APPLYING EVIDENCE BASED DENTISTRY TO YOUR PATIENTS

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GENERAL ISSUES

A common criticism of evidence based practice is that it seeks to usurp the individual clinician's judgment, imposing instead an external authority found in the literature that may or may not be appropriate. This criticism is not valid. Indeed, the fourth step of the Evidence based Practice Model (Fig. 1) reserves a place for the individual practitioner's judgment in the application of the literature to the clinical problem. Evidence based practice therefore seeks to inform clinical decisions, not to impose them.

After converting the patient's problem into an answerable question, searching the literature, and critically appraising the found articles, the clinician must to decide if the valid information that has been revealed can be applied to the patient whose problem triggered the process. To do so, the clinician must consider certain specific factors. First, clinicians cannot allow themselves to be dazzled by elaborate statistics showing extreme measures of statistical significance. In a trial comparing Brånemark and IMZ implants under mandibular overdentures, Boerrigter et al[1] found a statistically significant difference in bone level changes between the implant types 1 year after implant placement. The mean scores were 0.5 mm for the IMZ implants and 1.0 mm for the Brånemark implants. This difference was found to be statistically significant ($P <$

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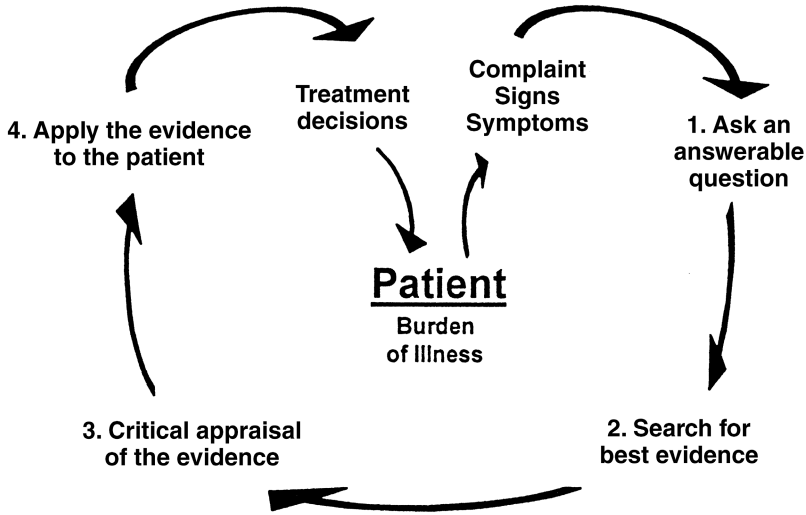

Figure 1. The steps in the model of evidence-based practice. (*From* Anderson JD: Need for evidence-based practice in prosthodontics. J Prosthet Dent 83:58–65, 2000; with permission.)

0.003), meaning there was only a 0.3% chance that such a difference could have occurred by chance. This difference seems major until one realizes that it is only a 0.5-mm difference and therefore is unlikely to be clinically significant. A highly significant statistical difference is therefore no indicator of a clinically significant difference.

Most articles that describe clinical research report their findings on a sample of patients. Often, the sample of patients is intended to represent the whole population. The selected patients therefore should have demographic and disease characteristics similar to those of the population at large. The distribution of age, sex, socioeconomic status, education, nutritional status, and occupational range all should reflect society in general. Similarly, the prevalence, severity, and duration of disease status should also mirror the general population. Clearly, a sample of patients in any given study is unlikely to fulfill all these criteria. Often, the authors do not want to reflect the whole population and limit their sample to persons of a certain age group, or with a history of exposure to an agent such as smoking, or with a clinical condition such as edentulousness. In applying the findings from such studies to the individual patient, a clinician must decide if the patient is similar enough to the study patients for the results to be applicable. One way to do so is to see if the clinician's patient would have met the inclusion and exclusion criteria to be included the study. Often, some differences are found between the study sample and the present patient. These differences may not make the article useless. A more useful approach may be to reverse the question and ask whether the study population is so different

from the patient that the results cannot possibly be applied. This approach makes it possible to apply some information from the article. If the study population is divided into subgroups, it may be possible to match the reader's patient to one of the groups for more focused information.

