Cost-benefit analysis of hepatitis A vaccination in Thailand

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
Three strategies for hepatitis A vaccination were evaluated. These were no intervention (strategy 1), vaccination against hepatitis A without screening (strategy 2), and vaccination against hepatitis A for those susceptible after screening for anti-hepatitis A virus (HAV) (strategy 3).

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised Thai citizens aged between 3 and 40 years in 1994. The analyses were performed for three separate age groups, 3 - 11 years, 12 - 18 years and 19 - 40 years. The authors justified the reasons for not including patients aged below 3 years or above 40 years.

Setting
The setting was not explicitly reported, but it appears to have been the community. The study was carried out in King Chulalongkorn Memorial Hospital, Thailand.

Dates to which data relate
The effectiveness data were derived from studies published between 1987 and 2001. Hepatitis A incidence was obtained from the Ministry of Public Health (Division of Epidemiology, 1994). Health care resource use was estimated from 23 hepatitis A patients admitted to the authors’ institution between 1990 and 1999. The dates of the indirect costs were not reported. The price year was not stated.

Source of effectiveness data
The effectiveness evidence was derived from published studies and authors’ assumptions.

Modelling
A Markov model was used to estimate the benefits and costs of the vaccine strategies evaluated. Simulations were performed for the Thai population in each age group in 1994. The model used a lifetime horizon. The health states considered in the model were susceptible to hepatitis A (not immune), infected with hepatitis A (inpatient), infected with hepatitis A with prolonged cholestasis (inpatient), infected with hepatitis A with fulminant hepatitis A (inpatient), infected with hepatitis A (outpatient), immune, and dead.
Outcomes assessed in the review
The outcomes assessed were:

- the efficacy of the hepatitis A vaccine;
- symptomatic cases of hepatitis A (per 100,000 population);
- the percentage of outpatient cases;
- the percentage of inpatient cases without complication;
- the percentage of inpatient cases with prolonged cholestasis;
- the percentage of inpatient cases with fulminant hepatitis A;
- the probability of death in symptomatic cases; and
- the probability of seroprevalence of anti-HAV.

Study designs and other criteria for inclusion in the review
Not stated.

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
At least 15 primary studies were included in the review.

Methods of combining primary studies
Most of the primary studies were combined using narrative methods. In some cases average values were calculated and inserted in the Markov model.

Investigation of differences between primary studies
It appears that the authors have not investigated any differences between the primary studies.

Results of the review
The efficacy of the hepatitis A vaccine was 96% (range: 94 - 100).

The number of symptomatic cases of hepatitis A (per 100,000 population) was 55 in the 3 - 11 year group, 76 in the 12 - 18 year group, and 45 in the 19 - 40 year group.

The proportion of outpatient cases was 91.5% in the 3 - 11 year group, 90.76% in the 12 - 18 year group, and 85% in
The proportion of inpatient cases without complications was 8.1515% in the 3 - 11 year group, 8.75% in the 12 - 18 year group, and 13.995% in the 19 - 40 year group.

The proportion of inpatient cases with prolonged cholestasis was 0.34% in the 3 - 11 year group, 0.4618% in the 12 - 18 year group, and 0.9005% in the 19 - 40 year group.

The proportion of inpatient cases with fulminant hepatitis A was 0.0084% in the 3 - 11 year group, 0.0279% in the 12 - 18 year group, and 0.1045% in the 19 - 40 year group.

The probability of death in symptomatic cases was 0.0025% in the 3 - 11 year group, 0.0112% in the 12 - 18 year group, and 0.0523% in the 19 - 40 year group.

The probability of seroprevalence was 9.4% in the 3 - 11 year group, 15% in the 12 - 18 year group, and 70% in the 19 - 40 year group.

**Methods used to derive estimates of effectiveness**
The authors made assumptions to derive some estimates of effectiveness.

**Estimates of effectiveness and key assumptions**
The authors assumed that:

- the adjusted incidence rate of hepatitis A was the true incidence of hepatitis A in Thailand;
- death from hepatitis A infection only occurred in the hospital as a consequence of fulminant hepatitis;
- the hepatitis A serology screening test had a sensitivity and specificity of 100%; and
- persons with naturally acquired immunity, or those already infected with HAV, will retain life-long protective immunity.

**Measure of benefits used in the economic analysis**
The authors did not derive a summary measure of benefit. The authors reported savings in resources as a measure of benefit. Resource savings should not be considered a summary measure of health benefit and must be reported in the cost fields. In effect, this study was a cost-consequences analysis.

**Direct costs**
The costs and the quantities were analysed separately. The economic analysis considered the costs of the vaccine (including its administration), serology tests, medical visits, and the treatment hepatitis A without complication, hepatitis A with cholestasis, and hepatitis A with fulminant liver failure. These direct costs were calculated according to the data collected from 23 hepatitis A patients treated in the authors’ hospital. The authors also estimated the transportation costs according to the data collected from 185 outpatients treated at the authors’ institution. Therefore, it seems that the costs were estimated from actual data. Discounting was not performed, but it may not have been required as, according to the authors, the cost of hepatitis A treatment was incurred within one year.

