

# The Evidence-Based Approach to Prosthodontic Practice and Research

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"Medicine is a science of uncertainty and an art of probability," according to the well-known Canadian physician William Osler. Are our prosthodontic theories and practices truly based on this principle, or is prosthodontics based on a fundamentalism that one must adhere to before being invited into a guild? This essay attempts to explain this phenomenon in light of the structural and philosophical changes in society and medicine. It is suggested that an approach to patient care based on evidence-based principles is the appropriate common denominator that should unite prosthodontics on a global scale. Differences in clinicians' perceptual and judgemental abilities and dissimilar treatment thresholds explain the variations in treatment decisions. At least 3 other factors heavily influence daily treatment decisions, whether consciously or unconsciously: (1) current philosophical trends, (2) the arrival of medical textbooks approximately 40 years ago that severely criticized the current health systems, and (3) the application of clinical epidemiology into clinical reasoning. These factors call for a rational strategy to cope with continuous changes. This strategy is coined evidence-based health care, practice, medicine, dentistry, and many other variations.

There are deep cultural and structural criticisms of the ontology and epistemology of modern western philosophy. Such trends are evident in many new scientific articles, even without the authors being consciously aware of them. Two examples are modernism, strongly influenced by Ihab Hassan, Karl Popper, and Thomas Kuhn, and postmodernism, influenced by Jean F. Lyotard. A third trend is poststructuralism, represented by Michel Foucault and Jacques Derrida, which focuses on theoretical deconstructionism in multi-ethnic, multicultural societies that are rapidly merging and changing.

Intensified cultural and structural criticisms have also become apparent in medicine. In 1962, Thomas McKeown<sup>1</sup> asked what the role of medicine is when improvements in health are due as much, if not more, to social and environmental changes than to health care. The first book to discuss the basis and process of clinical decision making in medicine was written in 1967 by Allan Feinstein.<sup>2</sup> Another essential book, by Archie

Cochrane in 1972,<sup>3</sup> questioned the knowledge base of medicine and called for rigorous evaluation of the effectiveness of interventions. Finally, the first publication of "Our Bodies, Ourselves: A Book by and for Women"<sup>4</sup> in 1973 seriously challenged the male-dominated medical services in North America and called for women to empower themselves.

Reflected in these central textbooks are severe criticisms of medical care effectiveness, health equity, costs, and priorities in health and research. Moreover, these textbooks served as calls for awareness regarding the ineffectiveness of many health care interventions, as well as the lack of evidence of effectiveness of other interventions.

Some assign the current lack of understanding regarding adequate and inadequate scientific papers to inappropriate training of physicians and dental clinicians, which in many parts of the world continues to replicate a curriculum suggested in 1910 (!), ie, the Flexner Report.<sup>5</sup> This report mandated that all curriculums should be based on pathophysiologic underlying principles, because many diseases and interventions at the time were poorly understood, and thus the answers would be found in the laboratories and not by direct patient observation and experimentation. While of course great progress has been made in laboratories over the centuries, experimental clinical research has been stifled in academic settings.

How have dental clinicians, particularly prosthodontists, been trained to identify pertinent clinical research, appraise papers for validity and generalizability, and continuously incorporate necessary changes into clinical practice? In medicine, at least one university in Canada, McMaster University, scrapped the century-old teaching style and adopted an approach based on evidence-based medicine.<sup>6</sup> One essential characteristic is the notion that pathophysiologic reasoning alone cannot guide clinical practice, and it is nonsense to imagine that undergraduate students can continue to absorb the increased load of theoretic curriculums. Furthermore, science progresses so fast that what is taught in medicine may be outdated by the time students graduate. Thus, a more proactive way to prepare students for life-long learning is to teach them how to identify and critically appraise the scientific literature that the practicing clinician will encounter.

The biggest misunderstanding of evidence-based medicine is that it is only concerned with the effectiveness of interventions and randomized controlled trials. Of course, there are appropriate study designs for all if not most research questions in prosthodontics. We should never forget that our main actions as prosthodontists can best be described according to words of the French physician Ambroise Paré (1510–1590): *Cure occasionally, relieve often, console always.*

## References

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## Where Science Fails Prosthodontics

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Science is a rigorous method of enquiry that challenged and largely replaced the religious authority of earlier times. It was seen by the British Association of the Advancement of Science (BAAS) during the 19th century as "the intellectual progenitor of technology, the guarantor of God's order and rule, the proper way of gaining knowledge, and the key to national prosperity and international harmony."<sup>1</sup> Today, the "rule" is clearly visible in physics, botany, and other disciplines where measurements are possible and reliable. However, it is less obvious in disciplines such as economics and sociology where measurements are unreliable if not impossible, and where practitioners attend to more humanistic, behavioral, and emotional issues.

William Osler, the 19th-century Canadian physician and modernizer of medicine in North America, asserted, "Medicine is a science of uncertainty and an art of probability." Science, he believed, provides uncertain answers to matters of health, whereas uncertainty dominates the minds of most competent clinicians. Since then, the quest for certainty has bowed to the theory of probability, whereas success for a competent clinician emerges from an artistic ability to see patterns. Indeed, this ability was crucial in Osler's day and in our own, despite the vast quantity of measured knowledge amassed by science over the last century. Today, statistical certainty is interpreted more appropriately as a probability rather than a confirmation of certainty. Artistic vision is likely to assume even greater influence in health care, following the large role that chance has played in a remarkable number of medical discoveries.<sup>2</sup> Moreover, the personal values and beliefs of both the clinician and patient play dominant roles in medical

diagnoses and assessments, despite the apparent objectivity of scientific measures and tests.

Recent theories on how we learn, develop, and apply clinical skills suggest that we interpret basic biologic mechanisms of disease through a process of "illness scripts" relating to an array of clinical cases and their probable causes.<sup>3</sup> The expert clinician is more successful than the novice because of an ability to recognize patterns of events and judge the probability of diagnoses or outcomes.<sup>4</sup> It is a learning process that relies more on the art of clinical judgment than on the science of evidenced-based knowledge. It takes many years before a novice accumulates the experiential knowledge to recognize a pattern of disease or dysfunction with the agility and confidence of an expert. But once it happens, Osler's art of probability trumps science.

## The Art of Caries

If we look at the scientific evidence on the cause and effect of caries, it is not surprising that clinicians draw more from previous clinical experiences and artistic acumen than from the hard evidence of science. Bader and Shugars<sup>5</sup> proposed a conceptual model of how dental clinicians make clinical decisions relating to caries that highlights the role of "pattern recognition" and "caries scripts," more in keeping with the humanities (esthetics, ethics, history, law, literature, philosophy, etc) than the sciences. However, the scripts relate almost exclusively to the consequence of caries and hardly at all to a medical model of caries focused on the pathogenesis and psychosocial causes of the disease. The authors explain that "the scripts tend to be complex, highly visual, and difficult to describe," and are largely influenced by the subjective bias that is an anathema to good science. The experience of older clinicians, for example, reduces the likelihood of a surgical approach to caries, presumably because artistically they see only limited "probabilities for caries presence or caries progression." Would that younger clinicians acquire this artistic prudence sooner in their careers to ease human discomfort and reduce iatro-

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