

Evidence Based Periodontology and Oral Implantology: A Review Update

Poonam M Singh^{1*} Arvind Shetty² Amit Bhirani³ Ankita Deshmukh⁴

¹Professor, Department of Periodontology and Oral Implantology, Dr. D. Y. Patil School of Dentistry & Hospital, Nerul, Mumbai, India.

²Professor and Head, Department of Periodontology and Oral Implantology, Dr. D. Y. Patil School of Dentistry & Hospital, Nerul, Mumbai, India.

³Post Graduate Student, Department of Periodontology and Oral Implantology, Dr. D. Y. Patil School of Dentistry & Hospital, Nerul, Mumbai, India.

⁴Post Graduate Student, Department of Periodontology and Oral Implantology, Dr. D. Y. Patil School of Dentistry & Hospital, Nerul, Mumbai, India.

ABSTRACT

Background: The goal of evidence-based dentistry is to help practitioners provide their patients with optimal care. Dentists need to make clinical decisions based on limited scientific evidence. In clinical practice, a clinician must weigh a myriad of evidences every day. Evidence-Based Periodontology aims to facilitate such an approach and it offers a bridge from science to clinical practice. This article will review the concepts of Evidence-Based Periodontology and implantology. Providing the most appropriate periodontal treatment requires an accurate diagnosis, performing optimum treatment, and monitoring the patient. Keeping up to date with current information, having a system for properly evaluating it, and using the knowledge to help make treatment decisions improves the opportunity for successful outcomes. The Evidence-based (EB) approach is a straightforward, systemic process which helps the clinician and researcher evaluate the relevant information regarding diagnosis, treatment, prognosis, and experimental decisions. Applying the Evidence-Based process to the periodontal literature will improve periodontal treatment.

Keywords: Evidence, Implantology, Periodontal disease.

INTRODUCTION

WHAT IS EVIDENCE BASED PERIODONTOLOGY?

Evidence based periodontology is the application of evidence based health care to periodontal patients. The evidence based health care as proposed by Muir Gray¹ is “An approach to decision making in which clinician uses the best evidence available in consultation with the patient, to decide upon the option which suits the patient best”. Therefore evidence based periodontology is a tool to support decision making and integrating the best evidence available with clinical practice. The foundation of evidence



based practise was laid by David Sackett² who has defined it as “Integrating individual clinical expertise with the best available external clinical evidence from systemic research”.

American Dental Association has defined evidence based dentistry as “an approach to oral health care that requires the judicious integration of systemic assessments of clinically relevant scientific evidence, relating to patient’s oral and medical condition and history, with the dentist’s clinical expertise and the patient’s treatment needs and preferences”³. Evidence based periodontology is the comprehensive integration of appropriate research evidence, patient preference and clinical expertise (Figure 1).

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*Correspondence Dr. Poonam M Singh.

Department of Periodontology and Oral Implantology, Dr. D. Y. Patil School of Dentistry & Hospital, Nerul, Mumbai, India.

Email: drpoonamm.singh@gmail.com

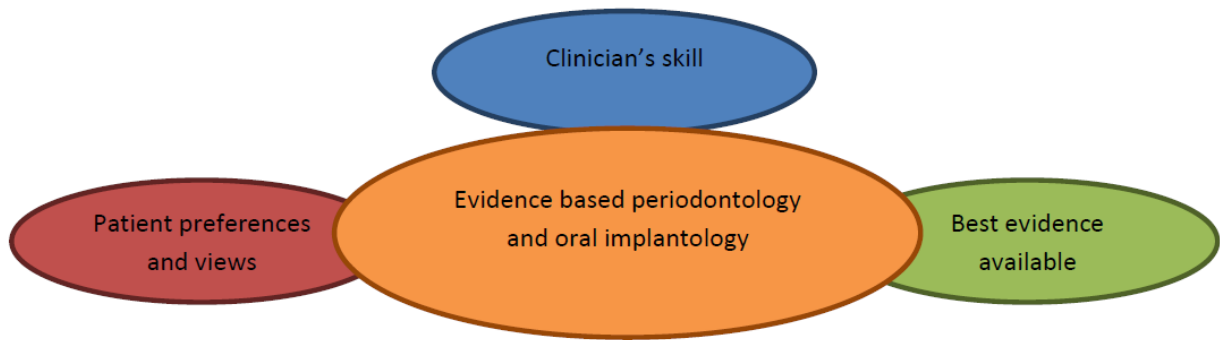


Fig 1: Relationship of clinical skills, the patient and the 'evidence' to evidence based periodontology.

