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Barriers to implementing evidence-based clinical guidelines: A survey of early adopters

Heiko Spallek, DMD, PhD, MSBA[1], **Mei Song, PhD**[1], **Deborah E Polk, PhD**[2], **Tanja Bekhuis, PhD, MS, MLIS**[1], **Julie Frantsve-Hawley, RDH, PhD**[3], and **Krishna Aravamudhan, BDS, MS**[3]

[1]Center for Dental Informatics, Department of Dental Public Health and Information Management, School of Dental Medicine, University of Pittsburgh

[2]Department of Dental Public Health and Information Management, School of Dental Medicine, University of Pittsburgh

[3]Center for Evidence-Based Dentistry, ADA Foundation Research Institute, American Dental Association

Abstract

Objective—The purpose of this study is to identify barriers that early-adopting dentists perceive as common and challenging when implementing recommendations from evidence-based (EB) clinical guidelines.

Method—This is a cross-sectional study. Dentists who attended the 2008 Evidence-based Dentistry Champion Conference were eligible for inclusion. Forty-three dentists (34%) responded to a 22-item questionnaire administered online. Two investigators independently coded and categorized responses to open-ended items. Descriptive statistics were computed to assess the frequency of barriers and perceived challenges.

Results—The most common barriers to implementation are *difficulty in changing current practice model*, *resistance and criticism from colleagues*, and *lack of trust in evidence or research*. Barriers perceived as serious problems have to do with *lack of up-to-date evidence*, *lack of clear answers to clinical questions*, and *contradictory information in the scientific literature*.

Conclusions—Knowledge of barriers will help improve translation of biomedical research for dentists. Information in guidelines needs to be current, clear, and simplified for use at chairside; dentists' fears need to be addressed.

Keywords

Dentistry; Evidence-Based Dentistry; Guidelines as Topic; Dental Informatics

Corresponding author Heiko Spallek, DMD, PhD, MSBA, Associate Professor, Center for Dental Informatics, School of Dental Medicine, University of Pittsburgh, 3501 Terrace Street, Pittsburgh, PA 15261, Skype: hspallek, Ph: (412) 648-8886, Fax: (412) 648-9960, hspallek@pitt.edu.

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A goal of *Healthy People 2010* is to promote the oral health of 50% of the nation's children by applying sealants to their molar teeth.1 Unfortunately, just 32% of children aged 6 to 19 years have sealants. 2 This may be due to the relatively slow translation of current biomedical science into dental practice.3,4 To facilitate the transfer of scientific findings, clinical decision support tools, such as evidence-based (EB) clinical practice guidelines, are developed to aid clinicians in the treatment planning process. In fact, creating and disseminating EB treatment guidelines is a priority for the National Institutes of Health.[5] Many organizations, including the American Dental Association (ADA)6 and the Centers for Disease Control and Prevention, invest resources in developing such guidelines even though few are implemented by practicing dentists.7,8 However, dentists are not atypical—in medicine, evidence informs patient care about 50% of the time, even when best practices are well known and documented in clinical practice guidelines.9 This discrepancy between science and practice exemplifies what was described in a report by the Institute of Medicine in 2001 as "not just a gap, but a chasm" (p.1).[10] Furthermore, difficulties in translating research into practice are not unique to healthcare as evidenced in other domains, such as agriculture, education, and communication.11

Barriers to implementing evidence-based dentistry

Changes throughout the healthcare delivery system are needed to encourage dentists to design treatment plans based on current scientific evidence. However, medical investigators report that barriers to change occur at various points in the system. These include the patient, the healthcare provider team, and the healthcare organization.[12–16] We describe below several barriers identified in the existing literature, which is primarily medical rather than dental. The presumed barriers are often based on opinion rather than empirical research, which highlights the dearth of knowledge about barriers facing practicing dentists.

