How to communicate cost-effectiveness analysis to a lay audience?

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Introduction to the Workshop

• Who are the ‘lay audience’?
  - the general public (including patients)
  - colleagues from other disciplines (in research or on committees)

• What do we need to communicate?
  - economic concepts
  - detailed methods and analyses

• What issues do we face?
What Issues Do we Face?

• The economic message is more complicated than the clinical message
• Consider:
  ‘This drug delivers no benefits’
  versus
  ‘The benefits from this drug do not justify the costs’

• The effort economists put in to learning about medicine and clinical research is not always reciprocated

Media Reporting of Economic Analysis

Alzheimer’s cover-up

Drugs watchdog refuses to reveal why it denied thousands of patients £2.50-a-day medication on the NHS
Poll: In a scale of 1 to 10, 1 being easy-peasy and 10 being almost impossible, how do you find communicating cost-effectiveness models to non-health economists?

Poll: When communicating a cost-effectiveness analysis to non-modellers, the essential tools are:
**Poll:** How often do you communicate cost-effectiveness models to non-modellers?

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**HOW TO COMMUNICATE COST-EFFECTIVENESS ANALYSIS TO A LAY AUDIENCE?**

Robert Hettle  
Director, Health Economics and Payer Evidence  
AstraZeneca
Laypersons and their involvement in HTA (1)

• A “layperson” may be a patient, carer, service user, expert by experience, survivor, and the public\(^1\)
  • Heterogeneous
  • Various levels of knowledge of Health Technology Appraisal (HTA)

• We extend the term “layperson” to cover medical or technical professionals that have limited knowledge or experience of
  • HTA
  • Economic evaluations
  • Statistics and/or simulation modelling

\(^1\) NICE’s approach to public involvement in guidance and standards: a practical guide;

Laypersons and their involvement in HTA (2)

• Layperson involvement in HTA varies considerably between countries:\(^2\)
  • 25% (13 of 53) of HTA agencies surveyed in 2016 had documented public and patient involvement
  • 15% (8 of 53) of HTA agencies had patients/public on committees

• The importance of layperson involvement in HTA is becoming widely recognised:\(^3\)
  • Key stakeholders and users of the technology
  • Provide insight not available elsewhere

• Patient organisations are increasingly involved in the dissemination of HTA decisions and results\(^2\)

\(^2\) Public and patient involvement in health technology assessment: a framework for action, 3 EU-PATI Guidance for Patient Involvement in Medicines Research and Development: Health Technology Assessment
Developing manufacturer submission dossiers for payers

- Manufacturer submission dossiers must cater for multiple audiences
- Submission dossiers can be long, complex and technical (NICE ~ 150 pages maximum excluding appendices, up to 1200 with appendix)
- In April 2017, NICE introduced a committee summary document (maximum length of 25 pages)
- Intention to reduce information burden on committee’s
- Section on cost-effectiveness includes model diagram
  - Requires annotation for cycle length, time horizon and transition probabilities

Why is communication of economic modelling important? An example from oncology

- Majority of models submitted in advanced cancer follow a simple three-state structure (progression-free, progressed disease, death)
- The majority (73% of NICE appraisals) use partition survival analysis
- They are/were often incorrectly described as Markov-Like or Semi-Markov
- Review groups (experts), manufacturers and committees have miscommunicated these methods

1 NICE TSD 19: Partitioned survival analysis as a decision modelling tool
Why is communication of economic modelling important? An example from oncology

- Partitioned survival and Markov models are distinct methods
- Different methods = different assumptions = different results

**Markov:**
- **Three sets of parameters** (progression-free to progressed, progression-free to death, progressed to death)
- Depends on multiple transitions (e.g. progression free to progressed to death)
- Dependency between progression status and death

**Partitioned survival:**
- **Two sets of parameters** (progression-free survival and overall survival)
- Independent of transitions (e.g. progressed disease inferred from progression free and overall survival)
- PFS and OS are independent

Use of model diagrams to present economic models – are they useful?

Different approaches convey different information……not all of which is critical to the final decision

- **Illustrates calculations, Parameters (PFS, OS), Patterns of survival**
- Patient pathway / health states, Time spent in health states
  - Survival curves are difficult to understand

- **Calculations and parameters used, Patterns of survival/ assumptions**
  - Understandable by laypersons, but does not communicate assumptions
What can we learn from others on the communication of scientific research?

