Health Services Research and Development Service
QUERI Economic Analysis Guidelines

December, 2009

The Quality Enhancement Research Initiative (QUERI) is developing and testing interventions to improve the quality of VA care. Economic analysis can provide important information needed to evaluate quality improvement efforts. Not all QUERI projects will benefit equally from an economic analysis. An economic analysis may be more appropriate if the intervention is costly, has large effects on health care utilization, or is nearly ready to be replicated on a wide-scale.

A QUERI economic analysis may be a study of the relationship between quality and production efficiency, the determination of the cost of an intervention, an evaluation of the impact of an intervention on total health care costs, or a cost-effectiveness analysis. A QUERI economic analysis measures costs and often outcomes, and places this information in context. A standard method of cost-effectiveness analysis, described below, allows the cost-effectiveness of new health care interventions to be compared. The standard method may not provide all of the information needed by VA decision makers, however.

Types of analysis

There are two common forms of QUERI cost analysis, a cost-effectiveness analysis (CEA) and a business impact analysis (BIA), also called a business case analysis. They are complementary analyses which employ different designs and answer distinct questions. A cost-effectiveness analysis calculates the dollars that must be spent to gain an additional quality-adjusted life year (QALY) from the intervention. (In QUERI, the term "intervention" would include the implementation effort.) A budget impact analysis reports the cost to VA of a proposed intervention over the first few years. Below we describe CEA, BIA, and cost-effectiveness analysis without QALYs.

1. Cost-effectiveness analysis (CEA)

In the 1990s a U.S. Public Health Service task force defined standard methods for conducting a cost-effectiveness. The task force used the term 'reference case' to refer to standard cost-effectiveness analysis, also called cost-utility analysis, that analyzes the costs and outcomes of an intervention relative to a comparator. The result is expressed as a ratio called the incremental cost-effectiveness ratio (ICER). The numerator of the ICER is the difference in cost between people in the intervention arm and those in the comparator arm. The denominator is the difference in outcomes, expressed as quality-adjusted life years (QALYs).

An alternative to the ICER approach is to estimate the net benefit. Here an arbitrary dollar value is assigned to each QALY gained, such as $75,000 or $100,000 per QALY. The net benefit is calculated as the value of QALYs gained from the intervention (relative to the comparator) minus the cost of the intervention. A CEA for an implementation project would also count the costs of the implementation effort.

The standard CEA uses the perspective of society as a whole. As a result, it considers not only the cost of an intervention and its effect on subsequent health care utilization, but also costs incurred by other health care systems, and by patients and their families. Standard CEA considers average costs, not incremental costs. The standard CEA thus includes fixed costs, facility overhead, and depreciation.

Standard CEA considers a lifetime perspective. Long-term costs and benefits are included. These are discounted to reflect the decline in economic value that results from delay.

In a standard CEA, outcomes are translated into a specific measure of benefit, the Quality Adjusted Life Year (QALY). Typically new interventions are more effective and more expensive than usual care. When this occurs, an incremental cost-effectiveness ratio is calculated. This provides information about whether the benefits of the intervention justify the costs. QALYs are treated as equal, regardless of the patient characteristics. Interventions are judged equivalently, regardless of their relation to the current standard of care.

Estimating costs and benefits through a lifetime horizon usually occurs through mathematical modeling. Two related approaches are Markov models and discrete event models, with Markov modeling being the more common. Simple models can be done using a spreadsheet. More extensive models typically employ specialized software applications.

CEA should include sensitivity analyses. There is uncertainty with respect to information and assumptions in cost-effectiveness analyses. Sensitivity analysis is an important way in which to represent the effect of this uncertainty on study findings.

2. Budget impact analysis (BIA)

A budget impact analysis (business case analysis) considers costs from the perspective of VA, and so the only costs counted are those that accrue to VA. When a typical short time horizon is chosen, such as 1-3 years, BIA often does not require discounting of future costs or benefits and only variable costs are taken into account.