Barriers associated with the patient

These barriers are impediments located at the level of the individual patient. By definition,[6] evidence-based dentistry (EBD) encourages a shared decision-making process in which evidence complements both the clinician's judgment and the patient's needs and preferences. Often, patient needs and preferences may be affected by financial considerations, dental advertising, and access to online information, which may be of questionable quality. Their requests sometimes conflict with guideline recommendations, Thus, to the degree that dentists strive to accommodate such patient preferences, they may be unable to implement proven interventions.[17,18]

Barriers associated with the healthcare provider team

These barriers have to do with obstacles at the point of care including: information constraints; quality of clinical-decision support tools, such as guidelines; and provider attitudes. In general, information constraints identified in the literature can be summarized as not involving "the right information at the right time, [for] the right person, and in the right format." (p. 318) [19] For example, dentists in need of information typically consult their colleagues20–23 who may not be knowledgeable about current best evidence 24. Even though evidence can be accessed online, practitioners may not have enough time or skill to find the information they need;[25] to recognize when information is untrustworthy;[26] or to reconcile conflicting information.[27] Dentists may not be able to apply the information correctly to the patient at hand.[28,29] They may inappropriately rule out a treatment option;[7] give low weight to knowledge about treatment options in the decision-making process;[26] or believe that no one else is using the treatment option.[26] Thus, there are many possible barriers for getting the right information to the dentist at the right time.

In order to address some of these barriers, organizations develop clinical practice guidelines to support clinical decision making. Although guidelines attempt to locate and appraise the current best evidence with respect to specific topics, understanding how to implement guideline recommendations may be difficult.

Guidelines can be complex. In order to meet accepted quality standards,[30] EB guidelines must provide sufficient information to maintain transparency and reproducibility. For example, the ADA sealant guideline[31] addresses four topics: caries prevention, noncavitated carious lesions, resin-based vs. glass ionomer cement, and placement technique. This 10-page document contains 13 recommendations published in the *Journal of the American Dental Association* with additional information posted online. Each recommendation is accompanied by ratings of *Grade of Evidence* and *Strength of Recommendation* to maintain transparency, and to explicitly link the level and quality of evidence to the strength or confidence in the recommendation. Although necessary, the complexity of information may itself prove to be a barrier in terms of time required for comprehension and then application in treatment planning. Furthermore, different systems used by organizations to grade evidence and recommendations may not be fully understood by the user. Thus, users may find it difficult to appropriately use evidence when making decisions about individual patients. In medicine, the complexity of guidelines has been linked to degree of accessibility and ease of use,[32] and guideline attributes, e.g., stepwise format and source credibility, are associated with utilization by practitioners.[33]

Additionally, there is a dearth of quality guidelines. For example, the National Guideline Clearing House offers a database of 2162 guidelines of which just 60 (about 3%) are related to stomatognathic diseases as of March 26, 2010:[34] three guidelines relate to jaw diseases, 35 to mouth diseases, nine to pharyngeal diseases, four to stomatognathic system abnormalities, one to temporomandibular joint disorders, and 27 to tooth diseases (some guidelines fall into more than one category of diseases). Naming and categorizing guidelines may not improve ease of access. For example, a “clinical guideline on appropriate use of antibiotic therapy for pediatric dental patients” 35 is listed under *periapical diseases*, which is listed under *jaw diseases*.

Finally, providers’ attitudes towards guidelines may create barriers. A recent synthesis of general practitioner (GP) attitudes identified three themes related to human barriers in the provider team: practitioners questioning guidelines; their experience; and desire to preserve the doctor–patient relationship.[17] Based on 12 studies, Carlsen and colleagues find that GP trust in guidelines is outweighed by concerns about guideline generalizability—primarily because of differences between real patients and those portrayed in guidelines. In some of the studies, fear of jeopardizing the relationship with the patient was mentioned by GPs as a reason for non-adherence.

In sum, the nature of clinical practice guidelines and dentists’ attitudes towards them may present barriers to adoption and implementation.

