**Motivation**

Current guidelines suggest adopting a lifetime time horizon when a mortality benefit is present. However, adopting the time horizon of a clinical trial is a common practice.

**Objective**

To systematically evaluate the impact of time horizon choice on the incremental cost-effectiveness ratio under varying assumptions regarding costs, treatment effectiveness and discount rate.

**Methods**

**Model**

- Simple Markov model
- 2 hypothetical strategies
- Outcome: alive / dead

- Model predicts:
  - Costs
  - Quality adjusted life years (QALYs)
  - Incremental cost-effectiveness ratios (ICER)
    - as a function of time horizon (5 to 50 years)
- Assumption: trial data available for 5 years

**Variables of interest**

- Cost
  - One time costs only (e.g. device or surgery)
  - Continued incremental cost (e.g. drug therapy)
    - Constant
    - Cost decrease in future (e.g. patent expiry)
- Discount rate
  - Undiscounted
  - Costs and QALYs discounted at same rate
  - Costs and QALYs discounted at different rate
- Extrapolation of survival benefit
  - Optimistic: continued divergence of survival benefit
  - Intermediate: equal mortality rates at end of follow up
  - Conservative: immediate loss of cumulative survival benefit at end of follow up

**Base Case Data**

**Drug**

- Costs: Constant continued
- Survival: Intermediate
- Discount Rate: 5% for costs and QALYs

<table>
<thead>
<tr>
<th>Time Horizon</th>
<th>Incremental Cost</th>
<th>Incremental Effectiveness</th>
<th>ICER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years 1-5</td>
<td>0.2</td>
<td>0.8</td>
<td>1.4</td>
</tr>
<tr>
<td>Years 6-50</td>
<td>1.2</td>
<td>1.5</td>
<td>0.9</td>
</tr>
</tbody>
</table>

**Device**

- Costs: One time
- Survival: Intermediate
- Discount Rate: 5% for QALYs

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>One time</td>
<td>1.0</td>
<td>2.0</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**Results**

**Base Case**

**Drug**

- Incremental Cost: constant
- Incremental Effectiveness: increase
- Incremental Cost-Effectiveness Ratio: decrease

**Device**

- Incremental Cost: constant
- Incremental Effectiveness: increase
- Incremental Cost-Effectiveness Ratio: decrease

**Sensitivity Analysis**

**Survival**

- Drug
  - Optimistic: continued incremental cost
  - Intermediate: continued incremental cost
  - Conservative: continued incremental cost

- Device
  - Optimistic: continued incremental cost
  - Intermediate: continued incremental cost
  - Conservative: continued incremental cost

**Discount Rate**

- Drug
  - Optimistic: continued incremental cost
  - Intermediate: continued incremental cost
  - Conservative: continued incremental cost

- Device
  - Optimistic: continued incremental cost
  - Intermediate: continued incremental cost
  - Conservative: continued incremental cost

**Cost**

- Drug
  - Optimistic: continued incremental cost
  - Intermediate: continued incremental cost
  - Conservative: continued incremental cost

- Device
  - Optimistic: continued incremental cost
  - Intermediate: continued incremental cost
  - Conservative: continued incremental cost

**Summary**

- No time horizon bias: “device” - conservative extrapolation of survival benefit
- Strong time horizon bias: All other scenarios

**Conclusion**

- Potential for bias is substantial
  - Bias greatest for optimistic extrapolation of survival benefit (impact more pronounced for “device”)
  - Discounting may also be important

- Our work quantitatively supports a time horizon choice beyond the duration of the clinical trials
- Choice of optimal time horizon needs to take into account the time dependency of uncertainty