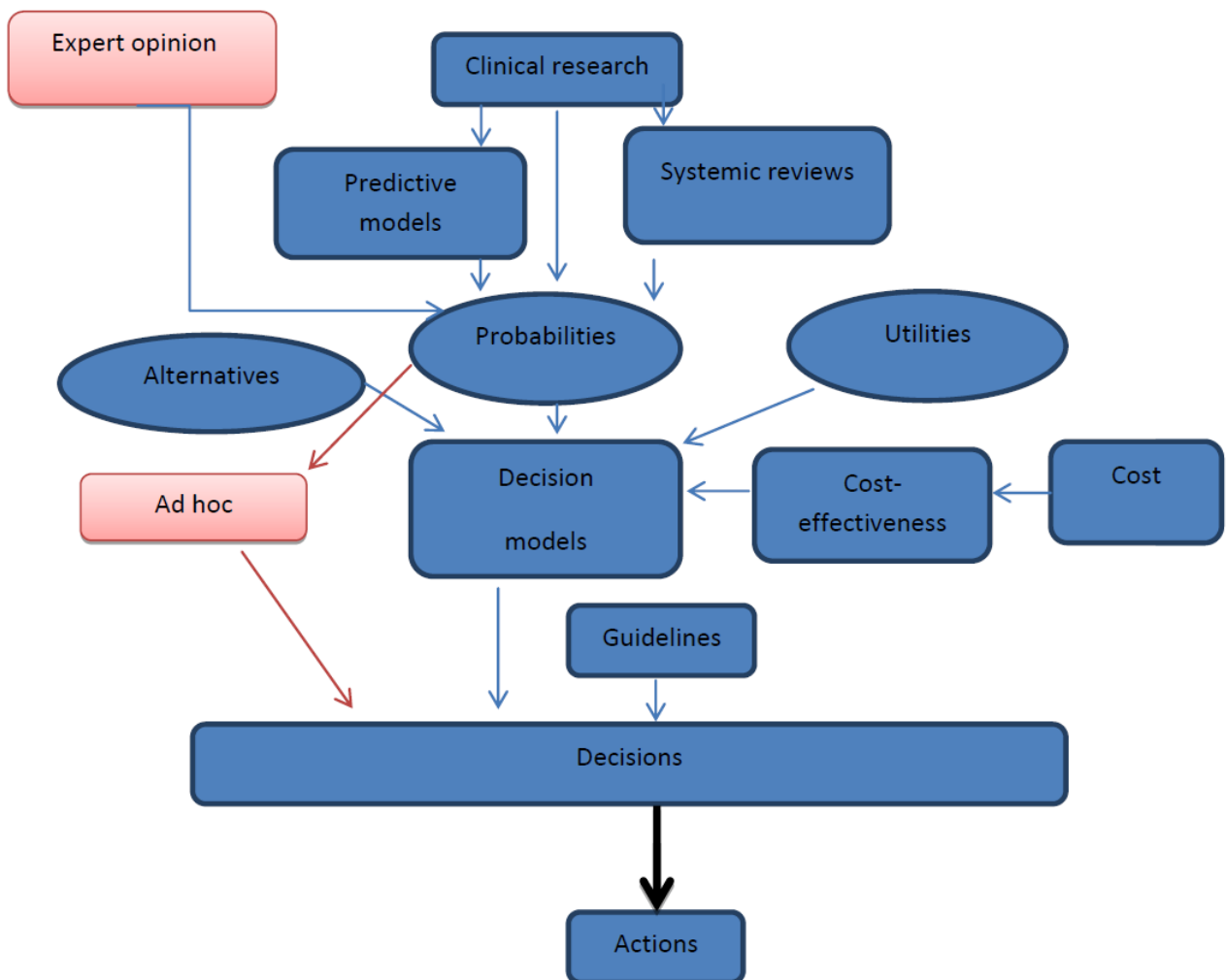


Fig 2: Overall scheme of decision making (Chapman and Sonnenberg, 2000).