Barriers associated with the healthcare organization

Some barriers are inherently part of the oral healthcare training and delivery system. First, although dental students are taught how to access and interpret scientific evidence in didactic courses,[36] their knowledge may not be reinforced by supervisors in clinical settings. Second, dentists in solo or small practices are slow to adapt, in part, because they are relatively free of peer influence.[7] This resistance to change is not limited to dentists; changes in treatments may require behavioral adaptations among staff as well.[37] Third, although guidelines most likely to be used regularly focus on prevention, financial reimbursement does not promote preventive procedures.[37] The lack of compensation incentives to

encourage adoption of EB medicine was recently addressed by the Institute of Medicine in its report titled “Rewarding Provider Performance: Aligning Incentives in Medicare.” This report urged the creation of a new payment system.[38] Fourth, guideline developers sometimes present recommendations that may not be actionable due to the need for additional equipment, skill, or training.[39]

Although each barrier identified in the research literature is possible, a recent systematic review by Francke et al. regarding the actual use of guidelines concluded that the evidence is still weak.[40] In addition, previous research on barriers to implementing EB treatments is mostly based on opinion rather than empirical studies of practicing dentists. Thus, the purpose of this study is (1) to find out which barriers to implementing EB treatments are perceived by practicing dentists as most common in their dental practices; and (2) to assess which barriers are considered serious problems. Identifying such barriers will facilitate future development of potential solutions to overcome them.

For this article, we use the following definitions of key terms. *Translation* is the process involving steps needed or taken to ensure effective and widespread use of scientific findings to improve health. Translation includes development, dissemination, adoption, and implementation. *Development* of an evidence-based practice guideline involves interpreting the best available evidence on a topic to provide guidance for effective interventions. *Dissemination* is a process of communicating information to providers to raise awareness and knowledge about effective interventions given the evidence. *Adoption* refers to the provider’s commitment to practice EBD. A clinical *guideline* is a comprehensive document comprised of *recommendations* based on scientific evidence. The terms *guideline* and *recommendations* are sometimes used interchangeably.

METHOD

Participants

To increase the likelihood that dentists who responded to our survey have experience with clinical guidelines, we focused on a convenience sample of practitioners who had made substantial efforts towards practicing EBD. Thus, early-adopting participants were self-selected from 127 dentists who attended the 2008 Evidence-based Dentistry Champion Conference organized by the ADA Center for EBD, and co-sponsored by the ADA and the *Journal of Evidence-Based Dental Practice*. The meeting was funded by an educational grant from Procter & Gamble.

Awareness of Clinical Decision Support Tools—Three clinical decision support (CDS) tools were presented at the EBD Champion Conference and are briefly described below. Thus, respondents in this study were aware of CDS tools useful for practicing EBD.

Systematic review of early caries management: This CDS tool is based on a systematic review published by the *Journal of Evidence-Based Dental Practice*.[41] The objective of the review was to assess the strength of evidence describing the effectiveness of alternative strategies for managing early occlusal caries and suspected occlusal dentinal caries.

American Heart Association guideline for prevention of infective endocarditis: This CDS tool was developed by the American Heart Association in 2007 as an update to its earlier guidance for the prevention of infective endocarditis. It was revised in light of current evidence that infective endocarditis is much more likely to result from bacteremia associated with daily activities than from bacteremia caused by dental, or gastrointestinal or genitourinary tract procedures. Portions of the guideline pertinent to dentistry were published by the *Journal of the American Dental Association.* [42]

Use of professionally applied topical fluoride: This CDS tool with evidence-based recommendations was developed by an expert panel established by the ADA Council on Scientific Affairs. The panel evaluated the body of scientific evidence on the effectiveness of professionally applied topical fluoride for caries prevention. The recommendations were published by the *Journal of the American Dental Association*. [43]

Procedure

Seven months after the conference, we invited dentists via e-mail to complete an online questionnaire delivered using SurveyMonkey (SurveyMonkey, Portland, OR). We sent an e-mail reminder about three weeks later. At the end of a three-week period following the reminder, the survey was closed. Participants did not receive any compensation. The University of Pittsburgh Institutional Review Board (PRO08060331) and the ADA Institutional Review Board (00000478) approved the study.

