Should all Pima Indians with type 2 diabetes mellitus be prescribed routine angiotensin-converting enzyme inhibition therapy to prevent renal failure?

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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 use of routine angiotensin-converting enzyme (ACE) inhibitors to prevent renal failure.

Type of intervention
Secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised all Pima Indians with type 2 diabetes mellitus. Male patients aged 35 years at diagnosis were used for the baseline cohort. The analysis also considered female patients and older patients (men aged over 55 years, women aged over 60 years).

Setting
Hospital. The study was carried out in Nova Scotia, Canada.

Dates to which data relate
Effectiveness data were derived from studies published between 1988 and 1996. Cost data were derived from 1997 sources. The price year was 1995.

Source of effectiveness data
Effectiveness data were derived from a literature review.

Modelling
A decision analytic model was used to determine the cost-effectiveness of the two screening strategies in the prevention of renal failure in all Pima Indians.

Outcomes assessed in the review
The review assessed the probabilities for patient survival and transition to the development of microalbuminuria, proteinuria, and ESRD.

Study designs and other criteria for inclusion in the review
Not stated.
Sources searched to identify primary studies
Not stated.

Criteria used to ensure the validity of primary studies
Not stated.

Methods used to judge relevance and validity, and for extracting data
Summary statistics from each study were collected.

Number of primary studies included
At least 5 studies were included in the review.

Methods of combining primary studies
Narrative method.

Investigation of differences between primary studies
Not stated.

Results of the review
The model assumed that ACE inhibitors can block, at least in part, the pathogenic mechanisms responsible for early diabetic nephropathy (microalbuminuria). The annual mortality rate in the type 2 diabetes mellitus cohort from normoalbuminuria was the same as that of the non-diabetic population. The annual mortality rate in the type 2 diabetes mellitus cohort from microalbuminuria was 1.3 (range: 1 - 3) times the normoalbuminuric rate. The annual mortality rate in the type 2 diabetes mellitus cohort from proteinuria was 2.4 (range: 2 - 6) times the normoalbuminuric rate. The annual mortality rate in the type 2 diabetes mellitus cohort from ESRD was 0.25 (range: 0.2 - 0.3). The transition rate (without ACE inhibitor therapy) from microproteinuria to proteinuria was 0.125 (range: 0.05 - 0.2) per year. The model assumed that preventing microalbuminuria also prevented the higher death rate associated with this state. It was further assumed that ACE inhibitors were well tolerated and not associated with marked adverse effects.

Measure of benefits used in the economic analysis
Expected patient survival was used as the measure of benefit. An annual discount rate of 3% was used.

Direct costs
Direct costs were discounted at an annual rate of 3%. Quantities and costs were reported separately. Direct costs included the cost of microalbuminuria screening, ACE inhibitor treatment and ESRD treatment. The quantity/cost boundary adopted was that of the health service. The estimation of quantities and costs was based on actual data. Cost data were taken from the literature. The price year was 1995.

Statistical analysis of costs
Not reported.

Indirect Costs
Not included.
Currency
US dollars ($)

Sensitivity analysis
Both one-way and multi-way sensitivity analyses were performed on all probabilities, costs and treatment efficacy rates.

Estimated benefits used in the economic analysis
The life expectancy for a 35-year-old non-diabetic Pima native man was 29.9 years and 23 years for a historical type 2 diabetic treated patient of similar description.

Cost results
Cost results were not presented separately.

Synthesis of costs and benefits
Assuming ACE inhibitor therapy reduced the transition rate from microalbuminuria to proteinuria by 50%, routine ACE inhibitor therapy had a cost per life year gained over microalbuminuria screening of $15,000, if ACE inhibitor therapy also reduced the transition from normoalbuminuria to microalbuminuria by only 9%. For younger patients and female patients, only a 17% reduction in microalbuminuria with routine ACE inhibition was needed to make routine ACE inhibitor therapy superior (lower cost) for patients with a longer historical life expectancy of 28 years with type 2 diabetes mellitus. Routine ACE inhibitor therapy was unlikely to be cost-saving for men older than 55 years or for women older than 60 years. The results were sensitive to annual ACE inhibitor costs and annual costs of ESRD.

Authors' conclusions
Routine ACE inhibitor therapy in Pima Indians with type 2 diabetes mellitus could prove more effective (and even cost saving) than the currently recommended approach of microalbuminuria screening.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator was clear. You, as a user of this database, should verify whether these health technologies are relevant to your setting.

Validity of estimate of measure of benefit
A relevant measure of benefit was used, although the authors did not consider quality of life. The effectiveness data have been derived from, what seems to have been, a non-systematic review of the literature. The internal validity of effectiveness estimates cannot, therefore, be fully assessed given the limited information provided about the literature review and the quality assessment of the primary studies. The authors noted the lack of data on the efficacy of ACE inhibitor therapy in Pima Indians. The model did not evaluate the potential impact on cardiovascular disease, retinopathy, neuropathy or other adverse effects. If these factors had been fully taken into account in the analysis the results may have been affected.

Validity of estimate of costs
Only direct costs were included. Indirect costs, such as those related to productivity lost or gained, were not considered. It was assumed that there was no difference in terms of annual ESRD costs between the general US population and the native American population. The model was sensitive to annual drug costs. Newer agents are generally cheaper and longer-acting agents may improve compliance. This may substantially affect cost-effectiveness.

Other issues
The authors did not consider other agents, such as anti-oxidants, other anti-hypertensive agents, or lipid-lowering agents which may be relevant in other settings. Adequate comparisons with other relevant studies were not made. The generalisability of the results to other settings was discussed and sensitivity analysis was performed, which partly addresses this issue. The authors do not appear to have presented their results selectively. The study encompassed Pima Indians with type 2 diabetes mellitus and this was reflected in the authors’ conclusions.

**Implications of the study**
A prospective trial examining these two screening strategies should be considered.

**Source of funding**
None stated.

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**Other publications of related interest**


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