A cost-effectiveness analysis of amniocentesis and chorionic villus sampling for prenatal genetic testing

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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
Amniocentesis and chorionic villus sampling for prenatal genetic testing.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
Hypothetical cohort of pregnant women aged 30 to 43 years.

Setting
The effectiveness analysis was performed in a hospital setting. The economic study was carried out in the USA.

Dates to which data relate
Effectiveness data were extracted from a number of studies published in different years. Resources were estimated using data for 1991-1992. 1992 prices were used.

Source of effectiveness data
Review of previously completed studies.

Modelling
Expected benefits and costs were derived using a decision tree model.

Outcomes assessed in the review
The review summarised probability estimates for each test, including the probability of: spontaneous abortion, false-negative and false positive; morbidity in first and second-trimester therapeutic abortion.

Study designs and other criteria for inclusion in the review
Not specified.

Sources searched to identify primary studies

NHS Economic Evaluation Database (NHS EED)
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Criteria used to ensure the validity of primary studies
Not stated.

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

Number of primary studies included
Not stated.

Methods of combining primary studies
Probabilities were pooled from the data where appropriate, but no indication was given of the exact pooling method.

Investigation of differences between primary studies
Not stated.

Results of the review
In a pregnant woman who would be 35 years of age at the expected date of delivery, probability for spontaneous abortion with amniocentesis was 2.8%, 3.3% for chorionic villus sampling and 2.5% with no prenatal testing. The probability of false-negative for both amniocentesis and chorionic villus sampling was 0.4%. The false-positive for amniocentesis was 0.07% and 0.1% for chorionic villus sampling. Morbidity after first-trimester therapeutic abortion was 0.6% and 1.4% after second trimester therapeutic abortion.

Measure of benefits used in the economic analysis
In the cost-effectiveness analysis, benefits were measured as abnormal birth averted and quality-adjusted outcome. Utility estimates were derived from standard reference gambles of patients receiving genetic counselling prior to amniocentesis, and from linear preference ratings of surrogate decision makers given written vignettes describing prenatal testing outcomes. Additional “intangible” benefits were included in the quality adjusted outcome arising from the earlier chorionic villus sampling in the 13th gestation week as opposed to amniocentesis in the 20th week.

Direct costs
Costs and quantities were analyzed separately. Only costs to the third party payer were included. Quantities were derived from modelling the data using decision analysis. Direct medical costs were considered including the costs of prenatal care, amniocentesis, chorionic villus sampling, spontaneous abortion, therapeutic abortion, and delivery. Hospital costs were based on hospital charge data of the University of Chicago Hospitals for 1992, and deflated by 24.3% to reflect operating costs.

Currency
US dollars ($).

Sensitivity analysis
The authors considered one way simple sensitivity analyses on: baseline costs; probability estimates; the anxiety unit on the utility; maternal age.
Estimated benefits used in the economic analysis
For a cohort of 100,000 pregnant women (1988 US natality cohort) 35 years of age at the expected date of delivery and without considering intangible benefits, amniocentesis and chorionic villus sampling each resulted in 485 abnormal births averted compared with no prenatal testing. Incremental quality-adjusted outcomes relative to no prenatal testing were 192 for amniocentesis and 70 for chorionic villus sampling.

Cost results
For each 35 year old pregnant woman the incremental cost per pregnancy, relative to no prenatal testing, was $889 for amniocentesis and $967 for chorionic villus sampling.

Synthesis of costs and benefits
Relative to no prenatal testing and without intangible benefits, for 100,000 pregnant women 35 years old, the incremental cost per abnormal birth averted was $183,299 for amniocentesis and $199,381 for chorionic villus sampling. The incremental cost per quality-adjusted outcome was $464,221 for amniocentesis and $1,407,563 for chorionic villus sampling. The authors considered how this is affected by maternal age: between 30-43 years the cost-effectiveness ratio is higher for chorionic villus sampling than for amniocentesis, but falls lower than amniocentesis for the ages 44-45. When intangible benefits are included, for all levels of maternal anxiety reduction greater than or equal to 0.2% risk of an abnormal child at birth, chorionic villus sampling has a lower cost-effectiveness ratio than amniocentesis at all age levels from 30-45.

Authors’ conclusions
Without intangible benefits, at all maternal ages from 30-43 years, amniocentesis was more cost-effective than chorionic villus sampling; at ages 44-45, chorionic villus sampling was more cost-effective. However, if the anxiety reduction provided by first-trimester diagnosis was equivalent to 0.2% risk of an abnormal child, chorionic villus sampling was more cost-effective than amniocentesis at all maternal ages.

CRD Commentary
A well conducted and clearly documented study. However, more details about the literature review would have been useful.

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