A recent task force on BIA noted that longer time horizons are possible; the best guide is to use the time horizon of greatest value to the managers who will use the results. If a long-run horizon is chosen then discounting could apply and fixed costs would be taken into account. For more information on the task force and its recommendations, see section 3.c under Training, below.

A BIA does not report clinical outcomes. It must take into account any impact of the intervention (including the implementation effort) on VA costs, which may include changes in the cost of treatment, the number and characteristics of treated patients, and VA enrollment.

BIA has a comparator, usually the current state of care. Thus VA costs are tallied under the usual care scenario and under the alternative scenario in study. The difference between those total costs is the incremental cost to VA over the time horizon specified. Like CEA, every BIA should include a sensitivity analysis that varies its parameters through a range of reasonable values.

The economic analysis will be more applicable to managerial decisions if it considers how much funding is needed to adopt the intervention given the current staffing and configuration of equipment and facility at sites where adoption is being considered. For example, an intervention that reduces hospital stays may save little if the effect is too small to allow reassignment of ward staff. Space and staffing constraints may make it unexpectedly expensive to adopt a new program. Unused capacity may make a program more economically feasible. Such considerations are often specific to a particular facility, making it difficult to generalize from a small sample of sites. The analyst may wish to consider whether the analysis would change if VA were to buy or make new services required by the intervention.

3. Cost-effectiveness analysis without QALYs

Economic analyses can be conducted using clinical outcome units. This leads to cost-effectiveness phrased in clinical terms such as "dollars per heart attack avoided." Determining the budget impact of an intervention (whether clinical or implementation) or its overall cost-effectiveness requires an assessment of both cost and the success of the intervention. This type of analysis can be seen as a component of both BIA and CEA, and it may be reported along with them depending on the audience.

This type of study is less useful to decision makers because the cost-effectiveness of interventions addressing different diseases cannot be compared. QALYs were developed to provide an outcome measure that would be consistent across all diseases and treatments. Moreover there is no widely accepted standard method for stand-alone cost-outcomes analyses. As a result one sees a variety of time horizons and perspectives used, which further erodes their comparability.

Cost

A variety of methods is employed to determine intervention costs. Microcost methods are usually employed to estimate the cost of providing the clinical intervention and associated implementation effort under study. When the intervention changes the quantity but not the character of health services, standard unit costs or average cost methods may be used to estimate cost. In a few cases reasonable estimates may be available from published studies, but a cost analysis specific to the intervention and health care system under study will have more credibility.

Microcost methods are also used to determine the cost of the implementation effort. There are several issues to consider: How long will the implementation program last? If it were implemented more broadly in the VA system, would the same program be used? How might implementation costs vary by station?

The analysis should determine what types of care will be affected by the intervention. For example, if the intervention were adopted, would it lead to attract new patients to enroll, or encourage existing patients to obtain more of their care through VA? If so then the analysis should consider how these will affect cost. Note that from the societal perspective of a cost-effectiveness analysis there may be little net impact on cost if people switch from one health care

system to another. But from VA's perspective, as in a budget impact (business case) analysis, that change will matter.

Presentation issues

The report of an economic evaluation must document data sources, methods, and assumptions. It should describe when costs are incurred and when benefits are realized. It should note which assumptions were varied in the sensitivity analysis and over what range.

Due to variation in costs across VA stations, researchers sometimes develop simple spreadsheet programs for use by VA managers. These programs enable a manager to enter local details about costs and possibly other parameters as well. The program then shows the budget impact of an intervention using those parameters.

Training

This section describes training resources for VA employees. Non-VA researchers will not have access to some items.

1. Archived cyber-seminars

VA researchers present many cyber-seminars on topics related to economic analysis within QUERI. Here is a sample of recent topics:

- Patient preferences and utilities
- Creating a decision model
- Analysis alongside a clinical trial
- Budget impact analysis
- Assessing outpatient VA health care use
- Systems thinking for implementation

Future and past cyber-seminars, including archived recordings, may be found on the HSR&D web site at *http://www.hsrd.research.va.gov for_researchers/cyber_seminars/catalog.cfm*.