Questionnaire

Because a review of the literature did not yield an existing suitable instrument, we developed a questionnaire assessing dentists' knowledge of EBD concepts, attitudes and opinions towards EBD, and information-seeking behaviors (Appendix A) using both a tailored design method[44] and principles from *Thinking about Answers*.[45] We developed the items based on recent research[23] and the expertise of the research team. Instrument development included an analysis of the initial set of items using a retrospective think-aloud protocol.[45] The final questionnaire consists of 22 items: eight demographic and professional development questions, including age, gender, specialization, reading behavior, and continuing education activities; ten questions regarding experience implementing EBD for patient treatment and prevention of diseases; three questions regarding barriers to EBD, partly based on the work of Hannes and colleagues;[46] and one prompt for general comments. To gauge respondents' knowledge about EBD concepts, we adapted an instrument from Schleyer et al[47] that presented paired concepts. Respondents were asked to rate their knowledge on the distinction between paired concepts, such as, *primary literature vs. secondary literature; controlled clinical trial vs. cohort study*; and *inductive inference vs. deductive inference*.

Data analysis

Responses to open-ended questions were independently coded and categorized by two investigators (HS, MS). They then compared categories and merged them when appropriate. Disagreements on coding were resolved through discussion. Frequencies and summary statistics were computed. As this article focuses on barriers to implementing EB guidelines, analyses of questions relating specifically to decision support tools are not presented here.

RESULTS

Demographics

Forty-three of 127 attendees (34%) completed our survey. They include 29 males, 7 females, and 7 undeclared who mainly work in private practice (61%) or academia (25%); are general dentists (75%); and are at least 45 years old (range = 25 to 65+ years). They graduated between 1964 and 2003, with half graduating after 1981 (n = 36 demographic items).

Professional development

To further characterize the respondents, we asked about professional development activities. On average, respondents read 3.6 dental or biomedical journals fairly regularly. Specifically, they most often read the *Journal of the American Dental Association* (n=27; 84%), the

Evidence-Based Dentistry (n=19; 59%) and/or *Journal of Evidenced-based Dental Practice* (n=6; 19%). As for continuing education, 10 respondents (28%) attend journal clubs sometimes or regularly; 23 (64%) attend study clubs; and 20 (56%) read articles for continuing education credits (n_{item} =36). In the past 12 months, respondents attended on average 4.5 online and onsite courses and 4.5 conferences (n_{item} =35).

Experience of implementing evidence-based dentistry

We asked two questions about dentists' experience implementing EBD. Thirty-five of 40 respondents (88%) stated that they are implementing EBD. Two of five respondents reported they are not yet implementing EBD but are in the early planning stages; none had started and then stopped; one does not practice dentistry; two do not plan to implement EBD.

Twenty-seven respondents (67%) answered a question about what they are doing differently as compared to before practicing EBD. Of 32 responses (multiple responses permitted), 12 reported a *change in information-seeking behavior*, e.g., dentists now focus on EBD resources. A typical response indicated that respondents who had implemented an EBD approach are processing information differently. For example, they now read "journals with a better understanding of the pros/cons of the levels of evidence."

Seven respondents (22%) described changes in specific treatment decisions, e.g., "I am implementing more conservative, tooth-sparing dentistry." Four respondents (13%) now apply more *critical thinking and appraisal* in treatment decisions. For example, one of the responses was "trying to question more and use various resources to help me."

Common and most challenging barriers

Respondents reported 14 types of barriers to implementing EBD in 65 instances. The barriers are associated with the healthcare provider team in 50 instances (77%) and with the healthcare organization in 15 instances (23%) (Table 1).

Among the barriers associated with healthcare provider team, *difficulty in changing current practice model* (17%) and *resistance and criticism from colleagues* (17%) are the top two barriers dentists experience in practice, followed by their *lack of trust in evidence or research* (14%) and *lack of time to search for guidelines or practice EBD* (8%).

When asked to rate a list of barriers from the literature in terms of the extent to which each poses a problem, they perceive the following barriers associated with the healthcare provider team as the biggest challenges: *lack of up-to-date evidence for many devices and products, lack of clear answers to clinical questions*, and *contradictory information in scientific literature*. Regarding barriers associated with the healthcare organization, they rate *continuing dental education courses are not up to date with respect to evidence* as a serious problem (n_{item}=38) (Table 2).

