MOH CLINICAL PRACTICE GUIDELINES 3/2006

Diabetes Mellitus

Ministry of Health

Diabetic Society of Singapore

Executive summary of recommendations

Details of recommendations can be found in the main text at the pages indicated.

Diagnosis and Screening of Diabetes Mellitus in Singapore

B In subjects with unequivocal hyperglycaemia with acute metabolic decompensation diabetes mellitus can be diagnosed without further testing (pg 20).

Grade B, Level III

B In patients with typical symptoms, diabetes mellitus can be diagnosed if any one of the following is present:

1. Casual plasma glucose ≥11.1 mmol/l
2. Fasting plasma glucose ≥7.0 mmol/l
3. 2-hour post-challenge glucose ≥11.1 mmol/l

Other individuals should have a repeat test on a subsequent day (pg 20).

Grade B, Level III

B Fasting plasma glucose measured in an accredited laboratory is the preferred test for the diagnosis of diabetes mellitus (pg 20).

Grade B, Level III

B We should recognise intermediate states of glucose metabolism termed impaired fasting glycaemia and impaired glucose tolerance in accordance with the report of the WHO consultation (pg 21).

Grade B, Level III

B All subjects with fasting plasma glucose from 6.1 to 6.9 mmol/l should undergo a 75 g oral glucose tolerance test to determine if they have impaired glucose tolerance or diabetes mellitus (pg 21).

Grade B, Level III

C Screening of asymptomatic individuals for diabetes mellitus should be carried out in accordance with the Ministry of Health Clinical Practice Guidelines for Health Screening (6/2003).

Grade C, Level IV

N.B. The workgroup recommends lowering the cut-off value of triglycerides at which the individual is considered at increased risk of diabetes from 2.82 in MOH Clinical Practice Guidelines on Health Screening to 2.30 mmol/l (pg 22).

Lifestyle Modification

B Lifestyle modification is a cornerstone of diabetes management. Medical nutrition therapy and exercise prescription should be the initial therapy in obese (BMI $\geq$ 30) and overweight (BMI $\geq$ 25) type 2 diabetic patients unless they are symptomatic or severely hyperglycaemic (pg 31).

Grade B, Level IIa

C Medical nutrition therapy should be individualized. Saturated fat intake should not exceed 10%, with carbohydrates making up 50-60% and proteins 15-20% of total calorie intake. Diet should include foods from each of the basic food groups (pg 31).

Grade C, Level IV

C An exercise programme tailored to suit the individual's age, fitness, aptitude and interest should be prescribed (pg 32).

Grade C, Level IV

C A pre-exercise evaluation to identify macrovascular, microvascular and neurological complications is recommended (pg 32).

Grade C, Level IV

C Individuals with diabetes, especially those on insulin treatment, should receive specific education on the prevention of exercise-induced hypoglycaemia (pg 32).

Grade C, Level IV

C Individuals with diabetic neuropathy should avoid exercises associated with repetitive foot trauma (pg 33).

Grade C, Level IV

C Individuals with severe diabetic proliferative retinopathy should avoid activities that dramatically elevate blood pressure (pg 33).

Grade C, Level IV

B Individuals with diabetes should be discouraged from smoking (pg 33).

Grade B, Level III

B Diabetic patients with poor glycaemic control or dyslipidaemia should be discouraged from consuming alcohol (pg 33).

Grade B, Level IIb

Pharmacotherapy in Diabetes Mellitus

A Type 2 diabetic patients may initially be treated with lifestyle modification (diet and exercise) for 2 to 4 months unless they are symptomatic or severely hyperglycaemic (i.e. random blood glucose >15 mmol/l or fasting blood glucose >10 mmol/l). Oral antihyperglycaemic agents should be started if glycaemic targets are not achieved. Insulin therapy should be started, if optimal combination therapy, fails to attain target control (i.e. 2 consecutive HbA_{1c} values failed to reach ≤8% over 3-6 months interval) (pg 36).

Grade A, Level Ia

A Type 2 diabetes is a progressive condition in which β-cell function deteriorates with increasing duration of diabetes. Stepwise therapy with multiple pharmacological therapies is often needed over time to maintain target glucose control. Two or more oral agents, or insulin therapy either alone or in combination with oral agents, may be required (pg 35).