The setting in which the study was gathered can have a major impact on the findings. The results of a new, experimental periodontal treatment tested in a major teaching institution may not be applicable to the patients of a general practitioner because of an effect called *referral filter* bias. The major teaching institution is likely to attract patients who have more severe periodontal problems than those seen in general practice. Similarly, the treatment they receive at a major center may not be feasible in general practice. The patients' response to the new treatment, therefore, may not be applicable to the patients of a general practice. An example is the series of patients treated with severe (apical third) periodontal bone loss who were rehabilitated with extensive fixed bridges and aggressive oral hygiene maintenance.[6] Such a report offers little help to the general practitioner who sees less severe periodontal destruction, is less likely to undertake such extensive reconstructions, and may not be able to expect such a high degree of patient compliance in oral hygiene. Therefore, if readers are seeking information to apply to their general practice, it will be necessary to pay special attention to how the patients were selected with respect to the severity of their disease and the feasibility of the treatment approach. The important question for the practitioner to ask is, ''Could such circumstances be duplicated in my office?''

No clinical decisions are made without some element of patient input. The patient's preferences, priorities, and resources will therefore affect clinical decisions. Stated another way, the social and cultural issues that are important to the patient must be considered when deciding how to apply the information found in a literature search related to the patient's problem. A new, highly effective treatment approach that takes too long, is likely to be painful, or is too expensive is not appropriate if it is not consistent with the patient's wishes. Similarly, treatment solutions exist for problems that are not important to some patients. The use of effective veneering techniques makes sense only if the social and cultural pressures on a patient exceed the risks inherent in the technique. For many people, a less than perfect smile is simply not important. To suggest a solution where there is no problem invites disaster. Marketing techniques aimed at creating demand are a concern here.

SPECIFIC APPLICATIONS

The general issues discussed previously apply to any situation in which one is contemplating the application of valid information found in the literature to a specific patient situation. There are, however, other

points to be considered when applying certain types of information to the patient's situation. These are considered in turn.

Diagnostic Tests

Once valid information about a diagnostic test has been recovered from the literature, the practitioner must decide whether the test will be useful for a given patient. To make this decision, the answers to a few questions will provide guidance[7].

1. Is the diagnostic test available, affordable, accurate, and precise in this setting?
2. Can a clinically sensible estimate of the patient's pretest probability of disease be generated?
   - Can personal experience or prevalence statistics be drawn on?
   - Are the study patients similar to this patient?
3. Would the results of the test affect the management and help the patient?
   - Could the results influence the decision to treat the condition?
   - Would the patient be a willing partner in the treatment?

First and most sensibly, practitioners must be assured that the test is available, affordable, accurate, and precise in their setting. The answer to the first two parts of this question are probably obvious. An electric pulp tester is easily available and usable at reasonable cost in most dental offices. On the other hand, computed tomography and the associated software are less available, and their use is certainly more expensive. The answer to the latter two parts of the question may be less apparent. A diagnostic test that has performed well in the office of a general practitioner may not perform as well in a specialist's office or university clinic. The reason is that the prevalence of the condition being tested will probably be different in the two settings. Therefore, the difference in the rate of false-positive (or false-negative) findings will change the likelihood ratios of the test. Because the prevalence of the disease may be a major component of the pre-test probability of disease, the test may behave differently in different settings. Thus, the interpretation of the electric pulp test may be different in a general practitioner's office and in a university teaching endodontic clinic. Similarly, a report of a new test that was validated in a tertiary care center must be applied with caution in a general practice setting.

The appropriate use of a diagnostic test begins with a pretest estimate of the likelihood of disease. This estimate may be no more precise than the prevalence of the condition in the population. A patient who presents with throbbing pain and facial swelling, however, raises the pretest estimate of the likelihood of apical periodontitis beyond the general prevalence in the population. Even if the diagnosis is a guess, under these conditions it is a better estimate than simple prevalence. On the other hand, it is more difficult to generate an estimate of the

pretest likelihood of a malignancy in a young patient with an unexplained ulcer in the palate. Where a practitioner estimates pretest likelihood, the most recent or most dramatic previous events encountered influence his or her judgment.[5]

The third question Sackett and colleagues pose is whether the results of the test will change the practitioner's treatment behavior.[7] For example, a patient presents with a maxillary lateral incisor consumed by decay that is sensitive to heat and percussion, with throbbing pain and swelling above the apex. It is highly unlikely that an electric pulp test of this tooth will change the treatment behavior of the dentist. In this situation, the treating dentist has already crossed a decision threshold to treat the tooth based on other clinical findings, and the electric test will add no new information. On the other hand, the dentist would not do a biopsy of a lesion in the palate of a teenager who reported burning his mouth on a hot pizza the night before. Similarly, the dentist has crossed a decision threshold in the other direction, deciding not to test the lesion because of the invasiveness of the test and the low probability of a finding that warrants treatment. It is in the area between these extremes, where the results of a test will influence the treatment behavior, that the time, cost, and discomfort of a test are warranted.

