Calcitonin measurement in the evaluation of thyroid nodules in the United States: a cost-effectiveness and decision analysis

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.

CRD summary
This study assessed the cost-effectiveness of calcitonin screening in combination with current screening practices, in the authors' setting, for the evaluation of thyroid nodules. The authors concluded that the cost-effectiveness of calcitonin screening compared favourably with the current screening methods, in their setting. Although a few details on the selection of clinical data were not reported, the study methods were adequate and the authors’ conclusions appear to be appropriate.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study compared the cost-effectiveness of two screening strategies for the detection of obscure medullary thyroid cancer (MTC) in adult patients with thyroid nodules.

Interventions
The current strategy in the authors’ setting was American Thyroid Association (ATA) guideline screening, which consisted of serum thyroid stimulating hormone measurement, neck ultrasound, and possibly ultrasound-guided fine needle aspiration and radionuclide thyroid scan with iodine-123 or technetium-99. This current screening alone was compared with the current screening plus serum calcitonin measurement.

Location/setting
USA/secondary care.

Methods
Analytical approach:
A decision tree was constructed to compare the two screening methods over a lifetime horizon. Life expectancy was estimated for each disease and treatment state. The perspective adopted was not explicitly reported by the authors.

Effectiveness data:
The effectiveness data were derived from published literature and from official national sources. The sources searched, the process used to identify the data, and any inclusion criteria for the estimates were not reported. The main clinical parameters included disease prevalence, the sensitivity and specificity of fine needle aspiration and calcitonin screening, the screening interval, and complication rates of thyroidectomy.

Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
The measure of benefit was life-years saved (LYS). Survival was estimated using Kaplan-Meier survival curves.

Cost data:
The cost categories included ATA guideline screening implementation costs, calcitonin screening, the cost for treating each stage of MTC, and complications due to thyroidectomy. The cost estimates were obtained from official national sources.
sources (Medicare Reimbursement Schedule) and were reported for the price year 2007. All costs were expressed in US dollars ($) and were discounted at an annual rate of 3%.

**Analysis of uncertainty:**
Uncertainty was assessed using one-way sensitivity analyses for various model parameters such as the prevalence of MTC, the sensitivity and specificity of the tests, calcitonin costs, the screening interval, years of surveillance, 10-year survival rate, the discount rate, patients’ age, gender and nodule size.

**Results**
An incremental analysis was performed. The addition of calcitonin screening to ATA guideline screening resulted in an incremental cost of $11,793 per LYS, with a range of $10,941 to $12,646.

The one-way sensitivity analyses demonstrated that the cost-effectiveness of calcitonin screening was sensitive to variation in the prevalence of MTC, the specificity of fine needle aspiration and serum calcitonin testing, the cost of calcitonin assessment, and the length of screening interval and follow-up. In addition, the cost-effectiveness of calcitonin screening was sensitive to variation in patients’ age, gender and nodule size.

**Authors’ conclusions**
The authors concluded that routine calcitonin screening for the assessment of thyroid nodules appeared to be a cost-effective option and compared favourably with widely used screening techniques in the USA, such as thyroid stimulating hormone, colonoscopy and mammography.

**CRD commentary**
- **Interventions:**
The interventions were clearly reported. The study appeared to be thorough in its coverage of alternative interventions, including current practice in the study setting.

- **Effectiveness/benefits:**
The effectiveness data were derived from a review of the literature, but the details of the searches and the methods of data selection and combination from the identified studies were not reported, so it is not possible to tell from this paper if the best evidence was used. Life expectancy may well be an appropriate measure of benefit given that mortality may be more significant than quality of life in this study.

- **Costs:**
The perspective adopted was not explicitly reported and, although the authors hinted that societal costs were calculated separately to the base-case incremental cost-effectiveness analysis, this societal analysis was not described. The analysis reported in the paper appears to suggest that the perspective was actually that of the health service provider. The resources used were not reported separately, but summary costs for each cost category were provided. In addition, the sensitivity analysis was restricted to the cost of calcitonin screening and the discount rate, limiting the generalisability of the results. Discounting and the price year were adequately reported.

- **Analysis and results:**
The model structure, relevant details and modelling assumptions were clearly reported. The authors conducted an incremental analysis and the results were adequately presented. Although the one-way sensitivity analysis was limited to certain modelling parameters, these results were adequately reported. The authors provided a full discussion on the findings of previous relevant studies and outlined a number of possible limitations to their study.

- **Concluding remarks:**
Although a few details on the selection of clinical data were not reported, the study methods were adequate and the authors’ conclusions appear to be appropriate.

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