Grade A, Level Ia

A All type 1 diabetic patients must receive insulin. Multiple daily injections (3 or more) or the use of continuous subcutaneous insulin infusion (CSII or insulin pump therapy) may be required to achieve target glucose levels (pg 44).

Grade A, Level Ib

Glycaemic Control: Assessment and Targets

GPP Health care professionals should be familiar with the practical use of glucometers (pg 48).

GPP

B Self-monitoring of blood glucose (SMBG) should be initiated in most patients with diabetes, especially in insulin-treated subjects, in pregnant women with pre-existing diabetes or gestational diabetes, and in patients who are at increased risk of developing hypoglycaemia (pg 48).

Grade B, Level IIa

GPP The visual method of self-monitoring of blood glucose is not recommended (pg 49).

GPP

A Besides receiving proper training in the use of blood glucometers, patients must be educated on the interpretation of the results and, where possible, taught to modify treatment according to blood glucose levels (pg 50).

Grade A, Level Ib

C Testing for glucose in urine is not recommended for monitoring of glycaemic status (pg 50).

Grade C, Level IV

C Testing for ketones in the urine is recommended in patients with type 1 diabetes, pregnant women with pre-existing and gestational diabetes, if there is:

- Acute illness or stress
- Persistent elevation of blood glucose (>16.7 mmol/l)
- Any symptom suggestive of ketoacidosis (nausea, vomiting, abdominal pain or acetone breath) (pg 51).

Grade C, Level IV

GPP Routine monitoring of blood ketones is not recommended for type 1 or type 2 diabetic patients (pg 51).

GPP

C Glycated haemoglobin (HbA_{1c}) testing should be performed routinely in all patients with diabetes. The frequency of testing for any individual patient may vary according to the treatment regimen used and the status of glycaemic control (pg 52).

Grade C, Level IV

C The following schedule is recommended for glycated haemoglobin testing:

- 3- to 4-monthly in patients with unstable glycaemic control, failure to meet treatment goals, recent adjustment in therapy, or intensive insulin therapy.
- 6-monthly in patients who have stable glycaemic control and who are meeting treatment goals (pg 52).

Grade C, Level IV

C The targets of glycaemic control should be defined for each patient, with patient participation in the process (pg 53).

Grade C, Level IV

A "Optimal" glucose control should be the target for the majority of patients with diabetes. This refers to glucose levels that approach the normal range (HbA_{1c} 6.5-7.0%; preprandial glucose 6.1-8.0 mmol/l) and is associated with a low risk of developing microvascular complications (pg 53).

Grade A, Level Ib

A "Suboptimal" glucose control (HbA_{1c} 7.1-8.0%; preprandial glucose 8.1-10.0 mmol/l) may be the target in special subsets of patients who are vulnerable to injury from the increased risk of severe hypoglycaemia associated with "optimal" glucose control (pg 53).

Grade A, Level Ib

Prevention of Cardiovascular Disease in Diabetes Mellitus

GPP The assessment of cardiovascular risk in persons with type 2 diabetes mellitus should include:

1. A medical history, which should include:
   a. A smoking history.
   b. A history of hypertension and/or medication taken for the treatment of hypertension.
   c. A history of pre-existing cardiovascular disease (CVD) to include angina pectoris, myocardial infarction, stroke, or peripheral vascular disease.
2. A physical examination which should include an assessment of peripheral pulses.
3. Blood pressure should be measured each time a patient with type 2 diabetes mellitus is seen in the clinic.
4. Fasting serum lipids should be measured at the time of diagnosis and at least once a year if they are in the optimal range.
5. Assessment of urine for microalbuminuria or proteinuria should be carried out at the time of diagnosis and at least once a year in all patients.
6. In view of the fact that persons with type 2 diabetes mellitus are more likely to experience atypical symptoms of coronary heart disease (CHD), a routine resting ECG is recommended at baseline. Subsequent ECG may be performed when clinically indicated. Specific abnormalities which may suggest CHD should be assessed by a cardiologist for appropriate risk stratification (page 57).

GPP

B The primary prevention of CVD should form one of the major goals of therapy in the management of type 2 diabetes mellitus (pg 57).