Overcoming barriers

Finally, we asked respondents how existing barriers could be removed, "In a perfect world, what would make a transition to EBD easier?" (n_{item}=31). We categorized all responses into four groups. The first category is *improving the quality and accessibility of EBD evidence or tools*. This includes making high-quality evidence easily accessible, easy to use, personalized, and with better coverage (n_{item}=16). For instance, one respondent said: "[We need] more really proven evidence out there. Simple tools for staff to use chairside." The second category is *increasing EBD education and dissemination*, e.g., by incorporating EBD into the dental school curriculum (n_{item}=5). One response in this category was: "[We need] more education, more free resources." The third category *is removing financial and political*

barriers. This includes providing better insurance coverage or reducing costs (n_{item}=4) and is exemplified by the following response: "I think the way dentistry is compensated (by 'procedure') also complicates the incorporation of evidenced-based dentistry." The fourth category is *encouraging dentists to be more open to changes*, perhaps by reducing the fear of losing independence or control of the practice (n_{item}=4). A response in this category was: "… make clinicians understand that EBD is not about dictating what to do, but about what information is available to supplement their knowledge."

DISCUSSION

The purpose of this cross-sectional and primarily qualitative study was to determine (1) which barriers identified in the research literature are common for dentists who try to practice EBD; and (2) which barriers are challenging, i.e., perceived to be *big problems*, even by early adopters of EBD. Most of the common barriers identified in this study are associated with the healthcare provider team (Table 1). Barriers perceived as most challenging have to do with *lack of up-to-date evidence*, *lack of clear answers to clinical questions*, and *contradictory information in the scientific literature*. Interestingly, several of the barriers most frequently mentioned by the respondents to our survey (Table 1) were not reported in the existing literature (Table 2, list based on the literature).

We found that barriers to EBD most commonly reported are related to dentists' perceptions. Consider, e.g., the two barriers most often encountered are *difficulty in changing current practice model* and *resistance and criticism from colleagues*. This finding is consistent with previous research addressing inertia in the dental profession.[7] As in other areas of healthcare,[48] dentists are often slow to adopt newer methods and may even use outdated or ineffective ones for prevention and treatment. Additionally, fear of criticism is a barrier because it may undermine attempts to promote adoption of new evidence. Thus, from the perspective of the healthcare organization, interventions aimed at increasing the rate of EBD guideline adoption need to address human factors that influence behavior. Clearly, some interventions must begin with dental education. Although most dental schools in the US offer didactic courses on EBD, little implementation in clinical courses focusing on patient care has been achieved.[49] In addition, some authors suggest that more practicing dentists should be included in clinical research studies. This would overcome some barriers by fostering early 'buy in' and an interest in the results of clinical research.[28] This rationale is supported in the report of the 2008 American Medical Informatics Association Health Policy Conference. [18] It concluded that the generation and adoption of evidence can be accelerated by engaging more practicing, community-based clinicians as active participants in the research process.

Our finding that the most challenging barriers have to do with currency of evidence and clarity of information corroborates the findings of Hannes et al. who conducted a focus-group study of Belgian dentists.[46] Access to scientific literature, lack of trust in published research, usability of tools, and clarity of research findings are all barriers to successful implementation of EB treatments. Generating well-developed EB guidelines will overcome some barriers, such as *lack of up-to-date evidence*, *lack of clear answers*, and *contradictory information in the scientific literature*. However, guidelines themselves may inadvertently create other barriers. Organizations involved in producing guidelines should (1) develop dissemination strategies for timely delivery of information; (2) reduce the complexity of recommendations for clinicians; and (3) produce useable chair-side tools with easy-to-understand EB recommendations. Barriers related to individual dentist's perceptions, such as *difficulty in changing current practice model* and *resistance and criticism from colleagues*, could be overcome by improving dissemination strategies once guidelines are developed. Robust and active dissemination strategies that target a practitioner's attitudes

could positively influence behavior. A review of the effects of interventions to change clinical practice found that interactive educational meetings, e.g., participative workshops encouraging discussion and practice, are consistently effective together with reminders and educational outreach.[50]

