Diagnostic criteria for diabetes

Diagnosis of diabetes is based on values of plasma glucose or glycated haemoglobin (HbA1c). Diagnostic cut-off values are presented in Table 3.

Table 3 Diagnostic criteria for diabetes

Measurement	Diagnostic cut-off value	Comment
Fasting venous or capillary plasma glucose**	≥7.0 mmol/L (126 mg/dL)	Least costly but difficulties with ensuring a fasting state
2-hour post-load venous plasma glucose	≥11.1 mmol/L (200 mg/dL)	Cumbersome and costly, difficulties with ensuring a fasting state
2-hour post-load capillary plasma glucose**	≥12.2 mmol/L (220 mg/dL)	Cumbersome and costly, difficulties with ensuring a fasting state
Random plasma glucose	≥11.1 mmol/L (200 mg/dL)	To be used only in the presence of symptoms
HbA1c***	6.5% (48 mmol/mol)	• Less intra-individual variability than plasma glucose • Does not require the fasting state but substantially more costly than glucose measurements • Is an indirect method • Can be inaccurate in some conditions (haemoglobinopathies, renal failure, some anaemias, conditions with rapid red blood cell turnover)

* Overnight fast of 8–14 hours.
** If laboratory measurement is not available, point of care, ("finger stick") devices can be used (they report glucose values in capillary plasma).
*** Plasma glucose is preferred in people with symptoms who are suspected of having type 1 diabetes.

Diagnostic tests

Venous plasma glucose is the standard method for measuring and reporting. However, in recognition of the widespread use of capillary sampling, especially in low-resource settings, values for capillary plasma glucose are provided for post-load glucose values. *Fasting values for venous and capillary plasma glucose are identical.*

Glucose should be measured immediately after collection, otherwise the blood sample should be collected into a container with glycolytic inhibitors, immediately centrifuged to separate the plasma, and frozen until analysis.

- In asymptomatic people, repeat the test to confirm the diagnosis, preferably with the same test, as soon as practicable on a subsequent day.
- If plasma glucose ≥18 mmol/L (325 mg/dL), or symptoms are present, measure urine ketones to assess degree of metabolic disturbance.
- If plasma glucose measurement is not possible, urine glucose testing can be used to confirm suspicion of diabetes in people with symptoms. *A negative urine test does not exclude diabetes, but it excludes severe hyperglycaemia.*

2 Management of diabetes

Type 2 diabetes is a progressive illness, with insulin secretion decreasing over time. Introduction of oral hypoglycaemic agents (OHA) will often be necessary in patients treated with diet and physical activity only, and further intensification with insulin might be needed as the illness progresses and OHAs are not sufficient to control glycaemia.

Blood glucose management protocol

The blood glucose management protocol is recommended for patients with established or newly diagnosed type 2 diabetes (see Fig. 1). A simplified blood glucose management protocol and key actions on complications are presented in Fig.2.

Non-pharmacological management

A healthy diet to achieve or maintain normal body weight and regular physical activity are the mainstay of diabetes management.

- People with diabetes should be advised to eat a healthy balanced diet that is applicable to the general population.
- Overweight patients should be advised to reduce weight by reducing their food (calorie) intake.
- All patients should be advised to practise regular daily physical activity appropriate for their physical capabilities (e.g walking). Most adults should engage in at least 150 minutes of moderate or vigorous-intensity aerobic activity per week, spread over at least 3 days.
- All patients should be advised on avoidance of tobacco use and harmful use of alcohol.

Pharmacological management

Control of blood glucose levels (glycaemia)

Initial treatment:

- Metformin does not cause weight gain or hypoglycaemia and is the recommended initial treatment for people who do not achieve the desired glycaemic control with diet and physical activity. Increase the dosage gradually according to the diabetes protocol.
- A second-generation sulfonylurea (preferably gliclazide) can be used as initial (first-line) treatment when metformin is contraindicated or not tolerated. Sulfonylureas may cause weight gain or hypoglycemia.
- Other pharmacological agents have not been shown to be superior to metformin or sulfonylurea for glycaemic control and long-term outcomes as initial treatment.

