includes frequent blood glucose monitoring as well).

The pumps also have the capability of recording the history of insulin delivery and this could be downloaded onto a computer for analysis.

In recent times insulin pump technology is being combined with continuous blood glucose monitoring system. When the feedback loop is complete (insulin delivery based on feedback of the blood glucose level) the system may function as artificial pancreas.

For more information refer to: [diabetes.webmd.com/insulin-pump](http://diabetes.webmd.com/insulin-pump); [en.wikipedia.org/wiki/insulin\\_pump](http://en.wikipedia.org/wiki/insulin_pump); [www.medtronic-diabetes.com.au](http://www.medtronic-diabetes.com.au)



***Note:*** *Very small numbers of patients in Fiji are using the insulin pens and even fewer may be using the pump. However, visitors to the country may be using these devices and may seek your advice or help.*

## Insulin treatment in type 2 diabetes

### (i) Deciding when to start

- Failure of oral hypoglycaemic agents – insulin therapy should not be delayed. Early treatment delays complications and preserves beta cell function.
- Patients undergoing major surgery,
- Critically ill patients,
- Pregnancy

### (ii) Administering insulin with oral hypoglycaemic drugs

- As outpatient treatment, initiate with Isophane or mixed insulin 10 units subcutaneously at bedtime and adjust dose according to blood sugar levels.
- If the blood sugar is not controlled then use Isophane or mixed insulin 10 units subcutaneously twice daily with subsequent adjustment of the dose according to blood glucose levels.
- Oral hypoglycaemic agents should not be stopped with the commencement of insulin therapy though adjustments can be made as required.

### (iii) Insulin regimens

#### (a) Multiple-dose (“QID”) regimen

This regimen is more suited for stabilization of blood sugar for inpatients.

- *Soluble insulin* starting with 5 units subcutaneously 30 minutes before each meal  
AND
- *Isophane* 8 units subcutaneously twice a day.

Insulin doses should be adjusted based on the blood sugar levels.

#### (b) Twice daily regimen

This regimen can be used for control of blood sugar for both inpatients and outpatients.

- *Mixtard insulin 70/30, starting with 10 units in the morning and 5 units in the evening subcutaneously 30 minutes before meals. Adjust insulin dose to control blood sugars.*

If mixed insulin preparation is unavailable then use:

*Isophane insulin 10 units in the morning and 5 units in the evening subcutaneously 30 minutes before meal. Doses are adjusted to control the blood sugar levels.*

In principle, two-thirds of the insulin dose should be administered in the morning and one third in the evening. However, insulin doses should be adjusted based on the blood sugar levels and increments of 5 units per dose are recommended.

If blood sugar level remains uncontrolled then contact the medical registrar at your divisional hospital.

***\*For both insulin regimen, extra soluble insulin 5 units subcutaneously can be given if blood sugars are not controlled.***

### 3.5 GENERAL APPROACH TO THE MANAGEMENT OF DIABETES

The general approach to the management of diabetes is outlined below in Figure 1.

All patients with **type 1 diabetes** besides lifestyle modifications (SNAP) require insulin therapy. Adults can be managed as an outpatient. (Note: children diagnosed with Type 1 diabetes should be referred to a specialist paediatric unit for full assessment and the management is discussed in section under Diabetes in Children).

For all patients with **type 2 diabetes**, Non-Pharmacological (SNAP) intervention is essential. This approach can produce good glucose control. Drug therapy should only be considered if blood sugar levels remain uncontrolled after 6 weeks of lifestyle modifications.

The decision to commence glucose lowering medications is based on the degree of hyperglycaemia and the presence or absence of symptoms.

In general, the use of oral glucose medications should be considered if despite SNAP intervention the fasting glucose levels are above 7 mmol/L and/or HbA1c is > 7.0%.

The figure below shows the targets to be achieved that ensues good diabetic control.

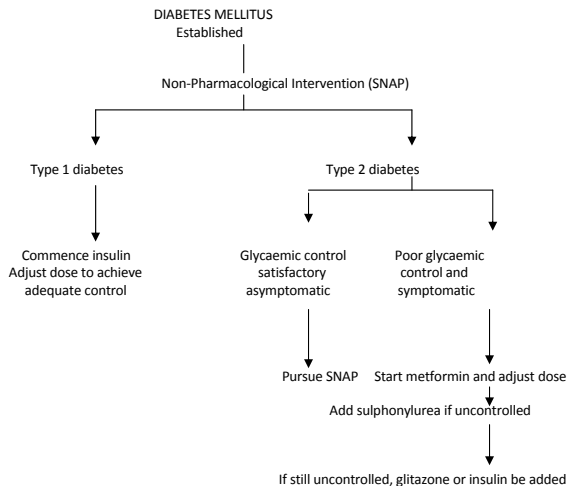
		<b>Aim for:</b>
<b>Blood glucose control targets for persons with Type 2 Diabetes</b>	Fasting	4 - 6 mmol/l
	Random	5 - 9 mmol/l
	HbA1c	<b>7%</b>

**NOTE:** As discussed above the glycaemic target for older patients with cardiovascular disease and multiple vascular risk factors warrants levels higher than that mentioned above (8-10 mmol/l)

**Metformin** is now generally considered to be first line treatment unless contraindicated. A sulphonylurea group of agent like glipizide or glibenclamide is added later if the blood sugar levels are still not adequately controlled. Treatment with other oral glucose lowering medications (glitazones, alpha glucosidase inhibitors) and/or insulin needs to be determined on an individual basis.

Glucose control progressively deteriorates over time requiring an increase in drug therapy to maintain glycaemic control. About 50% of patients will require insulin therapy in addition to oral medications within 5 to 10 years of diagnosis of Type 2 diabetes (secondary failure). In these patients combining oral glucose lowering medications with insulin minimizes the amount of insulin required.

## TREATMENT FLOW CHART FOR CONTROL OF HYPERGLYCAEMIA



If insulin therapy is commenced, start roughly with 0.3 unit / kg of body weight.

**Note:** continue oral anti diabetic drugs.

With insulin the following regimens can be used, it is preferable to start with the regimen and make adjustments later

- single dose of isophane nocte ( intermediate insulin) **or**
- isophane insulin twice a day **or**
- mixtard insulin (30/70) twice a day **or**
- soluble insulin tds and isophane nocte

Figure 1

## 3.6 SPECIAL SITUATIONS IN THE MANAGEMENT OF DIABETES

### 3.6.1 PHYSICAL ACTIVITY

- Physical activity carries additional risks in diabetic patients on insulin therapy. Hypoglycaemia is a major concern in this situation.
- For mild to moderate physical activity (e.g. fast walking on a flat surface, mopping the floor) for 30 minutes, extra carbohydrates should be taken beforehand.
- For “short bursts” or longer strenuous physical activity (e.g. scrubbing the floor, moving heavy furniture), it is advisable to reduce dosage of short-acting insulin.

### 3.6.2 FASTING

Many patients with diabetes fast for religious or other reasons.

**For Type 1 diabetic patients:** their usual daily insulin dose can be divided into two doses given before each of the two main meals of the day.

**For Type 2 diabetic patients:** The timing of the dose of the oral hypoglycemic agent is important.

For those patients on metformin, doses can be rearranged to coincide with the two main meals of the day.

For those patients on sulfonylureas especially Glibenclamide: for once daily dosage, give medication with the first main meal and for those on twice daily dosage, give the medication with the two main meals.

### 3.6.3 ILLNESS

Metabolic control may deteriorate rapidly during illness of any kind.

As part of their education program all patients should have a contingency plan on which they can work on if an illness upsets their diabetes control.

There should be close monitoring of blood sugar levels.

Insulin doses should be adjusted according to blood sugar levels and changed to short-acting insulin for better control. Insulin must not be stopped. If there is a need to reduce the dose, it should not be more than 30%.

Oral hypoglycaemic drugs should not be stopped unless the patient cannot eat.

Maintenance of fluid intake is important.

If the patient is unable to take in solid food, substitute with fruit juices, regular soft drinks, or other fluids containing glucose.

Patients who have repeated vomiting should contact medical help early as both intake of fluids and carbohydrates need to be maintained.

The patient should have thorough knowledge of when, how and where to contact a specialist health care facility.

### **3.6.4 TRAVELING**

Patients on insulin can travel overseas as long there is proper adjustment of their food and insulin doses to adapt to the changing local times.

