Commentary

The Need for High-Quality Economic Evaluations in Dentistry

Oral diseases pose a serious global health challenge. They impact more than 3.5 billion people, with untreated dental caries being the most widespread noncommunicable disease (NCD) overall.[1] Furthermore, dental diseases have grave economic consequences on both health care systems and societies via direct, indirect, and intangible costs.[2] Direct costs and indirect costs associated with oral diseases were estimated to be US$356.80 billion and US$187.61 billion, respectively, in 2015.[2] This approximates expenditures associated with some of the most severe NCDs (eg, diabetes, cardiovascular diseases) plaguing health care systems and societies today,[2] yet we have little understanding of the costs and benefits of the dental services provided. As oral health care costs continue to increase, there is an urgent need to implement efficient resource allocation and cost-containment strategies to slow their growth. Ensuring oral disease prevention and health promotion at the population level requires expanded equitable access to high-value services.

To develop and execute such strategies, economic evaluations for health care interventions, including robust cost-effectiveness analyses (CEAs), are paramount. As advocacy for incorporating oral health services under universal health coverage (UHC) increases, cost-effectiveness measures for dental interventions become critical for comparisons within dentistry, as well as between dental and medical interventions, for thoughtful allocation of resources. The Second Panel on Cost-Effectiveness in Health and Medicine identified a set of robust tools for conduct of CEAs which has set the standard for this type of analysis.[3] To understand whether these same standards used have been applied in dental CEAs, we reviewed the dental care cost-effectiveness literature.

We analysed 41 systematic reviews and meta-analyses, and an additional 71 studies contained within them, published between 1986 and 2021. Most economic evaluations we reviewed for dentistry did not adhere to the standards established for conduct of medical CEAs, such as the Drummond checklist, the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) checklist, Phillip's checklist, The Gold Book, and the Second Panel on Cost-Effectiveness in Health and Medicine.[3-9] Key concerns with the quality of dental CEA research we found in our review include, but are not limited to, inconsistencies in the health benefit(s) measured with limited use of the generic measure of quality-adjusted life years (QALY), lack of consistent classification for oral diseases with inadequate descriptions of patient populations, and moderate to high risk of bias according to the various standards mentioned above.[3-9] Additional barriers include a lack of agreed-upon diagnosis codes and a dearth of easily accessible large-scale data. All of these issues, along with others, hinder the pursuit of oral health services research and value-based care pilots, which hold the promise of containing costs and improving health outcomes within a whole-person approach to population health.

These problems impede researchers and policymakers from making decisions about dental policies that are informed by rigorous CEA evidence. Most dental interventions in the literature focus on preventive measures, such as frequency of fluoride application, toothbrushing schemes, sealant application, and educational programmes. These are process measures associated with care; they do not measure health outcomes associated with care. Given that a consistent health benefit has not been used to measure changes in health outcomes from these interventions, these studies cannot be appropriately compared to each other. Whilst QALYs serves as a composite indicator allowing quality and quantity of life to be combined in a single index,[10] it has not been consistently applied as the health benefit measured in dentistry. Therefore, we are not able to compare CEAs of dental interventions with those of medical interventions. This must be addressed, as comparing the health benefits of dental and medical interventions on the same scale is paramount given the United Nations' and the World Health Organisation's active dialog about including oral health services under UHC.

If dental CEA research is to be consistent with medical CEA research, we believe the following 3 areas offer potential to improve the quality of dental CEA research and enable comparisons across medical and dental care. Firstly, QALYs should be utilised as an outcome measure, especially if UHC is to include oral health services, so that dental care can be understood in the context of primary and preventive care. Some studies have used validated generic health-related quality of life measures, such as the European Quality of Life Five Dimension three and five levels (EQ-5D-3L or EQ-5D-5L), to derive QALYs associated with specific dental treatment and conditions.[11-14] Studies examining the experiences of oral health-related quality of life (OHRQoL) associated with caries impact, using the

Oral Health Impact Profile, and have proven beneficial.[13] However, its application to CEA studies is limited. Whilst some people have advocated for the use of quality-adjusted tooth years in dental CEA research,[15] this will hamper the comparison of oral health interventions to medical interventions which utilise QALYs.

Second, CEAs in dentistry generally lack a clear description of the patient population with explicit inclusion and exclusion criteria. Groups of dental care patients undergoing the same dental treatment may derive different benefits. In 2009, a clinical effectiveness movement commenced to highlight differences in benefits derived by individuals with high and low risk. This is an important consideration for CEA research in dentistry. Population-level research alone is insufficient, especially when thinking about chronic disease management and how the cost-effectiveness of various interventions will change depending on caries risk status and other systemic comorbidities. Additionally, rigorous randomised clinical trials assessing the efficacy of dental prevention and treatment targeting different populations are needed.

