Clinical Biochemistry Department

Diagnosis of Diabetes Mellitus

Who should be tested?

1. **Presentation of probable <u>Type 1 Diabetes</u> (irrespective of age):**
   - A short history (<1 month) of thirst, urinary frequency and or weight loss. <mark>In this situation HbA1c should NOT be used as a diagnostic test.</mark>

Check:
   - Urine for ketones
   - Finger prick glucose
   - Send a venous sample for glucose to the lab

Refer adults: urgently via Diabetes Specialist Nurses:
Bath Community DSN: 07876 265064 ruh-tr.communitydsn@nhs.net
Wiltshire Community DSN: 01225 711443 or 01249 456483 WHC.diabetesreferrals@nhs.net
RUH DSN: RUH switchboard: 01225 428331 bleep 7721, 7881 or 7234

Refer paediatrics: for same day assessment by the RUH Duty Paediatric Team, contact through RUH switchboard *(*01225 428331). **Out of hours advice:** Paediatric Registrar via RUH switchboard 01225 428331 bleep 7205.

2. **Symptoms of Type 2 Diabetes, may include:**
   - Thirst
   - Polyuria/nocturia (passing lots of urine especially at night)
   - Incontinence in older people
   - Tiredness/lethargy
   - Mood changes (irritability)
   - Weight loss
   - Blurred vision
   - Thrush infections (particularly genital)
   - Recurrent infections (particularly skin)
   - Tingling/pain/numbness (feet, legs, hands)
   - Unexplained symptoms

3. **Patients at risk of developing Type 2 Diabetes e.g. identified during a NHS Health Check appointment:**
   - BMI ≥ 30 (or ≥27.5 if Indian, Pakistani, Bangladeshi, other Asian or Chinese)
   - BP ≥ 140/90

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How should patients be tested for Type 2 Diabetes?

An individual patient's diagnosis of Type 2 Diabetes may be based on **EITHER** laboratory **glucose OR HbA1c** analysis but **NOT A COMBINATION** of these tests.

Note that whilst HbA1c testing may often be preferred by patients and clinicians, as a fasting sample is not required, there are a number of patient groups in which **HbA1c may be misleading** and should not be used to diagnose Diabetes.

HbA1c must NOT be used for diagnosis in situations where high glucose has developed rapidly (as it may not be increased):

