An economic analysis of different strategies of immunization against hepatitis A virus in developed countries

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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.

Health technology
Two strategies for immunisation against Hepatitis A virus (HAV) in developed countries: Strategy 1: universal vaccination; Strategy 2: children are initially screened for antibody and, if susceptible, are vaccinated.

Type of intervention
Primary prevention.

Economic study type
Cost-utility analysis.

Study population
A hypothetical cohort of healthy 2-year-old children.

Setting
Hospital. The economic study was set in the USA.

Dates to which data relate
Effectiveness and resource use data were collected from expert opinion and studies published between 1981 and 1997. Cost data were collected from studies published between 1994 and 1997 and were based on hospital charge data. The price year was not reported.

Source of effectiveness data
Effectiveness data were derived from a review of the literature.

Modelling
A Markov cycle tree simulation model followed 2-year-old healthy children over their lifetime in cycles of 1-year duration.

Outcomes assessed in the review
The review assessed the probability of compliance with the vaccination programme, the annual rate of decline of vaccine-induced antibody, the probability of natural immunity against HAV, the annual incidence of hepatitis A infection, the case fatality rate for acute hepatitis A infection, the sensitivity and specificity of the screening test, and utilities.
Study designs and other criteria for inclusion in the review
Not stated.

Sources searched to identify primary studies
Not stated.

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

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

Number of primary studies included
At least 11 studies were included in the review.

Methods of combining primary studies
Not stated.

Investigation of differences between primary studies
Not stated.

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

The probability of compliance with the vaccination programme was 0.8.

The annual rate of decline of vaccine-induced antibody was 12%.

The probability of natural immunity against HAV was 10% (0-10 years), 15% (11-20 years), 18% (21-30 years), 35% (31-40 years), 45% (41-50 years), 70% (51-70 years), 75% (over 70 years).

The annual incidence of hepatitis A infection was 0.0001.

The case fatality rate for acute hepatitis A infection was 0.3 (under 50 years) and 2.5 (over 50 years).

The sensitivity and specificity of the screening test was 100%.

Quality of life associated with the states of well but susceptible, well with natural immunity, and well with vaccine-induced immunity were taken as unity.

A disutility of 30 days was attributed to an episode of acute hepatitis A.

Measure of benefits used in the economic analysis
Quality adjusted life years (QALYs) were used as the measure of benefits. Benefit measures were discounted at an annual rate of 3%.

Direct costs
Direct costs were discounted at an annual rate of 3%. Quantities and costs were reported separately. The quantity/cost boundary adopted was that of society. Cost estimates were derived from the available literature and from actual data. The average medical costs were based on hospital charges for an episode of acute hepatitis A, antibody testing and cost of vaccination. They were obtained from an ambulatory practice in a university hospital setting and were compared with information from the literature. The price year was not reported.

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

**Indirect Costs**
Indirect costs were discounted at an annual rate of 3%. Quantities and costs were not reported separately. It appears that loss of work was included in the analysis. The quantity/cost boundary adopted was that of society. The estimation of quantities and costs was based on actual data and on the available literature. The price year was not reported.

**Currency**
US dollars ($).

**Sensitivity analysis**
One-way and two-way sensitivity analyses were conducted on the cost of antibody testing, the cost of vaccination, the discount rate, the probability of seroconversion after vaccination, utility values, probability of compliance, and the annual incidence rate.

**Estimated benefits used in the economic analysis**
The number of QALYs gained was 29.42402 with strategy 3, 29.43077 with strategy 2, and 29.43107 with strategy 1.

**Cost results**
Total costs amounted to $6.52 with strategy 3, $55.57 with strategy 2, and $59.42 with strategy 1.

**Synthesis of costs and benefits**
The marginal cost-effectiveness ratio over strategy 3 was $7,267.67 for strategy 2 and $12,833.34 for strategy 1.

When the probability of compliance fell below 65%, universal vaccination was preferred to the strategy of screening and vaccination.

If the cost of the two-dose vaccine was less than $57, the cost of the serological test was more than $21, or the cost of an acute episode of hepatitis A exceeded $11,215, then the strategy of universal vaccination was preferred to the strategy of screening and vaccination.

If the annual incidence rate was 0.03, the strategy of universal vaccination was preferred to the strategy of screening and vaccination.

**Authors’ conclusions**
While in the current analysis, the strategy of initial screening for protective antibody followed by vaccination of the susceptible population turned out to be more cost-effective, universal vaccination with a lower-priced vaccine will undoubtedly be the most cost-effective way to control and ultimately eradicate this disease.
CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparator is clear. The 'no-vaccination' strategy allowed the active value of the two vaccination strategies to be evaluated. You, as a user of this database, should decide if these health technologies are relevant to your own setting.

Validity of estimate of measure of benefit
The author did not state that a systematic review of the literature had been undertaken. More details about the design, conduct of the review and the method of combining primary effectiveness data could have been provided. Estimation of benefits was modelled. The instrument used to derive the measure of health benefit was not reported.

Validity of estimate of costs
All categories of costs relevant to the perspective adopted appear to have been included in the analysis. The author did not consider the costs of extra visits for hepatitis A vaccination. Some quantities and costs were reported separately. A sensitivity analysis was conducted on costs, quantities and discount rates. Charges were used to proxy real costs. The price year was not reported. Cost results might not be generalisable to other settings or countries.

Other issues
The author made appropriate comparisons of their findings with those from other studies, but did not address the issue of generalisability to other settings. The study considered 2-year-old healthy children in developed countries and this was reflected in the author's conclusions. As acknowledged by the author, the model did not take into account the dynamic effect of a programme of vaccination on the herd immunity of successive birth cohorts. The author only considered the two-dose vaccination schedule, and not the three-dose schedule.

Implications of the study
More widespread immunisation of the susceptible population in developed countries was found to be reasonably cost-effective and should be actively considered for incorporation into current immunisation programmes. Developments of vaccines combining inactivated hepatitis A with other vaccines in a single formulation need to be investigated.

Source of funding
None stated.

Bibliographic details
Das A. An economic analysis of different strategies of immunization against hepatitis A virus in developed countries. Hepatology 1999; 29(2): 548-552

PubMedID
9918934

DOI
10.1002/hep.510290225

Indexing Status
Subject indexing assigned by NLM

MeSH
Adolescent; Adult; Aged; Antibodies, Viral /blood; Child; Child, Preschool; Cohort Studies; Cost-Benefit Analysis; Hepatitis A /economics /epidemiology /prevention & control; Hepatitis A Vaccines; Hepatovirus /immunology; Humans; Infant; Infant, Newborn; Markov Chains; Middle Aged; Outcome Assessment (Health Care); Vaccination /economics; Viral Hepatitis Vaccines /economics
AccessionNumber
21999000316

Date bibliographic record published
31/03/2001

Date abstract record published
31/03/2001