

Do Systematic Reviews Change the Way We Think?

One of the techniques used in dental education involves the assembly of lists of scientific articles that are used to demonstrate levels of knowledge. This was an approach that was used by my mentors, and it's one that I have used for those that I have mentored. To be effective, the methods used to perform a specific literature review must continue to develop in response to the scientific rigor of the time.

Years ago, the quality of science from scientific articles was frequently quite low. Using the benefit of hindsight, it is easy to appreciate how much more diligent we are today than we were then. If we are honest with ourselves, however, our current forward thinking might not look so advanced when evaluated retrospectively by investigators who follow us while mapping the future. In scientific education, we are constantly striving to appreciate what we know while not losing sight of what we do not know, for it is the voids of knowledge that create avenues of investigation.

From a practical standpoint, the most important scientific investigations are performed at great depth but in a very narrow pool. The opposite approach, whereby broad expanses of knowledge are studied superficially, will provide few definitive answers. Although it would seem obvious to suggest that deep wells of knowledge need to be combined with an overarching appreciation of what needs to be known, making this actually happen is far more difficult than one might expect.

Perhaps this is the reason that the compilation of literature has been such an important factor in the gathering of scientific knowledge. The approach that we use today is to create systematic reviews of specific topics. Topics of investigation evolve from previous research endeavors. Although it is not a mandate that every investigation must utilize a test and a control and that the assignment to one or the other must be done randomly, we still can appreciate that the deep well of knowledge, or should I say potential knowledge, could occur on one topic at a time.

Conducting systematic reviews is not a simple process. The first task is to define a research question. Although I just said that it is possible to perform research in that deep well of knowledge, and only that one specific well, it is often more gratifying to make a specific comparison and then determine the difference, hopefully, between right and wrong.

The first, and often the most difficult, task occurs with the establishment of an important research question. The process identifies a population group that is in need of a therapeutic intervention. A comparison group, receiving a different intervention, is treated in parallel, and the outcomes from the two groups are ultimately compared.

Eventually, the investigators will take the information that has been gathered in their research and create a scientific publication that identifies all these factors. The value of the publication that comes out of this research is measured by the ability to differentiate the two treatments. That ability to differentiate is often dependent upon the number of subjects who were treated in each arm of the study and the duration of that treatment.

It is fairly easy to see that if the study has too few subjects in each treatment arm, it would be impossible to differentiate a small therapeutic effect. Likewise, if a specific complication of the treatment does not occur until a specific risk interval has been reached, it seems obvious that a study that is not conducted for that duration will fail to demonstrate a difference in outcome.

The systematic review offers a potential solution to the problems encountered when the study design is too small in population or too short in duration. If a number of studies, conducted with similar degrees of scrutiny, could provide sufficient data that, when combined, demonstrate the more favorable treatment outcome, the value of the individual studies would be magnified.

It is the ability to combine data from a number of different research studies that has led to the increasing popularity of the systematic review. It is not unusual for this journal to receive 30% to 40% of its new monthly submissions that fall into the systematic review category. Although most of what has been written to this point seems to favor the systematic review, there are potential problems.

Perhaps the biggest problem with a systematic review is that it requires an incredible amount of effort to conduct. If the research question is too broad, the number of articles that need to be evaluated may overwhelm the team conducting the systematic review. Conversely, if the research topic is too narrow, the research team may not be able to identify a suf-

ficient number of studies and associated data to demonstrate the difference that may exist.

Reading the previous paragraph, it would seem that a focused research question would likely solve either of the concerns. Unfortunately, this is not necessarily true. A comprehensive review of the literature may result in a search that, even with appropriate focus, generates hundreds of articles for review. With each effort to reduce the number of articles that will be included in the final review, the level of scrutiny of the articles increases. It is not unusual for investigators to read 100 or more articles to identify the articles that meet the inclusion criteria. Moreover, in some instances, the number will decrease so much through the assessment of the inclusion and exclusion criteria that there may be insufficient numbers of articles to perform a meta-analysis that provides any more knowledge than the investigative team had before the study was developed.

It is sometimes painfully obvious that some topics do not lend themselves to systematic review. Unfortunately, that observation may not occur until hundreds of hours have been dedicated to the search, item reduction, data extraction, and final data analysis.

This editorial began with the question, "Do systematic reviews change the way we think?" Conceptually, this type of review could be hugely beneficial to the science of implant dentistry, but investigators must be aware that the deep well or the shallow but large pool can each extract a large toll on the investigative team.



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