Third, a key recommendation from the Second Panel on Cost-Effectiveness in Health and Medicine is that CEA research include both a health care perspective and societal perspective when analysing costs.[3] Utilising the societal perspective is especially important for dentistry, given the estimated indirect and intangible costs that arise from lack of access to oral health services.[2] For instance, lost productivity due to absence from school and work, or difficulty interviewing for a job due to poor oral health, are examples of issues that are important to consider in the societal perspective. Unfortunately, no dental CEA research includes both the health care perspective and the societal perspective. Both of these perspectives are especially important for dentistry. Failure to analyse the consequences of limited, or no, access to dental services results in underestimating the true value derived from oral health interventions.

We must identify the most robust tools that can be utilised to achieve rigorous economic evaluations in dentistry to enhance allocation of resources for improved health outcomes. Whilst dentistry has done well with process measures, this is insufficient. To identify high-value care that has the maximum impact, we need to evaluate dental interventions on outcome measures that are comparable to medical interventions. The dearth of this type of high-quality research underscores the vital need for scholarship in this space, especially with CEAs being fundamental for efficient resource allocation, insurance reimbursement, and cost-containment within health care. The Second Panel on Cost-Effectiveness in Health and Medicine discusses the Centers for Disease Control and Prevention advisory committee that was created for cost-effective immunisation practices.[3] Creating and charging a similar multidisciplinary committee for oral health could achieve consensus around these issues and establish a path forwards for CEA research. We recommend a convening of CEA and oral health experts to do so and to advance the oral health research agenda.

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Conflict of interest

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REFERENCES

1. Kassebaum NJ, Smith AGC, Bernabé E, et al. Global, regional, and national prevalence, incidence, and disability-adjusted life years for oral conditions for 195 countries, 1990–2015: a systematic analysis for the global burden of diseases, injuries, and risk factors. J Dent Res 2017;96:380–7.
2. Peres MA, Macpherson LMD, Weyant RJ, et al. Oral diseases: a global public health challenge. Lancet 2019;394:249–60.
3. Sanders GD, Neumann PJ, Basu A, et al. Recommendations for conduct, methodological practices, and reporting of cost-effectiveness analyses: second panel on cost-effectiveness in health and medicine. JAMA 2016;316:1093.
4. Shariati B, MacEntee MI, Yazdizadeh M. The economics of dentistry: a neglected concern. Community Dent Oral Epidemiol 2013;41:385–94.
5. Anopa Y, Macpherson L, McIntosh E. Systematic review of economic evaluations of primary caries prevention in 2- to 5-year-old preschool children. Value in Health 2020;23:1109–18.
6. Rogers HJ, Rodd HD, Vermaire JH, et al. A systematic review of the quality and scope of economic evaluations in child oral health research. BMC Oral Health 2019;19:132.
7. Tonmukayakul U, Calache H, Clark R, et al. Systematic review and quality appraisal of economic evaluation publications in dentistry. J Dent Res 2015;94:1348–54.
8. Mariño R, Ravisankar G, Zaror C. Quality appraisal of economic evaluations done on oral health preventive programs - a systematic review. J Public Health Dent 2020;80:194–207.
9. Qu Z, Zhang S, Krauth C, et al. A systematic review of decision analytic modeling techniques for the economic evaluation of dental caries interventions. PLoS ONE 2019;14:e0216921.
10. Prieto L, Sacristán JA. Problems and solutions in calculating quality-adjusted life years (QALYs). Health Qual Life Outcomes 2003;1:80.
11. Hulme C, Robinson P, Douglas G, et al. The INCENTIVE study: a mixed-methods evaluation of an innovation in commissioning and delivery of primary dental care compared with traditional dental contracting. Health Serv Deliv Res 2016;4:1–126.
12. Hulme C, Yu G, Browne C, et al. Cost-effectiveness of silicone and alginate impressions for complete dentures. J Dent 2014;42:902–7.
13. Slade GD, Spencer AJ. Development and evaluation of the Oral Health Impact Profile. Community Dent Health 1994;11:3–11.
14. Slade GD. Derivation and validation of a short-form oral health impact profile. Commun Dent Oral Epidemiol 1997;25:284–90.
15. Rogers HJ, Freitas RD, Beeson MJ, et al. Economic evaluations in paediatric dentistry clinical trials. Int J Paediatr Dent 2021;31:56–65.

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