Journeys should be carefully planned. Enough insulin for the whole trip with some spares should be carried. Insulin should be kept cool inside a well-insulated bag. It is advisable to carry a medical report from the doctor with treatment details to facilitate customs clearance. The report will assist in dealing with any medical problems that may arise during traveling.

Easily absorbed sugary foods (e.g. lollies, fruit juice) should be available while traveling as well as food that takes a little longer (e.g. crackers) to absorb. These can be taken if there is an indication of impending hypoglycaemia.

## 4.0 Treatment of Associated Metabolic Conditions

### 4.1 Hypertension

This is a major risk factor for both cardiovascular diseases and renal complications. Blood pressure control is more important than the choice of anti-hypertensive drugs. However, angiotensin converting enzyme inhibitors (ACEIs) are the first-line drugs in controlling hypertension. Other anti-hypertensive drugs such as beta-blockers (e.g. atenolol), slow release calcium channel blockers (e.g. nifedipine), and loop diuretics (e.g. furosemide) can also be used. In Fiji, methyldopa is available and can be used if the above drugs are not available. A combination of the above drugs might be needed to achieve desired blood pressure control.

When ACEIs are used to control hypertension, it is important to monitor the renal function two weeks later. A slight increase in serum creatinine is generally expected and is usually less than 30% of baseline values. If there is more than 30% rise in serum creatinine from the baseline values, it is recommended that ACEIs should be stopped and replaced by another anti-hypertensive drug after consultation with the specialist at the divisional hospital. This rise in serum creatinine might indicate underlying renal artery stenosis.

Treat hypertension as follows:

- i) If renal function is normal (regardless of blood pressure) but microalbuminuria is present, start enalapril 5-40 mg daily. The target of BP control is less than 130/80 mm Hg.
- ii) In the presence of renal impairment and/or significant proteinuria (>1 g/day or +++ on dipstick), the BP should be lower than 120/80 mm Hg.

Caution is required with ACEIs therapy because of the risk of development of hyperkalemia. When possible, it is advisable to monitor electrolytes at least once every six months or earlier if required. A common side effect of ACEIs is cough. An alternative is to use ACE receptor blocker (not available in the Fiji Medicine Formulary).

### 4.2 Hyperlipidemia

This is a common occurrence in diabetic patients.

Elevated triglycerides and LDL (low-density lipoprotein) cholesterol with reduced HDL (high density lipoprotein) cholesterol is a common pattern and may warrant treatment. Getting the best possible control of blood glucose is an important first strategy. If lipid abnormalities persist despite this, they may need to be treated in their own right. The recommended drugs are statins (e.g. simvastatin, atorvastatin, pravastatin, lovastatin). The common side effects of lipid lowering drugs are muscle and liver problems.

It is advisable to do LFTs before starting statins and a month after commencement of statins.

Lipid lowering drug therapy with simvastatin 40 mg or atorvastatin 10 mg is recommended for primary prevention in patients with type 2 diabetes aged > 40 yrs regardless of baseline cholesterol. Patients under 40 years and other important risk factors should also be considered for anti-lipid treatment.

### 4.3 Antiplatelet therapy

Unless \*contraindicated *Aspirin* is recommended for adults with diabetes and a history of cardiovascular diseases (CVD). In the absence of CVD, it is "reasonable" to consider *Aspirin* in those patients who are at an increased risk based on age (males >50 years and females >60 years) and at least one additional CVD risk factor such as smoking, dyslipidemia, hypertension, family history of disease and albuminuria.

*Common contraindications to Aspirin therapy are:	
History of peptic ulcer disease	intracranial bleed
GI bleed	Bleeding disorder
Low platelet states	

## 5.0 Management of acute complications of Diabetes

### 5.1 HYPOGLYCAEMIA

Hypoglycaemia is a condition defined as a fall in the blood sugar level over a short period of time causing symptoms. Diabetic patients are more prone to hypoglycaemic symptoms, mainly because of the use of oral hypoglycaemic agents, insulin and the risk of sepsis.

However, the threshold varies from person to person. A diabetic patient who is subject to low blood sugar levels most of the time may not experience any symptoms for several hours even with blood sugar levels as low as 1.0 mmol/l.

On the other hand a diabetic patient with persistently elevated blood sugar level may experience hypoglycaemic symptoms if the blood sugar level falls quickly but is still above the normal range.

Hypoglycaemia presents as:

**sweating, tremor, tachycardia and pallor from adrenal and sympathetic activity triggered by the low blood glucose and/or hunger, and can proceed to mental confusion, coma and seizures.**

Patients suffering from pre-existing autonomic neuropathy may not have any warning symptoms that manifests with neurological symptoms straightway.

The factors that precipitate hypoglycaemia include:

- high insulin dose
- high doses of sulphonylureas
- presence of renal failure
- liver failure
- septicaemia
- missed or delayed meals
- hormonal disturbances, and
- vigorous physical activity.

**Patients should be treated urgently.**

If the patient is conscious and able to swallow, give a sugary food or drink followed by foods that take longer to be absorbed e.g. crackers.

If the patient is unable to swallow or becomes unconscious at home, give sugar paste or honey into the mouth and transfer immediately to the nearest health care facility for intravenous glucose therapy. At the health care facility, if the patient is unconscious or unable to swallow:

- ***Give 50 ml of 50% dextrose intravenously followed by continuous intravenous infusion of 5% dextrose for up to 24 hours.***

Hypoglycaemia in the elderly, particularly as a consequence of accumulation of sulphonylurea in the plasma, may be difficult to reverse and may reoccur for several days after stopping the drug.

It is important to educate all diabetic patients on the symptoms of hypoglycaemia, the factors that may precipitate it, the preventive measures and the treatment that can be undertaken in cases of mild attacks. In severe cases it is important to advise the relatives to seek immediate help from the nearest health facility to avoid any irreversible brain damage.



## 5.2 DIABETIC KETOACIDOSIS (DKA)

### 5.2.1 General considerations

Diabetic ketoacidosis (DKA) is characterized by the triad of ketosis, hyperglycemia and acidemia. The presence of ketone bodies is a consistent finding in DKA. DKA occurs predominantly in Type 1 diabetic patients but can occur in Type 2 diabetes. It might be the first presentation in an unknown type 1 person with diabetes.

The diagnostic features include:

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>• vomiting,</li><li>• abdominal pain,</li><li>• Kussmaul's breathing,</li></ul> | <ul style="list-style-type: none"><li>• dehydration,</li><li>• ketotic breath,</li><li>• mental confusion progressing to coma.</li></ul> |
|---|--|

It is necessary to test urine for moderate to large ketone bodies. **Venous rather than arterial blood pH and bicarbonate are now preferred.**

The common precipitating factors of DKA include:

- |   |
|---|
| <ul style="list-style-type: none"><li>• history of omission of insulin;</li><li>• drugs, e.g. corticosteroids; sepsis;</li><li>• acute coronary event; recent trauma; and pregnancy</li></ul> |
|---|

### 5.2.2 Management

Management should be undertaken urgently in the nearest health care facility. The most important therapeutic intervention in DKA is an appropriate fluid replacement. Insulin therapy can be started subsequently. Discuss with the medical team at the divisional hospitals. Ensure that patient has 2 Intravenous accesses.

**Transfer patient to an appropriate health facility once his/her condition has been stabilized.**

**a. Fluids:** Administer intravenous infusion of **normal saline** as follows:

- |   |
|---|
| <ul style="list-style-type: none"><li>• First liter for 30 minutes</li><li>• Second liter for one hour</li><li>• Third liter for 2 hours</li><li>• Fourth liter for 4 hours</li></ul> |
|---|

Further infusion should be administered according to clinical assessment of the patient.

Once the blood sugar level reaches 14mmol/l, change intravenous fluid to 5% dextrose (**Note 10% dextrose** fluid preferred). If 5% dextrose is not available, use dextrose saline.

It is important to continue normal saline to correct circulatory volume along with dextrose infusion if necessary. Caution is required in the elderly, pregnant, and those with renal and/or cardiac dysfunction.

## **b. Insulin**

A fixed rate IV insulin infusion 0.1 unit per kilogram body weight (estimated if necessary) is recommended.

### **Test:**

- Blood sugar every two hours
- Urine ketones every 4 hours.
- Venous bicarbonate every 4 hours
- Serum potassium and sodium every 4 hours.