Contrary to previous reports by other investigators regarding patients as potential barriers to implementing EBD, we found that early-adopting dentists see patients as facilitators. In the few responses where the patient is mentioned as a barrier, it is in the context of a lack of insurance coverage. Inadequate insurance can prompt the patient to opt for covered procedures in lieu of EB ones. Many of the responding dentists report that their patients see EBD as an asset and that practicing EBD ultimately attracts more patients. This finding is in line with calls for an increased involvement of patients and consumers in setting research priorities, identifying unanswered questions, translating findings for lay populations, and monitoring the impact of findings on patient health.[51]

It is noteworthy that our research identified barriers previously not emphasized in the literature, such as fear of criticism by colleagues or lack of trust in research results. On the other hand, some commonly identified barriers in the literature were not confirmed by our findings, such as lack of familiarity with searching for relevant information or expensive journals. This discrepancy may reflect the shortcomings of the current literature, which relies heavily on expert opinion rather than empiricism. Future research could replicate our study with diverse groups of dentists to identify and compare additional barriers across different contexts and clinical settings.

Given that dentists who participated in this study are presumably early adopters of EBD (an assumption based on their attending the 2008 Evidence-based Dentistry Champion Conference), their ideas on how to overcome barriers are valuable. We believe dentists' insights should guide dissemination strategies and influence future research on barriers to adoption and implementation. Not surprisingly, dentists report that improving usability and accessibility of evidence and tools will help them practice EBD. These findings are reassuring because they can be addressed. Moreover, they are in agreement with a conceptual framework of factors influencing guideline development, adoption, and implementation reported by Gagliardi et al. [52] They found that user attitudes and confidence in guidelines and adoption decisions are affected by the accessibility, usability, clarity, and validity of the evidence.

LIMITATIONS

The response rate in this study was low (34%), although typical of recent online surveys of health practitioners. [53,54] Thus, a nonresponse bias is possible. Moreover, because we focused on early adopters to ensure knowledge of and hands-on experience with EBD, it is possible that our findings may not generalize to the larger population of practicing dentists. To address this limitation, we are planning a follow-up study based on a representative sample of practicing dentists to assess the perceived challenge of barriers identified in this research.

CONCLUSION

The purpose of this study was to identify barriers that early-adopting dentists perceive as common and challenging when implementing recommendations from EBD guidelines. Our results indicate that the most common barriers are associated with inertia in the profession. If inertia is indeed characteristic of the profession, we need better ways of educating and motivating dentists. Specifically, we need to develop methods to help dentists overcome fear of change or fear of losing control in their practices, and methods to facilitate

implementation of empirically-based treatments. We also found that dentists report difficulties using guidelines. Thus, early adopters of EBD recommend improving ease of use and timely distribution of guidelines. Finally, dentists should consider using information from EBD guidelines to educate their patients because patients are empowered by EBD and seem to be attracted to dentists practicing EBD. In sum, knowledge of barriers will help inform the design of strategies to improve adoption and implementation of recommendations in EB clinical practice guidelines.

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APPENDIX A.: EBD QUESTIONNAIRE

ADA EBD Champions: Tell us about your problems practicing EBD

Dear Evidence-Based Dentistry Champion,

As someone who is thinking about practicing or who has already started to practice evidence-based dentistry (EBD), your knowledge and experiences relating to the barriers in implementing EBD in everyday practice is critical to our understanding of how to design effective clinical solutions. Below, you will find a survey that asks you about your experiences with evidence-based patient care. With the information you provide, we hope to design solutions to help you adjust to our rapidly changing field and provide optimal patient care.

Please answer the following questions as best as you can.

A: Using an evidence-based approach to patient treatment and prevention of disease

1. Are you implementing an evidence-based dentistry (EBD) approach now?

- ○ Yes
- ○ No

If ‘yes,’ what are you doing differently now as compared to before implementation?

2. If you are NOT implementing an EBD approach now, what are your plans?

- ○ I am in the early planning stage.
- ○ I will introduce EBD gradually.
- ○ At the moment, I do not plan to implement EBD.
- ○ I started, but have since stopped.
- ○ N/A (e.g., I do not practice dentistry.)