Grade B, Level III

B Type 2 diabetes mellitus should be considered a coronary CHD risk equivalent (pg 57).

Grade B, Level III

C An assessment of the CVD risk factors present is recommended for all persons with type 2 diabetes mellitus in order that appropriate therapy be instituted (pg 57).

Grade C, Level IV

A The prevention of CVD in persons with type 2 diabetes mellitus must take a global approach with intervention targeting all aspects of the disease (pg 58).

Grade A, Level Ib

C Therapeutic lifestyle modification (through modulation of diet and physical activity) should form the mainstay of strategies to reduce cardiovascular risk associated with type 2 diabetes mellitus (pg 58).

Grade C, Level IV

B All possible efforts should be taken to encourage persons with type 2 diabetes mellitus to stop smoking (pg 59).

Grade B, Level III

Hypertension in patients with diabetes mellitus

A The target of hypertension treatment in type 2 diabetes mellitus should be < 130/80 mmHg (pg 59).

Grade A, Level Ib

A Lifestyle modification and drug therapy should be instituted for all subjects with blood pressure >130/80 mmHg (pg 59).

Grade A, Level Ib

A The choice of first line therapy can include (a) diuretics (D) (b) β-blockers (BB) (c) ACE inhibitors (ACEI) (d) calcium channel blockers (CCB) (e) angiotensin II receptor blockers (ARB) and should be based on the cost of the drug and any compelling indications and contraindications for its use (pg 60).

Grade A, Level Ib

Dyslipidaemia in patients with diabetes mellitus

A For the prevention of CVD, the first priority is optimization of the LDL cholesterol. This is followed by HDL-cholesterol and then triglyceride (pg 63).

Grade A, Level Ia

C The exception is in individuals with levels of TG >4.5 mmol/l (400 mg/dl) who have an increased risk of acute pancreatitis. In these patients, the first priority is to reduce the TG level to prevent acute pancreatitis (pg 63).

Grade C, Level IV

C Fibrate therapy should be considered as first line therapy in those with TG > 4.5 mmol/l (400 mg/dl) to prevent acute pancreatitis (pg 63).

Grade C, Level IV

A For all other patients with type 2 diabetes mellitus and LDL cholesterol >2.6 mmol/l (100 mg/dl), the treatment of choice is an HMG CoA reductase inhibitor (statin) (pg 63).

Grade A, Level Ia

A For patients with LDL cholesterol <2.6 mmol/l (100 mg/dl) and low HDL-cholesterol (<40 mg/dl), a fibrate can be started as the initial lipid lowering therapy (pg 63).

Grade A, Level Ib

C If HDL cholesterol remains low (<1 mmol/l or 40 mg/dl) after achieving the LDL goal with a statin, combination therapy can be considered in selected high risk patients, such as those with type 2 diabetes mellitus and existing CHD (pg 63).

Grade C, Level IV

B When combining a statin with a fibrate, gemfibrozil should not be used (pg 64).

Grade B, Level III

Anti-thrombotic agents in patients with diabetes mellitus

A All patients with type 2 diabetes mellitus over the age of 45 years or who have concomitant hypertension, dyslipidaemia or pre-existing cardiovascular disease (CHD, stroke or peripheral arterial disease) should be treated with aspirin 75-100 mg per day. In the presence of contraindications for aspirin therapy, other antiplatelet agents such as clopidogrel may be a reasonable alternative for patients with high risk (pg 64).

Grade A, Level Ia

Prevention and Treatment of Diabetic Nephropathy

C Screening for albuminuria should begin at 5 years after the diagnosis of type 1 diabetes; it should, however, begin immediately with the diagnosis of type 2 diabetes. Thereafter, screening for albuminuria should be done annually (pg 70).

Grade C, Level IV

GPP Serum creatinine should be measured at least annually (pg 70).

GPP

C The blood pressure target in all diabetic persons should be less than 130/80 mmHg. Diabetic patients with proteinuria levels exceeding 1 gram should try to have their BP lowered to less than 125/75 mmHg (pg 72).

Grade C, Level IV

A In the absence of microalbuminuria or overt nephropathy, the principal intent is that of reducing the risk of a cardiovascular event. There is evidence for the initial antihypertensive agent to be from one of these classes: angiotensin converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARB), β-blockers, diuretics, calcium channel blockers (pg 73).

