The economics of intensive care: the decision-maker’s perspective

Prof Rachel Elliott, Professor of Health Economics, Manchester Centre for Health Economics, School of Health Sciences, University of Manchester
A few questions

• Can ICU care be “uneconomic”?  
• Is ICU care an efficient use of NHS resources?  
• What does “efficient” mean?
How health economists view health care

**INPUTS**
- Resources:
  - Staff
  - Equipment
  - Drugs

**Process of health care**

**OUTPUTS**
- Options:
  1) Intervention A
  2) Intervention B
- Effectiveness
  - Quality adjusted life years
  - “Willingness to pay”

How health economists choose between different health care interventions

<table>
<thead>
<tr>
<th>Intervention A</th>
<th>Intervention B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs</td>
<td>Costs</td>
</tr>
<tr>
<td>Benefits</td>
<td>Benefits</td>
</tr>
</tbody>
</table>

Cost required to achieve each extra unit of outcome is calculated: *Incremental cost/effectiveness ratio (ICER)*

\[
ICER = \frac{\text{Costs}_{\text{Treatment A}} - \text{Costs}_{\text{Treatment B}}}{\text{QALYs}_{\text{Treatment A}} - \text{QALYs}_{\text{Treatment B}}}
\]
Costs of providing health care: the value of perspective

- Costs to social services
- Costs to primary care
- Costs to secondary care

Hospital: operating theatre, ICU, ward, surgeon, anaesthetist, physiotherapist, nurses, pharmacist, drugs, prosthesis, X-rays etc

GP visits, drugs

Domestic help, disability allowance

hospital

health service

Public sector

Manchester Centre for Health Economics

The University of Manchester
Comparing outcomes across different diseases EQ-5D (3L) www.euroqol.org

By placing a tick in one box in each group below, please indicate which statements best describe your own health state today.

Mobility
- I have no problems in walking about
- I have some problems in walking about
- I am confined to bed

Self-Care
- I have no problems with self-care
- I have some problems washing or dressing myself
- I am unable to wash or dress myself

Usual Activities (e.g. work, study, housework, family or leisure activities)
- I have no problems with performing my usual activities
- I have some problems with performing usual activities
- I am unable to perform my usual activities

Pain/Discomfort
- I have no pain or discomfort
- I have moderate pain or discomfort
- I have extreme pain or discomfort

Anxiety/Depression
- I am anxious or depressed
- I am moderately anxious or depressed
- I am extremely anxious or depressed

5 dimensions, 3 levels = 245 health states \((3^5)\)

Example values:
- Health state 11111 = 1.00
- Health state 12111 = 0.82
- Health state 11223 = 0.26

![Graph showing mean weighted health status](image)
## Generating ICERs using quality-adjusted life-years (QALYs)

<table>
<thead>
<tr>
<th></th>
<th>High frequency oscillatory ventilation for ARDS</th>
<th>Conventional ventilation for ARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total QALYs at 1 year per patient</td>
<td>0.302</td>
<td>0.246</td>
</tr>
<tr>
<td>NHS costs at 1 year per patient</td>
<td>44,550</td>
<td>40,130</td>
</tr>
<tr>
<td>Incremental cost effectiveness ratio</td>
<td>£78,261</td>
<td></td>
</tr>
</tbody>
</table>

Which therapy is cost effective? Which therapy should be chosen?

Using an incremental cost effectiveness ratio

- NW quadrant
- NE quadrant
- SW quadrant
- SE quadrant

- Increased cost
- Decreased cost
- Increased effect
- Decreased effect

- Dominated
- £2000
- λ
- 0.2 QALYs
- Dominant
But when is something cost effective?

- NW quadrant: Decreased effect, decreased cost
- NE quadrant: Increased cost, Increased effect
- SW quadrant: Decreased cost, Decreased effect
- SE quadrant: Increased effect, Increased cost

<table>
<thead>
<tr>
<th>Cost</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>£8000</td>
<td>0.2 QALYs</td>
</tr>
<tr>
<td>£4000</td>
<td></td>
</tr>
<tr>
<td>£20,000 per QALY</td>
<td></td>
</tr>
<tr>
<td>£30,000 per QALY</td>
<td></td>
</tr>
<tr>
<td>£40,000 per QALY</td>
<td></td>
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</tbody>
</table>
## Which treatment should be funded?

<table>
<thead>
<tr>
<th>Disease</th>
<th>Cost per extra QALY</th>
</tr>
</thead>
<tbody>
<tr>
<td>High frequency oscillatory ventilation in ARDS</td>
<td>£78260</td>
</tr>
<tr>
<td>Trastuzumab added to anastrazole for HER-2 +ve advanced breast Ca</td>
<td>£54300</td>
</tr>
<tr>
<td>Trastuzumab for HER-2 +ve early stage breast Ca</td>
<td>£18000</td>
</tr>
<tr>
<td>Alpha blockers vs watchful waiting for moderate BPH symptoms</td>
<td>£10720</td>
</tr>
<tr>
<td>Ticagrelor plus aspirin vs clopidogrel plus aspirin in angina</td>
<td>£7900</td>
</tr>
<tr>
<td>Simvastatin in ARDS</td>
<td>-£26875</td>
</tr>
</tbody>
</table>
A few more questions

- Is intensive care “uneconomic”?
- Is ICU care an efficient use of NHS resources?
- What does “efficient” mean?
- Is ICU care expensive?
- Is ICU care effective?
- Is ICU care cost-effective?

Compared with what?
What is the aim of an ICU intervention?

- ↓ ICU LOS? ↓ hospital LOS?
- ↓ ICU mortality? ↓ hospital mortality?
- ↓ Longer term mortality?

Maintenance/improvement of QoL in the short or long term?

Compared with what?
Ask the question differently

What is the most cost-effective way to:

• Sedate patients on mechanical ventilation?
• Manage sepsis-induced acute kidney injury?
• Prevent ventilator-associated pneumonia?
• Provide prolonged mechanical ventilation?

• A specific intervention with a specific comparator in a specific patient group
Answer the question differently

- Use meaningful comparators
- Don’t rely on top-down costs
  - Ward bed: £413 per night
  - Level 2 High Dependency bed: £857 per night
  - Level 3 Intensive Care bed: £1932 per night
- Use a longer follow-up period for costs and outcomes
- Measure meaningful patient outcomes

What is the right question?

Is intensive care "uneconomic"?

Is intervention A cost-effective compared with intervention B in patient group C for indication D?
THANK YOU

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Useful resources (1)


• Database of Instruments for Resource Use Measurement (http://www.dirum.org)


Useful resources (2)