

UNIT NO. 2

DIAGNOSIS & DIAGNOSTIC ISSUES

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ABSTRACT

The way we diagnose diabetes mellitus has changed over the years. The most recent revisions in the diagnostic criteria for diabetes occurred in 1997 and 1998 when first the American Diabetes Association and, later, the WHO made representations to the world medical community. It is important for countries to examine these criteria in the context of their people, so that they may come up with appropriate recommendations not just for diagnosis but also for screening.

INTRODUCTION

Early diagnosis and treatment of DM and its associated metabolic derangements (hyperglycaemia, dyslipidaemia, hypertension and obesity) can prevent or delay the progression of both macrovascular disease (coronary and cerebrovascular disease) and microvascular disease (retinopathy, nephropathy, neuropathy). Whenever the diagnosis of DM is made, the clinician must feel confident that the diagnosis is fully established since the consequences for the individual are considerable and life-long.

DIABETES MELLITUS

We diagnose diabetes mellitus if one of the following is present:

Casual plasma glucose	>11.1 mmol/l
Fasting plasma glucose	>7.0 mmol/l
2 hour plasma glucose during an oral glucose tolerance test	>11.1 mmol/l

The following should be noted:

- κ In the absence of unequivocal hyperglycaemia with acute metabolic decompensation, a second confirmatory test must be done in all cases on another day by any one of the three methods although fasting plasma glucose is the diagnostic test of choice. If the second sample fails to confirm the diagnosis, periodic re-testing is recommended in accordance with the recommendations for screening of asymptomatic individuals or if the individual becomes symptomatic.
- κ Casual is defined as any time of the day, without regard to the interval since the last meal.

- κ Fasting is defined as no caloric intake for at least 8 hours.
- κ Fasting plasma glucose rather than an oral glucose tolerance test is the preferred diagnostic test.
- κ Oral glucose tolerance test (75g glucose) should be performed in accordance to WHO recommendations.
- κ Venous blood samples should be collected in appropriate tubes for plasma glucose measurement, which should be performed in accredited laboratories. Results obtained from finger prick capillary blood samples measured by portable glucose meters are not recommended.
- κ Venous blood samples should be collected in appropriate tubes for plasma glucose measurement, which should be performed in accredited laboratories. Results obtained from finger prick capillary blood samples measured by portable glucose meters should not be considered as a diagnostic procedure even if confirmed on another occasion.

Because of standardization issues, glycosylated haemoglobin (HbA1c) should not be used routinely for the diagnosis of DM. Urine testing should not be used to diagnose diabetes.

All subjects with 6.0 mmol/l <FPG< 7.0 mmol/l should be subjected to an OGTT to determine the glycemic status precisely. In Singapore an estimated 39.1% of individuals in this FPG category will have a 2hPG ≥11.1 mmol/l ie. they have diabetes.

OTHER CATEGORIES OF GLUCOSE TOLERANCE

Two states of glucose metabolism intermediate between normal glucose tolerance and DM exist. These are (1) impaired glucose tolerance (IGT) and (2) impaired fasting glucose (IFG). Both states present increased risks for the development of DM and cardiovascular disease.

IGT and IFG are diagnosed as follows:

	Fasting plasma glucose		2 hour plasma glucose
Impaired Fasting Glucose	6.1-6.9	And	<7.8
Impaired Glucose Tolerance	<7.0	And	7.8-11.0

All subjects with 6.0 mmol/l <fasting plasma glucose <7.0 mmol/l should undergo a 75g oral glucose tolerance test.

In late 2003, the ADA recommended that the lower limit for impaired fasting glucose be lowered from 6.1 mmol/l to 5.6 mmol/l on the belief that this level better predicts

