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HbA1c for MONITORING of Diabetes Mellitus

Frequency of measurement

HbA1c measures glucose bound to haemoglobin and it provides an indication of the average level of blood glucose during the previous 2-3 months (the lifespan of a typical haemoglobin molecule). Therefore re-checking HbA1c levels within 90 days of a change in diabetes management will not fully reflect the impact of the change.[$]

HbA1c requests for diabetes monitoring received within 60 days of a previous valid result will be rejected. The report will show the previous result and date of collection.

[$] Type 1 diabetes in adults, NICE NG17:Measure HbA1c levels every 3–6 months
Type 2 diabetes in adults, NICE NG28: Measure HbA1c levels at:
3–6-monthly intervals (tailored to individual needs) until the HbA1c is stable on unchanging therapy
6-monthly intervals once the HbA1c level and blood glucose lowering therapy are stable.

When is HbA1c not reliable?

HbA1c values in patients with disturbed erythrocyte turnover, or abnormal haemoglobin type may not correlate with glycaemic control (see table). HbA1c measurement performed in the labs at York and Scarborough Blood Sciences Laboratories can be used to *monitor* HbA1c levels in patients who are heterozygous (carriers) for variant hemoglobin, such as HbS, HbD or HbC, as the effect of the abnormal haemoglobin is usually consistent over time. Please be aware that treatment targets may vary from national guidance in these patients. A comment will be added to the report.

Alternatives to measuring HbA1c in diabetic patients with abnormal haemoglobin or invalid HbA1c results

An analytically valid HbA1c result cannot be generated for all haemoglobin variants, and in these situations, an alternative HbA1c (*total glycated haemoglobin*) method can be used. The laboratory will usually identify these patients and send the sample to an alternative laboratory for measurement. Results will be reported back to you and a comment added to the report.

All HbA1c methods are inappropriate for the assessment of glycemic control in patients who are homozygous, or compound heterozygotes, for a variant haemoglobin. This is also true for any other condition that alters erythrocyte survival (see table). In these situations, glycaemic control can be monitored using *fructosamine.*

Fructosamine measures glucose bound to albumin, instead of haemoglobin. It is therefore completely unaffected by any changes in haemoglobin or abnormal forms of haemoglobin. Albumin has a much shorter lifespan than haemoglobin, and fructosamine measurement therefore only indicates glycaemic control over the previous 2-3 weeks.

Fructosamine results cannot be directly compared to HbA1c results, but measurements are reported with an HbA1c-equivalent range. Note that in patients with low albumin levels, fructosamine measurements can be misleading.

Fructosamine cannot be used to diagnose diabetes.

Further advice

Unexplained discrepancies between HbA1c and other glucose measurements should always be investigated.

Seek advice from Clinical Biochemistry or the Diabetes and Endocrinology Department.

Please send an Advice and Guidance request to Clinical Biochemistry, or contact the Duty Biochemist on 01904 726366 (Mon-Fri, 9-5) for further information or to discuss the most appropriate alternative measurement.

<table>
<tr><th>Conditions with increased red cell survival may increase HbA1c:</th><th>Conditions with reduced red survival may lower HbA1c:</th></tr>
<tr><td>Splenectomy</td><td>Haemolytic anaemia</td></tr>
<tr><td rowspan="7">Haemoglobin variants have variable effects on HbA1c results.
Many haemoglobinopathies are detected by the lab, but should also be suspected in racial groups where there is a high prevalence of sickle trait, sickle disease or thalassaemia.
Most common variants do not directly affect the measurement of HbA1c itself but some rare variants may directly interfere in HbA1c measurement, usually giving falsely low results. It is more common that a variant shortens red cell survival time. Disorders which cause high levels of fetal Hb (HbF), such as thalassaemias, give falsely low HbA1c results.</td><td>Recent blood donation, severe blood loss, transfusion, venesection</td></tr>
<tr><td>Chronic kidney disease (CKD4 or 5) & renal dialysis patients</td></tr>
<tr><td>Antiretroviral drugs, dapsone, ribavarin (RBC destruction)</td></tr>
<tr><td>Liver disease / alcohol excess</td></tr>
<tr><td>Splenomegaly / hereditary spherocytosis</td></tr>
<tr><td>Chronic malaria</td></tr>
<tr><td>Aplastic anaemia</td></tr>
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