THE USE OF HbA1c to DIAGNOSE DIABETES

Background

The traditional diagnostic criteria for asymptomatic individuals who may have diabetes have been a fasting blood glucose equal or greater than 7.0 mmol/L or a random blood glucose equal or greater than 11.1 mmol/L or an OGTT with a two hour blood glucose equal or greater than 11.1 mmol/L. Oral glucose tolerance tests (OGTT) are time consuming for all concerned and are not always reproducible. For several years HbA1c has been endorsed by expert opinion as suitable to diagnose diabetes. The diagnosis is confirmed if the HbA1c is equal or greater than 48 mmol/L. It is very important to remember that for asymptomatic individuals (the majority of presentations in Primary Care) a second confirmatory blood test is necessary to make the diagnosis of diabetes. The key recommendation in this paper is that in the future 'in normal circumstances', **the confirmatory test should be an HbA1c if the initial glucose is equivocal. The initial testing should remain glucose.** This use of HbA1c will expedite diagnosis and reduce the need for OGTTs.

Costs and Workload Implications for the Laboratory

In 2015, GP Practices made approximately 200,000 requests for blood glucose measurement and 66,000 HbA1c requests. The cost of a blood glucose test is about 70p and an HbA1c costs about £4.00.

Furthermore the instrumentation for HbA1c analysis is more labour intensive with a slower throughput. To adopt HbA1c as the initial as well as the confirmatory test for diabetes would have significant costs and workload implications for NHS Laboratories. A major rise in HbA1c workload would lead to significant analytical delays and also potentially require additional staffing and instrumentation with further cost implications. **It is for this reason that the use of HbA1c in diagnosis must be restricted to confirmatory testing.**

Development of the New Diagnostic Pathway

With this in mind, PLIG agreed with senior Diabetologists in Lothian in 2015 that a pilot study should be set up. This would use HbA1c on the diagnostic pathway. Its use would be limited to the diagnosis in asymptomatic individuals. It would be used as the confirmatory test and not as the initial examination. A revised diagnostic pathway and flowchart for diabetes was drawn up. This pathway was then piloted within the Practices in South East Edinburgh allowing comparison to be made for the workload of HbA1c and OGTT's in the six months before and after the introduction of the pathway. Changes in QOF made interpretation of the results difficult but there was not a major impact on requests for HbA1c whilst there was a significant reduction in the number of OGTT's carried out. The results of the pilot have encouraged PLIG in collaboration with diabetic colleagues to extend this limited diagnostic use for HbA1c to all Practices across Lothian. It is for this purpose that the attached flowchart should be adhered to in the future. For advice on who to screen for diabetes in this category, please refer to the Diabetes Handbook.

Amendments to ICE

At the same time we are proposing to make some small changes to ICE. A fasting blood glucose result will be highlighted on the returning report if levels are 6.1 mmol/L or more and a random blood glucose similarly highlighted if the glucose level is 7.8 mmol/L or more. This will enable clinicians to then request further diagnostic investigations, namely, HbA1c (where appropriate) and glucose. In addition

there will now be two HbA1c request boxes, namely HbA1c for monitoring and HbA1c for diagnosis. This will allow us to record the diagnostic use of HbA1c more closely. Moreover, ticking HbA1c for diagnosis will also generate a reminder that there are certain specific situations where the test is not reliable or appropriate for diagnosis.

Monitoring the introduction of HbA1c to confirm the Diagnosis

There is concern that the pilot study may not represent what may happen to the HbA1c workload as this new pathway is implemented across Lothian. Accordingly, the Laboratories will need to continue to monitor the number of HbA1c requests and the impact on the Clinical Biochemistry service. Should the costs spiral excessively and/or if the analytical capacity of our existing instrumentation be threatened, then it would be necessary to once again limit HbA1c use to diabetes monitoring. Clearly it is not in anyone's interest for this to happen so we do need to be mindful of costs and workload implications. Based on the pilot, the Laboratories are optimistic that this will not be necessary but the Lothian-wide implementation of this new pathway can only be supported on a trial basis in the first instance.

Advantages of the New Pathway

The use of HbA1c for the diagnosis of diabetes means that the number of OGTT's required will be reduced. This will be of considerable benefit to Practices resulting in a reduced workload as well as being a lot more convenient for patients.

HbA1c has been used as a tool to monitor the degree of glycaemic control in individuals with Type 2 diabetes. Therefore, as well as confirming the diagnosis, the HbA1c result will give an indication of glycaemic control in the last 120 days.

Limitations of HbA1c as a diagnostic tool for Diabetes

Glucose binds irreversibly to haemoglobin in the red blood cells in direct proportion to the prevailing plasma/glucose concentrations. Red blood cells have an average lifespan of 120 days such that HbA1c broadly gives a measure of average glycaemic control over that period. Anything that alters haemoglobin or the lifespan of the red blood cell will alter the relationship between HbA1c and average glycaemia. Thus, haemolytic anaemia, haemoglobinopathies, acute blood loss, splenomegaly and some antiviral drugs can also result in an artificially low HbA1c. The result may also be lower in renal dialysis patients and may be altered by iron and vitamin B12 deficiency. HbA1c will also give a falsely reassuring result if there has been a rapid rise in blood glucose. Therefore it cannot be used as a diagnostic test of gestational diabetes, steroid-induced diabetes and Type 1 diabetes. It will also not always been reliable in pancreatic disease.

Summary

- HbA1c should **not** be used as the initial screening test for diabetes**. Glucose** is still the **first** test on the diagnostic pathway.

- Asymptomatic patients – 2 tests are required to confirm the diagnosis of diabetes. In future, if the initial glucose is in an equivocal range then the **confirmatory** test should be an **HbA1c.** This will expedite diagnosis and help reduce the need for oral GTTs.

- There are particular circumstances where HbA1c is not the appropriate confirmatory test and these situations are outlined clearly on the attached pathway.

- Early diagnosis of diabetes is important. Most patients are asymptomatic at the time of diagnosis. The attached pathway indicates which High Risk Groups should be offered an annual HbA1c in case individuals have developed diabetes.

Finally, please note that colleagues working in the Hospital-based diabetes services are available for email advice in the event of borderline or unclear results.

RIE: **RIE.DiabeticAdvice@nhslothian.scot.nhs.uk**
WGH: **WGH.DiabeticAdvice@nhslothian.scot.nhs.uk**
St John's: **WL.DiabeticAdvice@nhslothian.scot.nhs.uk**

The full Lothian wide implementation for using HbA1c on the diabetes diagnostic pathway will take effect from **Monday, 3rd October**.

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