The cost-effectiveness of two strategies for vaccinating US veterans with hepatitis C virus infection against hepatitis A and hepatitis B viruses

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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
The present study evaluated the cost-effectiveness of selective versus universal vaccination for hepatitis A and hepatitis B in US veterans with hepatitis C. Although selective vaccination had a lower average cost-effectiveness, universal vaccination may be cost-effective. The authors presented a transparent analysis. However, the study does not adequately value the outcomes of the intervention, so the authors' conclusions should be interpreted with care.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
Since individuals with hepatitis C virus (HCV) infection are at higher risk of complications due to other liver infections, the present study evaluated the cost-effectiveness of two vaccination strategies for hepatitis A (HAV) and hepatitis B (HBV) in US veterans. The strategies evaluated were selective vaccination and universal vaccination.

Interventions
The two strategies compared were selective vaccination and universal vaccination. With selective vaccination, patients received vaccination only against the virus for which they lacked serological immunity when screened. With universal vaccination, all patients were vaccinated with the combined HBV and HAV vaccine. The HAV vaccine was Havrix, administered in a two-dose schedule with a 6- to 18-month interval. The HBV vaccine was Engerix-B20, administered in a three-dose schedule at 0, 1 to 2, and 4 to 6 months. The combined vaccine (Twinrix) was administered in a three-dose schedule at 0, 1 and 6 months.

Location/setting
USA. Outpatient/inpatient care.

Methods
Analytical approach:
A decision tree was used to synthesise the costs and effects of each strategy in a hypothetical cohort of 1,000 veterans infected with HCV. The time horizon was the period needed to complete the vaccination scheme. The authors' stated perspective was that of the New Mexico Veterans Affairs Health Care System (NMVAHCS).

Effectiveness data:
A retrospective chart review of NMVAHCS electronic medical records was performed in order to evaluate HAV and HBV, as well as compensated or decompensated disease prevalences, in 2,517 HCV patients seen from 1990 to 2004. These data were combined with inputs from a non-systematic review of the literature (few details of which were provided) that included immunogenicities of the vaccines in HCV individuals with compensated or decompensated liver disease and compliance with vaccination visits, using the authors' best judgement to select the most appropriate source, parameters values and ranges.

Monetary benefit and utility valuations:
None.

Measure of benefit:
The measure of benefit was the number of individuals immune to both HAV and HBV at the end of the strategy or vaccination period.

Cost data:
The study included vaccination costs (vaccine plus administration) and blood tests, using the NMVAHCS Pharmacy and Pathology Departments as sources. The costs were expressed in 2004 US dollars ($). Resource use was modelled.

Analysis of uncertainty:
One-way (threshold) and two-way sensitivity analyses were conducted. The model was also run for different sub-groups of patients.

Results
The number of patients immune to both HAV and HBV from the 1,000 cohort was 625.90 with selective vaccination and 739.06 with universal vaccination.

The costs were $65,613.78 for the selective vaccination strategy and $83,082 for the universal vaccination strategy. Thus, the incremental cost-effectiveness ratio (ICER), expressed as $/patient immune to HAV and HBV, was $154.06 for universal compared with selective vaccination.

The results did not change significantly when analysing different genders, different age sub-groups, or patients with compensated liver disease. However, the ICER increased to $381 for the universal strategy in decompensated patients.

From the threshold analysis, the model was most sensitive to the cost of the combined vaccine. Other sensitive parameters included the costs of blood tests and the HBV vaccine, and the prevalence of underlying immunity to HBV. The two-way sensitivity analysis showed that universal vaccination became more cost-effective in populations with lower prevalence of immunity to both HAV and HBV, and that while lower costs of the combined vaccines favoured the universal strategy, lower costs of the blood tests favoured selective vaccination.

Authors’ conclusions
The authors concluded that the selective vaccination strategy for HAV and HBV in HCV patients was more cost-effective, but also that the universal strategy may be worth the additional cost in most settings. Also, in the Veterans Affairs setting, a small reduction in the costs of the combined vaccine would make the universal strategy more cost-effective. A randomised trial comparing both strategies may be needed in order to evaluate accurately the cost-effectiveness.

CRD commentary
Interventions:
The authors adequately described the interventions evaluated, which seemed of relevance to both their setting and the general care of patients with HCV infection. The authors explained the choice of the interventions. However, current practice did not appear to be included, presumably because the costs of treating HAV- and HBV-related complications were not included in the analysis.

Effectiveness/benefits:
The study was tailored to reflect the NMVAHCS perspective, and specific data about the prevalence of HAV and HBV immunity were retrieved. However, although the authors provided the references used for other parameters, it seems that a systematic review was not performed, so it is not clear that the best available evidence was used.

As the authors stated, the benefit measure chosen makes it difficult to compare the results with studies in other areas, or even in the same area that used other benefits (i.e. life-years). Since the health outcomes were not evaluated, the value of the vaccination strategies is not clear.

Costs:
Costs relevant to the study perspective and benefit measure have been included, and adequate local sources of the NMVAHCS were used. The costs of treating HAV and HBV complications were not considered in the analysis. This is
consistent with the limited measure of benefit, but it does not adequately value the outcomes of the interventions. The selection of parameter ranges used in the sensitivity analysis was not justified.

**Analysis and results:**
The data selection process necessitated sensitivity analyses, which were appropriately performed. The results were well reported. The authors correctly did an incremental cost-effectiveness analysis, but the average cost-effectiveness ratios were unnecessary. The key issue when interpreting the results is how much the system would be willing to pay for an additional percentage point of fully immunised subjects. Although the authors stated that the results are probably not generalisable to other settings, they reported a two-way sensitivity analysis on key costs in order to assist decision-making in other settings.

**Concluding remarks:**
The authors presented a transparent analysis. However, the study does not adequately value the outcomes of the intervention, so the authors' conclusions should be interpreted with care.

**Funding**
None stated.

**Bibliographic details**

**MeSH**
Computer Simulation; Cost-Benefit Analysis; Female; Hepacivirus /immunology; Hepatitis A Vaccines /administration & dosage; Hepatitis A virus /immunology; Hepatitis B Vaccines /administration & dosage; Hepatitis B virus /immunology; Hepatitis C /immunology; Humans; Male; Middle Aged; Vaccination /economics /methods

**AccessionNumber**
22007000246

**Date bibliographic record published**
19/02/2007

**Date abstract record published**
01/09/2008