Cost-effectiveness analysis of Helicobacter pylori screening in prevention of gastric cancer in Chinese


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 screening for Helicobacter pylori in the prevention of gastric cancer in the adult Singaporean Chinese population. Serology screening was potentially the most cost-effective strategy, especially in scenarios of high gastric cancer prevalence. However, the probability analysis highlighted the uncertainty of this finding. The study used robust methodology and, despite some limited reporting of the data sources, the authors’ conclusions appear to be valid.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to assess the cost-effectiveness of screening for Helicobacter pylori (H. pylori) in the prevention of gastric cancer in the adult Singaporean Chinese population.

Interventions
The three strategies considered were no screening, H. pylori serology screening, and the $^{13}$C-urea breath test (UBT). Patients who tested positive received eradication therapy, which consisted of rabeprazole 20mg, amoxicillin 1,000mg, and clarithromycin 500mg, twice a day for four days.

Location/setting
Singapore/primary care.

Methods
Analytical approach:
This economic evaluation was based on a Markov model with a lifetime horizon. The authors stated that the perspective of the public health care provider was adopted.

Effectiveness data:
The clinical data were derived from a critical review of published literature on the target population. Some characteristics of the primary sources were given. For example, data on survival rates were derived from a large prospective cohort study involving Chinese patients, while the proportion of gastric cancer death was derived from local reports. A key assumption was made on the relationship between H. pylori eradication and the reduction in risk of gastric cancer. Details were not given on other studies used to obtain the test accuracy and the transition probabilities.

Monetary benefit and utility valuations:
The utility valuations were derived from published sources, the details of which were not given.

Measure of benefit:
Quality-adjusted life-years (QALYs) were used as the summary benefit measure. Life-years (LYs) were also calculated, but were not combined with costs. These benefits were discounted at an annual rate of 3%.

Cost data:
The health services were serology screening, UBT testing, triple therapy, gastric cancer treatment, and adverse effects
related to eradication. The costs and quantities were derived from the records of local public hospitals. All costs were in US dollars ($) and the price year was 2006. Future costs were discounted at an annual rate of 3%.

Analysis of uncertainty:
A probabilistic sensitivity analysis was undertaken by assigning probabilistic distributions to the model inputs and generating cost-effectiveness acceptability curves. Also, different scenarios were considered such as alternate target populations (only men) and alternate levels of gastric cancer prevalence (high or low prevalence).

Results
In the population of 475,500 Singaporean Chinese people aged 40 years, the expected LYs and QALYs attained were 9,491,350 and 8,885,781, with no screening, 9,492,138 and 8,886,545 with serology screening, and 9,492,190 and 8,886,596 with UBT. The expected costs (in million) were $17.6 with no screening, $37.4 with serology screening, and $61.3 with UBT.

The incremental cost per QALY was $25,881 with serology screening over no screening, $53,602 with UBT over no screening, and $471,746 with UBT over serology screening.

The scenario analysis suggested that these findings were more favourable if screening strategies were applied, such as only screening Chinese men of the same age group, or only the population with the highest prevalence of gastric cancer. In the low prevalence scenario, the incremental cost-utility ratios were higher and so less favourable for the screening strategies.

The probabilistic sensitivity analysis indicated a probability of 75% that serology screening, over no screening, had an incremental cost per QALY gained below the threshold of $50,000. The corresponding probability for the UBT strategy was 38%. When comparing the two screening strategies, the probability of UBT screening being cost-effective over serology screening approached zero; all incremental cost-utility ratios were higher than the threshold value.

Authors’ conclusions
This analysis demonstrated that H. pylori serology screening was potentially the most cost-effective strategy for the prevention of gastric cancer in 40-year-old Chinese people in Singapore, especially when considering scenarios of high gastric cancer prevalence. However, the probabilistic analysis highlighted the uncertainty (less than 95%) of this finding.

CRD commentary
Interventions:
The selection of the comparators was appropriate as the two available screening strategies were compared, not only with each other, but also with a strategy of no screening. These strategies are likely to be valid in other health care systems.

Effectiveness/benefits:
The authors stated that the clinical inputs were derived from a critical review of the literature, but details of this review were not provided. Thus, the approach used to identify the data sources is not clear. Moreover, only a few key characteristics of the primary sources of data were reported, which limits the possibility of judging the validity of these estimates. Nevertheless, the authors investigated the influence of variations in key clinical inputs on the study findings. The derivation of utility valuations for the calculation of QALYs was not clearly described. The use of QALYs was appropriate given the validity and generalisability of such a benefit measure.

Costs:
The analysis of costs reflected the study perspective. A breakdown of cost items was provided for most items, although cancer costs were presented as a macro-category. This is quite common, but it does reduce the transparency of the economic analysis. The authors derived costs and quantities from local sources. Thus, the analysis of costs is likely to be specific to the Singaporean setting. Other aspects of the analysis such as the price year, discount rate, and the types of probabilistic distributions of economic inputs were reported.

Analysis and results:
The synthesis of costs and benefits was appropriately performed. The issue of uncertainty was satisfactorily addressed in the sensitivity analysis in which all the model inputs were simultaneously varied. Furthermore, the scenario analysis enhances the external validity of the study findings. In general, the findings from the base-case and the sensitivity analyses were clearly presented. However, triangular distributions were used for the probabilistic analysis which could be a limitation.

Concluding remarks:
Overall, the study used robust methodology and, despite some limited reporting of the data sources, the authors’ conclusions appear to be valid.

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