Assessing the cost-effectiveness of drug and lifestyle intervention following opportunistic screening for pre-diabetes in primary care

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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.

CRD summary
This study examined the cost-effectiveness of a screening programme for pre-diabetes in high-risk individuals, followed by medication (acarbose, metformin, or orlistat) or lifestyle interventions (diet and exercise). The authors concluded that screening for pre-diabetes followed by diet and exercise, or metformin was cost-effective and an increase in the number of dieticians and exercise physiologists was needed. The study was well conducted and the issue of uncertainty was satisfactorily investigated, which makes the authors’ conclusions robust.

Type of economic evaluation
Cost-utility analysis

Study objective
This study examined the cost-effectiveness of a screening programme, for pre-diabetes in high-risk individuals, followed by medication (acarbose, metformin, or orlistat) or lifestyle interventions (diet, exercise, or both). High-risk individuals were defined as those older than 45 years and with risk factors for diabetes.

Interventions
The screening programme was opportunistic and included the following patients: those over 55 years or over 45 years and with a high body mass index; those with a family history of type 2 diabetes or hypertension; and those at high-risk, such as indigenous Australians or women with gestational diabetes.

The treatments were diet, exercise, both diet and exercise, acarbose, metformin, orlistat, and a combination of metformin with diet and exercise. These strategies were compared with one of neither screening nor treatment.

Location/setting
Australia/primary care.

Methods
Analytical approach:
The analysis was based on a discrete-time micro-simulation model that assessed the clinical and economic impact of preventing diabetes, by identifying and treating pre-diabetes. Pre-diabetes was defined as having impaired fasting glucose or impaired glucose tolerance that had not developed into diabetes. The time horizon was lifetime and the authors stated that the perspective was that of the health care system, which was mainly funded by the Australian government, as a third-party payer. This included those costs borne by patients.

Effectiveness data:
The clinical data came from a variety of selected sources. Most of the epidemiological data were from the Burden of Disease and Injury in Australia study (Begg, et al. 2008, see ‘Other Publications of Related Interest’ below for bibliographic details) and the remainder were from country-specific databases and studies. The treatment efficacy inputs (reductions in the relative risk of diabetes) were the key model inputs and they were from a published systematic review and meta-analysis of clinical trials. An important assumption was that diet and exercise became less effective over time at a rate of 10% per year, with no effect after 10 years, while the pharmaceutical interventions maintained their efficacy, as long as patients adhered to treatment.
Monetary benefit and utility valuations:
The utility valuations were from the Burden of Disease and Injury in Australia study. The number of diabetes cases avoided was also reported.

Measure of benefit:
Disability-adjusted life-years (DALYs) were the summary benefit measure and they were discounted at an annual rate of 3%.

Cost data:
The analysis included the disease treatment costs and the costs of the interventions, such as health professional visits, medications, monitoring, and exercise physiologists. Patient costs were contributions to medications, their time, and travel expenses and official country-specific estimates were used. Treatment costs were from the Australian Institute of Health and Welfare, Disease Costs and Impact Study. Intervention costs were estimated using the Australian Medical Benefits Schedule and the Pharmaceutical Benefits Schedule. All costs were in Australian dollars (AUD) and the price year was 2003. They were discounted at annual rate of 3%.

Analysis of uncertainty:
The issue of uncertainty was assessed in a second-order simulation. A sensitivity analysis was carried out, using data from a published study, to examine the effect of adding a second oral glucose tolerance test to the opportunistic screening programme.

Results
In a cohort of 100,000 identified cases of pre-diabetes, the expected DALYs averted were 4,730 with diet and exercise, 4,000 with exercise, 2,290 with diet, 5,700 with acarbose, 4,290 with metformin, and 6,880 with orlistat. The government costs per patient were AUD 126 with diet and exercise, AUD 121 with exercise, AUD 102 with diet, AUD 248 with acarbose, AUD 58 with metformin, and AUD 1,290 with orlistat. The patient costs were AUD 265 with diet and exercise, AUD 164 with exercise, AUD 118 with diet, AUD 291 with acarbose, AUD 200 with metformin, and AUD 320 with orlistat.

The median cost-effectiveness ratios, compared with no screening, were AUD 23,000 with diet and exercise, AUD 30,000 with exercise, AUD 38,000 with diet, AUD 37,000 with acarbose, AUD 22,000 with metformin, and AUD 100,000 with orlistat. The probability that the cost per DALY averted was below the threshold of AUD 50,000 per DALY averted was 100% with diet and exercise, 86% with exercise, 75% with diet, 76% with acarbose, 100% with metformin, and 0% with orlistat.

The addition of metformin to diet and exercise produced a median cost-effectiveness ratio of AUD 81,000. The most influential model input was the efficacy of the interventions. The addition of a second oral glucose tolerance test did not substantially change the cost-effectiveness ratios.

Authors' conclusions
The authors concluded that screening for pre-diabetes followed by therapy with diet and exercise, or metformin was cost-effective and an increase in the number of dieticians and exercise physiologists was needed to deliver the lifestyle-change therapy.

CRD commentary
Interventions:
The selection of the comparators was appropriate and the scenario of neither screening nor treatment was the usual care in the authors' setting.

Effectiveness/benefits:
The clinical data were chosen by the authors and the methods and conduct of a literature review were not reported. The designs and key characteristics of these data sources were given. In general, the data were from well-conducted studies or from relevant databases. Most of the epidemiological data were country-specific and relevant to the setting. The treatment efficacy data were from meta-analyses of clinical trials and this should ensure their validity. Some
adjustments in adherence to screening were made to represent clinical practice. Few details on the derivation of the disability values were given. DALYs are an appropriate benefit measure and they capture the impact of the interventions on quality and length of life.

Costs:
The viewpoint was explicitly stated and those costs borne by patients were taken into account. It appears that no relevant category was excluded. A list of the cost items, their unit costs, and the quantities of resources used were not reported. The costs were varied in the sensitivity analysis and appropriate distributions were used. The price year and the use of discounting were reported.

Analysis and results:
The analytic approach used to synthesise the costs and benefits was appropriate. Cost-effectiveness ratios, compared with neither screening nor treatment, were calculated. An incremental analysis among alternatives was not conducted, but would have been useful. An extensive description of the model and the transition patterns across health conditions was given. The issue of uncertainty was satisfactorily investigated, in a probabilistic analysis. The authors acknowledged some limitations of their study, but correcting these would have favoured the interventions rather than limited them.

Concluding remarks:
The study was well conducted and the issue of uncertainty was satisfactorily investigated, which makes the authors’ conclusions robust.

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