Grade A, Level Ib

A In the presence of microalbuminura, both ACE inhibitors and ARBs can be used (pg 73).

Grade A, Level Ib

A In the presence of overt nephropathy in type 1 diabetes, there is evidence that an ACE inhibitor can retard the progression of otherwise progressive renal disease (pg 74).

Grade A, Level Ib

A In type 2 diabetes with overt nephropathy, either an ACE inhibitor or an ARB may be used to retard the progression of renal disease (pg 74).

Grade A, Level Ib

GPP The serum creatinine and potassium should be checked within 4 weeks of initiation of treatment to detect any rise in the serum creatinine or hyperkalaemia (pg 74).

GPP

GPP Progressive but non-continuous rise in the serum creatinine may be seen over 2 to 3 months after starting on ACE inhibitor or ARB. A short-term rise of less than 30% in the serum creatinine should not necessitate withdrawing the ACE inhibitor or ARB. Nevertheless, the possibility that there may be critical renal artery stenosis should be considered, especially in the presence of a renal artery bruit or refractory hypertension or asymmetric kidney sizes on ultrasound (pg 74).

GPP

GPP Therapy should aim to reduce albuminuria as much as possible, and it is reasonable to aim for a proteinuria target of less than 1 g/day or at least 50% of the pre treatment value (pg 75).

GPP

GPP Type 1 diabetic patients with overt nephropathy should be maintained on a low protein diet of 0.8 g/kg/day (pg 75).

GPP

GPP A nephrology referral is recommended when there are unexpected or rapid decline in renal function, difficulties with hyperkalaemia, atypical features e.g. haematuria, presence of casts in the urine sediment, presence of a renal bruit, difficult BP control, nephrotic range proteinuria (>3 g/day), and absence of retinopathy (pg 75).

GPP

Prevention and Management of Eye Complications

Screening

C All patients diagnosed with diabetes require regular visual acuity assessment and eye examinations by trained personnel to screen for diabetic retinopathy using a test of adequate sensitivity (pg 78).

Grade C, Level IV

C Type 1 diabetic patients should be examined 3-5 years after diagnosis of diabetes, and at least once yearly subsequently. Type 2 diabetic patients should have an ocular assessment at the time of diagnosis and at least once yearly subsequently (pg 79).

Grade C, Level IV

C Retinal screening preferably using retinal photography, or direct ophthalmoscopy (if retinal photography is not available) through dilated pupils is recommended (pg 78).

Grade C, Level IV

Management of systemic risk factors

A Good glycaemic control (HbA_{1c} preferably 6.5 to 7.5%) should be instituted to reduce the risk of retinopathy (pg 80).

Grade A, Level Ib

A Good control of blood pressure at or below 130/80 mmHg should be instituted to reduce the progression of diabetic retinopathy (pg 81).

Grade A, Level Ib

C Significant hyperlipidaemia should be treated to retard diabetic retinopathy (pg 81).

Grade C, Level IV

Referrals

GPP Diabetic patients found to have diabetic retinopathy by their physicians should be referred for further ophthalmological assessment (pg 84).

GPP

A Timely laser therapy should be offered to patients with proliferative diabetic retinopathy and diabetic macular oedema. Panretinal and focal/grid laser treatment results in at least a 50% reduction in the risk of visual loss (pg 85).

Grade A, Level Ib

Treatment

A Laser photocoagulation should be instituted for severe and proliferative retinopathy as it produces a 50% reduction in risk for severe visual loss and need for vitrectomy (pg 85).

Grade A, Level Ib

Prevention of Diabetic Foot Complications

B All individuals with diabetes should receive an annual foot examination to identify high-risk foot conditions (pg 92).

Grade B, Level IIb

B The assessment of the feet involves risk identification, treatment and patient education appropriate to the level of risk (pg 92).

Grade B, Level IIa

A All patients, regardless of risk category, should receive ongoing education on footcare and footwear advice (pg 93).

Grade A, Level lb

B Patients identified with foot-related risk conditions should have access to a specialized footcare team which should include diabetes specialist, podiatrist, physiotherapist trained in diabetes, diabetes nurse educator and vascular and orthopaedic surgeon (pg 93).

