



# Putting the Practice into Evidence-based Dentistry

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**ABSTRACT** Whenever a new field emerges in health care, a period is experienced in which the field tries to define itself. This is the position evidence-based dental practice finds itself in at the moment. In this paper, it is argued that, for dentistry to enter into the brave new world of evidence-based practice, it will require some rethinking of the research enterprise in the profession.

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**T**he standard definition is given by Sackett.<sup>1</sup> Evidence-based practice is “the conscientious, explicit and judicious use of the current best evidence in making decisions about the care of individual patients ... means integrating clinical expertise with the best available external clinical evidence from systematic research.”

This is usually contrasted to traditional dental practice where “Emphasis is placed on accumulated knowledge and experience, adherence to accepted standards and the opinion of experts and peers. It is practical, prudent, personal.”<sup>2</sup>

The definition for evidence-based practice, therefore, begs one or two questions. Words like “conscientious, explicit and judicious use” are not only a bit subjective but raise questions about who is to be the judge. Then, the added problem, what is the “best available external clinical evidence from systematic research”? To answer the second question, one needs to look at evidence-based research.

## Evidence-based Research

It is necessary to distinguish two different but intimately linked movements: evidence-based practice and evidence-based research. The latter refers to the process, by which evidence is generated, the methodologies such as systematic reviews, meta-analyses. But the former refers to the application of evidence to actual practice.

Though one might assume these two would be highly related in that the second should lead logically to the first, it is not necessarily the case. This occurs for a couple of reasons.

The first is that evidence-based research puts a premium on the quality of the research. It must be rigorous and be able to be replicated. While a wide range of evidence may be considered, evidence-based research has established a hierarchy in terms of the quality of research. The principle underlying this hierarchy is which methods give the most definitive answer in determining that the therapy used was responsible for the health outcome measured.

The clear answer is that studies that can answer questions about efficacy are the most preferred, and the method that does that most clearly is the random controlled trial. The dominant focus of evidence-based research practice, therefore, has been the random controlled trial. However, it is not the single, random-based trial that is the gold standard. Rather, it is the systematic review of numerous random controlled trials that is the most significant, particularly those that result in a meta-analysis. In fact, the results of a single, even double-blinded, trial can be misleading, particularly if the number of subjects is insufficient to power the study (in effect, give it statistical legitimacy). Meta-analysis overcomes that problem by combining studies that are homogeneous so that the subject pool is larger.

Other forms of study design may be included in an evidence-based research systematic literature review (nonrandom trials, cohort studies, and simple pre-post and post-case series) but the random controlled trial is given most weight since it is the design that most clearly establishes efficacy.

Unfortunately, such studies generally test a therapy under ideal conditions and often with homogeneous populations to ensure comparability of the groups when comparing outcomes. But evidence-based practice ultimately requires therapies that can be applied in normal practice, that is, effectiveness studies.<sup>3</sup> While on logical grounds, a therapy without any efficacy will not be effective; a therapy that has efficacy may not have effectiveness when applied to heterogeneous populations and normal practice conditions. Furthermore, therapies with equal or comparable efficacy may differ considerably in terms in effectiveness.

In contrast, however, random controlled trials test therapies under ideal

conditions and therefore, do not often help with determining effectiveness in everyday practice as opposed to efficacy in a controlled, and usually perfect, setting.<sup>4</sup> There are some very strict ethical limitations to conducting clinical trials that prevent certain populations from participating. If there is a very high risk but low benefit for a subgroup of pa-

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tients, this might mitigate against them being included, such as patients with high co-morbidities. Conversely, some low-risk patients may not be included because too large a number would be needed to be enrolled to make the study feasible.<sup>5</sup> The end result, therefore, is that clinically, it is not possible to know if the therapy can be applied to groups that were not included in the trial.

Although providers do treat populations, they treat them one at a time. Random control trials seldom contain the “soft data” about individual variations, particularly in response to therapy. The type of clinical detail essential for a provider to decide if a given patient is a candidate for a drug, procedure, therapy, is seldom provided in a random controlled

trial.<sup>6</sup> They provide the results of average patients, and, even then, it is an average of those who meet the inclusion criteria.

This problem can be solved through observation studies, but there is a dilemma about the role of observational studies. On one hand, they may seem more clinically relevant and include the populations and subpopulations of interest to the health provider, but, on the other hand, they do not provide the type of definitive evidence that might persuade the provider to recommend the procedure to the patient. Despite this ambivalence, observation studies continue to be widely published. Ray, in a survey for two months in 1998 of three leading medical journals, found that observational studies comprised 68 percent to 87 percent of their featured articles and communications and only 32 percent, 13 percent and 26 percent of their publications were random controlled trials.<sup>7</sup> He noted while it is now known how observational studies impact practice or policy, given the propensity to publish them, the journals must feel they are important to their readers.

