Cost-effectiveness of prenatal screening for postpartum thyroiditis

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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
Screening pregnant women for the thyroid peroxidase (TPO) antibody. This was compared with the current strategy of no screening, or an alternative strategy of a thyroid-stimulating hormone (TSH) test 6 weeks’ postpartum.

Type of intervention
Screening.

Economic study type
Cost-utility analysis.

Study population
The study population comprised hypothetical cohorts of 1,000 pregnant women with uncomplicated pregnancies and 1,000 pregnant women with insulin-dependent diabetes mellitus (IDDM). No inclusion or exclusion criteria were reported.

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

Dates to which data relate
The effectiveness and resource use data were taken from studies published between 1981 and 1998. The cost data were taken from studies published between 1992 and 1999. The price year was 1999.

Source of effectiveness data
The effectiveness estimates were derived from a review or synthesis of completed studies and from the authors' estimates or assumptions.

Modelling
A one-year decision analytic model was used to determine the cost-effectiveness of the three screening strategies for postpartum thyroiditis (PPT).

Outcomes assessed in the review
The review assessed the incidence of PPT, the sensitivity and specificity of the screening tests, the probabilities of symptoms, Graves’ disease and (in)correct diagnosis, and utility values.

Study designs and other criteria for inclusion in the review
The effectiveness estimates were derived from the published literature where possible. A wide range of probabilities was tested for those parameters where the data were unavailable.

**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**
Not stated.

**Number of primary studies included**
At least 17 primary studies were included in the review.

**Methods of combining primary studies**
To determine the probability of having symptomatic PPT, studies that included a questionnaire for symptoms were combined in a population-weighted average. Narrative methods were used to combine the other effectiveness estimates.

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

**Results of the review**
The results in the base-case were as follows.

The prevalence of PPT was 5% (range: 2 - 17).

The sensitivity of the TPO antibody for PPT was 67% (range: 18 - 96) and the specificity was 97% (range: 79 - 99).

The sensitivity of the TSH test for PPT at 6 weeks' postpartum was 53% (range: 49 - 100) and the specificity was 100% (range: 90 - 100).

The probability of having symptomatic PPT was 68% (range: 33 - 88).

The probability of a misdiagnosis of depression while suffering from PPT was 33% (range: 25 - 45).

The utility of undiagnosed PPT was 0.74.

The utility of treated PPT was 0.85.

Treatment of PPT that had been diagnosed incorrectly as depression had a utility of 0.74.

The utility of Graves' disease was 0.93.

**Methods used to derive estimates of effectiveness**
In the absence of published evidence, the authors estimated several parameters.
Estimates of effectiveness and key assumptions
The probability of an incorrect diagnosis of depression given a positive TPO or abnormal TSH test was 0%.

The sensitivity of TSH for the TPO screening strategy was 100% (range: 49 - 100) and the specificity was 100% (range: 90 - 100).

The probability of diagnosing PPT given no test or a negative TPO result was 25%.

The utility of no disease and asymptomatic PPT was 1 (range: 0.95 - 1.0).

Measure of benefits used in the economic analysis
The outcome measures used in the economic analysis were quality-adjusted life-years (QALYs) and the cases of PPT detected. The utility values were taken from published studies.

Direct costs
The direct costs were not discounted due to the short time horizon (one year) of the study. The quantities and the unit costs were reported separately. The direct costs were for the screening tests and for pregnancy and postpartum care. The quantity/cost boundary adopted was that of the hospital. The cost estimates were taken from published studies. All of the costs were adjusted to 1999 dollars.

Indirect Costs
The indirect costs were not included.

Currency
US dollars ($).

Sensitivity analysis
One-way sensitivity analyses were carried out on all model parameters using the ranges of probabilities and the ranges of costs of each test. Two-way analyses were conducted on the following:

TSH and TPO antibody tests versus incidence of disease;

the sensitivity of the TPO antibody test versus the incidence of disease; and

the probability of an incorrect diagnosis versus the probability of being diagnosed without screening.

Estimated benefits used in the economic analysis
For a cohort of 1,000 non-diabetics, the number of QALYs gained was 994 for no test, 995.2 for a TSH test at 6 weeks' postpartum, and 995.5 for TPO antibody testing during the first trimester. In addition, 950 would have no thyroid disease and none would have Graves' disease, regardless of strategy. TPO antibody testing during the first trimester correctly diagnosed 25 women, compared with 21 for the TSH test at 6 weeks' postpartum and 6 without screening.