Grade B, Level III

A Urgent referral to a specialized footcare team is needed in the presence of ulcerations, severe foot infection and gangrene (pg 91).

Grade A, Level Ib

Management of Women with Pregestational and Gestational Diabetes Mellitus

Preconception care

B All diabetic women in the reproductive age group should receive pre-pregnancy counselling, particularly before starting a family (pg 98).

Grade B, Level IIa

Screening and diagnosis

B Women at high-risk for gestational diabetes (GDM) should undergo an OGTT as early in pregnancy as feasible. Re-evaluation may be necessary at 28 weeks if glucose intolerance is not present at the early screen (pg 99).

Grade B, Level IIa

B In all other patients, urine for glucose should be obtained at each antenatal visit and random blood sugar levels ascertained when there is ≥1+ glycosuria. A diagnostic test is necessary if the random plasma blood glucose >6.6 mmol/l more than 2 hours after a meal, or >7.0 mmol/l within 2 hours of a meal (pg 99).

Grade B, Level III

Antenatal care

B In gestational diabetes (GDM), dietary control should be used in the first instance to attain glycaemic goals. If nutritional therapy does not consistently maintain a fasting or pre-meal capillary blood glucose of <5.5 mmol/l and/or a 2-hour postprandial capillary blood glucose of <6.7 mmol/l on two or more occasions within a 1-2 week interval, insulin therapy should be considered (pg 100).

Grade B, Level IIa

B In established diabetics (pregestational diabetes), intensive insulin treatment is often necessary to maintain target blood glucose levels (pg 100).

Grade B, Level IIb

B Maintain maternal capillary blood glucose concentrations as near normal as possible at <5.5 mmol/l in the fasting or premeal state, and/or <7.8 mmol/l 1 hour after meals, and/or <6.7 mmol/l 2 hours after meals (pg 100).

Grade B, Level III

B All women diagnosed with GDM and pregestational DM should receive specialized care (pg 100).

Grade B, Level III

Infants of diabetic mothers

B Close monitoring of blood glucose levels is necessary within the first 48 hours of the baby's life. Infants of diabetic mothers should be fed early (pg 103).

Grade B, Level III

Postnatal management

B Breastfeeding is not contraindicated in women with diabetes (pg 103).

Grade B, Level III

B An OGTT should be performed at least 6 weeks postpartum and the patient reclassified and counselled according to criteria accepted in the non-pregnant state (pg 103).

Grade B, Level IIb

Contraception

B Low dose oestrogen-progestin oral contraceptives and the intra-uterine contraceptive devices are not contraindicated in women with previous GDM (pg 104).

Grade B, Level III

B Oestrogen-progestogen contraceptives should be avoided in women with complications of diabetes and those at risk of vascular disease (pg 104).

Grade B, Level III

Management of the Child and Adolescent with Diabetes Mellitus

B In childhood type 1 diabetes mellitus, the aims of treatment are:

a. Normal physical growth and pubertal development.
b. Normal psychosocial development and full participation in age-appropriate activities.
c. Good glycaemic control with minimal hypoglycaemia.
d. Absence of diabetic ketoacidosis.
e. Minimization and early detection and treatment of complications (pg 107).

Grade B, Level IIa

B The care of diabetes in childhood and adolescence, whether type 1 or type 2, is best accomplished by a multi-disciplinary team in an institutional setting (pg 107).

Grade B, Level IIa

B Screening for diabetes should be considered for children and adolescents who are overweight, have a strong family history of diabetes and have acanthosis nigricans, hypertension, dyslipidaemia or the polycystic ovarian syndrome. Testing in these individuals should be done at least every 2 years starting from age 10 years or at the onset of puberty, if the latter occurs at a younger age (pg 109).

Grade B, Level IIa

C Children and adolescents with impaired glucose tolerance and obesity should be managed with diet and exercise (pg 111).

Grade C, Level IV

C Children with type 2 diabetes mellitus may initially be treated with lifestyle modifications (diet and exercise), unless they are symptomatic or severely hyperglycaemic (pg 110).

