

Screening for type 2 diabetes mellitus to prevent vascular complications: updated recommendations from the Canadian Task Force on Preventive Health Care

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An abridged version of this article appeared in the Jan. 18, 2005, issue of *CMAJ* and is available online at www.cmaj.ca/cgi/content/full/172/2/177/DC1

Recommendations

- There is fair evidence to recommend screening adults with hypertension for type 2 diabetes mellitus to prevent cardiovascular events and death (grade B recommendation).
- There is fair evidence to recommend screening adults with hyperlipidemia for type 2 diabetes to prevent cardiovascular events and death (grade B recommendation).
- There is good evidence to recommend lifestyle interventions for overweight individuals (body mass index > 25 kg/m², or > 22 kg/m² if of Asian descent) with impaired glucose tolerance to reduce the incidence of progression to diabetes (grade B recommendation).
- There is fair evidence to recommend acarbose treatment for overweight individuals (as described above) with impaired glucose tolerance to prevent cardiovascular events and hypertension (grade B recommendation).
- There is insufficient evidence to recommend metformin or acarbose treatment for overweight individuals (as described above) with impaired glucose tolerance to prevent diabetes progression (grade I recommendation).

In developing these recommendations, the Canadian Task Force on Preventive Health Care drew heavily on a recent systematic review prepared for the US Preventive Services Task Force of the evidence for screening asymptomatic people for type 2 diabetes mellitus to prevent cardiovascular events.¹ That review was enhanced by the Canadian Task Force on Preventive Health Care in 2 ways: all new literature on screening was incorporated, and a separate systematic review of the evidence related to the prevention of diabetes in people with impaired glucose tolerance was undertaken.

Clinical considerations

In patients who do not meet

the above criteria, the decision to screen for diabetes or impaired glucose tolerance may be made on an individual basis. The decision to screen should hinge on an estimate of the patient's overall risk of cardiovascular disease (CVD). Patients whose overall risk would be raised by a diagnosis of diabetes to the extent that treatment would be changed (i.e., if the overall risk of CVD is raised to more than 10%) may merit screening. Patients with other known CVD risk factors (e.g., smoking or increased age) may also benefit from screening for diabetes.

Screening involves only patients who are asymptomatic. Those who exhibit symptoms or signs of diabetes, or those who have potential complications

associated with diabetes, should receive diagnostic testing.

Screening is best accomplished with a fasting plasma glucose test. Diabetes is diagnosed if the fasting plasma glucose level is 7.0 mmol/L or greater, or if the plasma glucose level is 11.1 mmol/L or greater in a 2-hour oral glucose tolerance test (OGTT).² Either test should be done on 2 occasions before a diagnosis can be made. Impaired fasting glucose is diagnosed if the fasting glucose level is 6.1–6.9 mmol/L, and impaired glucose tolerance is diagnosed if the plasma glucose level is 7.8–11.0 mmol/L in a 2-hour OGTT.

There is no information regarding the optimal screening frequency.

Recommendations of others

In its 2003 clinical practice guidelines the Canadian Diabetes Association recommends screening for diabetes with a fasting plasma glucose test every 3 years in people 40 years of age and older (grade: consensus).³ It recommends that screening be considered at an earlier age or be performed more frequently, or both, using a fasting glucose or 2-hour OGTT in people with additional risk factors for diabetes (grade: consensus).³

The American Diabetes Association recommends that patients, particularly those with a body mass index of 25 kg/m² or greater, be screened with a fasting glucose test every 3 years beginning at the age of 45 years.⁴ It, too, suggests that test-

ing be considered at an earlier age or be carried out more frequently in people who are overweight if additional diabetes risk factors are present.

The US Preventive Services

Task Force found the evidence insufficient to recommend for or against routine screening of asymptomatic adults for type 2 diabetes, impaired glucose tolerance or impaired fasting

glucose (grade I recommendation).⁵ It does, however, recommend screening for diabetes in adults with hypertension or hyperlipidemia (grade B recommendation).

Evidence and clinical summary

The screening test

Patients with asymptomatic diabetes in the preclinical phase can be reliably identified through screening. A fasting plasma glucose level of 7.0 mmol/L has moderate sensitivity (40%–87%) but good specificity (96%–99%) to predict a plasma glucose level of 11.1 mmol/L in a 2-hour OGTT.^{6–9} This level (7.0 mmol/L), like the level of 11.1 mmol/L in the 2-hour OGTT, has been shown to reflect a threshold separating patients who are at substantially increased risk of microvascular complications (e.g., retinopathy).^{2,10–12} Lowering the fasting plasma glucose threshold to 6.1 mmol/L improves the test's sensitivity (66%–95%), but at the cost of specificity (90%–96%).¹³ The OGTT, although considered the "gold standard," is more costly and time-consuming than the fasting plasma glucose test and is less reproducible.¹⁴

Benefits of screening

There is no direct evidence that screening for diabetes in the preclinical phase leads to benefit. Although there is good (level I) evidence that treatment with tight glycemic control in patients who have a clinical diagnosis of diabetes decreases the progression of microvascular complications after 10 years of treatment, benefits were seen only in intermediate outcomes (i.e., decreased progression of retinopathy and nephropathy), with a non-significant trend toward decreased rates of myocardial infarction.¹⁵ Health outcomes such as death, cardiovascular events, blindness, end-stage renal disease and amputations were not reduced.

