How should age at diagnosis impact treatment strategy in asymptomatic primary hyperparathyroidism? A 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.

CRD summary
The objective was to examine the cost-effectiveness of parathyroidectomy, observation, and pharmacological treatment, for asymptomatic primary hyperparathyroidism, relative to the patient's life expectancy. The authors concluded that parathyroidectomy was the best strategy at predicted life expectancies over five years and observation was the best strategy at predicted life expectancies under five years. Despite limited reporting around the clinical data, the authors provided a relatively transparent analysis and the conclusions they reached appear to be appropriate.

Type of economic evaluation
Cost-utility analysis

Study objective
This study compared the cost-effectiveness of three management strategies for patients, with asymptomatic primary hyperparathyroidism, who were aged 50 years or older and who did not meet the criteria for parathyroidectomy as defined by the National Institute of Health. All strategies were compared relative to the patients' age at diagnosis and their predicted life-expectancy.

Interventions
The three strategies were observation and monitoring the asymptomatic patient, pharmacologic treatment with cinacalcet, and parathyroidectomy.

Location/setting
USA/secondary care.

Methods
Analytical approach:
A Markov decision model was used and the time horizon was the patients' remaining lifetime. Different models were constructed for in-patient and out-patient operations. The authors stated that the third-party payer perspective was adopted.

Effectiveness data:
The clinical data were derived from published studies. The main parameters included annual probability of progression from asymptomatic to symptomatic disease, perpetual remission of disease or cure rate, and long-term operative complications.

Monetary benefit and utility valuations:
The utility values were derived from published studies. If quality adjustment factors were not available, published valuations using the Short Form (SF-36) health survey were used and converted into quality-of-life adjustment factors using multivariate regression models.

Measure of benefit:
Quality-adjusted life-years were the measure of benefit and future benefits were discounted at an annual rate of 3.5%.

Cost data:
The economic analysis included the costs that differed between the three strategies. These were the costs of monitoring procedures and tests (serum calcium, serum creatinine, and axial and appendicular bone density), medication costs, and in-patient hospital costs (ultrasonography, parathyroidectomy, and electrocardiography), and physician costs associated with parathyroidectomy (anaesthesiology, surgery, office consultations, radiology, cardiology, nuclear medicine, and pathology). The resource use data for the monitoring strategy were derived from current practice recommendations and actual data from a tertiary referral hospital. A breakdown of the cost categories was provided. The costs were based on diagnosis-related group data. All costs were appropriately adjusted for inflation and reported for the price year 2007 in US dollars ($). An annual discount rate of 3% was applied.

Analysis of uncertainty:
A deterministic one-way sensitivity analysis was undertaken on all the input parameters. Probabilistic sensitivity analysis, using Monte Carlo simulations, was conducted at the threshold life-expectancy levels of cost-effectiveness for in-patient and for out-patient parathyroidectomy. It was also conducted assuming a 10-year life expectancy for in- and out-patient parathyroidectomy.

Results
Results were reported at different predicted life-expectancies, ranging from six months to 75 years, at six-month intervals. The best strategy was defined as the most effective one that did not result in an incremental cost-effectiveness ratio of more than $50,000 per QALY.

For in-patient parathyroidectomy, observation was the best strategy for life expectancies from six months to six years, while in-patient parathyroidectomy became the best strategy for life expectancies between 6.5 and 75 years. For out-patient parathyroidectomy, observation was the best strategy for life expectancies ranging from six months to 4.5 years and out-patient parathyroidectomy was best for life expectancies from five to 75 years. Pharmacologic treatment was never the best strategy under any life expectancy.

In-patient parathyroidectomy had a 0.5308 probability of being the best strategy at 6.5 years life expectancy and this probability increased to 0.8287 at 10 years life expectancy. Out-patient parathyroidectomy had a 0.5344 probability of being the best strategy at five years life expectancy and 0.9234 at 10 years life expectancy.

One-way sensitivity analysis demonstrated that these results were most sensitive to variation in the discount rate, the quality adjustment factor for asymptomatic primary hyperparathyroidism, the cost of initial parathyroidectomy, and the annual cost of observation.

Authors’ conclusions
The authors concluded that, for asymptomatic patients with primary hyperparathyroidism over the age of 50 years, parathyroidectomy was the most cost-effective strategy when predicted life expectancy was above five years, while observation was the most cost-effective strategy when predicted life expectancy was below five years.

CRD commentary
Interventions:
The interventions were clearly reported and included the recommended practice in the authors’ setting.

Effectiveness/benefits:
The effectiveness data were derived from published sources. The methods of the literature review were not reported, which makes it impossible to determine if the best available evidence was used. The basic characteristics of the primary data sources (the study population, design, follow-up, etc.) were not reported, which prevents an objective assessment of the validity of the input parameters. Similarly, little information on the derivation of the utility values was reported. QALYs are a validated benefit measure and allow cross-disease comparisons.

Costs:
The cost categories reflected the perspective adopted. A breakdown of the cost items was provided, but information on resource use was not given because of the use of diagnosis-related group data. The sources used to derive the costs were reported. The use of discounting, the price year and inflation adjustments were well reported.
Analysis and results:
Overall, the analytical approach was well reported and the model structure was described in detail, including a diagram. The results were fully and clearly presented. The authors performed exhaustive sensitivity analyses, using probabilistic and one- and two-way analyses. The authors also acknowledged the main limitations of their analysis.

Concluding remarks:
Despite limited reporting around the clinical data, the authors provided a relatively transparent analysis. The conclusions they reached appear to be appropriate.

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