

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

Necessary feature

Possible complexities

Compare all relevant options

Advanced meta-analysis
- indirect and mixed comparisons
- modelling of sequences

Generic measure of health (e.g. QALYs)

Mapping between disease-specific and generic outcomes

Relevant time horizon

Extrapolation beyond trial follow-up

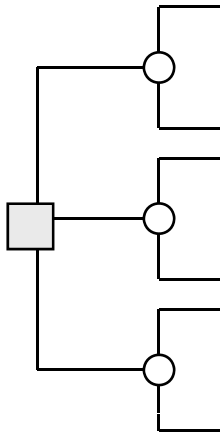
Identify relevant sub-groups

Risk and interaction modelling

Reflect all uncertainties

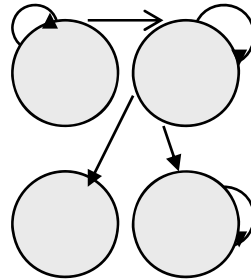
Probabilistic analysis and scenario analysis

Complexity depends on features of the disease, interventions and evidence



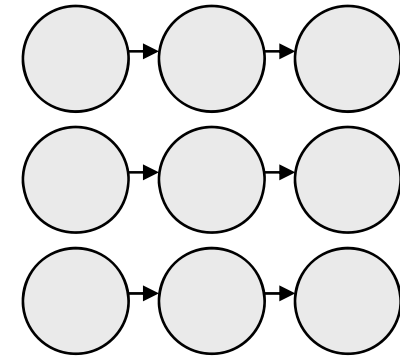
Decision tree

- 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

Palmer *et al.* Management of non-ST-elevation acute coronary syndromes: how cost-effective are glycoprotein IIb/IIIa antagonists in the UK National Health Service? *International Journal of Cardiology* 2005;100:229-240.

Modelling GPAs

Trial characteristic

Modelling method

Extensive trial evidence on treatment effect

Random effects meta-analysis of relative risks

Partial comparison

Indirect treatment comparison: pooled relative risks from trials applied to common baseline risks

Non-UK case-mix and clinical practice

UK-specific baseline risks from observational study. Relationship between baseline risks & treatment effect explored with meta-regression

No resource use data

Resource use data from UK observational study attached to clinical events

Short-term time horizon

Extrapolation from 6 months based on Markov model populated from UK observational study

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

Hawkins *et al.* *British Journal of Cardiology* 2005;12:AIC83-AIC91

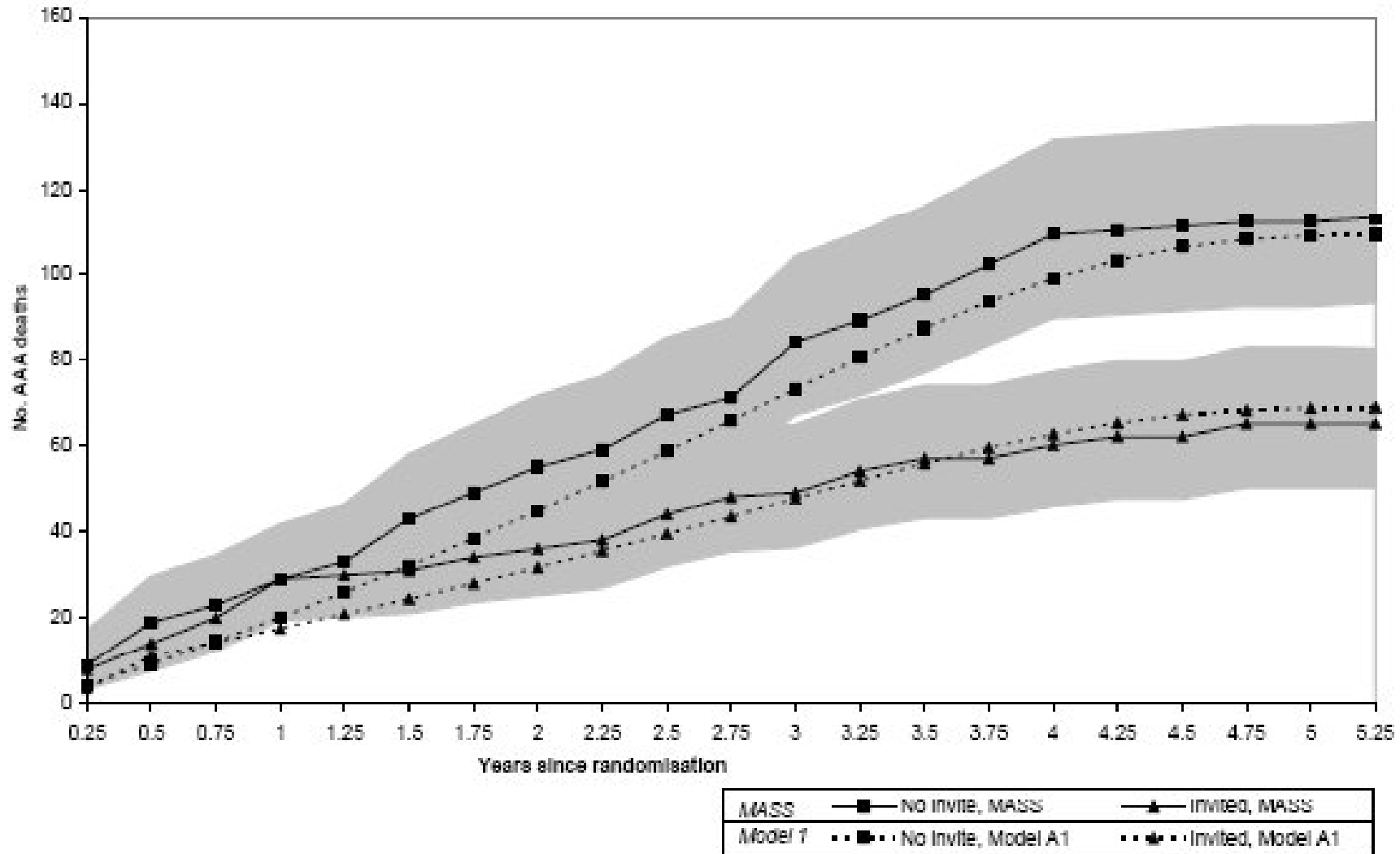
Hawkins N, Sculpher M. *Podium presentation at ISPOR, Florence, Italy, 2005.*

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



Kim *et al.* A Markov model for long-term cost-effectiveness modelling of screening for abdominal aortic aneurysms. MRC Biostatistics Unit, Cambridge 2005.