HOW COST-EFFECTIVENESS ANALYSIS HELPS IN HEALTH CARE DECISION-MAKING

Economic evaluation is important in choosing the most effective from among multiple alternatives.

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How can we determine if one health care treatment is better than another? How are limited health care resources best allocated toward a particular program or intervention?

Ideally, these decisions would be made based on comparing the potential health benefits, harms, and costs of each alternative. Doctors, patients, hospitals, health systems, third party payors, and other health care decision-makers all face challenges in gathering the information needed for optimal health care decision-making.

When it comes to costs, when hard choices have to be made and limited resources are available, things can be confusing. There is a substantial body of literature on economic evaluation in health care, including many studies by health economists, clinical researchers, and multidisciplinary teams. Unfortunately, these studies vary in methodology and quality.

An understanding of *economic evaluation* is fundamental to knowing how choices should be made. Economic evaluation is a process that provides a systematic way to identify relevant alternatives and minimizes the chance of an important option being missed. It allows evaluation from differing viewpoints (eg, institution, patient, or government).

Economic evaluation also provides a way of measuring what's known as *opportunity cost*: that is, an estimate of the true cost of an intervention or program, beyond just a monetary line item in a budget—a valuation that takes into account the value of benefits achievable in other programs that would be passed over by committing resources to the chosen program.[1]

AT A GLANCE

- An understanding of economic evaluation is fundamental to knowing how choices should be made.
- Cost-effectiveness analysis is one of several types of economic evaluation that can be useful in choosing among alternatives for health care delivery.
- The data from CEA can be used in multiple ways: during doctor-patient shared clinical decision making, in the development of health policy, or in the design of health systems for care delivery.

TYPES OF ECONOMIC EVALUATION

Let's review some fundamentals for your critical thinking tool kit for understanding health care costs evaluation. Economic evaluation involves the costs and consequences—that is, the inputs and outputs—of activities, and suggests choices based on a set of criteria.

There are four main types of studies involving economic evaluation: *cost analysis*, *cost-utility analysis* (CUA), *cost-benefit analysis* (CBA), and *cost-effectiveness analysis* (CEA).[1] Each is a way of comparing the benefits of a health care intervention or program with its costs, but each differs in the way that the consequences (ie, outcomes) of the intervention are measured and valued.

Briefly, cost analysis deals only with costs in monetary units and does not include an analysis of consequences. CUA and CBA both can involve single or multiple effects, but they differ in how these effects are valued. CUA uses health state preference scores (also known as utility scores), such as healthy years, typically measured in *quality-adjusted life years* (QALYs; stay tuned for more on these) to value the consequences of an intervention. By contrast, CBA uses a monetary value to weigh outcomes.

In general terms, the *utility* in CUA refers to patient preferences for a particular set of health outcomes or state of health: for example, how many years of life one would be willing to give up for a year of perfect eye health. (The work by Drummond et al[1] cited above contains a much more in-depth discussion of this.)

CEA differs from these other types of analysis in that it looks at only one consequence of an intervention—a single effect or outcome that is common to both alternatives in question—and assesses how that effect is achieved to differing degrees by the alternatives.

CEA involves what is considered a "natural" effect of an intervention, such as the number of years of life gained, proper diagnoses made, or disability days saved. Examples of other effectiveness measures commonly seen in the literature include millimeters of mercury (mm Hg) of blood pressure reduction, percentage of serum cholesterol change, and number of episode-free days. In CEA, no attempt is made to value the outcome; it is assumed that the outcome of interest is desirable.

In summary, all these types of evaluations share similarities in identifying costs and subsequent money-related outcomes; they differ in the nature of outcomes and consequences being examined. CEA looks specifically at an intervention and tells how much health benefit we can get for the money.

COMPONENTS OF CEA

The most commonly used measure of benefit in CEA is the QALY. The QALY is a metric that captures gains from reduced morbidity (quality gains) and reduced mortality (quantity gains) and combines them into a single measure. A key rationale for using QALYs in the development of health policies is to assist in comparing interventions and finding the alternative—for example, intervention A versus its alternative intervention B—that provides the greatest value for the money. This is accomplished through comparison of *incremental cost-effectiveness ratios* (ICERs), defined as the difference in cost between two possible interventions, divided by the difference in their effect.

An ICER is a ratio of incremental cost (cost of A minus cost of B) and incremental effect (effectiveness of A minus effectiveness of B). Incremental cost, in the numerator, represents additional resources needed due to using intervention A instead of B. The incremental effect, in the denominator, represents additional health outcomes, such as additional QALYs gained through use of A instead of B.