THE DEVELOPMENT OF EVIDENCE BASED PERIODONTOLOGY

Evidence based medicine has only been known for just over a decade and the term was coined by the clinical epidemiology group at Mc Master University in Canada.

One of the earliest to take up the challenge in periodontology was Alexia Antczak Bouckoms in Boston, USA. They challenged the methods and quality of periodontal clinical research in the mid 1980's and setup an oral health group as a part of Cochrane collaboration in 1994⁵.

The first Cochrane systemic review in periodontology was published in 2001 and researched the effect of GTR for infrabony defects⁵.

PROBLEMS OF INTRODUCING EVIDENCE BASED DENTISTRY⁶

The aim of evidence based dentistry is to encourage the ordinary dental practitioner in primary dental care to look for and make sense of the evidence available in order to apply it to everyday clinical problems. However, making clinical decisions based on evidence does pose several problems for the dental practitioners which are as follows:

1. Amount of evidence
2. Quality of evidence
3. Dissemination of evidence
4. Practice based on authority rather than evidence

1. AMOUNT OF EVIDENCE

Currently over 2 million biomedical articles are published annually in some 20,000 journals. There are about 500 journals related to dentistry. Clearly not all of these articles are relevant to all areas of dental practise, nor can one hope to read any more than small minority.

2. QUALITY OF EVIDENCE

Much of ever increasing volume of evidence is produced to enhance career prospects rather than

to increase knowledge. This can compromise quality.

3. DISSEMINATION OF EVIDENCE

Unless good methods of dissemination are available, even where there is good evidence, it takes many years for a particular treatment to become the norm.

4. PRACTISE BASED ON AUTHORITY RATHER THAN EVIDENCE

The use of techniques or therapies based on the views of authority rather than evidence may lead to the wrong treatment being performed.

WHY SHOULD WE GET INTO EVIDENCE BASED DENTISTRY?

James D Anderson (2000) has enlisted three major reasons for being attentive to this new paradigm.

- I. The explosion in the volume of information makes it virtually impossible to keep up with the current reading.
- II. The increasing use of randomized controlled trial and more emphasis on research methodology has resulted in much greater strength of evidence
- III. There is evidence from both medicine and dentistry that clinical skills deteriorate with increasing years since graduation.

Table 1: Evidence based v/s traditional periodontology.

	Evidence based periodontology	Traditional Periodontology
Similarities	1. High value of clinical skills and experience 2. Fundamental importance of integrating evidence with patient values	
	Uses best evidence available	Unclear basis of evidence
Differences	Systematic appraisal of quality of evidence	Unclear or absent appraisal of quality of evidence
	More objectives, more transparent and less biased process	More subjective, more opaque and more biased process
	Greater acceptance of levels of uncertainty	Greater tendency to black and white conclusions

STEPS IN USING EVIDENCE BASED DENTISTRY

1. Create an answerable question
2. Track down the best evidence to answer the question
3. Critically appraise the information
4. Apply the results to one's patient
5. Evaluate one's performance

WHAT CONTRIBUTES THE EVIDENCE?

Scientific evidence is the product of well-designed and well-controlled research investigations. A single research study doesn't constitute "the evidence" but rather contributes to a body of knowledge that has been derived from multiple studies investigating the same phenomena.

Once synthesized, evidence can help inform decisions about whether a method of diagnosis or a treatment/intervention is effective relative to other methods or treatment interventions, and under what circumstances.

ADVANTAGES AND DISADVANTAGES OF EVIDENCE BASED DENTISTRY

Advantages

For individuals –

- Enables clinicians to upgrade their knowledge base routinely
- Improves clinicians understanding of research methods and makes them more critical in using data
- Improves computer literacy and data searching techniques
- Improves reading habits

For clinical teams –

- Gives team a framework for group problem solving and for teaching
- Enables juniors to contribute usefully to team

For patients –

- More effective use of resources
- Better communication with patients about the rationale behind management decisions

Disadvantages

- It takes time both to learn and to practise
- Establishing the infrastructure for practising evidence based dentistry costs money
- Evidence based dentistry exposes gaps in the evidence
- Medline and the other electronic databases used for finding relevant evidence are not comprehensive and are not always well indexed

EVIDENCE BASED APPROACH AND PERIODONTAL DISEASE PROGRESSION

Not all patients with gingivitis will go on to develop periodontitis. Gingivitis and periodontitis are a continuum of the same inflammatory disease⁷. There is evidence that gingivitis may progress to periodontitis in susceptible individuals. However it is currently not possible to identify those individuals who are at risk to develop periodontitis. The weight of evidence also indicates that prevention of gingival inflammation prevents periodontitis. Moreover there are no prospective clinical/histological studies on the progression of gingivitis to periodontitis in humans.

