Self-Perceived Knowledge, Skills, Attitudes, and Use of Evidence-Based Dentistry Among Practitioners Transitioning to Dental Educators

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Abstract: Dental practitioners transitioning to dental educators (PTEs) have an integral role in dental education. While PTEs intrinsically apply some form of evidence-based dentistry (EBD) in patient care, it may not be a standardized, systematic approach. The aims of this study were to determine the self-perceived knowledge, skills, attitudes, and behaviors of PTEs regarding EBD at one U.S. dental school and to identify areas where formal calibration may be warranted to facilitate their competence and confidence as dental educators. Participants voluntarily completed a 32-question survey regarding their EBD training and self-perceived EBD skills in several areas: use of the clinical evidence pyramid; systematic, objective, and critical appraisal of the evidence; application of the evidence to patient care; and integrating clinical expertise, scientific evidence, and patient's preferences to formulate a treatment plan. The PTEs were invited to participate in the anonymous survey during regularly scheduled calibration sessions held between May and July 2014. After study information was distributed, 100% of the attendees (n=43) completed the survey. The percentage of total PTEs at the school could not be calculated. Of the responding PTEs, 69% rated themselves better than satisfactory (70% proficiency) in their knowledge, skills, and attitudes regarding EBD skills application. However, only 33-42% of the respondents indicated that they frequently used the evidence pyramid and systematically, objectively, and critically appraised the evidence, even though 65% indicated they applied the evidence to improve patient care over 70% of the time. In addition, the participating PTEs identified a need for more frequent use of formal EBD skills. Providing case-based EBD projects involving PTEs as mentors may provide more opportunities for the judicious and effective use of these important skills and may improve PTEs' self-perceived confidence.

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Culture is a powerful determinant of an individual's knowledge, perceptions, and actions.[1] Creating a culture of critical thinking, problem-solving, and lifelong learning in health professions education programs requires educators to adopt and demonstrate these behaviors in their day-to-day practice. According to the American Dental Education Association (ADEA), practitioners who are transitioning into dental educators (PTEs) account for approximately 50% of new dental faculty members.[2] While the majority of one group of PTEs reported intrinsically applying some form of evidence-based practice in patient care, it was far from being a standardized, systematic approach.[3]

Evidence-based dentistry (EBD) skills are core competencies of dental school graduates required in the accreditation standards of the Commission on Dental Accreditation (CODA).[4] The CODA standards state that "graduates must be competent to access, critically appraise, apply, and communicate scientific and lay literature as it relates to providing evidence-based patient care." Therefore, it is imperative that dental educators mirror a culture demanding judicious and effective use of EBD for their students to model.[5] As EBD educators, PTEs are required to be skilled in creating a searchable clinical question (PICO question); locating high-quality, peer-reviewed articles, using search engines such

as PubMed and Cochrane Reviews; appraising the dental literature critically based on levels of evidence (evidence pyramid); and applying the findings successfully to optimize patient care. It is also important that dental faculty members perceive themselves to be knowledgeable and confident in these skills. The American Dental Association (ADA)'s Evidence-Based Champions Conference is dedicated to fostering EBD skill development.[6] Cultivating the teaching skills of PTEs and their skills for a career in academics is also a major focus of the ADEA/AAL Institute for Teaching and Learning.[7]

The aims of this study were to determine the self-perceived knowledge, skills, attitudes, and behaviors of PTEs regarding EBD at one U.S. dental school as a subset of PTEs working in an academic setting and to identify areas where formal calibration may be warranted to facilitate their competence and confidence as dental educators. Readily available access to large amounts of information to students, educators, and patients alike mandates that dental educators be well versed in locating, identifying, and appraising peer-reviewed literature so they can be more effective.[8] We hypothesized that a majority of the PTEs would feel unsure of their EBD skills as formally defined and that they would not have sufficient formal EBD training beyond dental school to allow their self-perception of EBD skills to be favorable. The findings may facilitate the development and implementation of targeted faculty development programs to address specific areas of concern.

Methods

This study was approved by Midwestern University's Institutional Review Board. After receiving approval, we invited all 43 PTEs at Midwestern University College of Dental Medicine-Illinois who were attending regularly scheduled faculty calibration sessions between May and July 2014 to voluntarily participate in the study. Attendees were given written information explaining the purpose and design of the study before consenting to participate. The paper survey was administered on site during several sessions. All responses were anonymous, and academic status was self-reported.