The fixed rate may need to be adjusted if:

- the ketone concentration is not falling fast enough
- The venous bicarbonate level is not rising by 3mmol/L per hr.
- The capillary blood glucose level does not decrease by 3 mmol/L per hr

Insulin doses can be halved when blood glucose level reaches 14 mmol/L. Thereafter, insulin can be changed to multiple –dose insulin regimen subcutaneously followed by twice- daily dosing.

If venous excess cannot be established, give:

- Short acting insulin IM 8 units/hour
- Do not give subcutaneously, as in shock state the absorption is poor

## **c. Electrolytes and Acid Based Disturbance**

### **(i) Potassium**

(i) Insulin takes glucose and potassium into the cells and their respective serum concentrations fall. Potassium should be administered depending on the serum levels as follows:

- if remains above 5.5 mmol/L – do not give potassium
- if level between 3.5 – 5.5 mmol/l
  - Initiate intravenous potassium at a rate of no more than 10 – 20 mmol/hour (added to IV infusion fluid bag) once insulin and fluids have been started and renal function and urinary output have been assessed as satisfactory.
- If level is below 3.5 mmol/L
  - Review potassium requirement.
  - A separate potassium infusion line should be started

**Potassium infusion should not exceed 20mmol per hour.**

### **(ii) Bicarbonate**

Measure venous rather than arterial bicarbonate and PH. Sodium bicarbonate should not be given routinely. It is only given when the blood pH is less than 7.0. In such cases, infuse 50 mmol of sodium bicarbonate over one hour.

## **d. Treatment of underlying cause**

Treat the underlying cause especially infections.

#### e. Other measures

- An indwelling catheter should be inserted to monitor urine output.
- Oxygen therapy if required
- Insertion of nasogastric tube if paralytic ileus develops.

#### f. Patient Education

- re-educate about avoidance of the complication
- the recognition of early warning signs and symptoms.

### 5.3 HYPEROSMOLAR, HYPERGLYCAEMIC STATE

This is a relatively uncommon event usually occurring as a dramatic presenting feature or as a complication of type 2 diabetes.

It presents with a history of thirst, polyuria and progressive impairment of consciousness commonly in a patient who is 60 years or older. It differs from DKA in that patients with hyperosmolar, hyperglycaemic state do not develop ketoacidosis.

Investigations reveal very high blood glucose, usually higher than 30 mmol/L, the serum sodium is often elevated and the calculated serum osmolality  $>320$  mOsm/l.<sup>6</sup>

#### Management

The treatment is similar to that in DKA (see above).

Intravenous isotonic saline, low dose intravenous insulin infusion (as discussed under management of DKA) and careful attention to serum potassium concentrations are the central strategies.

Careful monitoring is required as in DKA.

On recovery, the patient may not need long-term insulin therapy. After an initial period of stabilization with insulin, most patients with type 2 diabetes who present in a hyperosmolar, hyperglycaemic state can be controlled with oral hypoglycaemic drugs combined with diet.

## 6.0 Management of Late complications of diabetes

Diabetes mellitus is associated with a variety of late complications that are either vascular or non-vascular. The vascular complications are broadly classified as micro-vascular or macro-vascular. The micro-vascular complications are **Retinopathy, Nephropathy and Neuropathy** and macro-vascular **Coronary Heart disease, Cerebrovascular Disease and Peripheral Vascular Disease**.

*(For community education purposes, the acronym 'SNAKE' is used to identify the late complications in the skin, nerves, arteries, kidneys and eyes).*

Major risk factors for the development of complications include:	
Younger age at onset	Family history of complications
Longer duration of diabetes	Hypertension
Poor glycaemic control	Smoking
Dyslipidaemia	

### 6.1 RETINOPATHY

**ALL PERSONS WITH DIABETES MELLITUS NEED REGULAR EYE CHECK UP FOR EARLY DETECTION OF DIABETIC RETINOPATHY TO PREVENT BLINDNESS.**

Diabetic retinopathy is a major cause of visual impairment and blindness in Fiji. However with good management visual impairment due to diabetes can be avoided for the vast majority of patients. Hence all patients with diabetes need regular eye check-up.

Important points to note are:

- Diabetic Retinopathy is asymptomatic in its early stage
- Screening **is the only way** to identify people with diabetic retinopathy
- Timely treatment can prevent vision loss from diabetic retinopathy.

There are **two main categories** of diabetic retinopathy:

- Non-proliferative diabetic retinopathy- previously called background diabetic retinopathy. At this stage the blood vessels leak and with progression they may get occluded.
- Proliferative diabetic retinopathy (when new blood vessels grow).

Some patients develop macula oedema and this can be present in either categories.

Both proliferative retinopathy and macula oedema if untreated can lead to visual impairment.

There is also an increased risk of cataract in diabetic patients.

#### 6.1.1 Risk factors for diabetic retinal disease (clinical modifiers)

poor glycaemic control	raised triglycerides & serum cholesterol
raised blood pressure	Longer duration of diabetes
Pregnancy	Micro-albuminuria & proteinuria

**Patients with multiple risk factors have a higher risk of developing diabetic eye disease.**

### 6.1.2 Symptoms of diabetic retinopathy

Diabetic retinopathy often has no early warning signs and vision may remain unaffected until the disease becomes severe. Also, diabetic retinopathy progresses rapidly without much warning. Therefore it is imperative that regular eye examinations are carried out to monitor progression of the disease, to identify and treat vision threatening diabetic retinopathy (DR).

### 6.1.3 Screening

There are trained screeners at Divisional Hospital Eye Clinics and on outreach. They take fundus photographs, grade retinopathy and only refer to Ophthalmologists those cases that need further assessment. The grading is done according to the Pacific Island Diabetic Retinopathy Guidelines.

The recommended screening tool in order of preference is a fundus or retinal camera, followed by an indirect ophthalmoscope and lastly a direct ophthalmoscope. For the latter two, the pupils have to be dilated.

#### A. People with Type 1 diabetes:

Initiate screening 5 years after diagnosis of diabetes is made, or at puberty, whichever is the earlier.

#### B. People with Type 2 diabetes:

Initial screening is done once diagnosis is confirmed. Ongoing screening is done at least every year if no diabetic retinopathy is detected.

#### C. Pregnant women who have diabetes. i.e. already have diabetes and become pregnant:

Screening is done early in the first trimester of the pregnancy, regardless of previous history of screening. If there's no retinopathy and no clinical modifiers present, annual screening can continue as usual. If minimal retinopathy is present, frequent screening throughout the pregnancy is indicated, and has to be seen by an Ophthalmologist. Given that diabetes mellitus is highly prevalent in Fiji, pregnant women with raised blood sugar should be screened as well at booking.

#### D. Follow up

On-going screening is carried out between 1 to 2 years if no diabetic retinopathy (DR) is detected. Refer to Ophthalmologist once any diabetic retinopathy is detected. The frequency of the assessments is increased depending on the severity of the retinopathy and the risk factors for progression to vision-threatening disease.

When to screen?		
	Type 1 DM	Type 2 DM
Initially	5 years after Diagnosis	At Diagnosis
Follow-up	No DR: Annual to 2 yrs At Puberty DR: According to grade	No DR: Annual DR: According to grade

When to screen?		
	DM + Pregnant	***Pregnant with raised Blood sugar
Initially	Before pregnancy (Planned) or 1 <sup>st</sup> Trimester	At Booking
Follow-up	Depending on grade	Advice

\*\*\*Exceptions

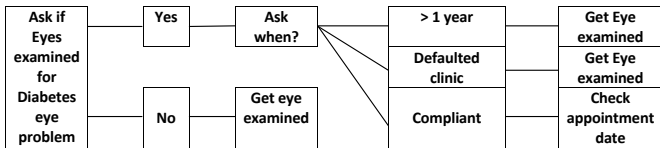
#### 6.1.4 Eye Assessment

- Check visual acuity with Visual Acuity (Snellen's) chart – unaided or aided (with present glasses). Check with pinhole if visual acuity 6/12 or worse.
- Check pupil reaction in both eyes [direct and consensual]
- Check depth of anterior chamber with light directed from the lateral limbus
- Check red reflex with ophthalmoscope; if present, do fundus photography.

#### IF FUNDUS CAMERA NOT AVAILABLE OR POOR RED REFLEX

- Dilate pupils with **tropicamide eye drop**. Add **phenylephrine eye drop** if available.
- Check for cataract or vitreous bleed/opacity
- Assess Retina using an indirect ophthalmoscope or a direct ophthalmoscope.

