Cost-benefit analysis of a new alcohol biomarker, Carbohydrate Deficient Transferrin, in a chronic illness primary care sample

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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 study examined a screening test for high-risk drinking that utilises the alcohol biomarker Carbohydrate Deficient Transferrin (CDT).

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients in primary care who were being treated for chronic conditions such as diabetes or hypertension.

Setting
The setting was primary care. The economic study was carried out in Wisconsin, USA.

Dates to which data relate

Source of effectiveness data
The effectiveness data were derived from a review of published studies.

Modelling
A decision tree model was used to compare the expected costs, outcomes and economic benefits of a CDT test with patient self-report to patient self-report alone. The model was used to combine data from multiple sources. Patients who were identified as heavy drinkers, either through testing positive for elevated levels of CDT or by self-report, were provided with a brief follow-up intervention. Patients who tested negative were given no further intervention. The model measured the cost outcomes in terms of medical events, motor vehicle crashes and legal costs arising from heavy drinking. The baseline characteristics of the hypothetical cohort modelled were not reported.

Outcomes assessed in the review
The outcomes assessed were:

the sensitivity and specificity of screening for heavy alcohol use using CDT testing or patient self-report,
the prevalence of heavy drinking, and
the outcome costs with or without the brief intervention.

**Study designs and other criteria for inclusion in the review**
The authors did not report the methods used for the review of published literature. The study types used to inform the sensitivity and specificity of CDT testing and patient self-report were unclear, but might have been observational. The prevalence of heavy drinking was derived from national survey data. The cost data were derived from a randomised trial.

**Sources searched to identify primary studies**
Not reported.

**Criteria used to ensure the validity of primary studies**
Not reported.

**Methods used to judge relevance and validity, and for extracting data**
Not reported.

**Number of primary studies included**
The review included approximately 7 primary studies.

**Methods of combining primary studies**
The point estimate for each model parameter was informed by a single study. For some parameters, the maximum and minimum values from a number of available studies were used to define the range around that model parameter.

**Investigation of differences between primary studies**
Not reported.

**Results of the review**
The prevalence of heavy alcohol use was 7% (Range: 2.5 to 20.0).

The sensitivity of patient self-report was 40% (Range: 30 to 50) and the specificity was 95% (Range: 90 to 100).

The sensitivity of CDT testing was 60% (Range: 45 to 75) and the specificity was 90% (Range: 85 to 95).

**Measure of benefits used in the economic analysis**
The only measure of clinical benefit used in this study was the number of cases of heavy drinking identified.

**Direct costs**
The resource use quantities were not reported separately from the costs. The costs used in the model are described in more detail in another publication (Fleming et al. 2002, see Other Publications of Related Interest- below for bibliographic details). The study included direct costs to the health service and patients. Direct costs to other agencies might have been included in the estimates of legal costs and motor vehicle crashes. The cost data were measured over a follow-up of 48 months, and were not extrapolated in the decision tree. Since the costs were incurred during more
than 1 year, a discount rate of 3% per annum was used. The source of the unit cost data was not reported in this publication. The study reported the average costs. All costs were converted to the price year 2005, but the method used was not reported.

**Statistical analysis of costs**
Since patient-level data were not incorporated in the model, a statistical analysis was not relevant.

**Indirect Costs**
The study included the opportunity cost of patient time used in travelling to and attending clinic visits. No rationale was provided for the inclusion of patient opportunity costs, and the method used to value patient time was not reported in this publication. A discount rate of 3% per annum was used and the costs were converted to the price year 2005.

**Currency**
US dollars ($).

**Sensitivity analysis**
One-way sensitivity analyses and a full probabilistic sensitivity analysis were employed to investigate uncertainty in the data. The source of many of the ranges used was not clear. The distributions assigned to model parameters were not reported.

**Estimated benefits used in the economic analysis**
The CDT and interview strategy identified 53 cases of heavy drinking.

The interview alone strategy identified 28 cases of heavy drinking.

**Cost results**
The total cost of screening with and without CDT testing was not reported. Cost-savings per patient were reported. These took the difference in upfront treatment costs and downstream treatment costs into consideration.

Screening with CDT testing was estimated to result in a net benefit of $212.30 per patient screened compared with patient self-report alone.

The one-way sensitivity analysis revealed that the result was sensitive to the lower bound of the legal cost estimate.

The probabilistic sensitivity analysis produced an average net benefit of $353 (Range: -450 to 1,619). The net benefit of CDT testing was estimated to be positive in 82.5% of iterations.

A discount rate of 3% per annum was used for all calculations.

**Synthesis of costs and benefits**
The costs and benefits were not combined.

**Authors’ conclusions**
The use of the Carbohydrate Deficient Transferrin (CDT) test to screen for heavy drinking results in cost-savings in comparison with patient self-report alone.
CRD COMMENTARY - Selection of comparators
The authors compared CDT testing to the current practice of patient interview in the study setting. You must decide whether this is a relevant technology in your own setting. CDT is only one of several biomarkers available, thus this study might not have compared all relevant alternatives.

Validity of estimate of measure of effectiveness
The effectiveness data were based on a review of published literature. The authors did not describe the methods used to identify the primary studies, so the model might have been informed by the selective use of available data. The authors did not report any synthesis of data from the primary studies. Where multiple estimates were available for a model parameter, they appear to have been used to inform the range or uncertainty around that parameter for the sensitivity analyses. This is not an appropriate method for reflecting true parameter uncertainty. The effectiveness data for the CDT test and patient self-report were derived from published studies, but the characteristics of the patients included in these studies was not reported. This may limit the generalisability of the study results. The authors did not explore any differences between the primary studies. In addition, they stated that CDT testing was less effective in women and episodic heavy drinkers, but they did not perform any sub-group analyses.

Validity of estimate of measure of benefit
The estimation of monetary benefits was modelled using a decision tree. The authors acknowledged that a limitation of their model was the lack of data for calculating outcomes in terms of quality-adjusted life-years.

Validity of estimate of costs
The authors did not specify the perspective of the study, but it appears to have been societal. Further information pertaining to the resource use and cost data included in the economic model is provided in another article (Fleming et al. 2002). The price year was 2005 although the method used to inflate the cost data was not reported. Discounting was conducted appropriately at a rate of 3% per annum, which is the recommended discount rate for US studies. Uncertainty in the cost data was explored in a sensitivity analysis, but the authors did not report the distributions assigned to cost parameters and it is not possible to determine whether these were appropriate.

Other issues
The authors made appropriate comparisons of their findings with those from other studies. The issue of generalisability to other settings was not addressed. The results of this study are unlikely to be generalisable outside the USA. The authors did not present their results in much detail, reporting only net benefits. The authors acknowledged that many of the model variables would vary between settings as they depended on the skill of clinicians and the composition of the patient population.

Implications of the study
The authors recommended that additional studies should be conducted in larger, general clinic samples to replicate their findings.

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Bibliographic details

PubMedID
Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Alcohol Drinking /blood /psychology; Alcoholism /blood /diagnosis; Biomarkers /analysis /blood; Chronic Disease; Cost Savings /statistics & numerical data; Cost of Illness; Cost-Benefit Analysis; Decision Trees; Diabetes Mellitus /blood; Female; Health Care Costs; Health Status; Humans; Hypertension /blood; Male; Mass Screening /economics /instrumentation /statistics & numerical data; Monte Carlo Method; Primary Health Care /economics; Sensitivity and Specificity; Transferrin /analogs & derivatives /analysis

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