The 32-question survey was constructed by the research team to determine the PTEs' self-perceived proficiency in several areas of EBD: use of the clinical evidence pyramid; systematic, objective, and critical appraisal of the evidence; application of the evidence to patient care; and integrating clinical expertise, scientific evidence, and patient's preferences to formulate a treatment plan. A ten-point scale from 1=not at all to 10=extremely was used on 30 of the questions, with higher scores indicating greater knowledge, skills, and behaviors and more favorable attitudes. Two open-ended questions were included at the end of the survey to gather input on respondents' perceptions of the most valuable aspects of EBD and their suggestions for how to promote EBD in dental curricula.

Given that this tool was developed specifically for this study, cut-off points were determined in a way consistent with the evaluation criteria used by the dental school in which the survey was conducted. In this school's curriculum, a performance level of 70% or greater is required to successfully pass a skill check, such as effective use of EBD. Therefore, scores of 7 or higher on the ten-point scale were considered to represent self-perceived proficiency in that domain.

The reliability and internal consistency of the survey were determined using Cronbach's alpha to assess how well each item correlated with the rest of the items on the survey. Descriptive statistics were used to determine demographic properties of the PTEs as well as distribution characteristics of their responses on the survey. Correlational and chi-squared statistics were used to explore possible relationships between the demographic information and the response variables. Only those relationships determined to be statistically significant ($p \leq 0.05$) are reported.

Results

Of the total 43 PTEs who attended the calibration sessions and were invited to participate in the study, 100% completed the survey. The percentage of total PTEs at the school could not be calculated. Among the respondents, 73% were male, and the average age was 52 years (Table 1). When asked if they had previous EBD training, 65% of the respondents said yes. Of those with formal training, 77% had attended an EBD internal development session, and 23% had attended the ADA's EBD conference. Regarding academic position, 44% of the respondents self-identified as preclinical faculty members and 56% as clinical faculty members. Preclinical faculty members at this school are involved in teaching first- and second-year dental students, whereas clinical faculty members are responsible for teaching

Table 1. Demographic information for respondents who reported faculty status

		Gender		Age in Years	Prior EBD Training		Full-Time Faculty?	
	Total	Male	Female	Mean±SD	Yes	No	Yes	No
Respondents	41	30	11	52.0±12.1	65.1%	34.9%	22	19

Note: Two of the total 43 respondents did not report their faculty status, so they were excluded from the gender identification, age, and faculty status data.

third- and fourth-year students. None of the preclinical PTEs identified themselves as full-time; however, 96% of the clinical PTEs self-identified as full-time faculty members.

The respondents' self-assessments are shown in Table 2. The percentages reflect those respondents who rated themselves at 7 or higher on the ten-point scale. Regarding self-perceived knowledge, skills, attitudes, and behaviors concerning the evidence pyramid, 55.8% rated themselves as knowledgeable in this area. Almost 70% reported feeling that using the pyramid to evaluate the overall quality of a research article was important. However, the majority considered themselves not skillful enough in this area, based on a self-assessment score of less than 7. While the majority reported thinking that use of the pyramid was important, only one out of three indicated that they used it at least 70% of the time in evaluating the quality of a research article. This was an unanticipated finding, especially since 65.1% indicated that they had received EBD training (Table 1).

Over 60% of the respondents considered themselves knowledgeable and skillful in systematically appraising evidence in the literature, with 72.1% considering this activity to be important (Table 2). However, only 41.9% reported that they systematically appraised the evidence the majority of the time. While over 60% of the respondents reported they had the knowledge to objectively and critically appraise the literature, only half (51%) indicated that they were skillful in those areas. Among the respondents, 70% perceived it important to be objective and critical in their appraisal of the literature, yet only about a third (37.2% and 32.6%, respectively) frequently did so. Regarding the use of EBD to improve the quality of dental care, the vast majority (91%) reported it was important. Almost 80% reported they had the knowledge and skills to apply the information to improve the quality of care for their patients, and 65% indicated that they did this frequently.

Of the respondents who rated themselves below 7 with regards to the importance of systematically, objectively, and critically appraising the evidence, 82-83% identified themselves as clinical faculty (Table 3). Of the respondents who rated themselves below 7 with regards to being knowledgeable in applying EBD to improve the quality of care for their patients, 78% were full-time faculty. Of those who scored below 7 regarding their frequency of applying the evidence to patient care, 93% were male.

