Box 2: Monitoring glycated haemoglobin (HbA_{1c}) in diabetic patients

How frequently should HbA_{1c} be measured in patients with diabetes?

- We recommend:
- A minimum of HbA_{1c} measurement every 15 months in all patients with diabetes
- Ideally, two measurements each year in patients who are meeting goals of treatment and who have stable glycaemic control
- More frequent measurements up to a maximum of four to six a year in patients whose treatment has changed or who are not meeting treatment goals

When should HbA_{1c} be used in the diagnosis of diabetes or in non-diabetic patients?

- We do not recommend that HbA_{1c} should be used in the diagnosis of diabetes or in non-diabetic patients

How are HbA_{1c} values interpreted?

- As the absolute risks and benefits of lower targets are currently unknown, we recommend:
- A general diabetes control and complications trial aligned HbA_{1c} target of <7.5% (and an ideal target of <6.5% to 7.0%), which should be individualised for each patient, noting life expectancy and age, the incidence of hypoglycaemia, comorbid conditions, and the potential for considerable inter-individual differences in mean blood glucose values and HbA_{1c} concentrations

diabetes are improved by better control, largely based around the diabetes control and complications trial and the UK prospective diabetes study,^{3 14} although the evidence base for desirable monitoring intervals is weaker, as these trials did not aim to examine periodicity of monitoring. The physiology of HbA_{1c} described above, however, forms a logical basis for avoiding very frequent testing, as no data assessing rate of change over short periods exist.

The guidance makes little reference to situations in which HbA_{1c} measurement is known not to be valid.¹⁵ These are established from observational studies and follow from the physiology of HbA_{1c}.

Useful websites

Lab Tests on Line (UK) (www.labtestsonline.org.uk)—A comprehensive guide for patients on laboratory tests and their use

Cochrane Library (www.nelh.nhs.uk/cochrane.asp)—Information and systematic reviews on evidence based medicine; the Cochrane collaboration is beginning reviews on laboratory diagnostic testing

JCP Online (www.jclinpath.com)—Website (subscription) containing electronic access to the *Journal of Clinical Pathology*, with full content of the questions and answers examined in this article

Clinical Evidence (www.clinicalevidence.com)—Summaries of current evidence based management guidelines

PRODIGY (www.prodigy.nhs.uk)—Clinical decision making guidelines designed principally for general practitioners

No evidence is available on the use of HbA_{1c} in these situations. Theoretically, if the factor influencing HbA_{1c} is stable, changes in the value over time might still reflect changes in diabetic control even if absolute values cannot be compared with target values. However, as situations of increased haemoglobin turnover are often not stable, if these values are interpreted at all this should logically be combined with home glucose measurement as an indicator of day to day control.

We thank Susan Richardson for typing the manuscript and the following people who kindly reviewed the original guidance work and added valuable comments in addition to those of the steering group: I S Young (Association of Clinical Biochemists), R Gama (Association of Clinical Pathologists), R Neil and N Campbell (Royal College of General Practitioners), and R Bilous (Diabetes UK).

Competing interests: None declared.

- 1 Goldstein DE, Little RR, Lorenz RA, Malone RL, Nathan D, Petereson CM. Tests of glycemia in diabetes. *Diabetes Care* 1985;18:896-909.
- 2 Beach KW. A theoretical model to predict the behavior of glycosylated hemoglobin levels. *J Theor Biol* 1979;81:547-61.
- 3 Diabetes Control and Complications Trial Research Group. Effect of intensive diabetes management on macrovascular events and risk factors in the diabetes control and complications trial. *Am J Cardiol* 1995;75:894-903.
- 4 European Diabetes Policy Group. A desktop guide to type 2 diabetes mellitus. *Diabet Med* 1999;16:716-30.
- 5 American College of Endocrinology consensus statement on guidelines for glycemic control. *Endocrine Practice* 2002;8(suppl 1).
- 6 National Institute for Health and Clinical Excellence. Type 1 diabetes: diagnosis and management of type 1 diabetes in adults. Clinical guideline 15, full guideline, main section. www.nice.org.uk/pdf/cg015_full_guideline_adults_main_section.pdf (accessed 3 Oct 2005).
- 7 National Institute for Health and Clinical Excellence. Management of type 2 diabetes—managing blood glucose levels. Guideline G. www.nice.org.uk/pdf/NICE_INHERITEG_guidelines.pdf (accessed 3 Oct 2005).
- 8 American Diabetes Association. Standards of medical care for patients with diabetes mellitus. *Diabetes Care* 2005;28(suppl 1):S4-S36.
- 9 Department of Health. National service framework for diabetes: standards. Download intervention details and draft service models. March 2002. www.dh.gov.uk/assetRoot/04/03/28/42/04032842.pdf (accessed 30 August 2006).
- 10 NHS Confederation. Quality and outcomes framework. Accompanying guidance document. 2003. www.nhsconfed.org/docs/quality_and_outcomes_framework_guidance.pdf (accessed 3 Oct 2005).
- 11 NHS Employers. Revisions to the GMS contract 2006/7. www.nhsemployers.org/primary/index.cfm (accessed 3 May 2006).
- 12 Rohlfing CL, Weidmeyer H-S, Little RR, England JD, Tennill A, Goldstein DE. Defining the relationship between plasma glucose and HbA_{1c}: analysis of glucose profiles and HbA_{1c} in the diabetes control and complications trial. *Diabetes Care* 2002;25:275-8.
- 13 Smellie WSA, Forth J, Bareford D, Twomey P, Galloway MJ, Logan ECM, et al. Best practice in primary care pathology: review 3. *J Clin Pathol* 2006;59:781-9.
- 14 UK Prospective Diabetes Study (UKPDS) Group. Intensive blood glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). *Lancet* 1998;352:837-53.
- 15 Kilpatrick E. HbA_{1c} measurement. *J Clin Pathol* 2004;57:344-5. (Accepted 9 August 2006)

doi 10.1136/bmj.38947.627847.AE

Interactive case report

Fever of unknown origin

This case was described on 2 and 9 September (*BMJ* 2006;333:484, 541). Debate on the patient's management continues on [bmj.com](http://bmj.bmjournals.com/cgi/eletters/333/7566/484) (<http://bmj.bmjournals.com/cgi/eletters/333/7566/484>). On 20 September we will publish the case outcome together with commentaries on the issues raised by the management and online discussion from relevant experts and the patient's parents.

doi 10.1136/bmj.38951.494028.68