From theory to practice: making value assessments more flexible and comprehensive

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Conventional cost-effectiveness analysis

Net monetary benefit = \text{Willingness to pay} \times \text{Effectiveness} - \text{Costs}

Can account for opportunity cost of new treatment
Additional considerations beyond costs and health gains

- QALYs gained
- Net costs
- Productivity
- Adherence-improving factors
- Reduction in uncertainty
- Fear of contagion
- Insurance value
- Severity of disease
- Value of hope
- Real option-value
- Scientific spillovers
- Equity

Green circles: core elements of value
Light blue circles: common but inconsistently used elements of value
Dark blue circles: potential novel elements of value
Blue line: value element in traditional payer perspective
Red line: value element also included in societal perspective
From theory to practice

- Can we incorporate these additional considerations into the standard CEA framework?
- Or are other techniques such a multi-criteria decision-analysis (MCDA) needed?
- Do these additional considerations have important impacts on estimates of value?
Value of hope

Treatment A: Mean survival of 10 months

Distribution of survival times

Survival curve

AUC = 10 months

Treatment B: Mean survival of 10 months

Survival is less variable

Survival curve

AUC = 10 months

The value of hope in NSCLC

Source: Analysis using the IVI-NSCLC model
Can the value of hope be incorporated into conventional cost-effectiveness analysis?

- Concept of risk can be introduced with expected utility theory
  \[
  \int u(x)f_2(x)dx = \int u(x)f_1(x + \alpha)dx
  \]
  The value of hope is determined by \(\alpha\), which is the extra survival needed to make Tx 1 have the same expected utility as Tx 2

- What is the appropriate utility function? And even if we know the utility function, how do we parameterize it?
  \[u(x) = x^\eta\]
  \(\eta\) is a measure of risk that determines whether an individual prefers more variable or more certain survival outcomes. But what is it's value? Does it vary across patients? Across diseases?
Impact of value of hope on estimates of value in NSCLC (afatinib sequence relative to gefitinib sequence)
**Conventional CEA:** How much would sick people pay for technology to treat their illness?

**Insurance value:** What additional premiums or taxes would healthy people pay for technology?
Insurance value as “value to the healthy”

• To a healthy person, sickness is a future risk

• A health technology can help “insure” against the risk associated with future sickness
  - Reduces physical risk
  - Converts uninsurable physical risk into an insurable financial risk

• Lakdawalla et al. (2017) approach fits into conventional CEA framework but in a simplified one-period setting
  - Difficult to reconcile with longitudinal models of disease progression

Insurance value in rheumatoid arthritis
What about MCDA?

• In some cases it may be difficult to incorporate additional value considerations into conventional CEA

- MCDA provides a transparent manner to weight these “attributes” and is a natural complement to CEA

• But….
  - Opportunity cost is not typically incorporated into MCDA
  - Results are sensitive to weighting implying that care must be given to the techniques used to weight attributes and define their scale
Conclusion

• Conventional CEA is a well-tested framework for estimating the value of health technologies and making funding decisions.

• Considering factors beyond health gains and costs in CEA is intriguing but requires more research.

• Likewise, while MCDA can complement CEA, more research is needed to address some of the existing concerns.