More TAVIs in Greece.
Under certain conditions

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• QALY stands for **Quality Adjusted Life Year**.

• The QALY is commonly used in health economic evaluations as a means of quantifying the health effect of a medical intervention or a prevention program and ultimately to help payers allocate healthcare resources.
Calculation

• The QALY can be calculated using the following formula which assumes a utility value (quality of life) between 1 = perfect health and 0 = dead:

  \[ \text{Years of Life} \times \text{Utility Value} = \text{#QALYs} \]

• This means:
  
  • If a person lives in perfect health for one year, that person will have 1 QALY.
    
    \[ (1 \text{ Year of Life} \times 1 \text{ Utility Value} = 1 \text{ QALY}) \]
  
  • If a person lives in perfect health but only for half a year, that person will have 0.5 QALYs.
    
    \[ (0.5 \text{ Years of Life} \times 1 \text{ Utility Value} = 0.5 \text{ QALYs}) \]
  
  • Conversely, if a person lives for 1 year in a situation with 0.5 utility (half of perfect health), that person will also have 0.5 QALYs.
    
    \[ (1 \text{ Year of Life} \times 0.5 \text{ Utility Value} = 0.5 \text{ QALYs}) \]
  
• In cost-effectiveness studies (or: health economic evaluations) the QALY is used to quantify the effectiveness of, for instance, a new medicine versus the current one. In other words, the current standard of care is taken as the baseline, and the QALYs gained from the new (improved) intervention are counted in addition.
The QALY in health economics

• Example

• If a person lives for 3 years with a disease and the current standard of care for that disease means he/she lives with a utility level of 0.7, that person will have 2.1 QALYs.
  \((3 \text{ Years of Life} \times 0.7 \text{ Utility Value} = 2.1 \text{ QALYs})\)

• If that person takes a new medicine (Med A) whereby his/her utility level increases to 0.9, that person will now have 2.7 QALYS. Therefore, the benefit of the new medicine will be counted as 0.6 QALYS as this is the increase over the current standard of care.
  \((3 \text{ Years of Life} \times 0.2 \text{ Additional Utility Level} = 0.6 \text{ QALYs})\)

• Similarly, if a new medicine (Med B) prolongs the patient’s life by 2 years, at a utility level of 0.7, the new medicine will provide the person with 1.4 additional QALYs.
  \((2 \text{ Years of Additional Life} \times 0.7 \text{ Utility Value} = 1.4 \text{ QALYs})\)

The beauty of the QALY therefore is that it allows you to compare the health effect of a new cancer therapy with the health effect of a new anti-depressant (or with any other medical intervention).
Cost per QALY

EXAMPLE

• Patient receiving a new drug can expect an average life expectancy of 5 years, at a quality of life of 0.7. With a current standard therapy, life expectancy is just 1 year at a quality of life of 0.3. This is how the new drug’s QALY calculation is worked out:

  • The QALY of the new drug is $5 \times 0.7 = 3.5$
  • Now the QALY of standard therapy is $1 \times 0.3 = 0.3$
  • The QALY gained is $3.5 - 0.3 = 3.2$
  • The new drug leads to a life expectancy of 5 years and costs £5000/year, so the cost per patient will be £25 000. Let us suppose that standard therapy will cost £1000 for the 1 remaining year of life.
  • This leads to a calculation that the excess cost of the new drug is £24 000. Therefore, the cost per QALY of the new drug is £24 000 ÷ 3.2, which works out at £7500 per QALY.
The incremental cost-effectiveness ratio (ICER) is a statistic used in cost-effectiveness analysis to summarise the cost-effectiveness of a health care intervention. It is defined by the difference in cost between two possible interventions, divided by the difference in their effect.

The ICER can be estimated as: \( \frac{C_1 - C_0}{E_1 - E_0} \)

where \( C_1 \) and \( C_0 \) are the cost and effect in the intervention group and where \( E_1 \) and \( E_0 \) are the cost and effect in the control care group. Costs are usually described in monetary units, while effects can be measured in terms of health status or another outcome of interest.
How much should the health systems pay per QALY?

THE BRITISH STANDARDS

1st Threshold
• Since 2004, NICE has formally acknowledges a range; from £20,000 to £30,000 per Quality Adjusted Life Year (QALY).

2nd Threshold
• At 2009, the concept of a range for cost-effectiveness was reinforced with flexibility introduced for end of life treatments. The cost for such treatments was acknowledged at around £50,000 (and sometimes above that too).