The number of QALYs gained for women with IDDM was 814.8 for no test, 820.1 for a TSH test at 6 weeks' postpartum, and 821.4 for TPO antibody testing during the first trimester. In addition, 750 would have no thyroid disease and none would have Graves' disease, regardless of strategy. The TPO test strategy correctly diagnosed 123 women, versus 28 without screening and 103 for the TSH strategy.

Cost results
The total costs were $18,000 for no test, $75,000 for TSH testing at 6 weeks' postpartum, and $93,000 for TPO.
antibody testing during the first trimester. The total costs for pregnant diabetics were $89,000 for no test, $156,000 for TSH testing at 6 weeks' postpartum, and $200,000 for TPO antibody testing during the first trimester.

**Synthesis of costs and benefits**
The incremental cost-effectiveness of TSH testing at 6 weeks' postpartum over no screening was $48,000 per QALY gained. The incremental cost-effectiveness of TPO antibody testing during the first trimester over TSH testing at 6 weeks' postpartum was $60,000 per QALY gained. For pregnant diabetics, the TSH strategy was more cost-effective at $13,000 per QALY gained than the TPO antibody strategy at $32,000 per QALY gained.

The one-way sensitivity analysis revealed that the cost-effectiveness ratio was generally higher for the TPO strategy than for the TSH strategy for all values in the ranges used. The exceptions were for TPO accuracy, TSH accuracy, the unit cost of TPO and TSH, and the costs of screening abnormal TSH women and TPO-positive women.

The two-way analyses revealed that the TPO strategy would be preferred if the two tests cost $85 each, but only if the incidence was less than 11%. If the tests cost $25 each, the TSH strategy would be preferred. A threshold of $100,000 per QALY would be exceeded by either strategy if the probability of incorrect diagnosis was 15%, and of the probability of correct diagnosis by no screening exceeded 75%.

**Authors' conclusions**
The authors argued that the thyroid-stimulating hormone (TSH) screening strategy was reasonably cost-effective for the general obstetrical population and very cost-effective for women with insulin-dependent diabetes mellitus (IDDM).

**CRD COMMENTARY - Selection of comparators**
The comparators were justified on the grounds that no screening was the current strategy and the TSH test was an alternative strategy. You should decide if these health technologies are relevant to your setting.

**Validity of estimate of measure of effectiveness**
The list of parameters and the method of analysis were comprehensively reported. The authors did not state that a systematic review of the literature had been undertaken. More details about the sources searched, the search strategies employed, and the method used to combine the estimates from the primary studies, could have been provided. Some effectiveness estimates were taken from a small number of primary studies, while the authors made assumptions about other, with little justification of the values given. However, these estimates were changed in the sensitivity analyses, although the source of the ranges was unclear. The authors did not report whose utility values were taken or how the health states were valued. The utility measure did not account for the hyperthyroid phase of the disease. The authors stated that they may have over-estimated the sensitivity of the TSH test.

**Validity of estimate of measure of benefit**
The estimation of benefits was obtained directly from the effectiveness analysis. The use of QALYs as the main outcome measure enables the results to be compared with those from other studies that report on similar health technologies.

**Validity of estimate of costs**
There were several positive features of the cost analysis. First, all of the direct cost categories relevant to a health service perspective appear to have been included. Second, the quantities and the unit costs were reported separately. Third, extensive sensitivity analyses were performed. Finally, the price year was reported. This makes it easier to replicate the results for other settings. The indirect costs were not considered and the economic perspective of the study was not stated. The estimates were taken from published studies, and this makes it difficult to assess the validity of the cost estimates or their ranges in the sensitivity analysis.
Other issues
The authors made appropriate comparisons of their findings with those from other studies. However, they did not address the issue of the generalisability of the results to other settings. The authors did not seem to present their results selectively, although this is difficult to assess in a large sensitivity analysis. The study considered pregnant women with and without IDDM, and this was reflected in the authors' conclusions. As the authors stated, the model assumed perfect compliance with follow-up testing for both the physicians and patients. They noted that less than perfect compliance would raise the cost-effectiveness ratio and could provide additional disutility. In addition, the time horizon of one year may have been insufficient to capture all effects. Finally, the study did not include any effects of PPT on the newborn, and did not consider risk stratification for first-trimester miscarriages.

Implications of the study
The authors argued that the TSH screening strategy was reasonably cost-effective for the general obstetrical population and was very cost-effective for women with IDDM. This conclusion should be viewed in the light of the caveats outlined.

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