Table 2. Respondents' self-reported proficiency in evidence-based dentistry, by percentage of those scoring 7 or greater

Survey Item	Respondents Scoring 7 or Greater
Using the evidence-based pyramid to evaluate overall quality of a research article	
Knowledge	55.8%
Skill	44.2%
Importance	69.8%
Frequency	32.6%
Systematically appraising evidence in the literature	
Knowledge	65.1%
Skill	60.5%
Importance	72.1%
Frequency	41.9%
Objectively appraising evidence in the literature	
Knowledge	65.1%
Skill	51.2%
Importance	69.8%
Frequency	37.2%
Critically appraising evidence in the literature	
Knowledge	60.5%
Skill	51.2%
Importance	69.8%
Frequency	32.6%
Applying information in the dental literature to improve quality of patient care	
Knowledge	79.1%
Skill	76.7%
Importance	90.7%
Frequency	65.1%

Table 3. Secondary analysis of respondents scoring below 7

	Respondents Scoring Below 7		Respondents Scoring Below 7	
Item	Full-Time	Part-Time	Clinical	Preclinical
Systematically appraising evidence in the literature: importance	88.3%	16.7%	81.8%	18.2%
Objectively appraising evidence in the literature: importance	84.6%	15.4%	83.3%	16.7%
Critically appraising evidence in the literature: importance	76.9%	23.1%	81.8%	18.2%
Applying information to patient care: knowledge	77.8%	22.2%	–	–

Note: The categories shown are those for which there were statistically different responses between the full- and part-time faculty members and between the preclinical and clinical faculty members.

The Cronbach's alpha for the survey as a whole was 0.950. Analysis of each section of the survey resulted in a Cronbach's alpha greater than 0.880: use of the pyramid (0.895), systematic review of the literature (0.920), objective review of the literature (0.889), and critically analyzing the literature (0.891). As such, the whole survey and each of its subsections demonstrated good to excellent internal consistency.

Discussion

This study identified areas of EBD for continued development in PTEs, especially regarding the frequency with which formal EBD skills are applied. Our results highlighted the continued need to train and standardize dental educators in EBD to improve their confidence and proficiency. The rapid advancements in science and technology result in a constantly evolving practice landscape, making the application of best practices in patient care a challenge.[8] To best prepare dental graduates to practice evidence-based, patient-centered care requires training, standardization, and routine use of these practices in student clinics to foster a culture of scientific enquiry and practice. This academic culture demands that dental educators, including PTEs, be proficient in EBD skills and model the successful application of EBD for their mentees. Furthermore, dental educators must embrace, adopt, and promote EBD skills as vital components to quality patient care practices to be effective role models and educators. For this philosophy to be pervasive throughout the dental education process, educators must be trained and confident and must perceive themselves to be proficient in EBD. In the developing program at this dental school, it was important to determine the skills and perceptions of faculty members in order to identify areas of concern and target interventions to promote this culture of scientific enquiry and practice.

Since Sackett et al.'s 1996 article on evidence-based medicine, the concept of evidence-based practice (EBP) has received attention across the health care field.[9] Electronic resources have contributed to efficient access to both high- and poor-quality scientific publications. Patients surfing the Internet identify what they believe to be relevant information to their health condition and seek confirmation by their provider that their assessment is valid. It is the social responsibility of the provider to identify the scientifically meritorious work that directly applies to their patients and to educate them regarding EBP. Health care providers, therefore, must be proficient in these skills. Fortunately, continuing education courses such as those offered by the ADA,[6] and programs such as the ADEA/AAL Institute for Teaching and Learning,[7] offer opportunities for PTEs and other early career dental faculty members to receive formal training in EBD techniques. As discussed by Sutherland, seasoned dental practitioners may rely more on information provided during dental school, in textbooks, and in their years of clinical experience.[10] Navigating huge databases now readily available due to the Internet and electronic capabilities can be perceived as a daunting task, one for which many may feel inadequately prepared.

That self-perception is evident in the findings of our study. Overall, more than 60% of faculty participants rated themselves below average regarding how frequently they reviewed the scientific literature and systematically, objectively, and critically appraised it (Table 2). The demographics of the cohort suggests that the majority of these participants were in dental school at least 25 years ago, when less attention was paid to EBD in dental education than it is now.[11] While the application of EBD techniques to patient care has gained acceptance,[12,13] it is experiencing much of the same growing pains as did the acceptance of evidence-based practice by the medical community.[9] Consistently and proficiently

performing EBD takes time and requires ongoing improvement.[14,15] The PTEs in our study seemed to realize that continual professional development is required for them to adhere to current standards in dental practice. As stated by one participant, "Dentistry of the future needs to be different; convincing our students of this is of paramount importance to the profession."