> - *Possible Type 1 diabetes*
> - *Symptomatic children and young adults*
> - *Symptoms less than three months*
> - *Acutely ill patients*
> - *Medication that may cause rapid rise in glucose e.g. corticosteroids, antipsychotics*
> - *Acute pancreatic damage or pancreatic surgery*
> - *In pregnancy for the investigation of gestational diabetes; OGTT is required.*
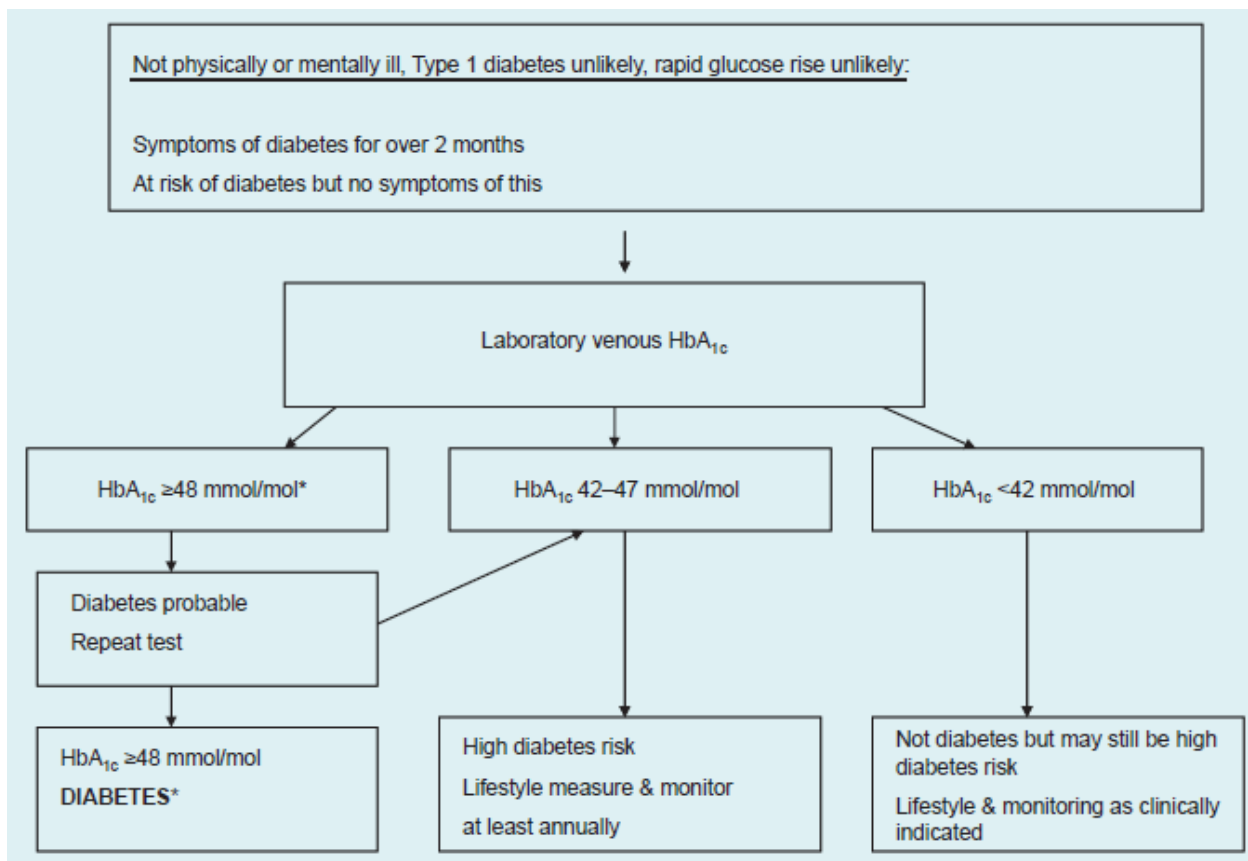
AS A BLANKET RULE, TO AVOID THE RISK OF OBTAINING FALSELY REASSURING RESULTS, HBA1c SHOULD NOT BE USED FOR DIAGNOSIS IN CHILDREN.

HbA1c must NOT be used in the presence of factors affecting its formation or measurement:

> - *Iron and vitamin B_{12} deficiency*
> - *Haemolytic anaemias*
> - *Administration of iron, vitamin B_{12} or erythropoietin*
> - *Chronic liver disease*
> - *Chronic renal failure (CKD 4 and 5)*
> - *Alcoholism*
> - *Rheumatoid arthritis*
> - *Splenomegaly or splenectomy*
> - *Haemoglobinopathies*
> - *Drugs that may affect erythrocyte lifespan e.g. antiretrovirals, ribavarin, dapsone*

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Where HbA1c has been deemed appropriate for use, the following algorithm may be used:

Algorithm for HbA1c based diagnosis (UK Expert Position Statement 2012)

Not physically or mentally ill, Type 1 diabetes unlikely, rapid glucose rise unlikely:

Symptoms of diabetes for over 2 months

At risk of diabetes but no symptoms of this

↓

Laboratory venous HbA_{1c}

HbA_{1c} ≥48 mmol/mol*	HbA_{1c} 42–47 mmol/mol	HbA_{1c} <42 mmol/mol
Diabetes probable Repeat test		
HbA_{1c} ≥48 mmol/mol **DIABETES***	High diabetes risk Lifestyle measure & monitor at least annually	Not diabetes but may still be high diabetes risk Lifestyle & monitoring as clinically indicated

*HbA1c ≥48 mmol/mol without symptoms; HbA1c should be repeated within 2 weeks.

*HbA1c >120 mmol/mol are likely to indicate marked hyperglycaemia which may need urgent assessment.

NB HbA1c is not an urgent laboratory test, results will not routinely be telephoned.

Request venous glucose where results of investigation are required urgently.