3rd Threshold
• At 2016 HSTs (orphan drugs) that cost below £100,000 per QALY will be automatically funded, as long as they don’t, at the same time, have a budget impact of more than £20million in any of the first three financial years following launch. If they do, then they’ll be subject to a ‘commercial agreement.’
Cost per QALY for different interventions in UK

<table>
<thead>
<tr>
<th>Intervention</th>
<th>£/QALY at 1990 prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol testing and diet therapy (all adults aged 40–69)</td>
<td>220</td>
</tr>
<tr>
<td>Neurosurgical intervention for head injury</td>
<td>240</td>
</tr>
<tr>
<td>GP advice to stop smoking</td>
<td>270</td>
</tr>
<tr>
<td>Neurosurgical intervention for subarachnoid haemorrhage</td>
<td>490</td>
</tr>
<tr>
<td>Antihypertensive treatment to prevent stroke (ages 45–64)</td>
<td>940</td>
</tr>
<tr>
<td>Pacemaker implantation</td>
<td>1,100</td>
</tr>
<tr>
<td>Hip replacement</td>
<td>1,180</td>
</tr>
<tr>
<td>Valve replacement for aortic stenosis</td>
<td>1,410</td>
</tr>
<tr>
<td>Cholesterol testing and treatment (all adults aged 40–69)</td>
<td>1,480</td>
</tr>
<tr>
<td>Docetaxel (as opposed to paclitaxel) in treatment of recurrent metastatic breast cancer</td>
<td>1,890*</td>
</tr>
<tr>
<td>CABG (left main-vessel disease, severe angina)</td>
<td>2,090</td>
</tr>
<tr>
<td>Kidney transplantation</td>
<td>4,710</td>
</tr>
<tr>
<td>Breast cancer screening</td>
<td>5,780</td>
</tr>
<tr>
<td>Heart transplantation</td>
<td>7,840</td>
</tr>
<tr>
<td>Cholesterol testing and treatment incrementally (all adults aged 25–39)</td>
<td>14,150</td>
</tr>
<tr>
<td>Home haemodialysis</td>
<td>17,260</td>
</tr>
<tr>
<td>CABG (one-vessel disease, moderate angina)</td>
<td>18,830</td>
</tr>
<tr>
<td>Hospital haemodialysis</td>
<td>21,970</td>
</tr>
<tr>
<td>Erythropoietin treatment for anaemia in dialysis patients (assuming 10% reduction in mortality)</td>
<td>54,380</td>
</tr>
<tr>
<td>Addition of interferon-α2b to conventional treatment in newly diagnosed multiple myeloma</td>
<td>55,060*</td>
</tr>
<tr>
<td>Neurosurgical intervention for malignant intracranial tumours</td>
<td>107,780</td>
</tr>
<tr>
<td>Erythropoietin treatment for anaemia in dialysis patients (assuming no increase in survival)</td>
<td>126,290</td>
</tr>
</tbody>
</table>

* Adjusted to 1990 prices using Hospital and Community Health Service Pay and Prices Index, Unit Costs of Health and Social Care PPS3RU, 1996.

1,431 x 1.8 x 135.6 = 1,890. * Translated into 1990 price, as above.
Threshold for the cost effectiveness of interventions

*Focus only on cost–effectiveness and ignore other criteria for policy decisions, such as equity, ethics and political feasibility.*

- **1st threshold**
  Based on per capita gross domestic product (GDP).
  An intervention that, per disability-adjusted life-year (DALY) avoided, costs less than three times the national annual GDP per capita is considered cost–effective, whereas one that costs less than once the national annual GDP per capita is considered highly cost–effective.

- **2nd threshold**
  Been established by a retrospective analysis of existing practice.
  Eg. In the USA, the $50,000 per QALY threshold was based on an estimate of the cost–effectiveness of dialysis for chronic renal disease.

- **3rd threshold**
  Focuses on getting the largest health impact for the budget.
  Eg., all interventions considered are ranked into a so-called league table according to their ICERs.
  Start with the ones with the lowest ICER – and then move down the list, to interventions with successively higher ratios, until the budget is exhausted.
TAVI in Greece

• Discuss openly and decide which our societal ethics should be

• Estimate our own QUALYs
  • Even if the efficacy of TAVI is similar in different countries, cost is different (different cost of the valve, different cost of hospital care, different salaries etc)
  • Negotiate the cost of the valve

• Decide which of the previous thresholds we would like to implement. There are many with too many faults
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