Complexity in Cost-Effectiveness Modelling: Analyses Need to be Fit for Purpose

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Outline

• Terminology
• Dimensions of complexity
• Some examples
• Increasing transparency in economic evaluations
Getting our terminology straight

Opaque — Transparent

Naive — Sophisticated

Poor analysis — Good analysis

Simple — Complex

? — ?
### Models need to be fit for purpose for decision making

May lead to additional complexities

<table>
<thead>
<tr>
<th>Necessary feature</th>
<th>Possible complexities</th>
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<tbody>
<tr>
<td>Compare all relevant options</td>
<td>Advanced meta-analysis</td>
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<tr>
<td></td>
<td>- indirect and mixed comparisons</td>
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<td></td>
<td>- modelling of sequences</td>
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<tr>
<td>Generic measure of health (e.g. QALYs)</td>
<td>Mapping between disease-specific and generic outcomes</td>
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<tr>
<td>Relevant time horizon</td>
<td>Extrapolation beyond trial follow-up</td>
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<tr>
<td>Identify relevant sub-groups</td>
<td>Risk and interaction modelling</td>
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<tr>
<td>Reflect all uncertainties</td>
<td>Probabilistic analysis and scenario analysis</td>
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Complexity depends on features of the disease, interventions and evidence

Decision tree
- Comparison of 3 options
- Simple meta-analysis
- Time horizon = trial follow-up

Markov chain
- Extrapolate beyond trial
- States include mortality
- Constant risks of death

Semi-Markov model
- Risk of death changes over time
- Semi-Markov model
- Use of tunnel states
Case study I – glycoprotein IIb/IIIa antagonists in acute coronary syndrome

Strategy 1: GPA as part of initial medical management [7 trials]

Strategy 2: GPA in patients with planned percutaneous coronary interventions (PCIs) [1 trial]

Strategy 3: GPA as adjunct to PCI [10 trials]

Strategy 4: No use of GPA

## Modelling GPAs

<table>
<thead>
<tr>
<th>Trial characteristic</th>
<th>Modelling method</th>
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<tbody>
<tr>
<td>Extensive trial evidence on treatment effect</td>
<td>Random effects meta-analysis of relative risks</td>
</tr>
<tr>
<td>Partial comparison</td>
<td>Indirect treatment comparison: pooled relative risks from trials applied to common baseline risks</td>
</tr>
<tr>
<td>Non-UK case-mix and clinical practice</td>
<td>UK-specific baseline risks from observational study. Relationship between baseline risks &amp; treatment effect explored with meta-regression</td>
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<tr>
<td>No resource use data</td>
<td>Resource use data from UK observational study attached to clinical events</td>
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<tr>
<td>Short-term time horizon</td>
<td>Extrapolation from 6 months based on Markov model populated from UK observational study</td>
</tr>
</tbody>
</table>
Case study II: drug eluting stents

• Comparison of drug-eluting and bare metal stents (as of 2005)

• Existing evidence consistent with no differential effect on mortality or myocardial infarctions

• Model simplifies:
  - Short-term analysis
  - QALYs a function of number of further revascularisations

• Complexity comes in evidence synthesis
  - 15 RCTs
  - Mixture of individual patient and summary data

Improving transparency

• Transparency to whom?
  – Decision makers
  – Third party assessors
  – Peer review

• Assess to electronic model

• Better reporting of models
  – Replication of model from report
  – Presentation of ‘intermediate (clinical) results’
  – Comparison of alternative models
Increasing transparency

Screening for aortic aneurysm