Screening for mild thyroid failure at the periodic health examination: a decision and cost-effectiveness analysis

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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
Measuring serum thyroid stimulating hormone (TSH) in the screening for mild thyroid failure (MTF) for individuals aged 35-years and over.

Type of intervention
Screening.

Economic study type
Cost-utility analysis.

Study population
Men and women screened every 5 years (during the periodic examination), beginning at age 35 years, for a total of 40 years (or 8 screenings).

Setting
The practice setting was primary care. The economic study was carried out in Baltimore, US.

Dates to which data relate
Effectiveness data were extracted from studies published between 1977-1993. Resource data were not reported. The cost data were obtained from Medicare or studies published between 1984-1994. 1994 prices were used.

Source of effectiveness data
The estimates for final outcomes were derived from a review of previously completed studies and assumptions made by the authors.

Modelling
A Markov cycle tree was used to estimate benefits and costs associated with the screening strategies for the 40-year time horizon of the model.

Outcomes assessed in the review
Base-case probabilities sought were: MTF prevalence; reversible MTF symptoms; positive antithyroid antibodies in MTF; MTF serum total cholesterol => 6.2 mmol/L (240mg/dL); develop MTF; develop overt hypothyroidism if positive antibody; overt thyroid disease presents as complicated myxedema; seek medical attention because of MTF symptoms; death from complicated myxedema; reduction in cholesterol with levothyroxine sodium; reduction in cholesterol with lipid-lowering therapy, utilities for health states including euthyroid; MTF and no symptoms, MTF with
symptoms, overt hypothyroidism, complicated myxedema, myocardial infarction, uncomplicated angina pectoris, intermittent claudication, and cerebrovascular accident.

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

**Sources searched to identify primary studies**
Medline, references review and expert consultations were used to identify primary studies.

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

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

**Number of primary studies included**
16 studies were included in the review.

**Methods of combining primary studies**
Not stated.

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

**Results of the review**
Base-case primary outcome probabilities were:

- MTF (mild thyroid failure) prevalence = 0.056 (women aged 35 years), 0.027 (men aged 35 years);
- reversible MTF symptoms = 0.280 (men and women);
- positive antithyroid antibodies in MTF = 0.670 (women), 0.400 (men);
- MTF serum total cholesterol => 6.2 mmol/L (240mg/dL) = 0.250 (men and women);
- develop MTF = 0.0028 (women), 0.0014 (men);
- develop overt hypothyroidism if positive antibody = 0.054 (women), 0.0265 (men);
- overt thyroid disease presents as complicated myxedema = 0.003;
- seek medical attention because of MTF symptoms = 0.500;
- death from complicated myxedema = 0.600;
- reduction in cholesterol with levothyroxine sodium = 17%;
- reduction in cholesterol with lipid-lowering therapy = 12%.
utilities for health states including euthyroid:

MTF and no symptoms, 1.0;

MTF with symptoms, 0.9;

overt hypothyroidism, 0.74;

complicated myxedema, 0.4;

myocardial infarction, 0.87;

uncomplicated angina pectoris, 0.75;

intermittent claudication, 0.85;

and cerebrovascular accident, 0.4.

**Methods used to derive estimates of effectiveness**
Assumptions were also made by the authors.

**Estimates of effectiveness and key assumptions**
The assumptions made regarding the effectiveness aspect of the study were as follows: “the risk of progression to overt hypothyroidism was considered only for subclinically hypothyroid patients with antithyroid antibodies; patients labelled with MTF incurred negligible disutility; using levothyroxine sodium cured all patients with MTF successfully; the percentage of MTF patients with cholesterol levels higher than 6.2 mmo/L was assumed to be equal between the general population and MTF population, and estimated to be 25% for men and women 35 to 74 years old; levothyroxine sodium therapy was assumed to be effective only in 25% of patients with cholesterol levels higher than 6.2 mmo/L. The independence of probabilities attributed to the three types of thyroid disease-associated abnormalities was assumed”.

