Exploring the cost-effectiveness of Helicobacter pylori screening to prevent gastric cancer in China in anticipation of clinical trial results

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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
This study examined the cost-effectiveness of Helicobacter pylori screening strategies to prevent gastric cancer in a high-risk region of China. The authors concluded that screening and treatment was the most cost-effective strategy due to the significant reduction in gastric cancer incidence, especially for younger cohorts. The methodology appears to have been valid. Most of the data were from published sources and were not reported in this paper, but the authors’ conclusions appear to be valid and robust.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
The objective was to assess the cost-effectiveness of Helicobacter pylori screening strategies to prevent gastric cancer in the high-risk region of Linqu, China.

Interventions
A strategy of no screening for Helicobacter pylori and no treatment was compared against three strategies implemented at ages 20, 30, 40, 50, and 60 years. The three strategies were screening once, using a serology test, with antibiotic treatment for those with positive results; screening once, with antibiotic treatment for those with positive results and re-screening for those with negative results; and universal antibiotic treatment, without screening.

Location/setting
China/secondary care.

Methods
Analytical approach:
The analysis was based on an empirically calibrated state-transition model of the natural history of non-cardiac intestinal gastric adenocarcinoma, with a lifetime horizon. The authors stated that a modified societal perspective was adopted and this excluded patient time costs.

Effectiveness data:
The clinical inputs were from several sources. A literature review identified the highest and lowest values and statistical tests were used to select the most appropriate estimate. Some assumptions for the model were derived from a panel of experts. The sources of some of the epidemiological data and a clinical study in the region of Linqu (China) were described, but the details of the other sources were not given, as they were reported in another publication. The key clinical input was the disease prevalence.

Monetary benefit and utility valuations:
The utility valuations were derived from the literature and the details were not reported.

Measure of benefit:
Life-years (LYs) and quality-adjusted life-years (QALYs) were the summary benefit measures and they were discounted at an annual rate of 3%.
Cost data:
The economic analysis included the costs of out-patient visits, diagnostic tests, antibiotic treatment, and gastric cancer treatment. These costs were based on World Health Organization regional estimates, published estimates, and the international drug price indicator guide. They were presented as macro-categories and some assumptions were made. All costs were in US dollars ($) and the price year was 2005. Future costs were discounted at 3% per annum.

Analysis of uncertainty:
A univariate sensitivity analysis was undertaken on the model inputs, with ranges of values based on published evidence, which included estimates from other countries. In an alternative scenario, patient time costs were included. Other scenarios were also considered.

Results
In 20-year-old men, the lifetime costs were $18.50 with no screening, $30.30 with screening, $32.50 with screening twice, $32.90 with universal treatment, and $33.60 with screening three times. The additional discounted life expectancy compared with no screening was 3.2 days with screening, 3.4 days with screening twice, 3.6 days with universal treatment and 3.4 days with screening three times.

After excluding the dominated strategies (those which were less effective and more expensive than another option), the incremental cost per LY gained over the next less expensive strategy was $1,340 with screening and $2,720 with universal treatment. Per QALY gained, it was $1,560 with screening and $3,250 with universal treatment. Similar results were obtained in women.

Using a decision threshold based on the gross domestic product (GDP) per capita of $1,700, the strategy of screening 20-year-olds and then treating those who tested positive was the most cost-effective option for both men and women.

The sensitivity analysis showed that the most influential model inputs were the Helicobacter pylori diagnostic test costs, antibiotic costs, Helicobacter pylori seroprevalence, and treatment effectiveness, but the rank order of the strategies remained the same. At the GDP per capita threshold, screening and treatment was optimal when the Helicobacter pylori seroprevalence was between 40 and 80%.

For all cohorts of patients, single screening and treatment or universal treatment at the youngest age was more cost-effective than all other strategies.

Authors’ conclusions
The authors concluded that Helicobacter pylori screening and treatment was the most cost-effective strategy in both men and women, due to the significant reduction in gastric cancer incidence, especially for younger cohorts.

CRD commentary
Interventions:
The selection of the comparators was appropriate as all the strategies examined were potentially relevant in the authors’ setting.

Effectiveness/benefits:
A literature review was appropriately used to identify the relevant sources of evidence, but no details of the methods and conduct of the review were reported. Statistical analyses were carried out to select the best estimates and published ranges of values were considered in the sensitivity analysis. The lack of details on the design and other characteristics of the source studies limits the possibility of judging the validity of the clinical estimates, but most of the evidence came from three epidemiological studies. Both benefit measures were appropriate as they captured the impact of the interventions on both quality of life and survival. More information on the derivation of the utility values would have been useful.

Costs:
The cost analysis used a limited perspective, which focused on medical costs, but patient time costs were included in the sensitivity analysis. The costs were presented as macro-categories and were not broken down into individual items. Only
limited details on the sources of data were given, which reduces the transparency of the economic analysis. The cost estimates were treated deterministically, but the impact of varying these estimates was tested in the sensitivity analysis.

Analysis and results:
The analytic approach used to synthesise the costs and benefits was appropriate and the incremental analysis identified the economically inferior (dominated) strategies. The expected costs and benefits of the strategies were reported in detail, for the youngest cohort, and cost-effectiveness ratios were appropriately presented for all age cohorts. The uncertainty was assessed by varying individual inputs in a deterministic approach, but a multivariate analysis would have been useful. The authors acknowledged some limitations of their analysis and these mainly related to the mixed validity of the clinical studies identified and the need for estimates from studies conducted outside China. The authors stated that similar results were found in other published economic evaluations.

Concluding remarks:
The methodology appears to have been valid. Most of the data were from published sources and were not reported in this paper, but the authors’ conclusions appear to be valid and robust.

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