#### What everyone can do !



#### 6.1.5 Management of diabetic retinopathy

Laser treatment is available in all divisions in Fiji. This treatment can slow down the progression of diabetic retinopathy and can stabilize vision. Cases requiring laser treatment are to be referred to the Eye Clinic in the 3 Divisional Hospitals if this service is not available in your nearest sub divisional hospital on outreach.

#### 6.2 NEPHROPATHY

Diabetic nephropathy usually takes 10-15 years to develop after the onset of hyperglycemia and it encompasses all the lesions occurring in the kidneys of patients with diabetes mellitus. **Microalbuminuria** is the earliest manifestation of diabetic nephropathy and is a marker of progressive deterioration of renal function. Microalbuminuria is defined as urinary albumin loss to between 30 and 300 mg per day. In practice a more practical assessment is based on albumin/creatinine ratio (ACR), >2.5mg/mmol in men and >3.5 mg/mmol in women is often used to define microalbuminuria.

**Proteinuria** is present with raised urinary albumin excretion of >300 mg/day. An ACR >30 mg/mmol in a spot urine is consistent with a diagnosis of diabetic nephropathy.

**Glomerular filtration rate (GFR)**. This is often calculated by using Cockcroft and Gault formula as shown below and useful in assessing kidney function.

##### Creatinine Clearance:

$$\text{Cr Cl in males} = \frac{(140 - \text{age in years}) \times \text{weight (kg)}}{\text{Serum creatinine } (\mu\text{mol/l)}} \times 1.23$$

$$\text{Cr Cl in females} = \frac{(140 - \text{age in years}) \times \text{weight (kg)}}{\text{Serum creatinine } (\mu\text{mol/l)}} \times 1.03$$

### 6.2.1 Stratification of Chronic Kidney Disease (CKD):

<b>Stage</b>	<b>Renal Function</b>	<b>GFR (ml/min)</b>
I	Normal GFR	≥90
II	Mild impairment	60-90
III	Moderate renal impairment	30-59
IV	Severe renal impairment	15-29
V	End stage renal disease	<15

### 6.2.2 Assessment

- Test urine for microalbuminuria if facilities available. If present repeat in 6 weeks to confirm that it is persisting
- Test urine for proteinuria if microalbuminuria facilities not available
- Arrange for blood urea and creatinine if proteinuria present
- Yearly assessment of renal function is important in the absence of micro-albuminuria

### 6.2.3 Management

#### (i) Management of Microalbuminurium

The literature recommends treatment with angiotension converting enzyme inhibitors (ACEIs) once microalbuminuria is detected. In Fiji, the recommended drug is:

Enalapril 2.5 - 5 mg daily.

#### (ii) Management of Established Diabetic Nephropathy

In general, treatment of established diabetic nephropathy includes the following:

- control of protein intake
  - is not recommended in early stages of chronic kidney disease (stages 1-3)
  - is for stages 4-5
- use of ACE Inhibitors and ACE receptor blockers to reduce proteinuria
  - The use of above drugs can cause microalbuminuria to regress to no albuminuria in diabetes. All attempts should be made to reduce proteinuria immaterial of baseline protein excretion
- control of blood pressure
  - blood pressure lowering is associated with a reduced rate of chronic kidney disease progression
  - refer to the section under blood pressure control in diabetes
- control of hyperglycaemia
  - meticulous control of hyperglycaemia should be maintained
- control of hyperlipidaemia
  - lipid disorders may contribute to the development and progression of diabetic kidney disease
  - refer to the section under lipid control in diabetes
- control of other vascular risk factors i.e. cessation of smoking.

For end stage renal disease, renal replacement therapy in the form of dialysis or renal transplant needs to be considered. Refer to consultant physician for advice.

*Good blood pressure control as well as good glucose control is essential in all diabetic patients to reduce progression of complications.*

#### 6.2.4 Referral

- Refer to physician if eGFR < 30 ml/min

### 6.3 NEUROPATHY

Several different types of neuropathy can develop in diabetic patients. The commonly seen ones are peripheral sensory-motor and autonomic neuropathy.

#### 6.3.1 Peripheral sensory-motor neuropathy

Symptoms of peripheral sensory-motor neuropathy include:

- numbness,
- paresthesia,
- pain, and
- weakness.

If pain is prominent, several treatments have been shown to be effective and improving the quality of life.

Tricyclic antidepressants and anticonvulsants should be considered.

Amitriptyline 50-150 mg orally at bedtime

OR

Carbamazepine up to 600 mg orally daily in two divided doses.

Carbamazepine should be introduced gradually starting at 100 mg twice daily and the dose to be increased gradually until the maximum dose that can control the pain can be achieved.

Gabapentin, another anticonvulsant not available on FMF is also effective. It can be combined with opiate analgesia in patients not controlled on monotherapy.

Good glycaemic control is essential for control of symptoms.

#### 6.3.2 Autonomic neuropathy

Autonomic neuropathy can present as:

- postural hypotension,
- dysphagia,
- intermittent diarrhoea
- impotence,
- bladder atony.

Postural hypotension requires specialist assessment but the patient may respond to:

Fludrocortisone 0.1 to 0.3mg orally daily.



## 6.4 DIABETIC FOOT DISEASE

Diabetic foot problems are a common complication of diabetes and include neuropathy, peripheral vascular disease and foot ulceration. Peripheral neuropathy with or without vascular damage puts feet at risk from ulceration and infection which may lead to gangrene and the need for amputation. Diabetic foot infections involve the skin and soft tissue as well as underlying muscle and bone, and should always be regarded as serious. Amputation rates are higher for patients with diabetes than patients for without diabetes. Diabetic foot screening is effective in identifying the level of risk of developing foot ulceration in patients with diabetes. Knowing the level of risk is important in providing correct advice to patients on foot care. An annual screening from the diagnosis of diabetes is appropriate. However more frequent screening may be warranted if the risk of developing foot ulceration remains high.

### 6.4.1 Foot Assessment

History	Physical Examination
<ul style="list-style-type: none"><li>• Inquire about any previous foot problems, symptoms of pain, tingling, numbness.</li><li>• Any history of intermittent claudication and rest pain</li></ul>	<ul style="list-style-type: none"><li>• Examine the feet for any high risk characteristics such as corn and callus, toe deformities such as claw toes, hammer toes, bony prominences, any infection in between the toes, and poor perfusion;</li><li>• Test sensation using a 10 gram monofilament or 128Hz tuning fork;</li><li>• Test ankle reflexes;</li><li>• Palpate pedal pulses and popliteal pulse;</li><li>• Measure Ankle-Brachial Index;</li><li>• Assess footwear and general foot care.</li></ul>

### 6.4.2 Risk Factors for Diabetic Foot Problems

The major risk factors for diabetes foot problems are:

- Peripheral Neuropathy – peripheral neuropathy and in particular sensory loss is a significant risk factor for the development of diabetic foot problems;
- Peripheral Arterial Disease – poor arterial blood supply is also a significant risk factor for diabetic foot ulceration;
- Poor Glycaemic Control – poor blood glucose level control increases the risk of neuropathy, vascular disease and infection;
- Foot Deformities – Foot deformity is a risk factor for ulceration. Hammer toe, claw toes and bony deformities subject the foot to high pressure and trauma that can lead to ulceration;

### 6.4.3 Risk Classification

Assessing the risk of developing foot ulcers and subsequent complications determines the frequency of clinic review.

<b>Risk Classification for the Diabetic Foot</b> (adapted from International Consensus on the Diabetic Foot. 1999; Frykberg et al,2006)		
<b><u>Risk Status</u></b>	<b><u>Clinical Findings</u></b>	<b><u>Clinical review</u></b>
Risk 1 <b>Low Risk</b>	<ul style="list-style-type: none"><li>• No increased risk of foot problems</li><li>• No signs of peripheral neuropathy</li><li>• No peripheral vascular disease</li><li>• No foot deformity</li></ul>	Annual review
Risk 2 <b>Medium Risk</b>	<ul style="list-style-type: none"><li>• Peripheral vascular disease and/or peripheral neuropathy</li><li>• Impaired sensation</li><li>• Foot deformities</li></ul>	Every three[3] to six[6] months
Risk 3 <b>High Risk</b>	<ul style="list-style-type: none"><li>• Peripheral neuropathy</li><li>• Peripheral vascular disease</li><li>• History of previous foot ulcers or amputation</li></ul>	Every one[1] up to six[6] months
Risk 4 <b>Acute Foot Problems</b>	<ul style="list-style-type: none"><li>• Acute foot problems, e.g. ulceration</li><li>• Ischemia</li><li>• Infection</li><li>• Acute Charcot foot</li></ul>	<b><i>Refer to specialist. Needs review every one[1] to seven[7] days dependent on need</i></b>

### 6.4.4 Management of Diabetic Foot

#### *i) Education*

All diabetic patients must be advised to “KEEP YOUR FEET HEALTHY” by:

- Controlling blood glucose level well at all times;
- Checking their feet every day;
- Avoiding walking around bare feet;
- Washing feet every day;
- Keeping skin soft and smooth with oil or lotion;
- Avoiding contact with hot or cold surfaces;
- Wearing proper fitting foot ware;
- Cutting toe nails as recommended;
- Stopping cigarette smoking immediately.

