ABSTRACT

OBJECTIVES: An estimated 35 million people were living with HIV around the world in 2012. Although a toolbox of prevention methods including condoms, risk reduction counseling, voluntary circumcision, pre-exposure prophylaxis, and more are available, the development of an HIV vaccine is seen as the only hope for completely eradicating HIV.

METHODS: A cost-effectiveness analysis of a partially effective HIV vaccine in combination with pre-exposure prophylaxis (PrEP) for high-risk people was performed from the perspective of a United States (US) healthcare payer using a patient’s lifetime horizon. Total direct costs, infections averted, and quality-adjusted life years (QALY) were the study outcomes. A decision tree modeled four preventive treatment strategies for high-risk men who have sex with men (MSM) in San Francisco: 1) vaccine and PrEP, 2) vaccine alone, 3) PrEP alone, and 4) no prevention strategy.

RESULTS: A vaccine was found to be most cost-effective and dominant prevention strategy in this analysis. The incremental cost-effectiveness ratio (ICER) for a vaccine and PrEP combined was $45,704 per QALY, falling below a $100,000 per QALY willingness-to-pay threshold. An HIV vaccine alone was estimated to cost the payer $6,859 per infection averted and was a dominant strategy compared to no preventive intervention. PrEP alone cost more than $1,15 million at current pricing per infection averted, and combined with a vaccine, the cost per infection averted was reduced to $904,326.

CONCLUSION: HIV incidence was the largest factor driving the cost per infection averted and cost per QALY for all prevention strategies, followed by the cost of PrEP for the two strategies that included it. US payers should actively advocate development, approval, coverage, and use of a vaccine to avert new HIV infections as a more cost-effective strategy than current preventive methods for people at high risk of HIV infection in the United States.

BACKGROUND & METHODS

• An HIV vaccine is seen as the only hope for eradicating HIV from the globe

• Pre-exposure prophylaxis (PrEP) is a new preventive treatment recommended for high-risk individuals to take as a daily pill.

• The cost-effectiveness of a modestly effective HIV vaccine candidate combined with the new PrEP standard of care is unknown.

RESULTS

• Offering an HIV vaccine in combination with PrEP to high-risk men who have sex with men in San Francisco is highly cost-effective over a patient’s lifetime.

Table 2. Cost per infection averted for each HIV prevention strategy.

<table>
<thead>
<tr>
<th>Prevention Strategy</th>
<th>Infections Averted per 1,000 Men</th>
<th>Cost/infection Averted</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Treatment</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Vaccine alone</td>
<td>130</td>
<td>$6,859</td>
</tr>
<tr>
<td>PrEP alone</td>
<td>231</td>
<td>$1,150,767</td>
</tr>
<tr>
<td>Vaccine and PrEP</td>
<td>295</td>
<td>$904,326</td>
</tr>
</tbody>
</table>

• Vaccine: $6,650 / infection averted

• ICER adding PrEP: $158,500/QALY

Figure 2. A cost-effectiveness plane showing QALY gained for each of the four prevention strategies and their associated costs. The slope of the dashed line represents the incremental ICER for using a vaccine with PrEP compared to the vaccine alone.

Figure 3. Tornado diagram of the one-way sensitivity analysis of model inputs in order of most to least impactful on the cost per infection averted for the vaccine with PrEP prevention strategy.

Figure 4. Tornado diagram of the one-way sensitivity analysis of model inputs in order of most to least impactful on the incremental cost-effectiveness ratio of a vaccine and prep combination compared to the strategy of no treatment.

DISCUSSION

• In the base case analysis, the HIV vaccine was a dominant strategy compared to no treatment, and was cost-effective when combined with PrEP.

• Results were robust to the one-way sensitivity analyses.

• When evaluating the ICER for the cost per QALY gained, the base case conclusions were sensitive to HIV incidence.

References