- Communication of scientific research is difficult, other organisations struggle:
  - Criticism of Policymaker’s summary of the international governmental panel for climate change
- EU clinical trials regulation 536/2014 (article 37) requires sponsors of clinical trials to provide summary results of clinical trials in a format understandable to laypersons
- General principles:
  - Simple text summaries
  - Present absolute numbers rather than relative measures
  - Use of visual aids in support of text are encouraged – infographics cited as an example
  - Presentation of design alongside results

EMA recommends the use of infographics to aid understanding of clinical trials

Infographics may help with the presentation of economic models (an imperfect example)

Concluding remarks

- Laypersons play a critical role in decision-making for new health technologies
- Existing visual approaches to communicating CEA in oncology may not be sufficiently informative
  - Important to focus on outcomes alongside modelling methods
- Adopting techniques used in other areas may improve communication
  - Infographics for summaries of clinical trial results
  - Learning from the experience of other groups
  - Involvement of graphic designers and end users to support development of visual aids
- Visual aids (e.g. infographics) may help with the dissemination of peer reviewed publications to a wider audience
Communicating.....
CEAs of diagnostic tests

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Outline

• Challenges in explaining CEA of diagnostic tests to lay (non-health economist) audiences

• (My) common pitfalls and potential solutions
Challenges of CEA of diagnostic tests

- Tests used at many stages
- Tests used in combination
- Tests have direct & indirect impacts

CEA of many strategies

Methods difficult to understand
Results difficult to communicate
The motivating example

Before turning on the computer...
Map out the impact of the test
Agree which impacts are modelled

**Direct impact**
- Cost of the test
- Direct health consequences
- Health consequences from side effects
- Costs of managing side effects
- Adherence to test

**Indirect**
- Different management decisions given diagnostic classification
- Timing of management
- Adherence to management

#communicateCEA

Represent the general testing strategy in the management pathway

- **Suspicion**
- **Referral**
- **Diagnostic strategy**
  - No cancer
    - **Discharge**
  - Cancer but not clinically significant
    - **Monitoring**
  - Clinically significant cancer
    - **Radical treatment**

Missed clinically significant cancer?
Decouple model diagram from mathematical model


Break down the problem

Test 1  Test 2  Test 3

Accept results  Accept results

MRI  Biopsy  MRI  Biopsy  MRI  Biopsy

Cut-offs  Cut-offs  Cut-offs  Cut-offs  Cut-offs  Cut-offs
避免敏感性和特异性
讨论条件概率

- 困难记住它们的定义
- 容易混淆概念
- 只适用于二值分类

条件概率
- 某肿瘤是CS癌症的概率，给定MRI评分是X。

## prepare the ground for the results

### How cost-effective is treatment?

<table>
<thead>
<tr>
<th>ICER (Thousands)</th>
<th>Threshold = £20,000/QALY</th>
</tr>
</thead>
<tbody>
<tr>
<td>£0</td>
<td>Headroom to invest in testing</td>
</tr>
<tr>
<td>£5</td>
<td>Assumes that non-CS cancer never treated</td>
</tr>
</tbody>
</table>

非临床显著性癌症 | 临床显著性癌症

这些图表是示例性的，并不一定代表激发示例的结果。
How much to invest in testing?

These graphs are illustrative and do not necessarily represent the results of the motivating example.

What if people diagnosed with non-CS cancer are treated?

These graphs are illustrative and do not necessarily represent the results of the motivating example.
What if the prevalence of CS cancer is lower?

![Graph showing maximum additional cost vs additional sensitivity vs existing strategy.]

- Blue line: No one without CS cancer receives treatment
- Orange line: An increasing proportion of people with no CS cancer are treated
- Gray line: What if prevalence is 50% lower at 0.25

Results

CEACs/CEACs are difficult to understand
CE planes too!

Relate results to the model diagram
Focus on the key results

These graphs are illustrative and do not necessarily represent the results of the motivating example.
If there is an accepted threshold
Show results as INB

These graphs are illustrative and do not necessarily represent the results of the motivating example. Inspired by Drummond et al. (2015). Methods for the Economic Evaluation of Health Care Programmes, Table 11.5.