One solution to the dilemma in evidence-based research has been to create a hierarchy of evidence. A standard hierarchy is the following, from the highest to the lowest: evidence provided by at least one appropriately designed random controlled trial; evidence provided by a controlled trial that is not randomized; evidence provided by a well-designed cohort or case-control study; evidence provided by a multiple time series; descriptive studies, case reports, and opinions of experts or respected authorities.<sup>8</sup>

### Evidence-based Dental Practice vs. Evidence-based Research

The problem is not so much that the practitioner and researcher disagree that practice should have some evidence to support. It is more to do with how

TABLE 1

**The Problem****The dentist**

Evidence means what works well for me in my practice and clinical experience is the basis for deciding this.

**The researcher**

Evidence means what has efficacy and why, and clinical experience is a very problematic source for this.

TABLE 2

**The Difference**

The dentist wants truth on his/her side.

The researcher wants to be on the side of truth.

that evidenced is defined. This is shown in **TABLE 1**. This can also be represented in another way as shown in **TABLE 2**.

There is, therefore, a disconnect between research and practice. Research can be both rigorous and clinically useful, unfortunately, a case therefore that “never the twain shall meet.”

### Is Dentistry Capable at the Moment of Doing Evidence-based Practice?

Clearly, dentistry does a lot of scientific research, but much of this is in the laboratory and focuses on what might be termed as biomedical research. This involves the use of the basic and biological sciences for the investigation of disease, its biological mechanisms, and reparative processes. One can also point to the large field of materials research, work in implants, periodontal disease, maxillofacial surgery, genetics, wound healing, and so on. But if one takes the most common of all oral diseases and evaluates the “evidence” for its diagnosis and treatment, the results are a bit sobering.

In 2001, the National Institutes of Health convened a consensus conference, bringing together a panel of experts, reviewing the research evidence, and hearing submission and testimonies from experts on this topic.<sup>9</sup> The overall conclusion of the panel was that the evidence base for most practices in the diagnosis and management of caries is weak. Across the whole spectrum of research from epidemiology, to diagnosis, to treatment, to outcomes, they found a lack of studies, in particular, those that could establish efficacy. There were not only a very low number of trials (only seven where there was definitive evi-

dence the patient had caries), the quality of the trials was also problematic.

The question is not so much “is dental research collecting evidence?” but more a case “is it relevant to practice, can it be translated into practice, and is it in fact being used to determine practice even within our teaching institutions?” Is sufficient work being done on trials to establish efficacy? Even where that is occurring, are further studies being done on effectiveness, which would determine real outcomes in real practices with real patients?

### The Problem

Until very recently, it was not at all clear the research was driven by the needs of practice. One of the benefits of evidence-based practice as a movement might be to help refocus the effort. But even there, it tends to be a one-way movement. The research mostly occurs in large institutions (i.e., National Institutes of Health, universities); much of it is in the laboratories. The results are published, disseminated, taught in dental schools, and in continuing education programs. One might term this the trickle-down theory of research. As in economics, the expectation is that all the boats will benefit and float a little higher. There is very scant evidence that the theory actually works.

In many ways, what happens in research is not dissimilar to the person who searches under the streetlamp for their keys. Upon being asked if they were sure they lost the keys there, the person answers “No,” but is looking there because that is where the light is. Very little research is done in dentistry in practice settings. Most research follows the medical model and is university- and hospi-

tal-based. But there is a huge difference between dentistry and medicine in this regard. Most dental patients are not in hospitals, and only a very small number of them are in the dental teaching clinics. Those who are tend to be atypical patients.

In the case of medicine, the universities are attached to huge teaching hospitals with access to very large populations of patients. So one can study cancer through the National Cancer Institute Centers with some assurance that trials can be conducted on the major cancers, and that these will not be significantly different from the cancers encountered in general practice. But this kind of infrastructure does not exist for dentistry, which may help explain the low number of trials conducted.

In the Caries Consensus Conference it became clear that two fundamental pieces of evidence were missing, which impact drastically on trying to conduct trials. The first is that the epidemiology of caries is insufficiently studied. The committee was unable to establish the natural history of caries. Without this it would be impossible to know whether any given treatment is actually performing better than leaving the disease untreated.

The second great gap in the evidence is in knowing what dentists are actually doing in their practice. There is almost a complete lack of descriptive studies, using random samples that would allow one to generalize about the practice of dentistry. The real answer to the question “Is dentistry evidence-based?” cannot be found in the evidence of evidence-based research, but can only be answered by knowing what is happening in the dental practices. The correct answer

to the question “Is dentistry evidence-based?” is we do not know. Despite all the scientific research being done within dentistry, the truth is we do not know how much of dentistry is evidence-based.

