

MacLeod Diabetes & Endocrine Centre Royal Devon & Exeter Hospital

Diagnosis of Diabetes Routine Cases

Diagnostic criteria for diabetes

Diabetes may be diagnosed on any of the following criteria (WHO 2006, John 2012).

	Diabetes	“Impaired” or “Pre-diabetes”	Normal
HbA1c	48 m/m and above	42 – 47 mmol/mol *	41 m/m and below
Fasting glucose	7.0 mmol/L and above	6.1 – 6.9 mmol/L	6.0 mmol/L and below #
2-hr glucose in OGTT	11.1 mmol/L and above	7.8 – 11.0 mmol/L	7.7 mmol/L and below
Random glucose	11.1 mmol/L and above		
A repeat confirmatory test is required in most cases, see below.			

* - The Exeter research group has shown that progression to diabetes is rare within 5 years after an HbA1c of 42 or 43. It would be reasonable to redefine “pre-diabetes” as an HbA1c of 44-47. This is not national guidance, but would reduce pre-diabetes workload by around 50%, with occasional delayed diabetes diagnoses.

- WHO defines normal as <6.1 mmol/L, but truly normal is probably <5.6 mmol/L. As the UK aligns with WHO, we do not advise diagnosing pre-diabetes at 5.6 mmol/L, but mention this because of awareness from the Exeter Family Study.

Which test is best?

National and international expert groups do not know. Relevant groups (WHO, ADA, UKDHADC) simply advise that HbA1c is now an option for diagnosing diabetes.

For each patient, choose one test. The RD&E diabetes team recommend HbA1c – except in those groups below where HbA1C may be unreliable, and glucose should be used.

<p>Benefits to using HbA1c for diagnosis <i>No need for patient to fast</i> <i>More reproducible</i> than glucose. <i>Continuity with diabetes</i> (once diagnosed, we switch from glucose to Hb1A1c, so it makes sense to use HbA1c for diagnosis)</p>	<p>Disadvantages to using HbA1c: <i>Inappropriate for some patients</i> (see below). Your preference: We do not wish to be prescriptive. You may prefer fasting glucose, if simpler than assessing each patient’s suitability for diagnosis by HbA1c.</p>
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Should a positive test be repeated?

- **For glucose – yes, in most cases.** This was always advised, except if classical diabetes symptoms.
- **For HbA1c – yes, in asymptomatic patients.** National guidance advises a repeat within two weeks. The second result is often lower! Both must be ≥ 48 mmol/mol to diagnose diabetes; if discordant, the lower result is used. The repeat sample must be sent with clinical detail (e.g. “repeat HbA1c to confirm diagnosis of diabetes”), as repeats within 30 days are usually rejected by the lab.
- **Do not delay urgent care while awaiting second test.** For young, very symptomatic, or ill patients, check ketones and seek specialist advice if necessary.

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When not to use HbA1c to diagnose diabetes

These are the most common situations where HbA1c is not suitable. Except in pregnancy, diagnose by fasting glucose ≥ 7.0 mmol/L twice, or once with symptoms. In pregnancy, follow NICE guidelines.

- 1. Rapid onset of diabetes** – an increase in HbA1c may not be detected until a few weeks later.
 - a. *Suspected type 1 diabetes* – rapid onset of symptoms, weight loss, ketosis.
 - b. *Children* – because most will have type 1 diabetes.
 - c. *Steroids*. Antipsychotics & immunosuppressants can raise blood glucose, rarely precipitously.
 - d. After *pancreatitis or pancreatic surgery*.
- 2. Pregnancy.** Multiple factors make HbA1c lower in pregnancy. The diagnosis of gestational diabetes should be made on blood glucose, in line with NICE guidance.
- 3. Conditions with reduced red survival may lower HbA1c:**
 - a. *Haemoglobinopathy* which will normally be detected by the lab, but should be suspected in racial groups where there is a high prevalence of sickle trait, sickle disease or thalassaemia.
 - b. *Haemolytic anaemia*
 - c. *Severe blood loss*
 - d. *Splenomegaly*
 - e. *Antiretroviral drugs*
- 4. Increased red cell survival** may increase HbA1c e.g. splenectomy.
- 5. Renal dialysis patients** have a markedly reduced HbA1c especially if treated with erythropoietin.
- 6. Iron and B12 deficiency and their treatment.** May raise or lower HbA1c, but the effect is small.

What if you have glucose values and an HbA1c on a single patient?

This is confusing, so don't get into that situation – use HbA1c alone, or glucose alone. If you already have both, WHO guidance diagnoses diabetes if either result is high.

How should we manage the patient with “pre-diabetes” or “impaired glucose tolerance”?

Treat as high diabetes risk:

- Give lifestyle advice.
- Monitor for progression to diabetes at least annually.

Monitoring can also be appropriate for individuals with HbA1c in normal range. For example, strong family history, overweight, previous gestational diabetes, or transient hyperglycaemia in acute illness.

What if a patient lowers their HbA1c or glucose through lifestyle change?

If a patient is diagnosed with diabetes, and then drops their HbA1c or glucose below the diagnostic threshold without medication, then strictly speaking they no longer have diabetes. However, the risk of recurrent weight gain and diabetes is very high. Unless they strongly object to keeping the label, it is pragmatic to treat them as having excellently-controlled diabetes on diet, and continue to give usual care for diabetes. In all cases, review at least annually.

References

WHO 2006 – http://whqlibdoc.who.int/publications/2006/9241594934_eng.pdf

John 2012 - <http://onlinelibrary.wiley.com/doi/10.1111/j.1464-5491.2012.03762.x/pdf>