#### *ii) Glycaemic Control*

Tight glycaemic control (HbA1c below 6.5%) is important to reduce the risk of vascular disease, neuropathy and infection.

### iii) Aggressive Treatment of Infection

Recognize and treat infection early and aggressively with proper antibiotics. 50% of diabetic patients will not show classic signs of infection. Diabetic infections are often caused by a mixture of organisms (aerobes and anaerobes).

- For mild to moderate infections, give **Metronidazole 400 mg orally 8 hourly PLUS Flucloxacillin 500 mg orally 6-hourly.**
- For severe infections, refer to the surgical department of the divisional hospitals.

### iv) Wound Care

Early and regular debridement of dead and devitalized tissues will provide an effective wound bed for healing. Sharp debridement by a skilled practitioner is very useful. A moist wound environment will encourage healing. A wound bed that is too moist or too dry will delay wound healing.

### v) Multidisciplinary Approach

The benefit of multidisciplinary approach is well established. The contributions from Surgeons, Physicians, Foot Clinic Nurses, Podiatrists, Physiotherapist and health educators must be sought to enhance the care for diabetic feet.

## 7.0 Targets for control in diabetes

It is important to have a set of targets for diabetes control. These targets are usually set by international diabetes agencies based on major research findings. See table below. These targets need to be discussed between the patient and the doctor before initiating treatment and during each follow-up visit. (This can be documented in the personal diabetes record book for the patients).

Targets for control in Diabetes.			
Indicator	Good	Fair	Poor
Fasting Blood glucose (mmol/L) FBS	4.0 - 6.0	6.1-7.0	>7.0
Random Blood Sugar (mmol/l) RBS	4.0 - 8.0	8.1-10.0	>10.0
*HbA1c (%)	< 6.5	6.5 - 7.5	>7.5
Total cholesterol (mmol/L)	< 4.0	4.1 - 4.9	>5.0
HDL-cholesterol (mmol/L)	> 1.0	1.0 - 0.9	< 0.9
LDL-cholesterol (mmol/L)	< 3.0	3.0 - 4.0	> 4.0
Triglycerides (mmol/L)	< 1.5	1.6 - 2.0	> 2.0
Blood pressure (mm Hg)	<130/80	>130/80 - <140/90	>140/90
**Body mass index (kg/m <sup>2</sup> ) Ideal BMI: 20 - 25 kg/m <sup>2</sup>	M: < 25 F: < 24	M: < 27 F: < 26	M: > 27 F: > 26

\*HbA1c - amount of circulating glycosylated haemoglobin, a measure of the overall control over preceding 3 months.

\*\* BMI ranges recommended for Pacific Islanders are somewhat higher at 20.5 - 27.0.

(Source: Schultz, D. 1999. BMI Cut-off for Pacific Islanders. National Food and Nutrition Centre, Suva.)

## 8.0 Diabetes in Children

### Introduction

Worldwide the incidence of Type 1 diabetes in children ranges from 0.1 – 37.4 per 100 000. In Fiji, this is uncommon with an estimated prevalence of <1 per 100 000 below 15 years. However, there is an increasing trend of obesity in children globally and hence increasing incidence of Type 2 diabetes in children.

### Aim

To provide the best clinical practice guideline on Diabetes in children for use by any doctor or nurse at the sub-divisional hospital, health centre and nursing station level.

### Parameters of the Guideline

This guideline covers children aged < 15 years diagnosed with type 1 (Part 1) and type 2 diabetes mellitus (Part 2).

#### **8.1 TYPE 1 Diabetes Mellitus:**

*The recognition of Type 1 is highlighted, on page 2 of this guideline. Below are some of the important features of diabetic ketoacidosis which a child or adolescent might present with.*

#### **I. Clinical presentation:**

##### **1a) Emergency presentations**

The usual emergency presentation of diabetic ketoacidosis in a child or adolescent includes the following clinical features:

- Severe dehydration
- Shock (*rapid pulse rate, poor peripheral circulation, mottling and peripheral cyanosis*)
- Hypotension (*a late sign and rare in children with Diabetic Ketoacidosis*)
- Frequent vomiting
- Continuing polyuria despite the presence of dehydration
- Weight loss due to fluid loss and loss of muscle and fat
- Flushed cheeks due to the ketoacidosis
- Acetone detected on the breath
- Hyperventilation of diabetic ketoacidosis (*Kussmaul respiration*) is characterized by a high respiratory rate and large tidal volume of each breath, which gives it a sighing quality
- Disordered sensorium (*disoriented, semi-comatosed or rarely comatosed*).

##### **1b) Non-Emergency Presentation of diabetes includes:**

- Recent onset of enuresis in a previously toilet-trained child, which may be misdiagnosed as a urinary tract infection or the result of excessive fluid ingestion
- Vaginal candidiasis, especially in prepubertal girls
- Vomiting, which may be misdiagnosed as gastroenteritis
- Chronic weight loss or failure to gain weight in a growing child
- Irritability and decreasing school performance
- Recurrent skin infections

## **II Medical Management**

*The majority of children with type 1 diabetes present at diagnosis with DKA. Management of DKA is covered in the PICU guidelines. Management will include ABC plus consult your divisional paediatrician for further care before referral.*

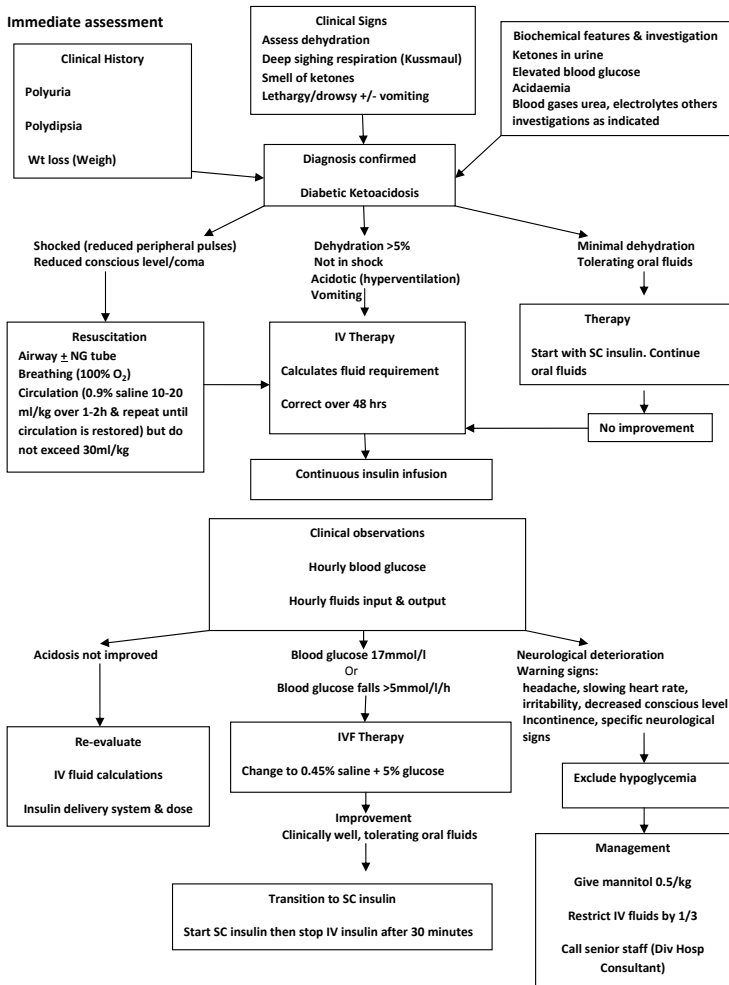
***Children with DKA must be referred to Divisional Hospital for specialised care.***

*On the following page is an algorithm on management, adopted from the PICU guideline.*

## Algorithm for the management of diabetic ketoacidosis

Source: adapted from Dunger et al. Karger Publ. 1999

### Immediate assessment



## **Ila) Diagnosis & Assessment:**

The diagnosis and assessment is similar to those in adults, and is documented in page 2 of this guideline.