Finally, if the test is painful or costly, the patient may choose not to know the results of the test rather than submit to the test. For example, a patient may be reluctant to submit to a CT scan with three-dimensional reconstruction to measure bone volume before the placement of two implants in his edentulous mandible when a conventional panoramic film and clinical examination confirm more than enough bone thickness and height. Clearly, the patient must be a willing participant in the diagnostic procedure with an expectation of obtaining valuable new information that will influence the outcome to justify the additional cost or discomfort.

Prognosis

Whether the information in an article about the prognosis of a condition should be applied to a specific patient can be decided by answering questions specific to this type of article:

1. Will the results lead directly to selecting or avoiding treatment for an individual patient?
2. Are the results useful for reassuring or counseling patients?

Knowledge of the natural history of a condition clearly will influence the decision to select or avoid treatment. For example, with the clarification of the prognosis of juvenile periodontitis,[8] treatment can be more focused and aggressive. On the other hand, an article by de Leeuw et al[3] suggests that in patients with osteoarthrosis and reducing temporomandibular joint disk displacement, the prevalence of pain dropped from 43% to only 17% in 2 to 4 years and dropped further to

only 2.4% after as much as 30 years. It would be difficult to suggest invasive surgical treatment in the face of this information. So, in addition to the general issues noted at the start of this article, readers of an article that describes a prognosis must ask whether the results will lead directly to selecting or avoiding treatment for an individual patient. Unless the results of an article about prognosis can be used in this way, it is unlikely that the results will have any application to the individual patient.

In situations such as temporomandibular disorders, providing information for the patient may be enough treatment. Simply giving the patient some understanding of the natural history of the condition can do much to relieve anxieties by providing realistic expectations. A second question for the reader of articles about prognosis, then, is, "Are the results useful for reassuring or counseling patients?"

Therapy

In dentistry, numerous articles advocate improved techniques or materials over existing therapies. It is not always appropriate to apply the results of every therapeutic improvement to every patient, even if the evidence was found to be compelling when critically appraised. Certain questions specific to articles about therapy will help determine when to apply improvements to patients and when not to:

1. Are the results reported as outcomes that are important to patients?
2. Were all clinically important outcomes reported?
3. Are the likely treatment benefits worth the potential harms and costs?

Evidence for the improvement usually takes the form of increased longevity (such as implants or fixed partial dentures), reduced numbers of failures (such as tooth loss), or improvement in subjective parameters (such as comfort or chewing ability). All of these outcomes are important to patients. Sometimes, when these outcomes are rare or take a long time to realize, substitute outcomes, such as attachment loss, bleeding on probing, and mobility, are used to predict those events that are important to patients. The use of these surrogates is reasonable and expedient only to the extent that they do, in fact, predict the events that are important to patients. A meta-analysis presented recently[2] suggested that guided tissue-regeneration procedures would result in a mean increase in attachment level of 4.0 mm. This result is impressive, but the application of this information to an individual patient requires that an increase in attachment level predicts greater tooth longevity—an outcome more likely to be of interest to the patient than the level of attachment. If this link has been previously established, this information is meaningful; if this link has not been established, the usefulness of this information is limited, even though it is based on a meta-analysis (a strong design). A further problem was that the underlying studies used

in the meta-analysis were limited to 1 year of follow-up. The reader of articles that report the results of trials of therapy must therefore be sure that the outcomes reported are important to patients and not merely surrogates lacking in predictive value.

To ensure predictive value, it is important that all clinically important outcomes have been reported in the article. In a randomized trial of the efficacy of flurbiprofen taken for 3 months after implant surgery in reducing alveolar bone loss around implants, Jeffcoat and others[4] noted that two patients had to be withdrawn from the study, one because of stomach upset and another because of a decrease in red blood cell counts thought to be related to the medication. The trial found a statistically significant reduction in bone loss between the third and sixth months after surgery, but at no other time up to 1 year. The difference in bone mass lost was between 8.6 and 12 mg. The reader therefore must consider whether the additional risks involved in that dosage of the drug are worth the benefit of saving those few milligrams of bone. The significance of saving those few milligrams of bone must also be considered. The clinician must balance the potential benefits of the treatment against the potential harms or costs of the treatment. The information presented in the article informs but does not dictate the clinician's decision to apply the findings to the particular patient.

SUMMARY

It should be evident by now that evidence based dentistry leaves much room for the application of clinical judgment to the literature. This article points out that judgment in evaluating certain factors is essential and that the practice of evidence based dentistry is not a process of blindly following the conclusions found in the literature. Clinicians can safeguard the patient and themselves against the inappropriate use of weak or irrelevant evidence in the conduct of daily practice. This skill adds confidence to decision making in clinical practice and prevents the decline in skills throughout a career.

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