Empirical treatment of chronic cough: a cost-effectiveness analysis
Lin L, Poh K L, Lim T K

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
Six common management strategies were compared for treating chronic unexplained cough:

test all then treat;
treat all;
treat post-nasal drip syndrome (PNDS), test asthma, treat gastroesophageal reflux disease (GERD);
treat sequentially starting with PNDS;
test then treat sequentially; and
treat PNDS, test asthma and GERD together.

Type of intervention
Diagnosis and treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population consisted of patients with chronic unexplained cough, usually caused by PNDS, asthma, and/or GERD.

Setting
The setting was primary and secondary care. The economic study was carried out in Singapore.

Dates to which data relate
No dates were reported.

Source of effectiveness data
Effectiveness data were derived from a review/synthesis of the literature and authors’ assumptions.

Modelling
A decision model based on an influence diagram and a decision tree was used to assess expected costs and outcomes of the six strategies. Few details of the model were reported.
Outcomes assessed in the review
In this decision model, the input parameters used were prevalence, sensitivity, and specificity of PNDS, of asthma, and of GERD; and degree of aversion towards prolonged cough (variable a).

Study designs and other criteria for inclusion in the review
The authors simply stated that the model was representative of reports in the literature and experience in the local population. No mention was made of which study designs were included and whether there were any specific inclusion/exclusion criteria.

Sources searched to identify primary studies
Not reported.

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

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

Number of primary studies included
Not reported.

Methods of combining primary studies
It appears that the studies were combined using the narrative method although the authors provided no explicit explanation.

Investigation of differences between primary studies
Not reported.

Results of the review
The results of the review were as follows:

Low, normal, and high prevalence rates were 0.22, 0.34, and 0.44 for PNDS, 0.24, 0.31, and 0.41 for asthma, and 0.05, 0.13, and 0.21 for GERD, respectively.

Low, normal, and high sensitivity values were 0.97, 0.985, and 1.0 for PNDS, 0.97, 0.985, and 1.0 for asthma, and 0.65, 0.825, and 1.0 for GERD, respectively.

Low, normal, and high specificity values were 0.67, 0.73, and 0.79 for PNDS, 0.67, 0.725, and 0.78 for asthma, and 0.66, 0.83, and 1.0 for GERD, respectively.

The low, normal, and high values of the degree of aversion towards prolonged cough (variable a) were 0.5, 1, and 2, respectively.

Methods used to derive estimates of effectiveness
The authors made some assumptions used in the decision model.
Estimates of effectiveness and key assumptions
It was assumed that the occurrences of the three diseases were independent; the maximum treatment period was 12 weeks; it took one week from getting a test to obtaining the test outcome; it took at most two weeks to see the effect of a treatment drug on a patient; and treatment drugs were considered 100% effective.

Measure of benefits used in the economic analysis
The benefit measure used in the economic analysis was the expected duration of the treatment, the measure being obtained from the decision model. It appears that no discount was used.

Direct costs
Direct costs comprised costs of consultation, treating and testing of PNDS, asthma and GERD. Discounting was not carried out due to the short time horizon of the analysis. Costs and quantities were not analysed separately. A complete breakdown of costs was not reported. Estimation of costs and quantities were derived using modelling but the source of cost and resource use data was not stated. Dates for price and quantity of resources were not reported.

Statistical analysis of costs
No statistical analysis of costs was carried out.

Indirect Costs
The authors regarded indirect costs in terms of the opportunity cost of inconvenience caused by coughing rather than any costs arising from loss of productivity.

Currency
Singapore dollars (S$) and US dollars ($).

Sensitivity analysis
One-way, two-way and three-way sensitivity analyses were carried out on the three most sensitive parameters, which were the degree of aversion of a patient towards prolonged cough (a), the cost of coughing for the first week (K), and the prevalence of PNDS. Sensitivity analyses of these three parameters were carried out to determine the extent to which variation of one or more of these parameters affected the final decision.