## **Ilb) Insulin Therapy:**

Consultations with the Divisional Hospital need to be sought as previously mentioned in the management of DKA. This is also advisable in cases of insulin dose adjustments, in order to avoid side-effects and complications.

### **1. Nutrition**

Nutrition is a fundamental component in Type 1 Diabetes management in children. This is not different from adult nutrition as highlighted on pages 5 & 6 of DMG.

**However, in children adequate energy and nutritional intake for normal growth and development is also a priority.**

### **2. Monitoring of Glycaemic Control**

- This includes - Home blood glucose monitoring
- Monitoring HbA1C &
- Monitoring Ketones

### **3. Physical Activity**

As part of the fight against non-communicable diseases, physical activity is very much a key component. This is well documented on page 7 of this guideline. However, special precautions need to be taken especially to avoid complications which are highlighted on page 18.

### **4. Psychosocial Issues**

Psychosocial stresses are common and have adverse effect on diabetes control due to non-adherence with treatment regimes. They are commonly experienced where educational level of parents are low, non-cohesion in the family, autonomy is impeded or promoted at an inappropriate time. Adolescent years are particular risk periods. Arrange frequent family conference and involve counsellors, other support networks and psychiatrist where appropriate.

### **5. Special Situations: Hypoglycaemia:**

Hypoglycaemia is a common occurrence in Diabetes, and needs to be well addressed. Refer to page 18 of these guidelines for further information.

### **6. Diabetes Complications and Screening**

Diabetic Retinopathy, nephropathy, neuropathy and other associated complications and conditions are well documented in children as well as adults. Refer to pages 22 to 27 of these guidelines for more details.

### **7. Clinic Follow Up**

Minimal of three monthly reviews per year at the divisional level is required, and more frequent reviews may be needed if diabetes control is poor. At least one sub-divisional review per year, either as an outreach clinic or at the subdivisional clinic. Review will include monitoring of home glucose, HbA1c and urinary ketones.

## 8. School

All children diagnosed with diabetes should participate in normal school activities. A letter should be sent to the head teacher or principal highlighting the following:

- Emergency management of hypoglycaemia
- Medical emergency contact, carers contact and
- need for certain privileges such as allowing food consumption during exams and sports.

### **8.2 Type 2 Diabetes Mellitus:**

**Diagnosis & Treatment of Type 2 Diabetes in children (please refer to Adult diabetes protocol):** Beginning on page 3 of these guidelines.

- I **Diagnosis** – as in type 1 diabetes
- II **Who To Screen:** *Is highlighted on page 2, however other risks to note in children include those below:*
  - Obesity
  - Strong family history of Type II Diabetes
  - High risk ethnic group
  - Presence of clinical signs such as acanthosis nigricans
  - Diagnosis of polycystic ovarian syndrome

**(Refer to Adult diabetes protocol for further information on screening)**



## 9.0 Diabetes in pregnancy

The term “gestational diabetes” has been used to define women with onset or first recognition of abnormal glucose tolerance during pregnancy. More recent consensus from the International Association of Diabetes and Pregnancy Group have recommended a change where diabetes diagnosed during pregnancy is classified as overt or gestational based on specific biochemical parameters. Our local data supports the use of this change in Fiji in that many of our so called GDM cases can be redefined as Overt Diabetes.

The risk of adverse pregnancy outcomes increases continuously as maternal fasting plasma glucose level increases from the  $\leq 75$  mg/dL [4.2 mmol/L], and as the one hour and two hour oral GTT values increase; there is no clear threshold that defines patients at increased risk. Adverse outcomes include: Preeclampsia, Hydramnios, Foetal macrosomia, Foetal organomegaly (hepatomegaly, cardiomegaly), birth trauma, operative delivery, perinatal mortality, neonatal respiratory problems and metabolic complications (hypoglycemia, hyperbilirubinemia, hypocalcemia, erythremia)

To date diabetes screening in pregnancy in Fiji is done selectively. Current evidence based on a local study and international evidence indicates that universal screening needs to be introduced in a manner that is suited to locally available resources. The Obstetrics and Gynaecology CSN suggests such screening for all based on historical risk markers and biochemical screening as follows:

### High Risk Group For Diabetes in Pregnancy and GDM

- Maternal Age  $\geq 35$  years
- Family History of Diabetes (parents/siblings)
- Past personal history of abnormal glucose tolerance
- Previous very large baby  $> 4.5$  kg birth weight
- Polycystic Ovarian Syndrome
- Persistent glycosuria
- Morbidly Obese (BMI $>40$ )
- Previous unexplained perinatal loss or birth of a malformed child
- Current use of Glucocorticoids

### Moderate Risk Group For Diabetes in Pregnancy

- Obese clients (BMI $>30$ ) or significant weight gain in early adulthood and between pregnancies Previous large baby  $> 4.0$ kg birth weight
- Past history of recurrent miscarriage  $\geq 3$  miscarriages
- Glycosuria in first antenatal clinic
- Pre-existing Hypertension

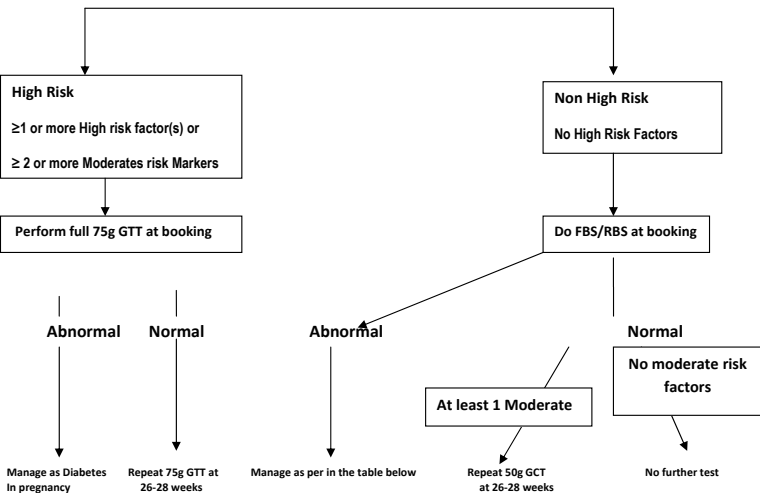
## Screening and Diagnostic Criteria for GDM

### Initial Risk Assessment

Overt Diabetes should be immediately managed as Diabetes in Pregnancy.

### Screening for GDM Flow Chart

#### RISK MARKER ASSESSMENT OF ALL PREGNANT WOMEN AT BOOKING



- The 50g GCT screening test can be replaced by a full 75g GTT if this is preferred by the patient and is easier to organize locally.

**NOTE: At ANY stage of pregnancy, if there is clinical suspicion that diabetes may be present, prompt testing with 75g GTT should be organised.**

## CLASSIFICATION OF ALL DIABETES SCREENING TEST and 75g GLUCOSE TOLERANCE TEST (GTT)

	<b>Abnormal</b>	<b>Significance</b>
GCT (Screening test)	Venous BGL $\geq$ 7.8 mmol/L *	Requires GTT
	Venous BGL $\geq$ 11.1 mmol/L	Treat as Overt Diabetes
FBS (Screening test)	Venous BGL $\geq$ 5.2 and $<$ 7mmol/L	Requires GTT
	Venous BGL $\geq$ 7 mmol/L	Treat as Overt Diabetes
RBS (Screening test)	Venous BGL $\geq$ 7.0 and $<$ 11mmol/l	Requires GTT
	Venous BGL $\geq$ 11.1 mmol/L	Treat at Overt Diabetes
GTT (Diagnostic test)	FBGL $\geq$ 5.1 mmol/L or 1 hr BGL $\geq$ 10.0 mmol/l OR 2 hr BGL $\geq$ 8.5 mmol/l <b>(1 or more abnormal readings)**</b>	GDM

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As discussed above, a diagnosis of overt diabetes is made in women who meet any of the following criteria at their initial prenatal visit:

- \* Fasting plasma glucose of  $\geq$ 126 mg/dL [7.0 mmol/L], or
- \* HbA1c  $\geq$ 6.5% using a standardized assay, or
- \* Random plasma glucose of  $\geq$ 200 mg/dL [11.1 mmol/l] that is subsequently confirmed by elevated fasting plasma glucose or HbA1c, as noted above.