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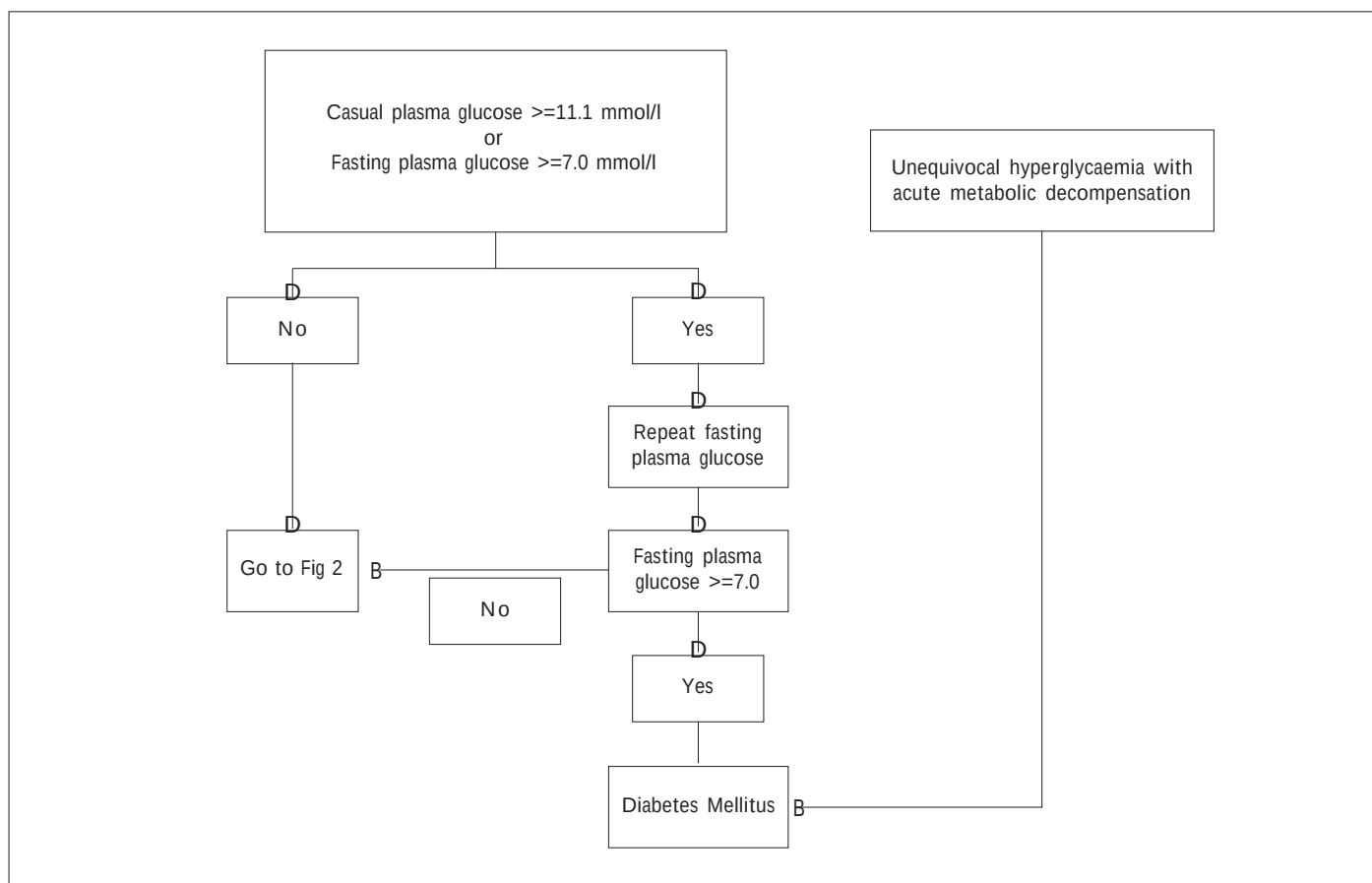
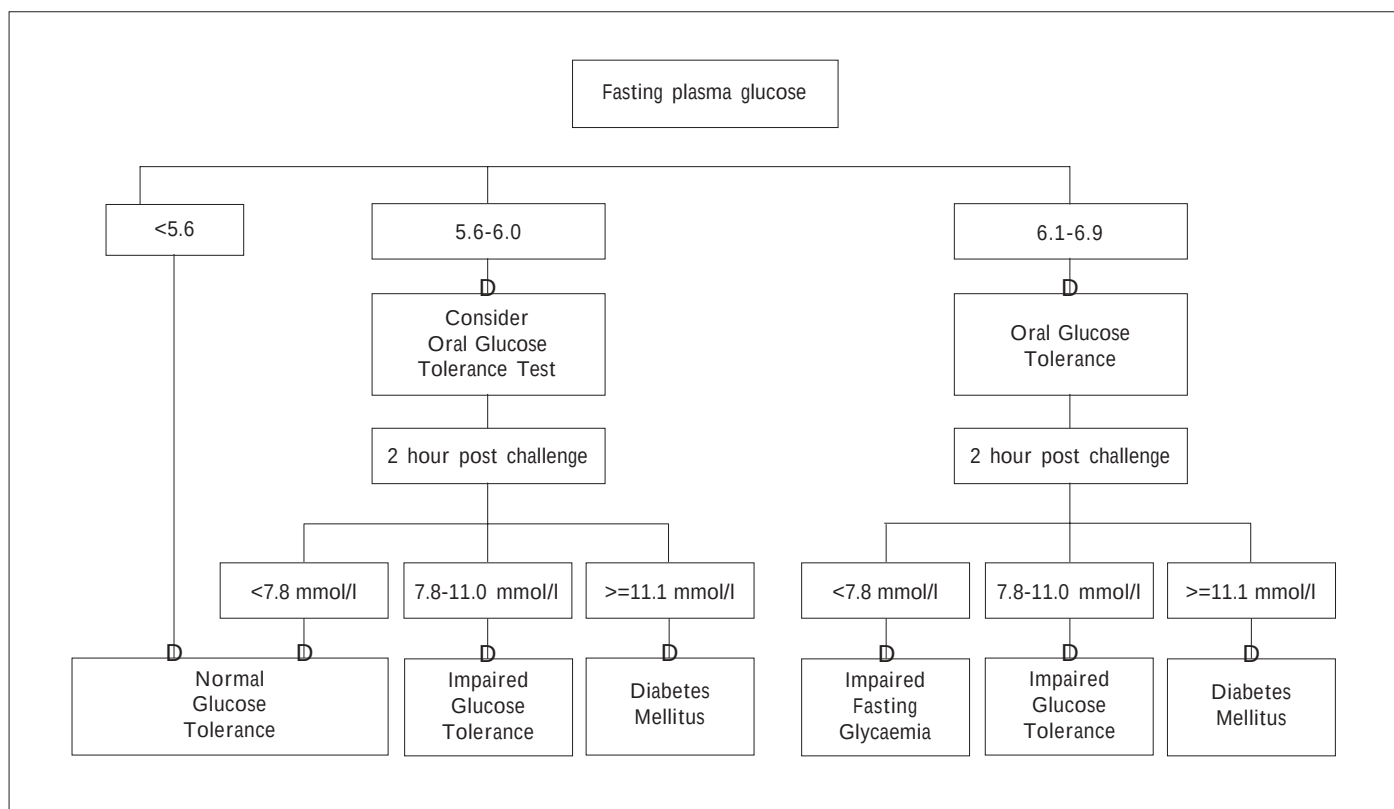