Estimated benefits used in the economic analysis
The expected duration of the treatment was 5 weeks for treat all, 6 weeks for treat sequentially, for treat PNDS-test asthma-treat GERD, and for treat PNDS-test asthma and GERD, 5 weeks for test then treat sequentially, and 4 weeks for test all then treat.

Cost results
The expected cost of the treatment was S$273 ($157) for treat all, S$260 ($149) for treat sequentially, S$319 ($184) for treat PNDS-test asthma-treat GERD, and S$487 ($280) for treat PNDS-test asthma and GERD, S$897 ($516) for test then treat sequentially, and S$967 ($556) for test all then treat.

Synthesis of costs and benefits
Costs and benefits were not combined. Although the strategy 'test all then treat' had the shortest treatment duration, it was also the most expensive (S$967). The least expensive option was the strategy 'treat sequentially starting with PNDS' (S$260). In the one-way sensitivity analysis, parameter a had the strongest impact, as it resulted in a shift to the final decision, with the strategy 'treat all' being the least costly with low values of a and the strategy 'test all then treat'
becoming the cheapest option with high values of $a$. In the two-way analysis, the optimal strategy was 'treat all' when values of $a$ and $K$ were low, and at higher values of $a$ and $K$, the best choice was 'test all then treat'. In the three-way analysis, the strategy 'test all then treat' became less favourable as the prevalence of PNDS increased.

**Authors' conclusions**
Empirical treatment was the cheapest option, while testing followed by treatment was the most expensive option with the shortest time course. Three of the six strategies dominated the remainder, with each of the three exhibiting optimality in different situations. The strategy 'test all then treat' was the optimal strategy when the values of $a$ and $K$ were high. The strategy 'treat sequentially starting with PNDS' was the best choice when the values of $a$ and $K$ were low, and the prevalence of PNDS was high. The strategy 'treat all' was the optimal choice when the values of $a$ and $K$ were moderately low, and the patient was very cost conscious.

**CRD COMMENTARY - Selection of comparators**
The rationale for the choice of comparators was provided. The different strategies were arrived at by consensus among several clinicians who regularly manage patients with this problem. You, as a user of this database, should assess whether they represent widely used health interventions in your own setting.

**Validity of estimate of measure of effectiveness**
The authors simply stated that the model was representative of reports in the literature and experience in the local population. However, no further explanation was provided regarding the reports extracted from the literature in terms of number of relevant studies, method of combination and validity of primary studies. In addition, no justification for the authors' assumptions was provided. These issues tend to limit the internal validity of the analysis.

**Validity of estimate of measure of benefit**
The benefit measure used in the economic analysis was the expected duration of the treatment. It would have been interesting to have seen an assessment of the impact of the treatments on patients' health using benefit measures reflecting health outcomes and quality of life. However, costs and benefits were not combined in a cost-effectiveness ratio.

**Validity of estimate of costs**
Only direct costs were included in the analysis. It was not stated from which perspective the economic analysis was carried out. Costs and quantities were not analysed separately and a complete cost breakdown was not provided. There was a lack of data concerning cost/quantity sources. No price year was reported. Costs were treated deterministically in the base-case analysis, although sensitivity analyses were carried out to take into account the uncertainty around some data.

**Other issues**
Extensive sensitivity analyses were carried out to test how robust the findings were to changes in the three most sensitive parameters. This should improve the generalisability of the results. However, the authors did not discuss how generalisable the results would be, and it is hard to make generalisations because of the lack of data regarding the source of primary studies that acted as inputs into the decision model. The authors did not compare their results with the findings from other studies. In addition, the authors reported no further limitations of their study.

**Implications of the study**
The implications of the analysis are that three of the six strategies dominate the rest. The optimal strategy depends on the relative values of the three most sensitive parameters ($a$, $K$ and prevalence of PNDS). The authors conclude by expressing their hope that this model can be further refined and be used by practitioners.
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