Metformin

Metformin is contraindicated in:

- people with chronic kidney disease (estimated glomerular filtration rate (eGFR) <30 mL/minute/1.73m^2)
- people with severe reduced liver function
- people with acute cardiac insufficiency
- people with respiratory insufficiency
- people who abuse alcohol
- people with history of lactic acidosis

Intensification of treatment when metformin alone fails to control glycaemia:

- Add a second-generation sulfonylurea (preferably gliclazide) to metformin in patients with inadequately controlled glycaemia on metformin, along with diet and physical activity.
- In hyperglycaemic patients with symptoms, give a sulfonylurea or refer for insulin treatment.
- Hypoglycaemia is a possible side-effect of sulfonylurea, more frequent with glibenclamide than with gliclazide.

Glibenclamide

Glibenclamide is not recommended in:

- people aged 60 years or older
- people with severe liver disease
- in patients for whom hypoglycaemia is a concern (people who are at risk of falls, who have impaired awareness of hypoglycaemia, who live alone)
- people who drive or operate machinery as part of their job.

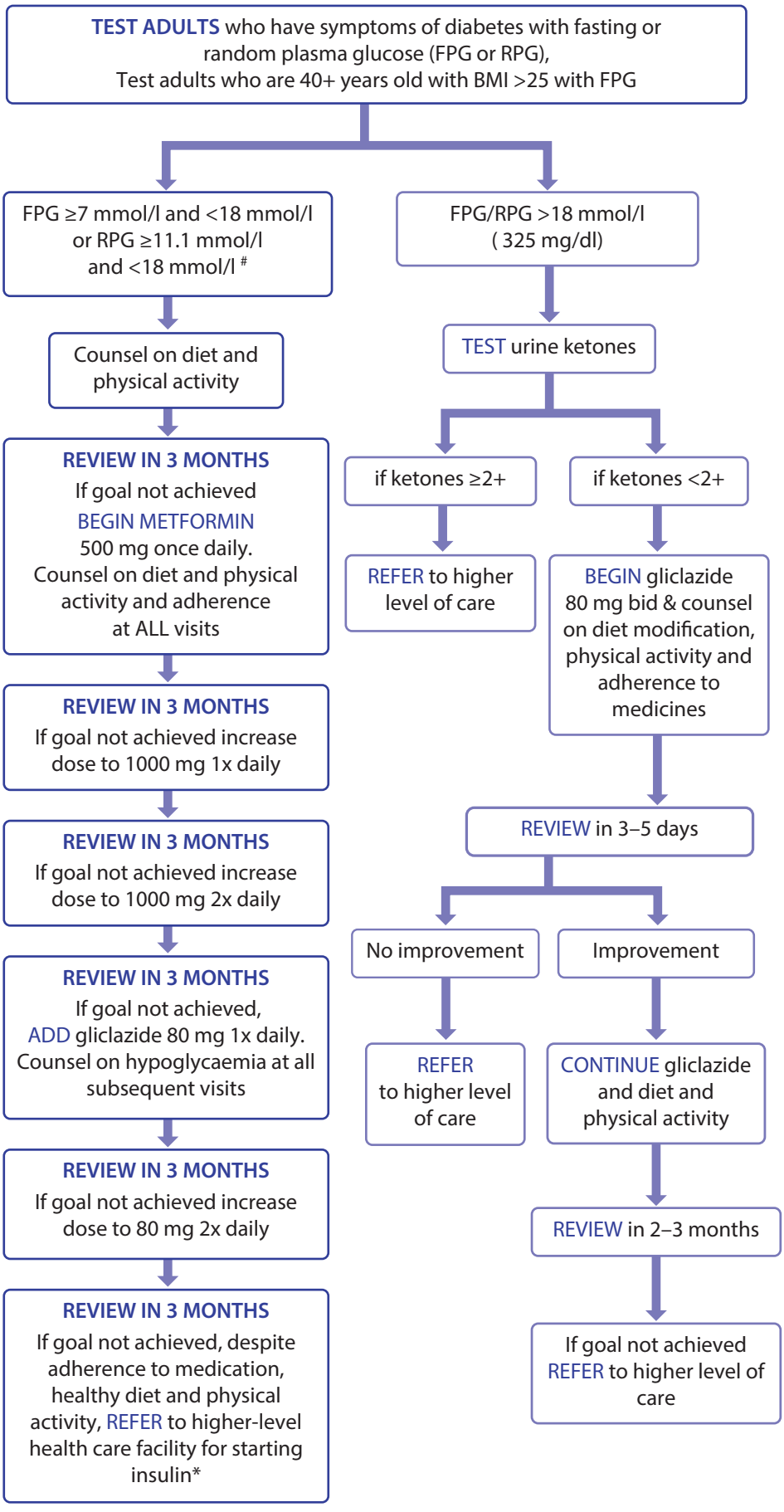
Intensification of treatment when metformin and sulfonylurea fail to control glycaemia:

- Refer for insulin treatment or add human insulin[1] to oral medication (Annex 1).
- If insulin is unsuitable [2], a DPP-4 inhibitor, SGLT-2 inhibitor or a thiazolidinedione (TZD) may be added, but these are not recommended for routine use due to high cost and, with the exception of SGLT-2 inhibitors, uncertain benefit.

[1] Insulin analogues are not recommended for routine use as they are substantially more costly than human insulin and there is considerable uncertainty over their benefits, especially in people with type 2 diabetes.

[2] Insulin treatment could be unsuitable when it is more costly than oral agents, or when circumstances make its use difficult (e.g. persons who live alone and are dependent on others to inject them with insulin).

Fig. 2 Type 2 diabetes management protocol derived from WHO-PEN



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SCREENING FOR CHRONIC COMPLICATIONS

- Measure blood pressure at every scheduled visit, review medication as per hypertension protocol
- REFER for dilated-pupil retinal exam upon diagnosis, and every two years thereafter, or as per ophthalmologist recommendation
- Examine feet for ulcers at every visit. REFER to higher level of care if ulcer present
- Assess risk of lower limb amputation annually (foot pulses, sensory neuropathy by monofilament, presence of healed or open ulcers, calluses). REFER to higher level of care if ulcer present or pulse absent
- Test for proteinuria annually. REFER to higher level of care if positive.

MANAGEMENT OF ACUTE COMPLICATIONS

Severe hypoglycaemia (plasma glucose <50 mg/dl or 2.8 mmol/l) or signs:

- If conscious, give a sugar-sweetened drink
- If unconscious, give 20–50 ml of 50% glucose (dextrose) IV over 1–3 minutes.

Severe hyperglycaemia (plasma glucose >18 mmol/l (325 mg/dl) and urine ketone 2+) or signs and symptoms of severe hyperglycaemia:

- Set up intravenous drip 0.9% NaCl 1 litre in 2 hours; continue at 1 litre every 4 hours, REFER to hospital.

Goal for glycaemic control	Plasma glucose**
Fasting	≤7.0 mmol/l (126mg/dl)†

\# refer to table on diagnostic values for other tests which can be used to diagnose diabetes.

* If they are more affordable than insulin, DPP4-inhibitors, SGLT2-inhibitors or pioglitazone can be used before insulin in cases of treatment failure with metformin and gliclazide. Introduce and titrate insulin treatment according to local practices.

** HbA1c should be used where available.

† Consider less stringent glycaemic control in patients with frequent severe hypoglycaemia, advanced complications, serious comorbidities and/or limited life expectancy.