3. Have you used any clinical decision support tools, such as the Prevention of Infective Endocarditis Guideline from the American Heart Association?

- ○ Yes
- ○ No

If ‘yes,’ please list the tools you have used.

4. In which situations are you UNLIKELY to use decision support tools? (Please list specific situations)

5. Have the decision support tools HELPED you in making diagnoses or treatment decisions for patients?

- ○ Yes
- ○ No

If ‘yes,’ please describe how:

6. Did the decision support tools HINDER your decision-making in any way?

- ○ Yes

- No

If ‘yes,’ please describe how:

7. Have you experienced any barriers when using tools or sources to support your clinical decision making? (Barriers can be internal, such as personal debate regarding change, or external, such as resistance to your efforts from others.)
   - Yes
   - No

   If ‘yes,' please describe these barriers.
8. How do your patients react to your practicing EBD?
9. In a perfect world, what would make a transition to EBD easier?

B: Disseminating an evidence-based approach to dentistry

10. Do you share information with or guide your colleagues in the EBD approach?
    - Yes
    - No

    If ‘yes,’ how do you do this? (Please briefly describe your methods, such as setting up a new study club.)
11. What concerns, objections, or barriers have colleagues raised to you regarding the practice of EBD?

C: Rating barriers to EBD

12. Based on your own experience, please rate the following barriers to EBD with respect to how much a problem each is for you, using a scale from 1 to 5 where 1 means “no problem” while 5 means “big problem”

	No problem				**Big problem**
Difficulties in keeping up-to-date due to fast- changing insights in the field of dentistry	1	2	3	4	5
Lack of up-to-date evidence for many devices and products	1	2	3	4	5
Complexity of the dental field regarding treatment choices	1	2	3	4	5
Difficulties in interpreting research results due to academic language	1	2	3	4	5
Contradictory information in scientific literature	1	2	3	4	5
Lack of familiarity with searching for relevant information	1	2	3	4	5
Lack of clear answers to clinical questions	1	2	3	4	5
Very expensive academic journals	1	2	3	4	5
No time to implement new evidence-based approaches	1	2	3	4	5
Lack of information exchange between Practitioners and academics	1	2	3	4	5
Patient satisfaction used as main criterion to justify treatments	1	2	3	4	5
Skills, not evidence, strongly influence outcomes	1	2	3	4	5

	No problem				Big problem
with patients					
Sole reliance on peer advice for problems	1	2	3	4	5
Continuing dental education courses not up-to-date with respect to evidence	1	2	3	4	5

D: About you

13. I work mainly in (please select one option):

- ○ Solo practice
- ○ Group practice
- ○ Community clinic/public health
- ○ Academia
- ○ Industry
- ○ Other (please specify): _____

14. When did you graduate from dental school? What dental school did you graduate from?

Year of most recent graduation _____

Name of most recent dental school _____

15. I am

- ○ Male
- ○ Female

16. How old are you?

- ○ 25–34
- ○ 35–44
- ○ 45–54
- ○ 55–64
- ○ 65 +

17. I am a

- ○ General dentist
- ○ Endodontist
- ○ Periodontist
- ○ Orthodontist
- ○ Oral surgeon
- ○ Other

18. I read (not just subscribe to) the following dental/biomedical journals on a fairly regular basis:

19. Dentists further their education in a variety of ways, such as by attending conferences, taking online or onsite courses, participating in study groups or journal clubs, and reading journal articles for continuing education credits. Please tell us how often you participated in the following activities during the last 12 months:

	Never	Seldom	Sometimes	Regularly
Journal clubs	□	□	□	□
Study groups	□	□	□	□
Reading journal articles for continuing education credits	□	□	□	□

20. Please tell us the number of times you participated in the following continuing education events in the past 12 months.