If one looks to medicine, the data would suggest the figure is not likely to be very high. There is considerable debate about how much of medical clinical practice is evidence-based. The initial estimates by the Office of Technology Assessment in 1979 and 1983 were that only about 10 percent to 20 percent of medicine could claim to be evidence-based.<sup>10,11</sup> As noted by Imrie and Ramey, this figure was simply an estimate.<sup>12</sup> These authors further note that other commentators have given figures as low as 15 percent for practices based on any evidence.<sup>13</sup>

The problem of establishing any figure is one first needs to define what will constitute the evidence. How one does that has a great impact on the result. If, for example, one demanded only one good single, random controlled trial, the figure will be much higher than if one required repeated random controlled trials. The use of a single, random control trial, no matter how good the study, poses methodological problems. Single studies can be contradicted by later studies. To overcome the problem of a single study, studies are pooled if they are homogeneous enough to permit a meta-analysis. This also greatly increases the sample sizes on which analyses can be done.<sup>14,15</sup> Examples of misleading meta-analysis have already been documented in the literature.<sup>16</sup> Furthermore, studies with negative results are less likely to be published.<sup>17</sup> This itself has a tremendous impact on the “evidence.”

If the figure for medicine for evidence-based practice is as low as has been estimated, it is very unlikely that the amount of evidence-based practice in dentistry is any higher.

### The Solution: Putting the ‘P’ Back Into Evidence-based Practice

One solution is to begin focusing on a different kind of research, what one might term practice-centric research. In an earlier article, the author suggested that one solution is a move toward health services research.<sup>18</sup> Briefly, such research with its focus on patients, access, utilization, services, costs, quality of care, appropriateness of care, the health encounter and outcomes would place the focus squarely on the practice of dentistry. Health services research is defined as the investigation of the relationship among social structure, process, and outcomes for personal health services.<sup>19</sup> In fact, it is difficult to see how evidence-based dental practice is going to be possible without this type of evidence.

Part of this shift in emphasis would also mean a shift from a focus on efficacy (trials) to a focus on effectiveness (what works in practice under normal conditions, with normal patients with normal dentists). When something has been shown to be effective in practice, then one should move to trials to determine efficacy. When something is known to be effective and efficacious, then one should move to understanding the biological mechanisms involved. This would be an almost complete reversal from the way research proceeds at the moment, and the way the National Institutes of Health funds research.

But in addition to a change in the type of research methods, there must also be a change in the sites of research. To advance evidence-based practice, practice-based research needs to be advanced. The first need here is simply to determine what dentists are doing in their practice (what is being practiced). This is known as descriptive studies and is virtually unfunded by the National Institutes of Health, which prefers hypoth-

esis-driven research. It cannot be obtained simply by looking at patient files or by interviewing patients and dentists. All of these are valuable, necessary, but inadequate. It requires observation of practices using methods such as a rapid ethnographic assessment to compile a comprehensive account of what dentists are actually doing in practice. The view of practice obtained by such areas as epidemiology/health services research, and that obtained by sociological and anthropological observation, are so different as to lead one to conclude the two groups are viewing totally different animals.<sup>20</sup>

A second requirement is that practices have to become the sites for collecting data. As noted before, hospitals, universities, and laboratories cannot provide the kind of data needed to determine what kind of dentistry is being practiced, or to study the outcome of particular therapies as used in practices. In many ways, dentistry is often seduced by its close relationship to medicine. Its research thrust for the most part attempts to replicate an approach that has been highly successful in medicine.

Unfortunately, the practice of dentistry is in fact quite unlike medicine. Dentistry much more resembles the practice of solo practitioners, such as optometrist and chiropractors. What the latter has recognized, and, in fact, what the entire Complementary and Alternative Medicine group has recognized, is that they must form practice networks for the assembling of data. Since they are not part of hospitals, and for the most part, not part of universities, they have recognized there is no alternative as they also face the challenge of substantiating that their practices are evidence-based. Hawk, Long and Boulanger in 1998 established such a network of practices for the chiropractic profession.<sup>21</sup>

## Conclusion

For dentistry to enter into the brave new world of evidence-based practice, it will require some rethinking of the research enterprise in the profession. Not only must the focus of the research change, but we must also see changes in the methodologies used, and the sites in which the research is conducted. If it is intended to label “evidenced practice” to mean what it actually says, putting the practice back into the equation is needed. That involves recruiting the dental profession, those in practice, to “come on over” to the world of research. While most dentists are used to their alma mater asking them to open up their wallets, in the future they may be asking them to open up practices. Open them up to the inconvenience of research. It is difficult to see how, without doing this, we can determine how much dentistry is evidence-based, and secondly, how we might transform the practice so that it is. ■■■■

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