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Where venous glucose has been deemed the most appropriate test, the following algorithm should be used to classify diabetes or related conditions:

Algorithm for glucose based diagnosis (WHO 2006)
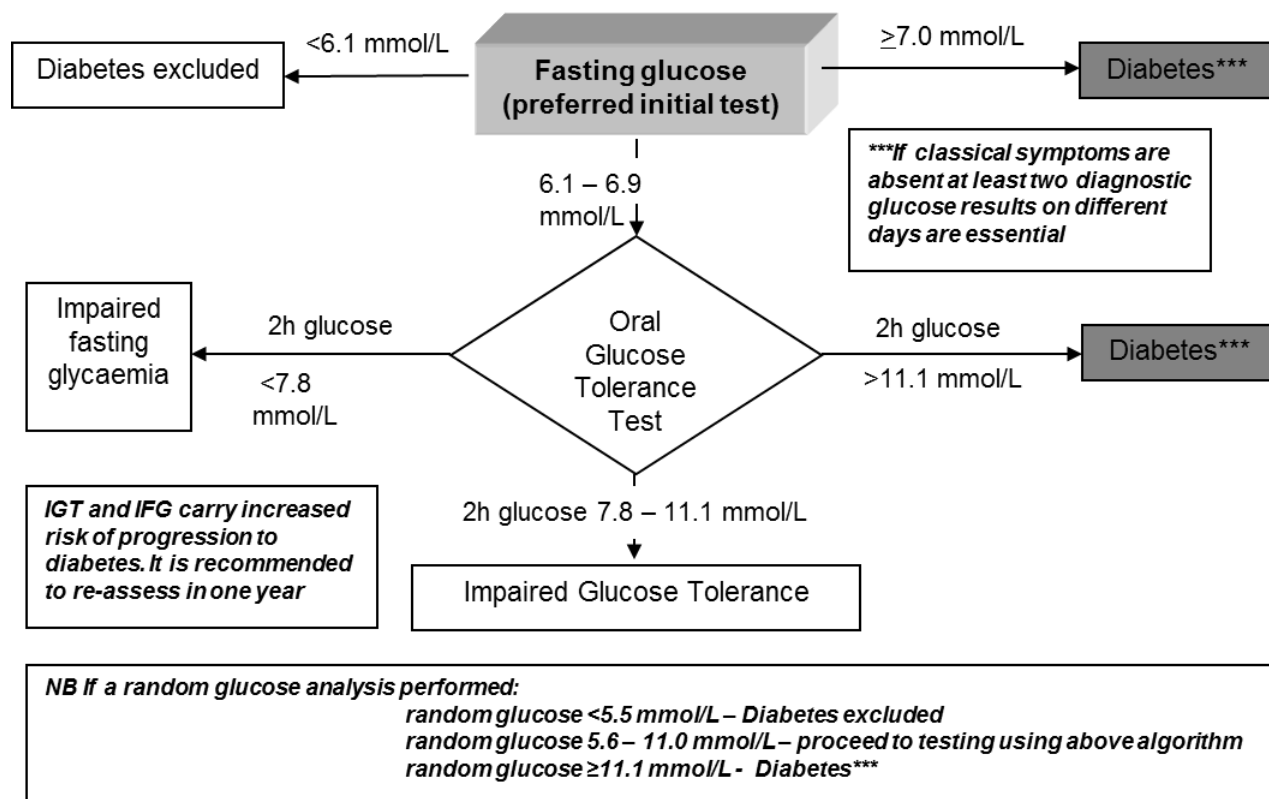
References and useful links

1. https://bathdiabetes.ruh.nhs.uk/
2. W.G. John (on behalf of the UK Department of Health Advisory Committee on Diabetes). 2012. Use of HbA1c in the diagnosis of diabetes mellitus in the UK. The Implementation of World Health Organisation guidance 2011. Diabet. Med.29:1350-1357.
3. Use of glycated haemoglobin (HbA1c) in the diagnosis of diabetes mellitus – WHO, 2011 https://www.who.int/diabetes/publications/report-hba1c_2011.pdf?ua=1
4. Definition and diagnosis of diabetes mellitus and intermediate hyperglycaemia - Report of a WHO/IDF consultation, 2006 http://whqlibdoc.who.int/publications/2006/9241594934_eng.pdf?ua=1
5. NHS Health Check Best Practice Guidance – Oct 2019 https://www.healthcheck.nhs.uk/seecmsfile/?id=1396

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