Climate change in endodontics: Is it time to recycle “garbage in–garbage out” systematic reviews?

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Systematic reviews have an important role to play in evidence-based health care, because they provide one of the best opportunities for clinicians to understand and translate the current best evidence of the effects of health care interventions into their daily clinical practice. The importance of these forms of research synthesis in summarizing evidence and identifying any of the gaps which might inform new research initiatives is widely acknowledged, but no less significantly there is a recognition that the methodologic quality of these reviews may reflect on their utility for clinicians or other users of health care.1

An assessment of the methodologic quality of systematic reviews examining the effectiveness of oral and dental health care interventions, reported that a substantial number of these reviews were of mediocre quality.2 Major weaknesses highlighted by the investigators were inadequate search strategies, a lack of quality assessment of included studies, no examination of heterogeneity, and inappropriate pooling of data. The report provided strong evidence of these shortcomings and clearly identified specific areas where there was room for improvement. Several years on, a thought-provoking editorial, “Systematic reviews in endodontics—examples of GIGO [garbage in–garbage out]?” echoed these concerns and indicated that at least in the field of endodontics there appeared to have been rather limited progress and that somewhat “alarmingly, the quality of these recent publications is negatively correlated to the frequency.”3

So, is there evidence of any measurable improvement in the methodologic rigor of systematic reviews in endodontics since that controversial editorial?

There have been several recent assessments of the methodologic quality of systematic reviews of oral health care interventions. One of these assessed a number of systematic reviews that had compared the “effectiveness of surgical and nonsurgical treatment of temporomandibular joint disorders,”4 and another conducted a “systematic evaluation of the quality of meta-analyses in endodontics,”5 and both of these the assessments were carried out using the Assessment of Multiple Systematic Reviews (AMSTAR) instrument.

AMSTAR is a relatively new tool that can be used to assess the methodologic quality of multiple systematic reviews.6 An improved understanding and clarification of the conceptual differences between methodologic and reporting quality in systematic reviews enabled the developers of AMSTAR to take these aspects into
consideration in its development, and in this way the tool differs somewhat from other available tools.\textsuperscript{1} This 11-item assessment tool has recently been validated for the assessment of reviews of health care interventions and is being used increasingly by health care policy makers, health technology assessment agencies, and some authors and journal editors.\textsuperscript{6}

Although AMSTAR has received consistently high ratings from the Canadian Agency for Drugs and Technologies in Health,\textsuperscript{7} its use in the assessment of systematic reviews of oral health care interventions, particularly endodontics, has been somewhat sporadic.\textsuperscript{5,5}

In selecting AMSTAR as their assessment tool to evaluate meta-analyses in endodontics, Suebnukarn et al.\textsuperscript{5} had clearly acknowledged the importance to clinicians of valid and accurate research syntheses and noted the key role that meta-analyses might play in decision and policy making in health care. However, although those authors chose to use this instrument for their evaluation of meta-analyses, it is important to remember that a methodologically robust systematic review is an indispensable precursor if an intervention or the strength of an association.

Fundamental to the authors’ “systematic evaluation of the quality of meta-analyses” should be a degree of confidence that the meta-analyses they had assessed provided explicit statements on whether the included studies were similar enough to combine and that the pooling of outcomes data across the included studies was plausible [item 9 of AMSTAR: “the clinical appropriateness of combining studies, i.e., is it sensible to combine?”\textsuperscript{6-10}]. Ideally, this should have included an exploration, by the producers of the meta-analysis, of the characteristics of the eligible studies to assess the similarities and differences among the types of participants, the interventions received, and the outcome measures being analyzed.\textsuperscript{5}

The challenges faced by review authors in deciding on the validity of including a meta-analysis in a systematic review are well recognized, but we were uneasy with the assessments of statistical heterogeneity that had been reported in several of the endodontic meta-analyses selected by Suebnukarn et al. This was because a lack of demonstrable statistical heterogeneity does not guarantee that it is appropriate to combine the results of the primary studies. The lack of statistical heterogeneity might obscure clinical heterogeneity, and statistical tests, such as the $\chi^2$ test, should be seen neither as the imprimatur nor as a substitute for a more careful exploration by the reviewers of the clinical diversity between the studies being considered for a meta-analysis and whether they are sufficiently similar to be combined.

While recognizing the complexities of carrying out interventional studies in the field of endodontics, we were also somewhat puzzled by how the assessors’ inclusion of a meta-analysis of in vitro studies, i.e., consisting of samples from human beings (ex vivo) as “participants,” matched their prespecified inclusion criteria of “studies limited to human subjects.”

A further key point that appears to have been overlooked by the assessors in their “systematic evaluation of meta-analyses in endodontics” is the inclusion of several observational studies as well as meta-analyses of nonrandomized comparative trials. The developers of AMSTAR have cautioned that “the applicability of AMSTAR has not yet been assessed for reviews of observational (diagnostic, etiologic, and prognostic) studies,” and they “recognize that it has only been tested on systematic reviews of randomized controlled trials evaluating treatment interventions.”\textsuperscript{9}

Although we have no disagreement with the acceptability of AMSTAR by Suebnukarn et al. as a valid and reliable tool for assessing the quality of systematic reviews of randomized trials of endodontic interventions, we do consider that they have not fully examined its applicability and indeed its limitations, which may have implications on the fidelity of their study.

The history of quantitative systematic reviews, particularly meta-analyses, has been dogged by criticism that they are mechanistic and susceptible to mindless aggregation of all things numeric. It has taken several decades of hard work to regain the trust of clinicians and decision makers that the same dedication to research principles is at the core of these analyses, as it is with primary research, and that the quantitative aspect is simply one component of the research process. With every new tool that becomes available, the risk of overreliance on the tool in replacing the research process returns, and the GIGO editorials begin anew.

AMSTAR is one such new tool, and like any tool, it must be understood in terms of its strengths and weaknesses, some known and others yet to be determined. We need to be clear when we are using a tool in a novel situation, especially when the consumers of such research are sophisticated enough to look to such studies for decision making.

Climate change skeptics beware; recycling is now an inescapable chore and a part of our daily life.

REFERENCES
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