**Measure of benefits used in the economic analysis**
The benefit measure was quality-adjusted life years (QALYs). Time-trade-off technique was used to estimate some of the utilities attributed to the health states.

**Direct costs**
Costs were discounted. Quantities and costs were not analysed separately. The cost components were reported separately. The perspective of society was used in the cost analysis. Direct health costs included: test cost (TSH assay, lipid profile, etc.) obtained from Medicare figures, 1994; annual therapy cost (levothyroxine sodium, lipid reducing treatment) obtained from the literature between 1990-1994; annual cost for clinical event state (MTF symptom evaluation, complicated/uncomplicated care, myocardial infarction, etc.) obtained from a survey, 2 estimates, Medicare, and the literature between 1984-1994. The date of the price data was 1994. A 3% inflation rate was used to adjust the cost data to 1994 dollars.

**Indirect Costs**
Not stated.

**Currency**
US dollars ($).
Sensitivity analysis
One-way sensitivity analysis varied model probabilities, costs, and utilities, age, sex, screening interval, time-horizon, and discount rate.

Estimated benefits used in the economic analysis
The incremental QALYs attributable to TSH screening strategy relative to no TSH over the 40-year time horizon of the model were 0.0159 (6 days) per woman and 0.0053 (2 days) per man. The discount rate was 3%.

Cost results
The discount rate was 3%. The incremental cost attributable to TSH screening strategy relative to no TSH over the 40-year time horizon of the model was $147 per woman and $120 per man.

Synthesis of costs and benefits
The cost-effectiveness (cost per QALY) of screening 35-year old patients with serum TSH assay every 5 years was $9,223 (female), and $22,595 (male) (discounted at 3%), becoming more favourable for both sexes as age increases. The sensitivity analysis established that the cost of TSH assay and utility attributed to MTF with nonspecific symptoms were the most sensitive variables in the model.

Authors’ conclusions
The cost-effectiveness of MTF screening compares favourably with other preventative strategies. Doctors should consider measuring TSH concentration in patients aged 35 years and undergoing routine periodic health examinations. The cost-effectiveness of screening is most favourable in elderly women.

CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparator is clear.

Validity of estimate of measure of benefit
The internal validity of the estimates of the benefit can not be objectively assessed due to lack of adequate details regarding the literature review, quality assessment of the primary studies included in the review, and the method of combination of data obtained from different studies.

Validity of estimate of costs
Resource utilisation was not reported separately from the costs. However, adequate details of methods of cost estimation were given. Despite adopting a societal perspective in the cost analysis, no indirect costs were assessed.

Other issues
Given the lack of randomisation, the results may need to be treated with some caution.

Source of funding
Mr Danese was supported in part by National Eye Institute training grant T32 EY07127. Dr Powe was supported in part by National Institute of Aging grant K01 AG000561. Dr Savin was supported in part by the Research Service, Department of Veterans Affairs, Boston, Mass. Work also supported in part by unrestricted research grants from Forest Laboratories and Corning Clinical Laboratories

Bibliographic details

PubMedID
**Other publications of related interest**

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Adult; Age Factors; Aged; Baltimore; Cholesterol /blood; Cost-Benefit Analysis /statistics & numerical data; Decision Support Techniques; Family Practice /economics; Female; Health Care Costs; Humans; Hypercholesterolemia /blood /prevention & control; Hypolipidemic Agents /economics /therapeutic use; Hypothyroidism /blood /prevention & control; Linear Models; Male; Mass Screening /economics; Medicare; Middle Aged; Practice Patterns, Physicians’ /economics; Quality-Adjusted Life Years; Sensitivity and Specificity; Sex Factors; Thyroid Diseases /blood /drug therapy /economics /prevention & control; Thyrotropin /blood; Thyroxine /economics /therapeutic use; United States

**AccessionNumber**
21996008196

**Date bibliographic record published**
31/07/1999

**Date abstract record published**
31/07/1999