Therefore, early detection of diabetes through screening 5–6 years before clinical symptoms emerge in order to treat with tight glycemic control may not have a substantial incremental benefit over clinical diagnosis. With screened patients, presumably the gain during the first 15 years would be similar to or even less than that seen in diagnosed patients, given that their level of hyperglycemia would be milder in most cases. One could expect that the benefit might be translated into improved health outcomes in trials of longer duration. Improved health outcomes might also be demonstrated if treatment were started sooner; however, there is no evidence indicating this currently.

There is good (level I) evidence that treatment of hypertension^{16–19} and hyperlipidemia^{20–30} in patients with diabetes decreases the incidence of cardiovascular events and cardiovascular-related death (macrovascular complications) within 5 years. Therefore, if one extrapolates this evidence to a screened population, early identification of diabetes in patients with hypertension or hyperlipidemia, and aggressive treatment, would have a substantial early benefit.

A targeted approach of screening only patients with

hypertension or hyperlipidemia provides more certain benefit. In addition, it subjects fewer people to potential harms than does screening a broader population, because the number needed to screen in order to prevent 1 cardiovascular event over 5 years in a population with hypertension or hyperlipidemia is substantially lower than the number in the general population.¹

Screening for impaired glucose tolerance

Although there are studies suggesting a benefit of treating people who have impaired glucose tolerance to reduce the incidence of progression of diabetes and possibly cardiovascular disease, the evidence is still inadequate to recommend screening for impaired fasting glucose or impaired glucose tolerance. However, people with the latter condition may nonetheless be identified in the course of their health care. These patients should be treated with lifestyle interventions aimed at lowering weight and increasing exercise, because such interventions may lower the incidence of diabetes (level I evidence).^{31–33} Acarbose treatment can also be considered for these patients, because it has been shown to reduce the incidence of cardiovascular outcomes and hypertension (level I evidence).³⁴ Although the use of metformin³³ and acarbose³⁵ in patients with impaired glucose tolerance has been shown to reduce the incidence of diabetes over 3 years, the rate of diabetes dropped when metformin was discontinued.³⁶ Of note, the prevention trials were all of 3 to 6 years' duration, and it is unclear whether the effects of lifestyle or pharmacologic intervention persist beyond that period. Furthermore, it is still uncertain whether diabetes can truly be prevented or whether these strategies simply delay its onset. The impact of delaying diabetes for a few years on preventing microvascular complications would likely be small, since the risk of complications is low in the first 15 years after diabetes diagnosis. The beneficial effects of lifestyle modification on cardiovascular events in people with impaired glucose tolerance also remain to be demonstrated. Finally, the cost-effectiveness of screening for impaired glucose tolerance and offering lifestyle interventions only to those with a positive test result and not to all people with diabetes risk factors has not been examined.

Potential harms of screening

There has been little direct assessment of the potential harmful effects of screening for diabetes, and no decrease in quality of life has been associated with screening.³⁷ The potential but unresearched harms of screening may include labelling, anxiety and altered self-perception, and loss of insurability. It has been estimated that in at least 30% of people who have positive impaired glucose tolerance or impaired fasting glucose test results, glucose levels revert to normal and diabetes never develops.^{38–44}

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Competing interests: None declared for Valerie Palda or Lorraine Lipscombe. Denice Feig has received research funding from Novo Nordisk and an unrestricted educational grant from Aventis Pharma.

Contributors: Denice Feig and Valerie Palda reviewed the systematic review prepared for the US Task Force on Preventive Health Care, updated the literature on screening and wrote the technical report on which this article is based. Lorraine Lipscombe conducted the systematic review of prevention of diabetes in individuals with impaired glucose tolerance and wrote sections of the technical report related to that topic. Denice Feig drafted the recommendation statement; Lorraine Lipscombe and Valerie Palda reviewed drafts and made subsequent revisions. The Canadian Task Force on Preventive Health Care critically reviewed the evidence and developed the recommendations according to its methodology and consensus development process.

Acknowledgements: We thank Dr. Russell Harris for his valuable input and Ruth Walton for her helpful assistance in preparing this manuscript.

The Canadian Task Force on Preventive Health Care is funded by Health Canada.

This statement is based on the technical report: "Screening for type 2 diabetes to prevent vascular complications: updated recommendations from the Canadian Task Force on Preventive Health Care," by Denice Feig, Valerie A. Palda and Lorraine Lipscombe, with the Canadian Task Force on Preventive Health Care. The full technical report is available from the task force at ctf@ctfphc.org.

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