Grade C, Level IV

C Oral hypoglycaemic agents may be started in children with type 2 diabetes if glycaemic targets are not achieved. Insulin therapy should be started if oral agents fail to attain target control (pg 110).

Grade C, Level IV

Prevention of Type 2 Diabetes

A Individuals at high risk for developing diabetes should be made aware of the benefits of even modest weight loss and participating in regular physical activity (pg 116).

Grade A, Level Ib

B Screening for high risk individuals should be done opportunistically, with either a fasting plasma glucose test, or a 2-hour OGTT (pg 114).

Grade B, Level IIb

A Persons with impaired glucose tolerance or impaired fasting glucose should be given counselling about weight loss as well as instructions on how to increase physical activity (pg 116).

Grade A, Level Ib

C Drug therapy should not be routinely used to prevent diabetes until more information, particularly in regard to cost-effectiveness, is available (pg 116).

Grade C, Level IV

Clinical Quality Indicators for Diabetes Mellitus

A Measures of process of diabetes care should include the initial and ongoing performance of medical indicators which have been proven to influence long-term outcome (pg 122).

Grade A, Level Ib

GPP Data to measure the outcomes of diabetes management should be obtained from the individual with diabetes (pg 122).

GPP

Flowchart for the diagnosis of diabetes mellitus

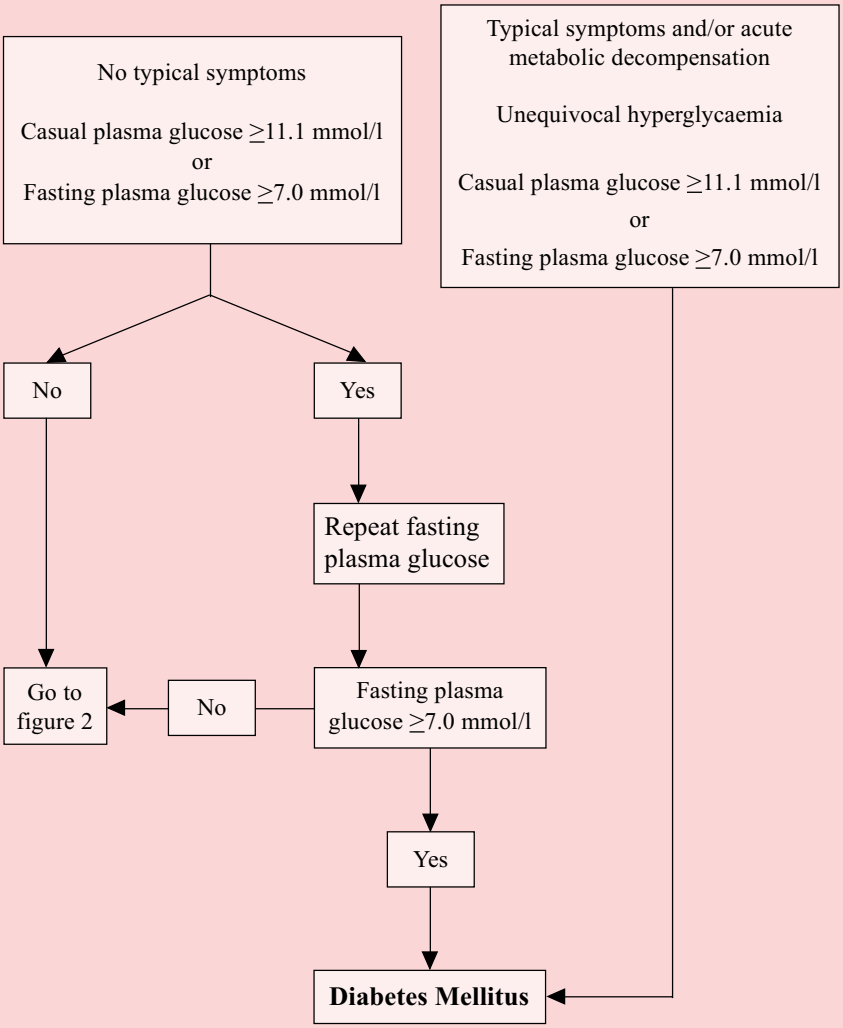

Figure 2 Flowchart for individuals suspected to have diabetes but whose fasting plasma glucose <7.0 mmol/l