Number of online and onsite courses taken _____

Number of conferences attended _____

21. Below is a set of paired terms that relate to evidence-based dentistry. Please rate your knowledge of the distinction between the terms in each pair by using the scale:

	I don't understand the distinction at all	I have a general appreciation of the distinction, but can't define it	I can define the distinction
Primary literature vs. secondary literature			
Traditional literature review vs. systematic review			
Gray literature vs. published literature			
Narrative analysis vs. meta-analysis			
Controlled clinical trial vs. cohort study			
Randomized controlled clinical trial vs. nonrandomized controlled clinical trial			
Sensitivity vs. specificity			
Inductive inference vs. deductive inference			
Cohort study vs. case series			
Evidence vs. authority			
Blinded clinical trial vs. nonblinded clinical trial			
Qualitative research vs. quantitative research			

22. If you would like to add any comments regarding this survey, please use the space below. Thank you for participating in this study!

Table 1

Barriers to evidence-based dentistry experienced by dentists and their peers [a]

BARRIER	EXAMPLE	FREQUENCY (%)
Barrier Associated with Healthcare Provider Team		**50 (77%)**
Difficulty in changing current practice model	"I've been doing it such and such a way since WWII and I'm not going to change!"	11 (17%)
Resistance and criticism from colleagues	"If the tool leads one to a treatment that differs from one that has been traditionally used or accepted, I have felt that I may be exposing myself to criticism of colleagues."	11 (17%)
Lack of trust in evidence or research	"… significant debate amongst staff and colleagues as to the independence and reliability of the entities who developed the clinical support tools and the research upon which those tools are based."	9 (14%)
Lack of time to search for guidelines or practice EBD	"Who has time in a clinical practice to try to make complex decision[s] while rooting through thousands of pages of research to find 'evidence'?"	7 (8%)
Conflicting opinions about evidence	"Primarily where to apply certain tools causes some debate"	3 (5%)
Feeling that clinical experience overlooked	"… view it as a constraint to their clinical experience based decision making process."	3 (5%)
Difficulty in using EBD tools	"They are cumbersome to use chairside."	2 (3%)
Fear of losing independence in practice	"opposed to anyone dictating what may work best"	2 (3%)
Lack of clarity and agreement regarding evidence	"every EBD article endlessly begs for more research."	1 (2%)
Difficulty in accessing EBD literature	"Journal articles online that require a fee to view the text."	1 (2%)
Barrier Associated with Healthcare Organization		**15 (23%)**
Lack of insurance coverage for EB treatment	"sealant coverage is not provided by insurance carriers for bicuspid teeth or age limited"	5 (8%)
Insufficient/inappropriate EBD training in dental school	"not enough time in the current curriculum and the time needed to make any curriculum changes in the dental/dental hygiene school to accommodate EBD training"	4 (6%)
Inadequate continuing education in EBD	"[colleagues] don't understand it or don't feel they need it in their practice. I was in ORD for 2 days to 'get' it. A two or three hour talk is not enough to give the basics. …"	3 (5%)
Concerns on reduced revenue	"take radiographs outside FDA guidelines. … Some agree, but find it difficult to accept a reduce income flow from reducing the number of radiographs they take."	3 (5%)

[a] n=38 respondents; multiple responses permitted; where applicable, peer experience of barriers reported by respondents; percentages reported within rounding error.

Table 2

Dentists' ratings of barriers to evidence-based dentistry[a]

PERCEIVED BARRIER	MEDIAN
Barrier Associated with the Patient	
Patient satisfaction used as main criterion to justify treatments	3
Barrier Associated with the Healthcare Provider Team	
Lack of up-to-date evidence for many devices and products	5
Lack of clear answers to clinical questions	4
Contradictory information in scientific literature	4
Difficulties in keeping up-to-date due to fast-changing insights in the field of dentistry	3
Difficulties in interpreting research results due to academic language	3
Complexity of the dental field regarding treatment choices	3
Very expensive academic journals	3
Reliance on peer advice for problems	3
Lack of familiarity with searching for relevant information	3
Skills, not evidence, strongly influence outcomes with patients	3
No time to implement new evidence-based approaches	3
Barrier Associated with Healthcare Organization	
Continuing dental education courses not up-to-date with respect to evidence	4
Lack of information exchange between practitioners and academics	3.5

[a] n=38 respondents; 5-point rating scale (1= no problem; 5=big problem); medians reported because several frequency distributions are asymmetrical; observed range=1 to 5 for each barrier.