Fig 1. Flow Chart for the Diagnosis of Diabetes Mellitus

Fig 2. Flow Chart for the Diagnosis of Individuals with Fasting Plasma Glucose < 7.0 mmol/l

future diabetes mellitus and cardiovascular disease. Although this newest recommendation has not received wide acceptance to date, it may have some importance in the Singapore context because IGT is, in general, underdiagnosed. The national recommendation is hence that individuals with fasting glucose 5.6 - 6.0 mmol/l should be informed that doing an oral glucose tolerance test may be helpful in determining if there is IGT or not. Overweight subjects (BMI>23) and subjects above 40 years with fasting glucose 5.6 to 6.0 mM may be more likely to have IGT on OGTT.

SCREENING OF ASYMPTOMATIC INDIVIDUALS

Screening of asymptomatic individuals at high risk for type 2 diabetes mellitus should be carried out on an opportunistic basis. Screening should begin at age 40 years, but may be considered at an earlier age (e.g. 30 years) if risk factors for diabetes are present. Subsequently, screening should be carried out every three years for those with normal glucose tolerance and annually for those with impaired fasting glycaemia or impaired glucose tolerance.

Risk factors for diabetes include:

- Overweight/obesity (body mass index ≥ 25 kg/m²)
- Hypertension ($\geq 140/90$ mmHg)
- A first degree relative with diabetes mellitus
- Previous gestational diabetes mellitus
- Coronary artery disease
- Polycystic ovary disease
- Dyslipidemia (HDL cholesterol <1.0 mmol/l, and/or triglyceride level ≥ 2.8 mmol/l)
- Previously identified impaired fasting glycaemia (IFG) or impaired glucose tolerance (IGT).

METABOLIC SYNDROME (MS)

In recent years, interest in the metabolic syndrome has increased. Metabolic syndrome (MS), previously called 'syndrome X', was first described in 1988. The latest definitions for diagnosing metabolic syndrome were proposed by WHO and National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III).

