Cost-effectiveness of pembrolizumab plus platinum and fluoropyrimidine-based chemotherapy as first-line treatment of advanced esophageal cancer in the United States

Clinical inputs
- QOL, FEV, and TTO for pembrolizumab + 5-FU + cisplatin and 5-FU + cisplatin were estimated from the KEYNOTE-059 trial patient-level data (data cut-off date: 2 July 2019). For OS and PFS, progression analysis was used to extrapolate HR data from the study. The Kaplan-Meier data for pembrolizumab + 5-FU + cisplatin and 5-FU + cisplatin were estimated by using the ESMO handbook on cancer care (2017 edition).

Methods

Objective
- To evaluate the cost-effectiveness of pembrolizumab plus chemotherapy or chemotherapy alone for the first-line treatment of advanced esophageal cancer with pembrolizumab estimated from the perspective of a US health care payer.

Results

Costs and utilities inputs

Table 3. Costs and utility inputs model

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Costs (US$ per QALY)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug acquisition cost (per cycle)</td>
<td>Pembrolizumab + 5-FU + cisplatin: $126,400; 5-FU + cisplatin: $84,000</td>
<td>Unconstrained analysis</td>
</tr>
<tr>
<td>Drug administration cost (per cycle)</td>
<td>Pembrolizumab + 5-FU + cisplatin: $50,000; 5-FU + cisplatin: $30,000 (estimated average) $41,236</td>
<td>Unconstrained analysis</td>
</tr>
<tr>
<td>All management cost (per cycle)</td>
<td>Pembrolizumab + 5-FU + cisplatin: $900,370; 5-FU + cisplatin: $489,355</td>
<td>Unconstrained analysis</td>
</tr>
<tr>
<td>Subsequent treatment cost (per cycle)</td>
<td>Pembrolizumab + 5-FU + cisplatin: $30,000; 5-FU + cisplatin: $16,000</td>
<td>Unconstrained analysis</td>
</tr>
<tr>
<td>Social work costs (per QALY)</td>
<td>$34,049.48</td>
<td>Unconstrained analysis</td>
</tr>
<tr>
<td>Disease management costs (per QALY)</td>
<td>Pembrolizumab + 5-FU + cisplatin: $105,354; 5-FU + cisplatin: $104,563</td>
<td>Unconstrained analysis</td>
</tr>
</tbody>
</table>

Deterministic sensitivity analysis results
- The results were stable to variation in key parameters (Figure 6) and alternative model settings, input sources, and assumptions (Table S5).

Conclusions
- Pembrolizumab plus 5-FU + cisplatin had 7.8% probability of being cost-effective at a willingness-to-pay threshold of $150,000 per QALY gained compared to chemotherapy alone.

References
- The content of the paper is available at: https://www.sciencedirect.com/science/article/pii/S002251762100240X.

Disclosures
- The authors declare no conflicts of interest.

Acknowledgments
- The study was supported by Merck Research Laboratories, Merck & Co., Inc., Kenilworth, NJ, USA; 1-Dana-Farber Cancer Institute, Harvard University, Boston, MA, USA

Limitations
- The uncertainty associated with the long-term extrapolation of clinical outcomes was a limitation of the study. For example, for the OS and PFS for pembrolizumab + 5-FU + cisplatin, there was no real-world evidence of long-term survival after progression.

Figure 1. Transition diagram for cohort simulation

Figure 2. Base case choice of OS extrapolation for pembrolizumab + 5-FU + cisplatin and 5-FU + cisplatin, overall population

Figure 3. ICR (QALY) of pembrolizumab + 5-FU + cisplatin vs 5-FU + cisplatin

Figure 4. Cost-effectiveness acceptability curves of pembrolizumab + 5-FU + cisplatin vs 5-FU + cisplatin

Table 1. Model scope and settings in base case

Table 2. Sensitivity analysis results

Table 3. Costs and utility inputs model

Table 4. Base case results

Table S5. Alternative model settings, input sources, and assumptions