**Statistical analysis of costs**
The costs were treated deterministically.

**Indirect Costs**
Productively losses were calculated using the human capital approach. The costs and the quantities were reported separately. The work days lost were collected from 185 outpatients treated at the authors’ institution. In the 3 - 11 year group, the estimation was undertaken by considering the work days lost by their parents. It was assumed that the working population comprised 20- to 60-year-old citizens. Therefore, the cost of death was calculated as the period of 60 years minus the age at death. Discounting was not performed, although it would have been relevant.

Currency
Thailand baht.

Sensitivity analysis
One-way sensitivity analysis was performed on the incidence rate. A threshold analysis was conducted on the cost of the vaccine.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

Cost results
It would appear that the average costs per person were reported.

The cost of no intervention was 1,339.48 baht in the 3 - 11 year group, 1,245.76 baht in the 12 - 18 year group, and 420.94 baht in the 19 - 40 year group.

The cost of vaccination without screening was 2,597.68 baht in the 3 - 11 year group, 2,571.5 baht in the 12 - 18 year group, and 3,676.79 baht in the 19 - 40 year group.

The cost of vaccination with screening was 3,307.45 baht in the 3 - 11 year group, 3,117.45 baht in the 12 - 18 year group, and 2,152.99 baht in the 19 - 40 year group.

The potential cost-savings of vaccination without screening was -1,258.2 baht in the 3 - 11 year group, -1,325.74 baht in the 12 - 18 year group, and -3,255.85 baht in the 19 - 40 year group.

The potential cost-savings of vaccination with screening was -1,967.97 baht in the 3 - 11 year group, -1,871.69 baht in the 12 - 18 year group, and -1,732.05 baht in the 19 - 40 year group.

Synthesis of costs and benefits
No summary measure of health benefit was derived.

The sensitivity analysis showed that the vaccination strategies would become cost beneficial within all age groups if the incidence of hepatitis A were to increase 5 to 10 times. The cost of strategy 2 would equal the benefits if the cost of a vaccine dose was about 293 baht for the 3 - 11 year group and about 250 baht for the 12 - 18 year group. Strategy 3 would not be cost beneficial at any vaccine cost for the 3 - 11 year group and 12 - 18 year group. In the 19 - 40 year group neither strategies 2 nor 3 would be cost beneficial at any vaccine cost.

Authors' conclusions
It would not be cost beneficial to launch a hepatitis A vaccine campaign in Thailand. The authors argued that the vaccine had to be administrated only to some selected groups at high risk of contacting the virus.

CRD COMMENTARY - Selection of comparators
The choice of the comparators was clear. The option of no vaccination was compared with the two strategies commonly
used in economic evaluations (selective and mass vaccination). You should decide if the three strategies evaluated are relevant in your own setting.

Validity of estimate of measure of effectiveness
The authors did not state that a systematic review of the literature was performed. Neither the sources searched nor the inclusion and exclusion criteria in the review were reported. It was difficult to assess the validity of the effectiveness estimations since the authors provided little detail of the methodology used in the review. The incidence of hepatitis A was evaluated in the sensitivity analysis.

Validity of estimate of measure of benefit
The authors did not derive a summary measure of health benefit for use in the economic analysis. The authors used the term "cost-benefit analysis", but they did not calculate the monetary value of the health benefits. Instead, they calculated the savings in resources arising from vaccination. It is, therefore, more appropriate to categorise the analysis as a cost-consequences analysis.

Validity of estimate of costs
It appears that all the categories of costs relevant to the perspective adopted in the analysis have been considered. Both direct and indirect costs were obtained from actual data. The costs were not discounted, the authors stating that the costs were incurred within one year and, therefore, discounting was unnecessary. The costs and the quantities were reported separately, which will aid generalisability. However, the price year was not reported, which will hinder any future reflation exercises.

Other issues
The authors did not compare their results with those from other published studies. They partially addressed the issue of generalisability by commenting that their findings could not be extrapolated to hepatitis A patients treated in other hospital or health care institutions. The authors did not report their results selectively, although they did not present the net savings ratios. No further limitations to the study were reported.

Implications of the study
The authors suggested that, under the assumptions considered in the analysis, the option of no vaccination is the most cost beneficial in Thailand.

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Bibliographic details

MeSH
Adolescent; Adult; Child; Child, Preschool; Cost-Benefit Analysis; Hepatitis A /epidemiology /prevention & control; Hepatitis A Vaccines /administration & dosage /economics; Humans; Markov Chains; Outcome Assessment (Health Care); Research Support, Non-U.S. Gov't; Thailand /epidemiology

AccessionNumber