NCEP ATP III Definition of MS

A person has MS if he or she has three or more of the following:

1. Waist circumference > 102 cm in men and > 88 cm in women
2. Serum triglycerides ≥ 150 mg/dL (1.7 mM)
3. HDL < 40 mg/dL (1.0 mM) in men and < 50 mg/dL (1.3 mM) in women
4. BP $\geq 130/85$ mmHg
5. Fasting glucose ≥ 110 mg/dL (6.1 mM)

In Asians, a modified definition has been proposed that revises the waist circumference down to > 90 cm for men and > 80 cm for women.

RECOMMENDED READING

1. Genuth S, Alberti KG, Bennett P, Buse J, Defronzo R, Kahn R, Kitzmiller J, Knowler WC, Lebovitz H, Lernmark A, Nathan D, Palmer J, Rizza R, Saudek C, Shaw J, Steffes M, Stern M, Tuomilehto J, Zimmet P: Follow-up report on the diagnosis of diabetes mellitus. *Diabetes Care* 26:3160-7, 2003.
2. Alberti KG, Zimmet PZ: Definition, diagnosis and classification of diabetes mellitus and its complications. Part 1: diagnosis and classification of diabetes mellitus provisional report of a WHO consultation. *Diabet Med* 15:539-53, 1998.
3. Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care* 20:1183-97, 1997.

LEARNING POINTS

- o Diabetes mellitus should be diagnosed and screened in a systematic and rigorous way.
 - o Whenever the diagnosis of DM is made, the clinician must feel confident that the diagnosis is fully established since the consequences for the individual are considerable and life-long.
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other healthcare providers would provide the foundation for an integrated approach towards chronic care management. It is crucial for GP clinics to view chronic care as a priority. In this way innovations and quality improvements are more likely to take place.

(3) Self Management Support

Because diabetes is a self managed condition, strategies focusing on self management is critical to the effective management of diabetes. It is important to have a systematic approach to help patients and their families acquire the necessary life skills and confidence in self management. Family physicians must empower patients and increase patient's knowledge and awareness of the need to achieve good diabetic control. These messages must be refocused from the perspective of the patient rather than from the perspective of the family physician⁴.

(4) Delivery System Design

Family physicians must seek to understand how care is being delivered at the clinic level. Who are the healthcare team members and how is care provided by them? A structured system for planned visits/appointments will help improve care rather than a walk in system. Non physician staff could be trained to arrange for routine annual screenings e.g. laboratory tests, eye and foot screening as well as support patient self management.

(5) Decision Support

There are more than sufficient evidence-based guidelines available for the family physicians. More importantly is how such guidelines could be Incorporated into daily routine care. The GP clinics should developed a system of reminders (e.g. reminders slips, colour coding, monitoring charts etc) to assist family physicians and other co-workers in clinical decision. In clinics where resources are available, investing in IT system, which incorporates decision support will enhance the practice even further.

(6) Clinical Information System

A well organised clinical or patient information system is essential for good chronic care management. Such a system serve 3 key functions namely a reminder system, a feedback channel to monitor clinical indicators and a registry so that care can be provided at the individual level as well as at the patient population level.

Ideally such a clinical information system should be electronic, however it is also feasible to re-structure the patient records system to facilitate reminders and retrieval of key clinical indicators.

Clinical quality indicators are essential to enable family physicians to monitor quality of care trends and improvements. The process and outcome indicators as recommended by the MOH Clinical Practice Guidelines for Diabetes Mellitus 1999 are as shown in Tables 1 and 2.

Table 1 : Process indicators and recommended frequency

Performance Parameter	Recommended frequency
Glycated haemoglobin (HbA _{1c})	2-4 times a year
Body weight	at least quarterly
Blood pressure	at least quarterly
* Urine albumin/creatinine ratio	at least annually
+ Lipid profile	at least annually
* Serum creatinine	at least annually
* Eye examination	at least annually
* Foot examination	at least annually
Patient education	at diagnosis and regular intervals

*Notes: * In type 1 diabetes, screening should begin after 5 years of diabetes in pubertal subjects; + Lipid profile is recommended in children older than 2 years after diagnosis of diabetes and when glucose control has been established.*

Table 2 : Recommendations on outcome data to collect

Condition	Data to collect
Eye	Retinal photocoagulation Vitreous haemorrhage Blindness
Cardiovascular	Fatal or non-fatal myocardial infarction Heart failure Angina
Cerebrovascular	Fatal or non-fatal stroke
Peripheral Vascular	Lower extremity amputation
Renal	Renal replacement therapy Death from renal failure
Other causes of death	Sudden death Death from hyper- or hypoglycaemia

OPTIMISING THE CONSULTATION – THE 5 Cs APPROACH

Consultation for chronic conditions, unlike acute care, requires a more systematic approach so that all elements of care are taken care of. The 5 Cs approach is a simple and practical way to enable family physicians to ensure more effective management of patients with chronic conditions.

