Cost-effectiveness of influenza vaccines and economic evaluation of its impact

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George Bernard Shaw, 1929

“You let a doctor take a dainty, helpless baby, and put that stuff from a cow, which has been scratched and had dirt rubbed into her wound, into that child. Even, the Jennerians now admit that infant vaccination spreads disease among children. More mites die from vaccination than from the disease they are supposed to be inoculated against.” (David Bloom et al)
Overview

• Methods in economic analysis

• Trials on effectiveness in special groups

• Cost effectiveness studies
Key considerations in an economic analysis

• Details of the new vaccine and its proposed use

• Data from comparative trials if available

• Economic evaluation for main indication

• Estimated extent of use and financial implications
Details of the new vaccine and its proposed use

Pharmacological action

• Mechanism of action ???

• Has the regulatory authority approved the new vaccine for this indication

• Who will be vaccinated

• Are there any conditions under which additional drugs will be prescribed?
Details of the new vaccine and its proposed use

Treatment details

• Dosage form

• Dose regimen

• Implementation programme
Details of the proposed alternative - comparator

**Alternative**

- What is the key alternative treatment to manage the disease?

- Is the alternative treatment considered to be “best practice”?

- What are the differences between the vaccine and the alternative treatment?
Data from trials (2)

Description of search strategy

- Databases searched
- Search terms
- Time periods
- In house studies
Data from comparative randomised trials (2)

**Identification of relevant RCTs**

- List of all potentially relevant trials – characteristics including head to head, indirect comparison

- Assessment of methodological quality of studies - discussion of impact of quality on results

- Selection of studies – basis for the selection
Data from comparative randomised trials (2)

Methodological Quality

• Randomisation

• Blinding

• Follow up

• Generation of allocation schedule

• Concealment
Data from comparative randomised trials (2)

Characteristics of the comparative randomised trials

• Are the trial participants representative of the patients that would be receiving the drug

• Are subjects comparable across the different trials

• numbers of patients randomised and duration of follow-up of the trials
Data from comparative randomised trials (2)

Analysis of the comparative randomised trials

- Outcome measures – definition of outcome, clinical relevance of outcome measure, measurement bias

- Method of analysis – meta-analysis, statistical considerations – superiority, equivalence, non inferiority studies
Data from comparative randomised trials (2)

Results of the comparative randomised trials

• Comparative effectiveness - extent of difference with 95% CI, preferably with both RR and ARR and NNT

• Comparative toxicity - key toxicity data from the trial
Data from comparative randomised trials (2)

Interpretation of the results of the comparative randomised trials

Possible categories of claims:
• significant advantages in effectiveness over main comparator and having similar or less toxicity
• similar effectiveness to its main comparator but having less toxicity
• significant advantages in effectiveness over its main comparator but having more toxicity
• no worse than main comparator in terms of effectiveness and toxicity
• less effective than main comparator but having less toxicity.
Data from comparative randomised trials (2)

Economic evaluation based on the evidence from the comparative randomised trials

• Identify costs to be used in economic analysis
• Identify source of information
• results of the incremental costs
• incremental cost effectiveness ratio corresponding to the 95% CIs of the outcome measure
Estimated extent of use and financial implications (4)

- Estimated extent of use of the vaccine
- Estimated extent of substitution of other drugs
- Estimated financial implications
Effectiveness of influenza vaccination in the elderly in South Africa (VAN VUUREN, RHEEDER AND HAK)

**Aim:** association between influenza vaccination and the occurrence of hospitalization for acute respiratory or cardiovascular diseases, or all-cause death during the influenza season in an elderly population in South Africa.

**Method:** nested case-control study using data from a cohort of 45 522 elderly members of a private medical funding organization during the moderate 2004 influenza season.
**Table 4. Estimates of vaccine effectiveness**

<table>
<thead>
<tr>
<th>Endpoint</th>
<th>% Vaccine effectiveness</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined endpoints</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All elderly</td>
<td>19.3</td>
<td>(3.1 to 32.9)</td>
</tr>
<tr>
<td>High-risk subgroup</td>
<td>19.9</td>
<td>(2.2 to 34.4)</td>
</tr>
<tr>
<td>Low-risk subgroup</td>
<td>-48.4</td>
<td>(43.5 to -289.7)</td>
</tr>
<tr>
<td>All-cause mortality</td>
<td>23.6</td>
<td>(1.0 to 41.0)</td>
</tr>
<tr>
<td>Hospitalizations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>14.6</td>
<td>(-12.8 to 35.4)</td>
</tr>
<tr>
<td>Respiratory</td>
<td>13.8</td>
<td>(-24.6 to 40.3)</td>
</tr>
<tr>
<td>Respiratory and cardiovascular combined</td>
<td>13.1</td>
<td>(-10.0 to 31.0)</td>
</tr>
</tbody>
</table>

CI, Confidence interval.
Efficacy and effectiveness of influenza vaccines in elderly people: a systematic review

T Jefferson et al
A cost comparison of the use of influenza vaccine in old age home residents in Johannesburg (Cobb)

- Aim: evaluate the costs of treating influenza and influenza-like illnesses in old age home residents versus those not vaccinated

- 151 people residing in two old age homes divided into 2 groups ie vaccinated and no vaccination

- Medical records were reviewed.

- The costs were then calculated

- There were no significant differences in the treatment costs, comparing those who had been vaccinated to those who had not been vaccinated.
Influenza Vaccine and HIV

- Prospective study was conducted to evaluate the clinical efficacy and immunologic responses to the vaccine

- 262 HIV-1-infected patients received a trivalent influenza vaccine

- Influenza illness occurred in 6% vaccinated and 21.2% nonvaccinated patients.

- Good antibody responses were observed irrespective of CD4 counts.

- Specific CD4 responses correlated with HIV-1 viral load (VL), especially in patients treated with highly active antiretroviral therapy (HAART) compared with those without HAART ($P < 0.01$), although the clinical efficacy did not correlate with HIV-1 VL. HAART may enhance the immunologic efficacy of influenza vaccine.
Conclusion and Recommendations

• Economic analyses is a complex instrument that requires a range of skills and other resources that are not readily available in developing countries.

• The costs of evaluating/performing economic analyses in a developing country context compared to the relative benefit can be significant for vaccines.

• Cost effectiveness not the only consideration when adopting a vaccination strategy, infact it may be the least important consideration.
Thank you