ETIOLOGY OF PERIODONTAL DISEASE

Microbial Factors

Socransky⁸ published a set of weighted criteria for microbial causation in periodontal disease that have been frequently referred to in dental research.

According to these a potential pathogen must,

1. Be associated with disease, as evident by increase in the number of organisms at diseased sites.
2. Be eliminated or decreased in sites that demonstrate clinical resolution of disease, with treatment.
3. Demonstrate a host response, in the form of an alteration in the host cellular or humoral immune response
4. Be capable of causing disease in experimental animal models

5. Demonstrate virulence factors responsible for enabling the microorganism to cause destruction of the periodontal tissues

The following are the three microorganisms considered as prime etiologic agents: *Aggregatibacter actinomycetem-comitans*, *Porphyromonas gingivalis*, and *T. forsythia*. *Actinomycetemcomitans* is most often found in early-onset periodontitis, whereas *P. gingivalis* and *T. forsythia* are found as or more frequently in adult onset periodontitis.

PERIODONTAL-SYSTEMIC INTER-RELATIONSHIP

Teeuw WJ et al (2010) suggested that periodontal treatment can lead to an improvement of glycemic control in type 2 diabetic patients for at least 3 months. A greater risk of periodontal disease progression is associated with type 2 DM which was considered a risk factor for periodontitis.

Blaizot A et al (2009)⁹ reviewed several studies and found that the risk of developing cardiovascular disease was found to be significantly higher in subjects with periodontal disease compared to those without periodontal disease. A retrospective analysis suggested that periodontal disease may be a significant risk factor for coronary heart disease. Thus, higher risk of developing cardiovascular diseases was seen, but the reduction in the risk of cardiovascular events associated with the treatment of periodontitis remained to be investigated.

Studies have shown that poor oral hygiene and periodontal disease may foster colonization of the oropharyngeal region by respiratory pathogens, particularly in hospital or nursing home patients. If aspirated these pathogens may cause pneumonia. Other cross-sectional epidemiologic studies point to an association between periodontal disease and chronic obstructive pulmonary disease.

PERIODONTAL DIAGNOSIS

Improvements in radiography and periodontal probing offer promise for increased accuracy and precision of diagnostic measurements

- Digital subtraction radiography (DSR) provides an objective method too small to be seen by eye or by conventional interpretation of serial radiographic examinations.
- Controlled force periodontal probes include both mechanical and electronic instruments and offer improved control of probing force for assessment of bleeding on probing

NON SURGICAL POCKET THERAPY

Mechanical methods of subgingival debridement accomplished by thorough scaling and root planing, accompanied by oral hygiene procedures have served as a gold standard of periodontal therapy for decades^{10,11}.

Mechanical therapy is usually the first mode of treatment recommended for most periodontal infections. After adequate time to evaluate healing response, the patient must be re-evaluated to determine if further mechanical, adjunctive pharmacological, and/or surgical treatment is indicated.

EVIDENCE-BASED APPROACH AND MECHANICAL NONSURGICAL POCKET THERAPY

Nonsurgical pocket therapy (NST) was found to have a positive effect with the exception of pockets <3 mm. Patient, environmental, and operator factors affect therapy delivery. Long term clinical trials which included maintenance have documented mean gains and stability of clinical attachment following scaling and root planing.

Studies show that the adjunctive use of sub-antimicrobial doses of doxycycline (SDD) with scaling root planing is statistically more effective than SRP alone in reducing PD and in achieving CAL gain.

CHEMICAL PLAQUE CONTROL

Three systematic reviews and 1 meta-analysis that evaluated the efficacy of anti-plaque, anti-gingivitis mouth rinses have been done. The systematic reviews concluded that there is strong evidence supporting the efficacy of chlorhexidine and essential oils as anti-plaque, anti-gingivitis mouth rinses. Stannous fluoride dentifrices have

shown statistically significant reduction in gingivitis.