(1) Control

One of the key tasks of the family physician in the management of chronic condition is to evaluate and ensure good control. In the case of diabetes, the family physicians should evaluate and ensure good control of glycaemia, blood pressure, lipid levels, and weight.

(2) Compliance

Compliance, which is largely patient dependent, must be assessed routinely during every visit. The family physician needs to work together with patients to ensure compliance with dietary habits, healthy lifestyle habits, medication, follow up, and screening. The family physician must assess the reasons for non compliance (e.g. side effects, poor motivation, drug costs etc).

(3) Complications

There are many associated complications of diabetes. Many of the complications can be relatively asymptomatic

until they are advanced. Hence screening for diabetic complications (cardiovascular, cerebrovascular, renal, eye, feet, neurological) must be done regularly so that intervention or treatment can be instituted early. Complications could also arise as a result of treatment.

(4) Counselling/Concerns

Patient self management and empowerment are critical to the effective management of diabetes. Patients should be counseled regularly on self management and life skills.

There must be opportunities during the consultation to enable patients to highlight their concerns, expectations and fears. The family physician also plays a key role as a motivator and facilitator.

(5) Customization

Management of patients and their conditions must always be tailor to patient's individual needs and expectations. Patients with different co-existing conditions and complications have to be managed differently. There are also social, financial and psychological factors that will influence patient care. The family physician must appreciate these factors from the patient's perspective and work with the patient to formulate an agreed management plan and set realistic goals.

SELF MANAGEMENT

Patients with chronic conditions must become the principal caregiver themselves. Patients are in direct control of many of the key components of the management plan e.g. diet, exercise, lifestyle modification, medication use, self monitoring etc. Studies have also shown self care or personal care with educational and surveillance support will reduce diabetic complications.⁴ Self management is often the weakest link in the management of diabetes. Therefore family physician must emphasize the importance of self management and empower patients and their families so as to enable them to manage their conditions proactively and personally.

The MOH Clinical Practice Guidelines on Diabetes recommends that the diabetic education programme should include the following areas of content:

1. Overview of diabetes
2. Nutrition, exercise and activity, medications
3. Relationship between nutrition, exercise, medications and blood glucose levels
4. Monitoring of blood sugars, HbA1c and use of results

5. Acute and chronic complications and their prevention
6. Care of feet, skin and dentition
7. Preconception care, pregnancy and gestational diabetes
8. Use of healthcare systems and community resources

Patient education should be tailored to patient's individual needs. Setting goals with patients focussing both on self care behaviour as well as control targets are important to facilitate compliance⁵. Family physicians should learn to use different techniques to influence behavioural changes⁶. Self management tools should also include personalised action plans and self monitoring of glycaemic and blood pressure.

Support groups are also very helpful in bringing patients with similar problems together so that they can share with each other their coping strategies as well as provide social and psychological support.

Community groups like Diabetic Society of Singapore, Touch Diabetes Support Association and CDC Diabetes Education and Care Centre, Home Nursing Foundation and Diabetic Support Groups provide very useful patient resource materials that the family physicians tap on to enhance patient education. These community groups also routinely organised programmes to reach out to patients and the general public.

CONCLUSION

Diabetes is a chronic condition with the potential severe complications. Effective management can be achieved through a multi-faceted approach. Optimising the clinic as well as structuring the consultation process can improve the quality of care of diabetes. Patient Self management is more often than not a key critical success factor in ensuring good diabetic care.

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6. MR Koenigsberg, D Bartlett, JS Cramer. Facilitating treatment adherence with lifestyle changes in Diabetes. Am Fam Physician 2004;69:309-16,319-20,323-4.

LEARNING POINTS

- o The majority of patients with diabetes mellitus in Singapore are seen by family physicians.
- o Good control of glycaemic, blood pressure and lipid levels lead to better outcomes.
- o Three key strategies GP clinics can undertake to improve diabetic care in their clinics are to optimise the clinic; optimise the consultation; and promote self-management by the patient.
- o Patients with chronic conditions must become the principal caregiver themselves looking after their diet, exercise, lifestyle modification, medication use, and self monitoring.
- o Support groups are also very helpful in bringing patients with similar problems together to share with each other their coping strategies and provide social and psychological support.