2. Resource centers

HSR&D funds four resource centers. HERC documents economics data and provides publications and training on economic methods. Its web site is www.herc.research.va.gov. (Visit the corresponding intranet web site to download most documents.) VIREC documents most other VA datasets, including many within the Decision Support System, and presents cyber-seminars on informatics topics. The VIREC web site is at www.virec.research.va.gov. CIDER coordinates the HSR&D cyber-seminar series and manages web sites for HSR&D headquarters in Washington. The CIDER web site is at www.cider.research.va.gov. CIPRS assists researchers

in developing quality-improvement research within the QUERI program. Its web site is at http://www.queri.research.va.gov/ciprs/default.cfm.

3. Journal articles and book chapters

a. Cost and the stages of implementation

McIntosh E. Economic evaluation of guidelines implementation strategies. In: Changing professional practice: theory and practice of clinical guidelines implementation. Thorson T, Mäkelä M, eds. Copenhagen: Danish Institute for Health Services Research and Development, 1999. DSI Report no. 99.05. URL: http://www.dsi.dk/projects/cpp/monograph/DSI9905.pdf (accessed 13 Nov. 2009).

Severens JL. Value for money of changing healthcare services? Economic evaluation of quality improvement. *Qual Saf Health Care* 2003;12(5):366-371.

Vale L, Thomas R, MacLennan G, Grimshaw J. Systematic review of economic evaluations and cost analyses of guideline implementation strategies. *Eur J Health Econ* 2007;8(2):111-121.

b. Cost-effectiveness analysis (without reference to implementation)

Drummond MF, Jefferson TO. Guidelines for authors and peer reviewers of economic submissions to the British Medical Journal. *BMJ* 1996;313:275-283.

Gold MR, Siegel JE, Russell LB, Weinstein MC. Cost-effectiveness in health and medicine. New York: Oxford University Press, 1996.

The following three papers summarize contents of the Gold et al. book cited above.

Russell LB, Gold MR, Siegel JE, Daneils N, Weinstein MC. The role of cost-effectiveness analysis inhealth and medicine. Panel on Cost-Effectiveness in Health and Medicine. *JAMA* 1996;276(14):1172-1177.

Siegel JE, Weinstein MC, Russell LB, Gold MR. Recommendations for reporting cost-effectiveness analyses. Panel on Cost-Effectiveness in Health and Medicine. *JAMA* 1996;276(16):1339-1341.

Weinstein MC, Siegel JE, Gold MR, Kamlet MS, Russell LB. Recommendations of the Panel on Cost-Effectiveness in Health and Medicine. *JAMA* 1996;276(15):1253-1258.

c. Budget impact analysis

Luck J, Parkerton P, Hagigi F. What is the business case for improving care for patients with complex conditions? *J Gen Int Med* 2007;22(Suppl 3):396-402.

Mauskopf JA, Sullivan SD, Annemans L, et al. Principle of good practice for budget impact analysis: report of the ISPOR Task Force on Good Research Practices – Budget Impact Analysis. *Value in Health* 2007;10(5):336-347.

Nicholson S, Pauly MV, Polsky D, et al. How to present the business case for healthcare quality to employers. *Appl Health Econ Health Policy* 2005;4(4):209-218.

d. Sensitivity analysis

Briggs A, Goeree R, Blackhouse G, O' Brien B. Probabilistic analysis of cost-effectiveness models: choosing between treatment strategies for gastroesophageal reflux disease. *Medical Decision Making* 2002;4:290–308.

Briggs A, Schulpher M, Claxton K. Decision modelling for health economic evaluation. Oxford: Oxford University Press, 2006.

Doubilet P, Begg CB, Weinstein MC, Braun P, McNeil BJ. Probabilistic sensitivity analysis using Monte Carlo simulation. A practical approach. *Medical Decision Making* 1985;5(2):157-177.