SPLINTING

According to the systematic review done by Hinckfuss SE, Messer LB¹², in which both short term (14 days or less) and long term splinting (over 14 days), the evidence for the association between short-term splinting and an increased likelihood of functional periodontal healing, acceptable healing, or decreased development of replacement resorption appears inconclusive.

SURGICAL POCKET THERAPY AND REGENERATION

Successful surgical pocket therapy depends on an acceptable level of plaque control by the patient and/or compliance with SPT. In addition, research supports that cigarette smoking adversely affects the outcomes of periodontal surgery¹³.

EVIDENCE-BASED APPROACH IN PERIODONTAL REGENERATION

Role of root surface biomodification in regenerative therapy

Histologic evidence is available demonstrating that regeneration is associated with citric acid root surface conditioning. In clinical trials, statistically significant differences were noted between tests and control sites however they were not clinically relevant. Additional research is needed to delineate the role of root surface biomodification in periodontal regenerative therapy.

Guided tissue regeneration

Needleman IG et al¹⁴ included 17 randomized control trials of 12 month duration comparing guided tissue regeneration (with or without graft materials) with open flap debridement for the treatment of infra-bony defects. They concluded that, GTR has a greater effect on probing measures of periodontal treatment than open flap debridement, including improved attachment gain, reduced pocket depth, less increase in gingival recession and more gain in hard tissue probing at re-entry surgery.

Enamel Matrix derivative

Venezia E et al¹⁵ used 28 studies of intrabony defects treated with EMD. It was concluded that EMD is safe and can regenerate lost periodontal tissues in previously diseased sites. EMD seems to have broad regulatory effects on malignant cells and on several carcinoma related factors. Evidence suggests that patients with premalignant or malignant mucosal lesions should not be treated with EMD¹⁶.

Use of Platelet rich plasma for tissue regeneration

Martinez-Zapata MJ et al¹⁷ reviewed 20 RCTs. It was concluded that, PRP improves the gingival recession but not the clinical attachment level in chronic periodontitis.

MUCOGINGIVAL SURGERY

Gingival recession

Subepithelial connective tissue grafts, coronally advanced flaps alone or associated with other biomaterial, and GTR may be used as root coverage procedures for the treatment of localized gingival recession. In cases where root coverage and gain in keratinized tissue are expected, the use of SCTGs seems to be more adequate¹⁸.

Subepithelial connective tissue grafts

Chambrone L et al¹⁹ considered 23 studies and the results of these studies indicated a statistically significant reduction in gingival recession for SCTG, when compared to acellular dermal matrix grafts and guided tissue regeneration with resorbable membranes.

Overall comparisons allowed considering it as the 'gold standard' procedure in the treatment of recession-type defects.

EVIDENCE BASED ORAL IMPLANTOLOGY

Implant Basics

The clinicians should assess the strength of evidence before choosing an implant system.

Antibiotic Prophylaxis

Esposito M et al concluded that there is some evidence suggesting that 2 gm of amoxicillin

given orally one hour preoperatively significantly reduces failures of dental implants placed in ordinary conditions.

Immediate Versus Delayed Implants

Immediate implants are placed in dental sockets just after tooth extraction. Immediate-delayed implants are those implants inserted after week's upto about a couple of months to allow for soft tissue healing. Delayed implants are those placed thereafter in partially or completely healed bone. The potential advantages of immediate implants are that the treatment time can be shortened and that bone volume can be partially maintained thus providing good esthetic results. The potential disadvantages are an increased risk of infection and failures. After implant placement in post extraction sites, gaps can be present between the implant and the bony walls.

It is possible to fill these gaps and to augment bone simultaneously to implant placement. There are many techniques to achieve this but it is unclear when augmentation is needed and which could be the best augmentation technique. Sanz I et al considered randomized control clinical trials and concluded the placement of dental implants at an early timing after tooth extraction may offer advantage in terms of soft and hard tissue preservation when compared with the delayed protocol. Nevertheless well designed high quality randomized clinical trials are needed because the available evidence is today limited in terms of available studies and quality.