2-way sensitivity analysis
What is the cost-effective option?

These graphs are illustrative and do not necessarily represent the results of the motivating example.
Concluding remarks

• Discuss CEA with stakeholders from scoping to final results

• Acknowledge the compromise between completeness and clarity.

• More work is needed on how to
  • Engage with the users of CEA from the outset.
  • Develop outputs that work for the audience.

Thank you!

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**Experience from NICE clinical guidelines**

Gabriel Rogers
Centre for Guidelines, NICE

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**NICE clinical guidelines**

**The decision-making context**

- All decision-making committees for NICE guidelines are experts in the topic but seldom in methods
  - Always at least 2 patient / carer members
- NICE guideline committees have an unusual dual role. They are:
  - The source of topic-specific knowledge as you build a model
  - The decision-makers who have to make sense of what you ultimately present
- Always concentrate on the things they know about
  - They are experts on the pathway and patients’ experience
- Find ways to help them inform and then validate the model
  - Time spent visualising structure and outputs is never wasted
- Aim to get 95% of the way through before mentioning costs and QALYs
  - If the topic experts validate the model’s simulation of the world they know, the cost–utility results are just the consequence
Understanding model dynamics
A case-study from spondyloarthritis (NG65)

Screening for axial spondyloarthritis

Model structure

- Initial brainstorm
- First draft
- Final structure
State occupancy graph

Current practice

Perfect screening

State occupancy animation

Inspiration: ‘A Day in the Life of Americans’ – flowingdata.com
State occupancy animation

Current practice

Perfect screening

NICE

State occupancy animation (2)

NICE

Year: 40.00
Age: 72.00

Year: 68.00
Age: 100.00
State occupancy graph

Current practice

Perfect screening

Understanding cost-effectiveness results
In defence of the cost–utility plane
Cost–utility plane

PSA results – case-study from type 2 diabetes

Conventional CEAC

Figure 15: Cost-effectiveness acceptability curve for initial therapy
**Pairwise PSA results**

CEACs and scatterplots for all pairwise combinations

<table>
<thead>
<tr>
<th></th>
<th>Metformin</th>
<th>Pioglitazone</th>
<th>Placebo</th>
<th>Repaglinide</th>
<th>Sitagliptin</th>
<th>Sulfonylurea</th>
<th>Vildagliptin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metformin</td>
<td>0.042</td>
<td>0.010</td>
<td>0.087</td>
<td>0.003</td>
<td>0.000</td>
<td>0.000</td>
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<tr>
<td>Pioglitazone</td>
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<td>0.247</td>
<td>0.195</td>
<td>0.133</td>
<td>0.990</td>
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<tr>
<td>Placebo</td>
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<td>0.716</td>
<td>0.745</td>
<td>0.554</td>
<td>0.913</td>
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<tr>
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<tr>
<td>Sitagliptin</td>
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<td>0.865</td>
<td>0.474</td>
<td>0.207</td>
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<tr>
<td>Sulfonylurea</td>
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<td>0.893</td>
<td>0.737</td>
<td>0.793</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vildagliptin</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Values estimate probability that [option in column] is cost effective compared with [option in row] (if QALYs are valued at £20K each)
Concluding remarks

• We do ourselves few favours by relying on MSOffice
  - I haven't presented anything that complicated, but it feels like I'm pushing PowerPoint to its limit
    » Slide 10 had 1,052 animation events
    » Slide 11 had 276 graphs
    » Embedded videos don't always work
      (I bet PowerPoint has failed at least once in the last 10 minutes)
  - We're using R more and more
    » Dedicated charting solutions?
      » Charticulator, Flourish, Tableau, etc.
      » Questions of expense and confidentiality
  - But we still end up pasting the output into a .ppt

• Animations are hard to put in documents!
• Some research on what objectively works would be extremely valuable
  - NICE guidelines might be a good testbed for that

NICE

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Rachel Houten (spondyloarthritis model)
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Will Stahl Timmins (ideas pinched)

Thank you
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Poll: When communicating a cost-effectiveness analysis to non-modellers, the essential tools are:

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