Current recommendations are that the diagnosis of gestational diabetes is made at the initial prenatal visit if the fasting plasma glucose is  $\geq$ 92 mg/dL [5.1 mmol/L], but  $<$ 126 mg/dL [7.0 mmol/L]. However, this has ward work implications, thus the above is recommended for now. The resource implications of these recommendations will need to be reviewed before fully adopting this recommendation.

Current recommendations indicate that if overt diabetes or gestational diabetes has not been diagnosed with initial testing at the first prenatal visit, a 75 gram two hour oral GTT should be administered at 24 to 28 weeks of gestation to **all** patients. Whilst this would be ideal the CSN concerns with resource restrictions have resulted in recommendations for GCT screening at 24 to 28 weeks for the sub-group with normal FBS but moderate risk factors.

All abnormal screening tests using Capillary Blood Samples (CBG or Capillary Blood Glucose Testing) must be repeated with a venous blood sample before further course of action is defined. Hence the need to ensure that venous blood glucose testing facilities are available at every SDH and major health centres.

**CAUTION** : About 1% of women with Gestational Diabetes in a clinic setting are at risk of developing Type 1 Diabetes.

Type 1 Diabetes should be suspected in women who have minimal or no risk factors for GDM, present with high BGL (e.g. >20 mmol/L), + significant ketonuria. These women should be followed up for at least 2 years postpartum. Note that, their postpartum GTT may be normal or only show IGT in the first year postpartum.

#### **Women with known impaired glucose tolerance (IGT)**

Women with known impaired glucose tolerance (IGT) pre- pregnancy should generally be treated as GDM once pregnant and do not need to undergo a further GTT in pregnancy.

#### **Screening Test : 50g Glucose Challenge Test (GCT)**

- \* Dietary preparation ( e.g. 3 day diet/ fasting) are not required
- \* Should be done in the morning
- \* Client to be seated for the duration of the test
- \* The 50g glucose load should be consumed within 5 minutes
- \* Blood glucose Meters are NOT to be used
- \* Venous blood should be taken 1 hour after glucose load, timed accurately, and the specimen sent to the lab as soon as possible

**NOTE 18% false negative rate at these cut-offs**

#### **Diagnostic Test : 75g Glucose Tolerance Test (GTT)**

- \* 3day preparation – high carbohydrate diet
- \* Fast for 8- 12 hours prior to test, usually from 10 PM (only WATER may be consumed – no tea, coffee, etc.)
- \* No smoking on the morning of the test (from 12 MN until test completed)
- \* Should start in the morning before 9.30 AM (glucose tolerance worsens later in the day)
- \* Client to be seated for the duration of the test
- \* A baseline venous blood glucose level determined
- \* The 75g glucose load should be consumed within 5 minutes
- \* Blood glucose Meters should NOT be used
- \* Venous blood should be taken at 1 hour and 2 hours after the glucose load, timed accurately, and the specimens sent to the lab as soon as possible.

#### **Glycosuria present but GCT or GTT were normal**

If normal GCT or GTT and subsequently glycosuria or Polyhydramnios develops, or if there are any other clinical concerns that GDM may be present, re-test with 75g GTT

- If GTT has been repeated, and BGLs are clearly below cut-off levels, and there is glycosuria- repeat GTT in 4-6 weeks.

#### **Elevated Random BGL but GCT or GTT were normal**

If normal GCT or GTT and subsequently an elevated blood glucose (>7.0 mmol/l) develops, or if there are any other clinical concerns that GDM may be present, re-test with 75g GTT

- If GTT has been repeated, and the BGLs are close to cut- off levels, no further action should be needed even if there is glycosuria

- If GTT has been repeated, and the BGL are close to cut-off levels, and there is an elevated blood glucose ( $>7.0\text{mmol/l}$ ) – repeat GTT in 4-6 weeks.

### Vomiting during the GCT/GTT

- If there is vomiting with GCT or GTT, the test should be repeated the next week after giving the client Maxolon on the morning of the test
- If the woman vomits during the repeat test, organise for her to come to Antenatal Clinic for some postprandial blood test levels and assessment

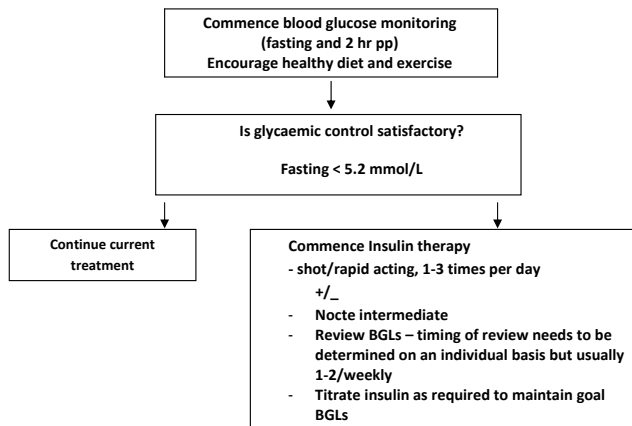
### Ramadan

- Ideally, women should be screened for GDM just before or immediately after Ramadan. However, if screening is required during Ramadan, GCT should be performed in the evening.
- If the GCT is abnormal, a diagnostic GTT should be performed immediately after Ramadan. In the meantime, women should be advised to avoid simple, carbohydrate (soft drinks, fruit juice, etc.) Random blood glucose levels should be measured at Antenatal Clinic visits.

## 5.2 MANAGEMENT

All patients defined as Gestational Diabetes need to be referred to a divisional Hospital for initiation of therapy. Ongoing therapy can be conducted in Subdivisional Hospital settings as long as there is ongoing close supervision by the divisional hospital Obstetrics and Gynaecology Unit.

### Treatment Flow Chart



**NOTE: Due to severe insulin resistance, a small percentage of women will require in excess of 350 units of insulin a day. These women are likely to require the addition of morning intermediate acting insulin to their treatment regimen.**

### **Use of Metformin in Gestational Diabetes**

In selected cases Metformin can be used in Pregnancy for GDM cases however this will be based on consultation with divisional hospital consultants. Metformin is not to be used in people with type 1 Diabetes.

### **INITIAL WORK UP OF ALL DIABETES CASES DIAGNOSED FOR THE FIRST TIME IN PREGNANCY**

1. Assess for complications of Diabetes
  - a. Baseline Ophthalmic review for Retinopathy
  - b. Renal Function Test
  - c. Chest X-Ray
  - d. ECG
2. Get a baseline dietary assessment and counselling
3. Counsel on:
  - a. Impact of Diabetes on Pregnancy outcome,
  - b. Self Glucose monitoring,
  - c. Logistics of ongoing care

### **DIABETES EDUCATION AND BLOOD GLUCOSE MONITORING**

Initial education should cover the implications of GDM for the mother and her baby, blood glucose monitoring, overview on diet and recommendations regarding exercise and the importance of postpartum follow-up. Women with GDM should also be provided with positive encouragement to minimize their emotional stress.

Once diagnosed with GDM, women need to monitor their BGL fasting (pre- breakfast) and 2 hour after meals timed from the beginning of the meals for the rest of the pregnancy. Therefore clients should be instructed to purchase a blood glucose meter. They should be registered with the divisional hospital diabetes in pregnancy registry and efforts to ensure compliance with review schedules need to be documented.

BGLs in pregnancy are approximately 20% lower than outside pregnancy therefore, women should be given the following BGL target ranges.

**Fasting: 3.5 – 5.2 mmol/l**

**2 hr p.p: 5.0 – 7.0 mmol/l (the upper limit set by the ADA and ACOG is 6.7)**

HbA1c and fructosamine levels may provide additional information regarding the adequacy of the glycaemic control. In general, HbA1c should be measured at diagnosis and monthly thereafter. It should be noted that HbA1c/fructosamine results are approximately 20% lower by mid pregnancy compared to outside pregnancy.

NOTE: For clients on a home glucose monitoring scheme, the accuracy of capillary blood glucose testing and venous blood glucose testing should be reviewed regularly at least every month.

