Value of Information and Research Prioritization

Workshop on Methods for Setting Research Priorities
March 6th, 2012

Overview

- Why is value of information (VOI) of interest to PCORI?
- VOI basics
- Challenges and opportunities in using VOI for research prioritization
  - Legislative
  - Methodological
  - Comparative
- Areas for additional research

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Why is value of information (VOI) of interest to PCORI?

- Limited research funding but unlimited research questions
- Selecting topics for PCOR is politically charged
  - If done right, PCOR may determine that some current or proposed medical practices are of limited value
    - Why research decision A instead of decision B?
    - Any decision of importance with be scrutinized
- VOI offers a quantifiable and replicable methodology that can be used to prioritize topic selection
  - We funded research about A because it is the intervention or treatment with the greatest potential economic impact.

VOI Background

- For any decision the alternative with the greatest net benefit (NB) is considered the most cost-effective

- Net Benefit (NB) is estimated as $B_j \cdot \lambda - C_j$

  B is the quantity of the benefit, λ is the willingness-to-pay per incremental unit of B, C is costs, and j references the alternatives

- VOI estimates measure the expected difference of the NB when a decision is made with perfect information minus the expected NB when made with uncertain information
  - Expected value of perfect information (EVPI)
  - Expected value of parameter perfect information (EVPPI)

VOI Background (cont.)

- VOI information is a function of;
  - The size of the benefits and costs: Number of people and the effects and costs per person
  - Uncertain measurements of benefits and costs
  - Willingness to pay for benefits (λ)

- Additional research can diminish uncertainty
  - Common drivers of uncertainty: Effectiveness, implementation costs, utility weights

- The greater the dollar value of eliminating uncertainty, the greater need for research

- Therefore, value of information could be a useful tool to quantify and rank research priorities

Challenges to Using VOI for Research Prioritization

- Legislative directives limiting the use of Quality Adjusted Life Years (QALYs)
    - Legislative language
    - QALY alternatives

- Computational challenges estimating VOI
    - Scaling VOI for research prioritization purposes

- Standardization of VOI estimates
    - Create apples to apples comparisons for research prioritization

Legislative directives limiting the use of Quality Adjusted Life Years (QALYs)

Problem: Use of QALYs to allocate resources is controversial and may be prohibited by legislation.

- Can PCORI legally use QALYs to set research priorities?

- Would alternatives to QALYs slow or distort research prioritization?

Can PCORI use QALYs to set research priorities?

PUBLIC LAW 111-148, 124 STAT. 727, SEC 1182(e)

The Patient-Centered Outcomes Research Institute established under section 1181(b)(1) shall not develop or employ a dollars per-quality adjusted life year (or similar measure that discounts the value of a life because of an individual's disability) *as a threshold to establish what type of health care is cost effective or recommended*. The Secretary shall not utilize such an adjusted life year (or such a similar measure) *as a threshold to determine coverage, reimbursement, or incentive programs* under title XVIII. [emphasis added]

Would alternatives to QALYs slow or distort research prioritization?

- Recall $NB_j = \boldsymbol{B}_j \cdot \lambda - C_j$

  – VOI measures the monetary value of reducing the uncertainty of NB_j

  – **B** = the measure of benefit

- Benefits are usually measured in QALYs but do not need to be

- Any measure can be used for B provided that

  – Allows for comparisons across conditions

  – Has a meaningful scale (semi-meaningful might be fine too)

Would alternatives to QALYs slow or distort research prioritization? Alternatives

Measure	Definition	Advantages	Disadvantages	Notes
QALY	Value of 1 year lived in health state in units of years lived in perfect health	- Enables cross-condition comparisons - Semi-Meaningful scale	- Negative framing, difficult to communicate, unpopular - Sensitive to measurement error - Violates welfare/behavioral economic theory	- Much of existing VOI methods developed with QALYs as the basis
Willingness to Pay	Monetary value to avert one unit of a health condition (with units variously defined)	- Enables cross-condition comparisons - Meaningful scale - Intuitive to a wide lay audience	- Lesser theoretical issues - Time-consuming to measure for all conditions - Sensitive to measurement methodology	- Special case of contingent valuation - Global Burden of Disease study possible candidate
Multi-attribute Health Indexes	Generic, descriptive measure of health summarized in a single index measure.	- Enables cross-condition comparisons - Ordered scale - Existing population normed evidence - Simple algorithms facilitate decision making	- Measurement scales have no arithmetic meaning (i.e. may fail the meaningful scale test) - May be difficult to communicate	- Possible example is the EQ-5D - PCORI could develop its own index to fit its specific policy context

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Computational challenges estimating VOI

Problem: Developing decision analytic models is time consuming

- Impedes research prioritization, which requires the speedy evaluation of a large number of research topics
- Alternative estimation procedures if refined and standardized could allow PCORI to evaluate the EVPI or EVPPI of a large number of decisions quickly
- Primary Challenges
    - Balancing speed of implementation against
        – Transparency
        – Risk of major errors (precision, reliability)
        – Applicability

Computational challenges estimating VOI

Estimation Options and Their Tradeoffs

Method	Speed	Transparency	Risk of major errors	Applicability
Non-parametric estimation of EVPPI	Slow	Low	Very Low	Wide
Non-parametric estimation of EVPI	Slow	Low	Low	Wide
Parametric estimation of EVPI	Fast	High	High	Limited
Minimal/No modeling estimation of EVPI or EVPPI	Moderate	High	Low	Not applicable to chronic conditions
Abbreviated models/Model decomposition	Moderate to slow	Moderate	Moderate	Wide
Enveloping based on burden of disease and plausible treatment effect	Fast	High	Moderate	Wide

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Standardization of VOI estimates

Problem: Population VOI estimates depend on choices about a number of factors. Unstandardized choices about these factors complicated comparisons, which complicates research prioritization.

$$pEVI = \sum_t \beta^t \cdot Durability_t \cdot Implementation_t \cdot Incidence_t \cdot Population_t \cdot EVI$$

Where $pEVI$ population EVPI or EVPPI, *t* is the year, EVI is the per person expected value of information.

- ## Discount rate (β)
  - Preference for benefits today versus benefits in the future
- ## Durability
  - Waning usefulness of research findings over time

Standardization of VOI estimates (cont.)

- Implementation
  - The delay in uptake of a new intervention or treatment
- Incidence
  - Future cases of disease that will be affected by a decision
- Population
  - The size of the group to which the benefits of research will accrue
- Time horizon
  - The number of future years incorporated into the model

Future directions and pilot initiatives

What questions should PCORI resolve before implementing VOI for research prioritization?

- The use of QALYs
  - PCORI probably can use QALYs for research prioritization purposes, but does it need and want to?

- The estimation methodology
  - Time constraints
  - Scalability
  - Accuracy and transparency
  - Centralized or distributed estimation

- Standards for result standardization and presentation
  - What are the decision rules to guide the construction of population level results?

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Thank You!

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