Screening for diabetes mellitus in high-risk patients: cost, yield, and acceptability

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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The screening of high-risk patients, not diagnosed or recently tested for diabetes, for diabetes mellitus using a two-step, glucose-based screening protocol. The patients were initially screened with a random glucose test, then those with abnormal results received a follow-up fasting, 2-hour, 75-gram oral glucose tolerance test (GTT). The study aimed to examine the number of newly-identified diabetes cases in comparison with no explicit screening programme. The patients received an initial letter from a primary care physician at their clinic for a free diabetes screening test, which did not require an appointment or for them to fast beforehand. To maximise attendance, postcards were sent 1 week after the letter and non-attendees were sent a second letter 3 weeks later.

The results of the random plasma glucose test were evaluated using published Center for Disease Control and Prevention nomograms based on age and hours fasting before the test. To maximise the sensitivity for new patients, the cut-off points were set at the lowest values of the normal ranges. The patients with abnormal results were invited for a fasting, 2-hour, 75-gram oral GTT and were advised on proper preparation for the test. The analysis was performed from the perspective of a managed care organisation.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
The study population consisted of patients with established dyslipidaemia and hypertension, who had no history of diabetes and had not been screened for diabetes. The patients were enrolled with a managed care organisation.

The patients were assigned a diagnosis of dyslipidaemia if they had filled a prescription for a dyslipidaemia-specific drug. Alternatively, if they had a total cholesterol of 240 mg/dL or more, a high-density lipoprotein cholesterol of 35 or less, or a fasting low-density lipoprotein cholesterol of over 190 mg/dL.

The patients were assigned a diagnosis of hypertension if they had been given International Classification of Diseases, 9th revision, Clinical Modification (ICD-9-CM) codes 401, 401.1, 401.9 at two or more outpatient visits.

No history of diabetes was assigned if the patient had either not filled a prescription for a diabetes-specific drug, or had not been assigned two or more outpatient ICD-9-CM codes for diabetes mellitus (code 250.0).

No prior screening was defined as no evidence of a fasting plasma glucose test.

Setting
The setting was the community. The economic study was carried out in Minneapolis, USA.
**Dates to which data relate**
The effectiveness and resource use data refer to a period of time which commenced October 1995. The price year was 1995.

**Source of effectiveness data**
The effectiveness data were derived from a single study.

**Link between effectiveness and cost data**
The costing was conducted prospectively using the same patient sample as that used in the effectiveness analysis.

**Study sample**
No power calculations to determine the sample size were reported. The study population was selected with the aim of identifying high-risk individuals who had not been diagnosed with diabetes. The eligible adults were identified through automated clinical data, which were based on information obtained from October 1994 to September 1995. Out of the 38,989 patients enrolled in the study clinics, 1,548 patients were considered at high risk of diabetes. Of these, 386 had a history of diabetes, 640 were screened for diabetes in the previous year and 53 were unavailable (death, disenrolment). A total of 469 high-risk patients, who were eligible for screening, were identified and invited to participate. The baseline characteristics of the participants were not presented. The study sample was identified from 3 of the 19 clinics in the HealthPartners Medical Group.

**Study design**
This was a screening test evaluation. The implicit assumption was that not screening the same sample of individuals would result in the detection of no cases of diabetes. Of the 469 patients invited for screening, 269 (56%) did not attend, while 30 of the 103 patients with an abnormal random glucose screening test did not complete the test. Thirty-eight per cent of the targeted patients completed the screening protocol. The length of follow-up was until the diabetes test had been completed and the newly-identified diabetes patients had been scheduled a physician visit to start treatment for diabetes.

**Analysis of effectiveness**
The analysis of the clinical study was conducted on an intention to treat basis. The primary health outcome was the number of newly-diagnosed diabetes cases.

**Effectiveness results**
Five new cases of diabetes mellitus were identified among the 469 targeted high-risk adults using defined World Health Organisation criteria. Only 3 of these met the more stringent National Diabetes Data Group criteria, with glycosylated haemoglobin A (HbA1c) test values of 6.7, 6.9 and 7.2%. One of these patients was diagnosed during the random glucose test and the other 4 during the GTT test. Six written or telephone call complaints were received after the second mailing to non-respondents.

**Clinical conclusions**
The yield and acceptability of systematic diabetes screening were low in the high-risk managed care population.

**Measure of benefits used in the economic analysis**
The measure of benefit was the new cases of diabetes diagnosed.

**Direct costs**
The costs were analysed from the perspective of the managed care organisation. The costs incurred by the provider were included, and were for the plasma glucose tests, oral GTT, programming to identify high-risk individuals, mailing and coordinator to track responses to mailings, and screening results. Estimates were made on the basis of the actual number of tests provided. The unit costs and the resource quantities were given. No discounting was necessary as the quantities and costs were analysed for less than one year.

**Statistical analysis of costs**
The costs were not treated in a stochastic way.

**Indirect Costs**
No indirect costs were analysed.

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analyses were performed.

**Estimated benefits used in the economic analysis**
Five new diabetes cases were identified through the diabetes-screening programme.

**Cost results**
The total cost of the screening programme was $20,320.

**Synthesis of costs and benefits**
The incremental cost per new diabetes case diagnosed was $4,064.

**Authors' conclusions**
The diabetes-screening programme identified five new cases of diabetes at an incremental cost of $4,064 per diabetes case detected. "In this high-risk managed care population, the yield and acceptability of systematic diabetes screening were low, and the costs were relatively high."

**CRD COMMENTARY - Selection of comparators**
The implicit assumption was that no screening would detect no cases. In other words, there was no alternative technology, however disparate or disorganised, by which cases could be detected.

**Validity of estimate of measure of effectiveness**
The analysis was based on screening the whole study sample identified. This design was appropriate for answering the question on the additional diabetes cases that can be identified by a screening programme, with the implicit assumption regarding no detection of cases. It is possible that patients might be detected by symptomatic presentation or testing on an ad hoc basis. The study design (i.e. the lack of a control group) prevented the timing of the diabetes diagnosis from being explored in the usual care situation. The study also did not explore the impact of a diabetes diagnosis on the further health prospects of the patients.
Validity of estimate of measure of benefit
The estimation of the benefit was obtained directly from the effectiveness analysis. This choice of estimate was justified by the study objective. However, the authors acknowledged that it revealed little in terms of the benefits of screening.

Validity of estimate of costs
All of the relevant costs, which were incurred from the perspective of the managed care organisation, were accounted for. The costs and the quantities were reported separately, thus enhancing transparency and generalisability. However, the unit costs were derived from the costs in the authors' setting. Also, no sensitivity analyses were performed for the unit costs and resources used. The costs of care for delayed or non-diagnosed cases avoided were not included.

Other issues
The authors compared their results with those from similar studies. The authors presented their results in full and their conclusions reflected the scope of the analysis. The issue of generalisability to other settings was partially addressed. The authors reported a number of limitations to their study. First, the relatively high baseline surveillance of the high-risk patients at the study clinics. Second, that only approximately 10% of the patients were non-white.

Implications of the study
The authors suggest that screening high-risk patients for diabetes at the time of routinely scheduled office visits could be more convenient for patients and achieve a higher rate of screening. In addition, the acceptability of office-based diabetes screening may be improved by using a one-step screening test (HbA1c test).

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Other publications of related interest


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