Recommendations for Conducting Cost Effectiveness: Elements of the Reference Case

Ciaran S. Phibbs, Ph.D.

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PHS Recommendations

PHS Recommendations, JAMA

Summary


Poll

■ Have you ever conducted a cost-effectiveness analysis?

■ Answers

■ No

■ One study

■ More than one study
Why Do We Need Cost-Effectiveness Analysis?

- Health care interventions affect many different outcomes, in different ways.
- Need a common metric to allow comparisons across diverse diseases, conditions, and patient populations (e.g., compare the value of interventions for PTSD and coronary artery disease).
What is Cost-Effectiveness Analysis?

- Tool for making decisions, a common metric to compare diverse interventions
- Need to find both the costs of the intervention and assign values to outcomes
- Outcomes must be measured on a single scale; the standard is Quality Adjusted Life Years (QALYs)
Dominance Principles

- Only available tool if outcomes are not measured in QALYs
- An intervention is favored if it is more effective and costs less
- Extended dominance can be used when 3 or more treatments are being compared
Application of Dominance

<table>
<thead>
<tr>
<th>Change in Cost</th>
<th>Change in Effectiveness</th>
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<tbody>
<tr>
<td>+</td>
<td>Standard care preferred</td>
</tr>
<tr>
<td>-</td>
<td>?</td>
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For Standard care preferred, if there is an increase in cost and no change in effectiveness, then Standard care is preferred. If there is a decrease in cost and no change in effectiveness, then Standard care is preferred. If there is an increase in cost and an increase in effectiveness, then Intervention is preferred. If there is a decrease in cost and a decrease in effectiveness, then Intervention is preferred.
Example of Strong Dominance
(better outcomes and lower costs)

- Neonatal surfactant replacement therapy, 50% reduction on RDS mortality
- Reduced mortality increases costs
- But, surfactant reduced treatment intensity and LOS of those who would have survived anyway
- Net result, lower mortality and lower costs
- This is RARE!!!!!!!!
Incremental Cost-Effectiveness Ratio

Calculated when one intervention is more effective and more costly

\[
\frac{\text{Cost}_{\text{EXP}} - \text{Cost}_{\text{CONTROL}}}{\text{QALY}_{\text{EXP}} - \text{QALY}_{\text{CONTROL}}}
\]
Application of Critical Cost-Effectiveness Ratio

Standard care preferred

Intervention preferred

Change in Effectiveness

Change in Cost

CE Ratio=$50,000/QALY
What is the “Reference Case”

- A standard set of methods and assumptions to serve as a point of comparison across studies
Why Do We Need a Reference Case?

- There are many different assumptions, methods, and perspectives that can affect the outcomes of a cost-effectiveness analysis.

- Without standardization, it would not always be possible to compare the results across studies.

- Standardization greatly increases the policy value of C-E analysis.
PHS Recommendations: Summary

- Adopt perspective of society
- Measure all costs
  - direct cost of intervention
  - all health care expenditures
  - patient incurred cost
- Express outcomes as Quality-Adjusted Life Years (QALY)
PHS Recommendations: Summary (continued)

- All health effects in the denominator of the C/E ratio
- The numerator of the C/E ratio captures all changes in resource consumption associated with the intervention
- Discount costs and outcomes at 3% annual rate
PHS Recommendations: Summary (continued)

- Model when effects of intervention not fully realized during the study period
- Conduct sensitivity analysis
- Test statistical significance of cost-effectiveness findings
- Standards for reporting of C/E analyses.
Societal Perspective

- Adopt perspective of society
- Payer perspective may yield very different results; benefits or costs may occur to others, including:
  - Patient
  - Other payers
  - Other individuals (e.g., family members)
  - Employers
Budget Impact Analysis

- For VA studies, may also consider doing a Budget Impact Analysis, in addition to a CEA
- Provides VA managers with information about the time line of the costs and benefits; important for budget planning.
- May help speed adoption/implementation
- Will be covered in a later lecture
Denominator vs. Numerator

- All health effects in the denominator, expressed in QALYs
- The numerator of the C/E ratio captures all changes in resource consumption associated with the intervention
- There are gray areas, that could be placed in either
- Avoid double counting.
Poll: Do these belong in the numerator of the ICER? Yes/no answers

- Health care costs associated with the intervention
- Length of stay
- Costs of patient time
- The value of lost productivity
Components Belonging in the Numerator of the C/E Ratio

- Costs of health care services
- Costs of patient time ***
- Costs of care-giving (paid and unpaid)
- Other costs (e.g. travel time)
- Costs measured in constant dollars
- Use wage rates to value time costs
Components Belonging in the Numerator of the C/E Ratio (cont)

- Non-health care costs
  - E.g., education, criminal justice, environment
- Costs imposed on others
  - E.g., employers, rest of society
- Do **NOT** include lost productivity; would result in double counting
Components Belonging in the Numerator of the C/E Ratio (cont)

- Health care costs that result from living longer
  - Include costs for intervention-related diseases within original expected life span, and for added years of life
  - Include costs of treating adverse events
  - Exclude unrelated health care costs and non-health care costs within original expected life span
  - Exclude non-health care costs for added years of life
  - No recommendation for unrelated health care costs for added years of life
Components Belonging in the Denominator of the C/E Ratio

- Measure health effectiveness in QALYs
- QALYS should be preference based
- Weights based on community preferences
- Use a generic health-state classification, as opposed to disease-specific
- Use age- and sex-specific HRQL to value gains and loses
Modeling May Be Necessary

- Most clinical trials don’t cover full time horizon of the potential effects
- It is allowable to use modeling and/or data from other sources to complete the analysis
- Use of expert judgment should be avoided, if possible
Discounting

- Real discount rate of 3%
- All costs should be adjusted for inflation
- Both costs and health outcomes should be discounted
- Conduct sensitivity analysis of the discount rate.
Sensitivity Analysis

- Conduct sensitivity analysis
- 1-way sensitivity analysis for key assumptions
- 1-way sensitivity analysis under-state overall uncertainty; should also conduct multivariate sensitivity analysis
Bootstrap Determination of Cost-Effectiveness Confidence Region

- Sample n observations with replacement
- Find incremental cost-effectiveness ratio
- Repeat 1,000 times
- Find percentage of replicates that are not “cost-effective”
  - this is the p-value
  - p-value may vary by threshold
Distribution of Bootstrapped Cost-Effectiveness Ratios
Sensitivity Analysis: How Does Significance Vary by CE Threshold?

![Graph showing the relationship between CE Threshold and P Value. The graph indicates a decrease in P Value as the CE Threshold increases.](image-url)
Standards for Reporting Results

- List of information that needs to be included to allow comparison across studies
- This is very important from a policy perspective
Alternative Method

- Just to mention, alternative to reporting ICER, net benefit regression.
- HERC Cyber-Seminar, Hoch 8/23/2006
Other References

- **Methods for the Economic Evaluation of Health Care Programmes (Paperback)**


Other References

- ISPOR Task Force for CEA in clinical trials, see:
Next HERC Cyber Course

September 26, 2012
Estimating the Cost of Intervention
Todd Wagner, Ph.D.