### DIETARY ASSESSMENT AND ADVICE

Nutritional advice should be culturally appropriate and individualized to incorporate each client's specific needs. The advice should cover both diabetic diet recommendations and specific pregnancy requirements.

Adequate dietary intake is important to avoid foetal growth retardation – ketonuria may help detect inadequate carbohydrate intake. Lack of material weight gain (particularly in non-obese women) may also indicate excessive restriction of food intake.

### EXERCISE

Women should be advised that a moderate degree of exercise is beneficial, unless there are other medical or obstetric contraindications.

### INSULIN

At this stage it is not generally accepted practice to use oral anti-hyperglycaemic agents in pregnancy. Therefore insulin therapy is indicated if the blood glucose levels are not adequately controlled on diet alone.

Insulin therapy should also be considered if there is evidence of reduced or accelerated foetal growth on fundal height or ultrasound.

Short-acting or rapid acting insulin given pre-meal (one to three injections/day) should be commenced if 2 hr post prandial BGLs are elevated (>7 mmol/l). In general, individual insulin doses of between 5 to 10 units should be commenced, depending on the degree of hyperglycaemia. Pre-bed intermediate insulin should be commenced if fasting BGLs are elevated (>5.5 mmol/L). Frequent dose adjustments are often required. This insulin starting regime is based on the Alfred Hospital Diabetes Protocol and is the one currently in use at CWM Hospital.

### TIMING OF DELIVERY

In women with unfavourable cervixes, excellent glycaemic control, no vascular disease or preeclampsia, normal foetal growth, reassuring antepartum foetal surveillance, and no history of stillbirth, induction can be safely delayed until 40 weeks. If the above conditions remain and the cervix is favourable there is little benefit in continuing the pregnancy beyond 39 weeks. Delivery as early as 37 weeks is indicated if there is suboptimal glucose control and/or evidence of evolving maternal or foetal concerns. It is preferred to document foetal maturity by amniocentesis for non-urgent inductions before 38 weeks or those with unsure gestation.

**NOTE: Daily insulin requirement alone is not a determinant of timing for delivery. The main determinant is overall quality of diabetes control.**

### POSTPARTUM MANAGEMENT OF WOMEN WITH GDM

Women with GDM are at marked increase risk of future diabetes and should be advised regarding optimum lifestyle and appropriate follow-up. Some women will continue to have abnormal glucose tolerance in the early postpartum period. **Therefore, women should be advised to see their general practitioners 6 weeks postpartum to undergo a repeat OGTT, and OGTT should be performed annually thereafter.**

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## 11.0 Annexes

Annex 1

### WEIGHT AWARENESS

WEIGHT FOR HEIGHT TABLE  
FOR ADULTS FROM 18 YEARS ONWARDS  
(WITHOUT SHOES, IN LIGHT CLOTHING)

(cm)	Height (ft & in)	Desirable body Weight (kg)	Overweight (fat) (kg)	Obese (very fat) (kg)
140	4'7 - 1/2"	39 - 49	50 - 58	Above 58
142	4'8"	43 - 50	51 - 60	* 60
144	4'8 - 1/2"	41 - 52	53 - 62	* 62
146	4'9 - 1/2"	43 - 53	54 - 63	* 63
148	4'10 - 1/2"	44 - 55	58 - 65	* 65
150	4'11"	45 - 56	57 - 67	* 67
152	5'0"	46 - 58	59 - 69	* 69
154	5'0 - 1/2"	47 - 59	60 - 71	* 71
156	5'1 - 1/2"	49 - 61	62 - 73	* 73
158	5'2 - 1/2"	50 - 62	63 - 74	* 74
160	5'3"	51 - 64	65 - 76	* 76
162	5'3 - 1/2"	52 - 66	67 - 78	* 78
164	5'4 - 1/2"	54 - 67	69 - 80	* 80
166	5'5 - 1/2"	55 - 69	70 - 82	* 82
168	5'6 - 1/2"	56 - 71	72 - 84	* 84
170	5'7"	58 - 72	73 - 86	* 86
172	5'7 - 1/2"	59 - 74	75 - 88	* 88
174	5'8 - 1/2"	61 - 76	78 - 90	* 90
176	5'9 - 1/2"	62 - 77	78 - 92	* 92
178	5'10"	63 - 97	80 - 95	* 95
180	5'11"	65 - 81	82 - 97	* 97
182	5'11 1/2"	66 - 83	84 - 99	* 99
184	6'0 - 1/2"	68 - 85	86 - 101	* 101
186	6'1 - 1/2"	69 - 86	87 - 103	* 103
188	6'2"	71 - 88	89 - 106	* 106
190	6'2 - 1/2"	72 - 90	91 - 108	* 108
192	6'3 - 1/2"	74 - 92	93 - 110	* 110
194	6'4 - 1/2"	75 - 94	95 - 112	* 112
196	6'5 - 1/2"	77 - 96	97 - 115	* 115
198	6'6"	78 - 98	99 - 117	* 117
200	6'6 - 1/2"	80 - 100	101 - 120	* 120

#### Waist Circumference

Risk levels and recommendations based on waist circumference

Waist Circumference		Risk Level	Recommendations
Female	Male		
> 88	> 102	High	Lose weight
80 - 88	84 - 102	Medium	Don't gain weight
< 80	< 94	Low	Stay the same

**Fiji Association of Mental Health's 12 S's to Lessen Stress:**

- 1. SMILE**
- 2. STRETCH & EXERCISE**
- 3. SOOTHING & CALMING MUSIC**
- 4. SING & DANCE**
- 5. SHARE WORRIES & TASKS**
- 6. SPIRITUALITY (PRAYER/MEDITATION)**
- 7. SIMPLIFY & PRIORITIZE THINGS**
- 8. SLEEP WELL**
- 9. SELF-CARE & ESTEEM**
- 10. SOCIALIZE**
- 11. SLOW & DEEP BREATHING**
- 12. SPEND (TIME & MONEY) WISELY**

## KEY INTERVENTION POINTS AND ASSOCIATED ACTION REQUIRED

KEY INTERVENTION POINTS	ACTION – KEY TASKS
No Diabetes*	<p>Keep the healthy, healthy.</p> <p>Prevent the healthy population from developing risk factors.</p> <p>Increase public awareness of risk factors, the significance of risk factors and risk factor reduction strategies.</p>
Pre-diabetes (At –risk people)	<p>Reduce risk factors in the ‘at risk’ population*</p> <p>SNAP intervention to reduce risk factors.</p> <p>Support goal directed research into causes of and preventative interventions.</p>
Undiagnosed Diabetes*	<p>Active NCD Tool Kit Screening for people over 30 years of age.</p> <p>Provide avenues for opportunistic screening as well (workplaces, festivals, etc.)</p> <p>Increase public awareness of symptoms, risk factors and where people can go for screening.</p>
<p><b>KNOWN DIABETES</b></p> <ul style="list-style-type: none"> <li>• At Diagnosis</li> <li>• Established uncomplicated Diabetes</li> <li>• Diabetes with complications</li> </ul>	<p>Provide services for:</p> <ul style="list-style-type: none"> <li>- Clinical care according to guidelines (DMG, IECs)</li> <li>- Education in self –care &amp; monitoring (PDRB)</li> <li>- Information about recommendations for clinical care (personal targets for control)</li> </ul> <p>Provide services for:</p> <ul style="list-style-type: none"> <li>- Routine monitoring of diabetic and general health status</li> <li>- Regular screening for complications</li> <li>- Management of problems as they arise</li> <li>- Reinforcement of self-care education</li> <li>- Affordable therapies and supplies.</li> </ul> <p>Implement programs for:</p> <ul style="list-style-type: none"> <li>- Identification and reduction of risks for diabetes complications</li> <li>- Self –care education and psycho-social support</li> </ul> <p>Support goal directed research aimed at curing diabetes.</p> <p>Provide services for:</p> <ul style="list-style-type: none"> <li>- Prevention of the progression of complications</li> <li>- Self –care education and psycho-social support</li> <li>- Rehabilitation of people with disabilities</li> <li>- Palliation for people with end stage complications</li> </ul> <p>Support goal directed research aimed at the reversal of complications.</p>

*\*Until modifiable risk factors are identifiable and effective interventions available, these interventions cannot be applied to Type 1 diabetes.*

Adapted from the Australian National Diabetes Strategy and Implementation Plan, 1998

