Screening for diabetes

See also separate articles: Metabolic Syndrome, Managing Impaired Glucose Tolerance in Primary Care and Gestational Diabetes.

Our affluent and sedentary society has led to an increasing prevalence of obesity. This has caused an increase in the relative frequency of diabetes in the general population, particularly type 2 diabetes in older adults. There may also be an increasing incidence of type 1 diabetes, but this is uncertain and the cause(s) for such an increase are unclear. However, type 1 diabetes tends to present symptomatically in a relatively short space of time as insulin reserves are exhausted and significant hyperglycaemia develops; thus, it is of less concern in terms of a target for screening.

In contrast, type 2 diabetes can remain hidden and asymptomatic for long periods (many years), either as the pre-diabetic 'metabolic syndrome'/impaired glucose tolerance (IGT), or mild-to-moderate frank type 2 diabetes:

- Recent evidence shows that many people with type 2 diabetes have the condition for 9-12 years before diagnosis.[1]
- Given that chronic damage to many of the body's organ systems can occur during this time, and that many patients presenting with type 2 diabetes already have complications, or may present with life-threatening metabolic derangements such as hyperglycaemic, hyperosmolar, nonketotic coma (HONK), screening for type 2 diabetes should be an effective way to reduce the burden of this disease in the appropriately selected population.

Epidemiology and evidence base for diabetic screening

Screening of an older, predominantly white, socially representative cohort of patients enrolled in population-based heart disease studies has revealed a prevalence of frank undiagnosed type 2 diabetes in this group, of around 7%. Impaired glucose tolerance (IGT) had a prevalence of about 20%. [2] Thus, it appears there is a relatively urgent need to detect this at-risk group and diagnose and treat their condition before irreversible complications set in. There is, as yet, no definitive evidence that such a policy will lead to better outcomes in terms of mortality and morbidity, but intuitively it seems worthy of formal investigation.

There is good evidence that an appropriately designed and targeted screening strategy is effective at detecting undiagnosed type 2 diabetics in a UK-based primary care setting:

- The number of patients needing to be screened to detect one case of type 2 diabetes, or impaired fasting glucose, is relatively low at 7-13.[3] [4]
- Random population screening has been found to diagnose type 2 diabetes in 4.3%. [3] Research is needed to assess the real-world effectiveness of such screening strategies.
- Screening for diabetes appears to be cost-effective for the 40-70-year age group - increasingly more cost-effective for the older age bands. [5] Screening is more cost-effective for people in the hypertensive and obese subgroups and the costs of screening are offset in many groups by lower future treatment costs.

The cost-effectiveness of screening is also determined by assumptions about the degree of control of blood glucose that will be achieved and future treatment and cardiovascular disease (CVD) prevention protocols. The very low cost now of statins is also an important factor.

Who should be screened for type 2 diabetes?

There are no agreed hard-and-fast criteria for selection of the screening population. Screening on the basis of age alone has been shown to have a low yield. [6] [7] Most studies have used some or all of the following criteria:

- Age >45.
- Body mass index (BMI) >27-30.
- Membership of a high-risk ethnic group for type 2 diabetes, eg UK-based African-Caribbean or Asian-origin populations.[8]
- Family history of type 2 diabetes.[4]
- High waist circumference. [4]
- Sedentary lifestyle. [4]

Other criteria might include:
Those with CVD.
A history of gestational diabetes.
Obese women with polycystic ovary syndrome.
Previous evidence of impaired glucose tolerance.

The more complex and esoteric the criteria become, the more difficult it will be to find cases, so a balance needs to be struck between ease of information retrieval and more honed indicators of possible diabetes. Obviously, the two criteria that are most easily available to the majority of practitioners are age and BMI.[9] The effect of the new GP contract in encouraging practices to record BMI should increase the availability of this latter piece of information within the population at large.

What tests should be done and what do the results mean?

Currently, there are no definitely agreed protocols. Fasting venous plasma glucose measurements are usually used as the primary measure, although it may be sufficient, and certainly cheaper/quickier, to perform fasting capillary sampling, but there is no good evidence available on this yet. A large UK-based study used the following interpretations for their results:[4]

- Fasting plasma glucose >6 mmol/L, recall for further test.
- 2 results >7 mmol/L defined as having diabetes.
- Fasting plasma glucose of 6.1–6.9 defined as having impaired glucose tolerance (IGT) and should probably be screened again after a year or so.
- Fasting plasma glucose of <6.1mmol/L, unlikely to have impaired glucose metabolism; should be re-enlisted for further screening at a later date (probably in a further 3 years or so).
- Fasting or random plasma glucose on one reading of >11.1 mmol/L is diagnostic of diabetes.

Results of some studies have used oral glucose tolerance testing to identify those with diabetes formally. However, this test is relatively complex to interpret, and can be time-consuming for patients and healthcare teams alike. These factors mean it is less likely to find favour as a population-based measurement, where there are simple schemes that are able to use only a spot fasting plasma glucose. It may be used in cases where there is doubt about the diagnosis. Some studies have used scoring systems based on easy-to-measure criteria such as age, BMI, waist circumference, family history of diabetes and sedentary physical activity to assign scores and risk-stratify the population before testing.[9] The Cambridge risk scoring system has been found to be a useful tool in this regard.[10]

Such systems seem to be effective in terms of their positive and negative predictive values and sensitivity/specificity in detecting likely type 2 diabetics. However, testing of biochemical parameters will always be needed before one can label a patient as diabetic, and the interpretation of the meaning of the score results is difficult for practitioners without a solid grounding in epidemiology and the correct statistical analysis of predictive factors.

What should be done when type 2 diabetes or impaired glucose tolerance are detected?

Type 1 or type 2?

It should not be assumed that all those detected by screening have type 2 diabetes. There are many cases of people who develop type 1 diabetes in their 30s, 40s, or even even when older. In population screening, such patients will be detected occasionally and should not be lumped in with type 2 diabetics, just because they were detected by screening and not illness. Clinical factors such as the degree of hyperglycaemia, symptoms associated with both type 1 and type 2 diabetes, BMI, family history and other biochemical markers should be used to decide on the type 1/type 2 divide. Admittedly, the vast majority of patients detected by screening will have type 2 diabetes, but this is not a sine qua non. If unsure, refer the patient for specialist diabetic advice.

Impaired glucose tolerance detected by screening

Patients with impaired glucose tolerance (IGT) should have the nature of their condition explained to them and be made aware that if they do not alter their lifestyle they have a reasonable chance of progressing to type 2 diabetes. Diet modification, increased exercise and modification of risk factors for CVD are the mainstays of management of this condition. Lifestyle and pharmacological interventions reduce the rate of progression to type 2 diabetes in people with impaired glucose tolerance. Lifestyle interventions seem to be at least as effective as drug treatment.[11] See separate Managing Impaired Glucose Tolerance in Primary Care article. There has been some research on the use of acarbose to prevent the development of type 2 diabetes.[12]
Type 2 diabetes detected by screening

Patients with type 2 diabetes should be managed as for all patients with this condition. Community- and hospital outpatients-based follow-up, appropriate dietary and pharmacological treatment, along with cardiovascular risk factor assessment and modification, are the most important therapeutic avenues. See separate article Managing Diabetes in General Practice, and other type 2 diabetes-related articles.

Further reading & references

- Definition and Diagnosis of Diabetes Mellitus and Intermediate Hyperglycaemia, World Health Organization/International Diabetes Federation, 2006
- Olatunbosun ST et al, Glucose Intolerance, Medscape, Apr 2011
- Care recommendations - The provision of services in primary care, Diabetes UK

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