Assuming intervention A is more costly and more effective than B, the resulting low ICER value indicates that A provides improvement in health at a small extra cost per unit of health, and therefore dominates B as better value for the money.

For an intervention to be considered cost-effective, a *cost-per-QALY threshold value* must also be considered. As examples, one could reference a threshold value of $50,000 to $150,000 per QALY gained, or even an individual willingness-to-pay value of twice one's annual salary.[3]

A critical component of CEA is the use of *effectiveness data*. These are high quality data on the effectiveness of the intervention or interventions under consideration. Of note, CEAs are more often criticized for the quality of the effectiveness data they have used than for the economics of their analyses.[1]

GLOSSARY OF TERMS

Economic evaluation: a process that provides a systematic way to identify relevant alternatives and minimize the chance of an important option being missed. It allows evaluation from differing viewpoints (eg, institution, patient, government) and provides a way of measuring opportunity cost.

Cost analysis: cost analysis deals only with costs in monetary units and does not include an analysis of consequences.

Cost-benefit analysis (CBA): can involve single or multiple effects; uses a monetary value to weigh outcomes.

Cost-effectiveness analysis (CEA): looks at only one consequence of an intervention–a single effect or outcome that is common to both alternatives in question–and assesses how that effect is achieved to differing degrees by the alternatives.

Cost-utility analysis (CUA): can involve single or multiple effects; uses health state preference scores, such as healthy years.

Effectiveness data: high quality data on the effectiveness of the intervention or interventions under consideration.

Incremental cost-effectiveness ratios (ICERs): the difference in cost between two possible interventions, divided by the difference in their effect. An ICER is a ratio of incremental cost (cost of A minus cost of B) and incremental effect (effectiveness of A minus effectiveness of B).

Incremental cost: (in the numerator of an ICER) represents additional resources needed due to using intervention A instead of B.

Incremental effect: (in the denominator of an ICER) represents additional health outcomes, such as additional QALYs gained through use of A instead of B.

QALY (quality-adjusted life years): a metric that captures gains from reduced morbidity (quality gains) and reduced mortality (quantity gains) and combines them into a single measure.

The health care literature serves as a major source of effectiveness data. There are three things that affect the use of these data in CEAs: quality, relevance, and comprehensiveness.[1] Grading evidence and understanding its methodological features are key to appraising the overall quality of effectiveness data. (For more information on quality evidence and grading, see the American Optometric Association's evidence-based process for clinical practice guidelines development, available at bit.ly/AOA919.)

Additional recommendations for CEA include conducting detailed discussion of limitations and findings from both societal (all health effects and costs) and heath care sector (pay-or-incurred costs, benefits, and harms) perspectives, and creating an impact inventory and reporting checklists.[2]

CONSIDERATIONS IN EVALUATING A CEA

It's valuable to know how alternatives, costs, and benefits are assessed, especially when examining resource allocation. Some questions to ponder when reviewing studies or proposals include the following:

- What are the alternatives being considered?
- What is the range of costs, and what do they include?
- What is known about the effectiveness of the proposed interventions?
- Would costs or benefits be different on a smaller or larger scale?
- What are the main sources of uncertainty surrounding the outcomes? Are they reliable?

Finally, it's relevant to know how this information is to be used. A CEA does not "make" a final decision for any one stakeholder. Recall that, just as other quality health care–related evidence is used by people to assist in making decisions, CEA provides related data for our use in making important clinical decisions that can improve health. This is true whether these data are used during doctor-patient shared clinical decision making, in the development of health policy, or in the design of health systems for care delivery. And just as technology serves as a data-generating tool for decision-making, so does CEA.

Ultimately we, as members of the health care arena, make decisions on how health is valued and how much we collectively are willing to spend to improve it. CEA is one of the tools available to help us make those decisions. ■

1. Drummond MF, Schulpher MJ, Torrance GW, O'Brien BJ, Stoddart GL. *Methods for the Economic Evaluation of Health Care Programmes*. 3rd ed. Oxford, United Kingdom: Oxford University Press; 2005.
2. Sanders GD, Neumann PJ, Basu A. et al. Recommendations for conduct, methodological practice, and reporting of cost-effectiveness analyses: Second Panel on Cost-effectiveness in Health and Medicine. *JAMA*. 2016;316(10):1093-1103.
3. Institute for Clinical and Economic Review. ICER Value Framework. January 2018. https://icer-review.org/wp-content/uploads/2018/05/ICER-value-framework-v1-21-18.pdf. Accessed August 5, 2019.

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