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Economic evaluation of diagnostic methods used in dentistry. A systematic review

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ARTICLE INFO

Article history:
Received 27 March 2014
Received in revised form
25 July 2014
Accepted 30 July 2014
Available online xxx

Keywords:
Economics
Health care costs
Dentistry
Diagnosis
Systematic review

ABSTRACT

Objectives: To review the literature of economic evaluations regarding diagnostic methods used in dentistry.
Data sources: Four databases (MEDLINE, Web of Science, The Cochrane library, the NHS Economic Evaluation Database) were searched for studies, complemented by hand search, until February 2013.
Study selection: Two authors independently screened all titles or abstracts and then applied inclusion and exclusion criteria to select full-text publications published in English, which reported an economic evaluation comparing at least two alternative methods. Studies of diagnostic methods were assessed by four reviewers using a protocol based on the QUADAS tool regarding diagnostic methods and a check-list for economic evaluations. The results of the data extraction were summarized in a structured table and as a narrative description.
Results: From 476 identified full-text publications, 160 were considered to be economic evaluations. Only 12 studies (7%) were on diagnostic methods, whilst 78 studies (49%) were on prevention and 70 (40%) on treatment. Among studies on diagnostic methods, there was between-study heterogeneity methodologically, regarding the diagnostic method analysed and type of economic evaluation addressed. Generally, the choice of economic evaluation method was not justified and the perspective of the study not stated. Costing of diagnostic methods varied.
Conclusions: A small body of literature addresses economic evaluation of diagnostic methods in dentistry. Thus, there is a need for studies from various perspectives with well-defined research questions and measures of the cost and effectiveness.
Clinical significance: Economic resources in healthcare are finite. For diagnostic methods, an understanding of efficacy provides only part of the information needed for evidence-based practice. This study highlighted a paucity of economic evaluations of diagnostic methods used in dentistry, indicating that much of what we practise lacks sufficient evidence.

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http://dx.doi.org/10.1016/j.jdent.2014.07.018
0300-5712/

1. Introduction

Diagnostic methods used in dentistry include clinical visual examinations and radiography while screening methods are used to discover those among the apparently well who are in fact suffering from disease. These services, however, are produced using resources that could otherwise be employed in delivering other types of care or serving other patients. In order to ensure that whatever level of resources we commit to delivering care are used in ways that provide the greatest health gain, health care interventions must be assessed in terms of both effectiveness and costs.[1]

Only through such comparisons can the opportunity cost of possible new interventions (what other uses of the same resources have to be forgone in order to support a new intervention) be identified and hence the impact of the new intervention on total health gains be considered. The need for economic evaluation applies to all methods used in health care i.e. preventive, diagnostic, and treatment methods.

Different types of economic evaluation have been developed, which are aimed at addressing fundamentally different questions. Cost- analysis (CA) addresses questions about the additional cost of new interventions. This approach is generally used where the aim is to compare different ways of producing the same level of outcome. Cost- effectiveness analysis (CEA) builds on CA by also considering comparisons between interventions where the outcome need not be the same. The additional effects of the new intervention are measured in terms of the intended clinical outcome of the intervention (e.g., reducing rates of mortality, morbidity or the level of a clinical risk factor such as blood pressure). In this way CEA addresses questions about the additional (or incremental) costs of producing the additional (or incremental) effects produced by the new intervention (compared to the current way of serving the same patients) based on the incremental cost-effectiveness ratio (or ICER), i.e. the ratio of incremental costs to incremental effects. Cost- utility analysis (CUA) addresses similar questions to CEA and uses the same ratio (ICER) but expresses effectiveness using a preference based measures (mostly Quality Adjusted Life Years/QALYs) that measure what the outcomes of the intervention mean to patients. Through this approach, questions can be addressed about the additional costs of producing comparable improvements in health related quality of life among interventions aimed at serving different patient groups and/or producing different types of clinical outcomes (e.g., reducing mortality among infants versus palliative care for the elderly). Finally, cost-benefit analysis (CBA) addresses questions about whether a new intervention represents a net gain to society by answering questions about whether the additional effects of the intervention exceed the additional costs of the intervention, by expressing additional costs and additional effects of a new intervention in the same units.

There is a growing awareness regarding the need for economic evaluations in dentistry. An initial survey of the scientific literature indicates that economic evaluation in dentistry mainly concerns methods used for prevention and treatment but few studies deal with diagnostic methods.[2] As the results of a diagnostic examination provide the basis for treatment planning and for the evaluation of treatment outcomes it is of importance that a diagnostic method serves its purpose and is cost-effective. To further our understanding in this field, this paper aims to elucidate economic evaluation of diagnostic methods in dentistry, using a systematic review approach.

2. Material and methods

To achieve a systematic approach, we conducted the literature review in accordance with the PRISMA Statement[3] and CRD's guidance for undertaking reviews in health care.[4] The following steps were defined: (i) problem specification, (ii) formulation of a plan for the literature search, (iii) literature search and publication retrieval, and (iv) data extraction, quality assessment, and data synthesis.

2.1. *Problem specification*

The review of the literature on economic evaluation of diagnostic methods in dentistry aimed to address the following questions:

- Which diagnostic methods have been analysed?
- What types of economic evaluation have been conducted?

The following elements were defined prior to the literature search:

- Dentistry: defined according to Medical Subject Heading term (MeSH) in PubMed: ''The profession concerned with the teeth, oral cavity, and associated structures, and the diagnosis and treatment of their diseases including prevention and the restoration of defective and missing tissue.''
- Diagnostic method: a test included in the process of attempting to distinguish one disease from another or from no disease, such as clinical, imaging or laboratory tests.
- Economic evaluation: defined according to Drummond et al.[1] as the comparative analysis of alternative courses of action in terms of costs and consequences.

2.2. *Formulation of a plan for the literature search*

Searches were conducted in four electronic databases MEDLINE using PubMed as search engine, the Web of Science (WSci), the Cochrane Library (Cochrane) and the NHS Economic Evaluation Database (NHS EED) under the guidance of librarians. The selection of search terms was based on the MeSH terms used in eight studies on economic evaluation.[5–12] The search strategies are presented in Table 1.

2.3. *Literature search and retrieval of records*

The records retrieved were imported to RefWorks® and duplicates from searches in WSci, Cochrane and NHS EED in relation to the MEDLINE search were subtracted. Relevant records were selected via a two-stage process. First, two

Please cite this article in press as: Christell H, et al. Economic evaluation of diagnostic methods used in dentistry. A systematic review. Journal of Dentistry (2014), http://dx.doi.org/10.1016/j.jdent.2014.07.018