Esposito M et al suggested that immediate and immediate delayed implants may be at higher risks of implant failures and complications than delayed implants and on the other hand the esthetic outcome might be better when placing implants just after teeth extraction.

One Stage Vs Two Stage Implants

One stage implants could be done when the primary stability is good preferably in non-stress bearing areas and two stage implants despite a second surgery should be considered in those cases where primary stability is not achieved and there are chances of failures due to placement of temporary or fixed prosthesis.

IMPLANTS WITH MODIFICATION IN MODIFIED/COMPROMISED AREAS

Short Implants

Telleman G et al²⁰ concluded that short implants (less than 10 mm) can be placed successfully in the partially edentulous patients, although with a tendency towards an increasing survival rate per implant length, and the prognosis may be better in the mandible of non-smoking patients.

Platform Switching

Platform switching for maintaining peri-implant bone levels has gained popularity among implant manufacturers over the last few years.

Al-Nsuor MM et al²¹ considered 9 studies out of which 7 articles demonstrated that platform switching was effective in preserving marginal bone around implants.

IMPLANTS IN COMPROMISED PATIENTS

Diabetes and Smoking

Javed F, Romanos GE²² identified 33 studies. The included studies reported that poorly controlled diabetes negatively affects implant osseointegration; however, under optimal serum glycemic control, osseointegration can successfully occur in patients with diabetes. Thus, a successful dental implant osseointegration can be accomplished in subjects with diabetes with good metabolic control in a similar manner as in subjects without diabetes. Klokkevold PR, Han TJ²³, demonstrated that smoking has an adverse effect on implant survival and success.

Bisphosphonate Therapy

Based on the evidence the placement of an implant may be considered a safe procedure in patients taking oral Bisphosphonates for >5 years with regard to the occurrence of Bisphosphonate-related osteonecrosis of the jaw (BRONJ) since in these studies no BRONJ has been reported.

Infection and Immediate Implants

Waasdorp JA, Evian CI, Mandracchia M (2010), found 417 references which concluded that

implants can be placed into sites with peri-apical and periodontal infections. The sites must be thoroughly debrided prior to placement. Guided bone regeneration is usually performed to fill the bone-implant gap and/or socket deficiencies.

Implant Therapy In Chronic Periodontitis Patients

Within the limitations of the studies available a moderate level of evidence indicates that subjects with periodontitis were at significantly higher risk for implant failure and greater marginal bone loss as compared with periodontally healthy subjects.

Implant Therapy In Aggressive Periodontitis Patients

Evidence suggests that bone loss around implants in aggressive periodontitis patients appears to occur more frequently than it does in chronic periodontitis patients or periodontally healthy individuals.

IMPLANT SELECTION CRITERIA

For the success in implant dentistry one should ideally evaluate a long term primary outcome of an implant prosthetic complex as a whole.

Need for studies reporting individual patient data

Individual patient data (IPD) is considered the gold standard for the following reasons:

- Only IPD can provide the information needed to investigate the role of various factors in different clinical situations.
- If data are only available on a trial level and not for individual sites, it is impossible to individually relate the baseline recession depth of a site to the treatment results of that specific site.

What is the significance of individual patient data?

The clinical trial usually answers yes or no, but the rest of the information remains unused. The lost information would be very valuable in

exploring data in order to raise few sensible questions and to design new trials. Therefore at least the following issues are relevant:

- The possibility of exploring data from different viewpoints.
- The possibility of analysing the same data in different ways.
- The possibility of replicating the study to reduce the margin of doubt that cannot be eliminated.
- The possibility of an in-depth check of the reliability of the data collection and analysis.
- The possibility of sizing new experiments in an economically sound way by saving or designing expensive pilot studies more rationally.
- The possibility of computing the confidence intervals of some statistics those are of interest to the reader.

CONCLUSION

The principles of evidence-based healthcare provide structure and guidance to facilitate the highest levels of patient care. There are numerous components to evidence - based periodontology including the production of best available evidence, the critical appraisal and interpretation of the evidence, the communication and discussion of the evidence to individuals seeking care and the integration of the evidence with clinical skills and patient values. Evidence-based healthcare is not an easier approach to patient management, but should provide both clinicians and patients with greater confidence and trust in their mutual relationship.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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