



A practical approach to evidence-based dentistry: IX

How to appraise and use an article about economic analysis

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NINTH IN A SERIES

In the previous 8 articles in this series, we introduced the process of evidence-based dentistry,¹ how to search for evidence to inform clinical practice,² and how to use a research report to inform clinical decisions regarding questions of therapy,³ harm,⁴ diagnosis,⁵ systematic reviews,⁶ clinical practice guidelines,⁷ and qualitative research.⁸



Supplemental material is available online.

In this article, we will explain how to use an economic analysis to inform clinical and policy decision making in dentistry. We will introduce and describe the basic concepts needed to understand economic analysis, and we will explain how to critically appraise such studies.

BOX 1

Clinical scenario.

One of your patients, a first-year college student, came to ask for your opinion regarding his third molars, which have not erupted yet. He explained that a friend of his just had 2 of his mandibular third molars extracted and is planning to extract the remaining 2 because he was told that the early, prophylactic removal of third molars is less traumatic than the “inevitable late extraction of infected third molars,” and that it prevents future teeth crowding. Your patient does not have dental benefits, and he is concerned about his out-of-pocket expenses for extracting these teeth and whether such expenses would be worth the potential benefits and risks of the procedure. You realize that, to answer your patient’s question, you need to find an economic analysis whose authors considered both short-term and long-term risks, benefits, and costs for third-molar extraction. You decide to conduct a literature search and a critical appraisal to inform the decision.

This article has an accompanying online continuing education activity available at: <http://jada.ada.org/ce/home>.

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ABSTRACT

Background and Overview. In everyday practice, dentists face clinical decisions for which they need to consider both treatment consequences (that is, benefits and harms) and costs. Economic analysis is a study design in which investigators evaluate and compare the costs and consequences of different treatment alternatives within a defined period. A critical appraisal of such studies includes an assessment of the risk of bias, results, and applicability of the study. The authors provide the concepts and guidelines that dentists can apply to critically appraise economic analyses.

Practical Implications. Dentists who wish to inform their clinical decisions regarding questions that involve both treatment consequences and costs can use these guidelines to understand the different types of economic analyses and to decide what type of economic analyses to search for, as well as to critically appraise any economic analyses identified.

Key Words. Evidence-based dentistry; economic analysis; cost-effectiveness; decision model; critical appraisal. JADA 2015;146(9):679-689

<http://dx.doi.org/10.1016/j.adaj.2015.06.021>

WHY ECONOMIC ANALYSIS IN DENTISTRY?

The economic burden of oral health care is significant, with a reported \$111 billion spent on dental care in the United States and \$11.7 billion in Canada in 2012.^{9,10} Public health agencies invest significant resources in oral health care programs that amounted to \$9 billion in 2012 in the United States.⁹ Although most of the programs offered are assessed with respect to their effectiveness, whether they represent a good “value for the money” rarely is investigated.

Clinicians daily make treatment decisions not only on the basis of information about the benefits or harms but also on the basis of costs. With a patient’s best

interest in mind, a clinician needs to assess whether the expected treatment benefits justify the resources used. For example, imagine that you want to buy more advanced 3-dimensional (3-D) dental imaging equipment for your practice; does this possible purchase represent a good value for money spent? Or imagine yourself as a policy maker who must decide if the \$2 million set aside for a public dental program should be directed toward an oral health prevention program for children or toward a program for adults who have low incomes and who are edentulous. Patients also need to invest their resources (for example, personal income, time off work) in interventions that will provide them with the best value for the money. Over time, such decisions are likely to get more, rather than less, difficult: the projected demographic changes in countries with high and low levels of income, our ever increasing demand for better care, and increasingly costly health care innovations will continue to strain our already scarce health care resources. All these aspects illustrate the importance of investigating an intervention's effectiveness and safety in conjunction with its efficiency, the balance of costs, and (positive and negative) health consequences.

There are different types of economic analysis that can evaluate the efficiency of a dental intervention. If the dentist is only interested in the overall cost of treating a particular condition, he or she can use a cost analysis, taking into account all resource utilization during and after treatment. This is, however, not a full economic analysis as it does not compare alternative treatments. If the dentist is interested in both the benefits and the costs of 2 or more treatments, a full economic analysis in the form of cost-effectiveness, cost-utility, or cost-benefit analyses would be a more appropriate source of evidence (Table 1¹¹⁻¹⁴). In all these types of economic analyses, treatment costs are measured in monetary units.

Cost-effectiveness analysis. In a cost-effectiveness analysis (CEA), treatment consequences (that is, benefits and harms) are measured in natural units, such as number of teeth extracted, gingival bleeding rates, or tooth survival. The main outcome of a CEA is the incremental cost-effectiveness ratio (ICER) (that is, the additional cost per additional unit of effect of a candidate intervention compared with an alternative). The results of a CEA can assist clinicians only in making decisions between treatments that share the same clinical effect.

Cost-utility analysis. In a cost-utility analysis (CUA), treatment consequences are measured in quality-adjusted life-years (QALYs), which is a combined measure of the duration and quality of life.¹⁵ The advantage of this type of analysis is its transferability, as it offers the means to make comparisons across different

interventions and different diseases using a common measure (for example, cost per QALY for oral health prevention versus cost per QALY for hypertension prevention). Because of this advantage, CUA is the most common form of economic analysis.

CUA also has limitations: the QALY can be insensitive to improvements in health-related quality of life achieved with dental interventions owing to the fact that few dental interventions are lifesaving or extend life. Furthermore, given that in most settings dental care is paid out of pocket or through private insurance, the need for prioritizing the allocation of resources across dental strategies (for example, investing in a caries prevention program for children or in an oral cancer awareness campaign) is limited. For these reasons, CUAs are rarely used in dentistry.

Cost-benefit analysis. In a cost-benefit analysis (CBA), the treatment consequences are evaluated in monetary terms, providing a direct estimate of whether consequences exceed costs.¹⁵ CBA is the least used form of economic analyses, with only few examples in dental literature.

TRIAL-BASED VERSUS DECISION MODEL-BASED ECONOMIC ANALYSES

Economic analyses can be conducted alongside clinical studies (trial based) in which investigators collect patient-level data on health care resource use and costs, along with effectiveness outcomes.¹⁶ These clinical studies include randomized controlled trials (RCTs), observational studies, patient registries, and administrative databases.¹⁷ Constraints of a trial-based economic analysis include the facts that the duration for which costs and outcomes are assessed is limited to the actual study duration, information originating from other similar studies on the treatments of interest is ignored, and collecting data for economic analysis alongside a trial is often resource-intensive.^{15,17}

Alternatively, decision models can be used to estimate the long-term (or lifetime) costs and consequences of health care interventions (see Figure 1^{15,18} for a simplified example of a decision tree). A decision model is a statistical tool that allows clinicians to compare the costs and benefits of 2 or more alternative clinical decisions while considering the probability of events occurring over a selected period (that is, the time horizon).

ABBREVIATION KEY. 3-D: 3-dimensional. CHF: Swiss franc. DMF: Decayed, missing, and filled. NA: Not applicable. NHS: National Health Service. RCT: Randomized controlled trial.

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