One of the contributing factors in the participants' self-perceived limitations in EBD was that the majority were experienced practitioners but novice teachers. While the clinical expertise of PTEs is priceless, limited formalized training and EBD skill development throughout their clinical career may make the shift to being dental educators challenging. Among the participants in this study, 65% indicated that they had received formal EBD training. Of those, 23.3% received it through continuing education course offered by the ADA. The majority (76.7%) of the participants with prior EBD training indicated they received it during faculty calibration sessions, thus supporting the importance of in-house faculty development to promote EBD skills. These sessions were said to be primarily dedicated to formulating a PICO question, literature searches, appraisal of evidence, and study design, as these areas were relevant to the DMD year 1 curriculum.

Studies have found that the most effective continuing education format combines formal lectures with clinical application.[12,16,17] Those studies reported that formal instruction alone improved knowledge but did not result in a significant change in attitudes, skill levels, or confidence, similar to what was identified in our study. This issue has been addressed by many dental schools, where curriculum and student projects have evolved to provide continuity in EBD development. The University of Texas Health Science Center at San Antonio Dental School promotes EBD in its curriculum, student training, and faculty development.[18] Parallel to the many changes reported to integrate EBD throughout dental curricula,[19-24] PTEs' development should include continuous EBD skills training and opportunities to demonstrate its use. Classroom-based learning followed by active application of EBD skills to virtual and actual patient cases will foster mastery of and confidence in EBD skills by PTEs as well as students. These opportunities provide formal instruction and hands-on EBD skill development in formulation of a PICO question, search strategies, appraisal of the literature, and presentation of findings with a clinical treatment plan. Not all the clinical PTEs in our study attended these classroom or EBD faculty calibration sessions, which may explain the discrepancy in their self-perceived skills. Our in-house faculty calibration sessions were not aimed at changing the educational attitudes of PTEs regarding EBD because the vast majority acknowledged the importance of EBD, but rather at developing proficiency and confidence in their EBD skills. Further expansion of faculty development programs will focus on EBP in day-to-day student patient care clinics, thus improving the PTEs' confidence in their EBD skills.

Which factors contributed to the majority of PTEs in this study rating themselves as less than satisfactory in the frequency with which they used the scientific literature and systematically, objectively, and critically appraised the evidence? Insufficient time is a well-recognized barrier to effective EBP.[15] It takes a significant amount of time to review the evidence in a systematic, objective, and critical manner, especially for individuals who perceive themselves to be insufficiently trained or limited in opportunities to routinely perform this task. In an academic setting, research librarians, basic scientists, and clinician academicians should be part of the EBP training team that develops, trains, and champions these practices to be pervasive throughout preclinical and clinical education. These teams can train PTEs for more comprehensive use of databases such as Cochrane Reviews, systematic reviews, and meta-analyses. This team approach might allow PTEs to become more confident, efficient, and familiar with experimental design and statistics, thus contributing to the PTEs' abilities to successfully analyze and apply the evidence.

The results of the survey indicated that PTEs would benefit from in-house calibration sessions dedicated to improving their confidence in using EBD so that they can more effectively teach their students these skills. As a new program, we have developed and integrated threads of EBD in our curriculum, starting in year one with formulating the clinical question, searching databases, and appraising the evidence based on statistics, research design, and levels of evidence. In year two, exercises are incorporated into the courses where literature supports foundational knowledge and its application to case management. A capstone clinical integration course incorporates structured cases that require students to apply foundational knowledge and support their choice based on the literature. As the learners progress through the clinical years, these skill sets are reinforced as they are required to provide supporting

evidence for their treatment plans, case presentations, Grand Rounds cases, and other experiences. Faculty development programs are being simultaneously developed in which faculty members present on controversial clinical care topics to calibrate their peers. Poster presentations at university research days enable students to demonstrate their case-based EBD skills to their peers and the faculty. Through a concerted effort by the faculty, research librarians, and administrators and student involvement, we hope to foster a culture of scientific enquiry and practice, driven by the desire to develop future dental care providers. As recommended by one PTE in our study, "Apply [EBD] to specific situations, so students can see the actual value in it in regards to hands-on dentistry. [Otherwise,] students may just view it as something related [only] to theory."

Developing EBD skills and effectively using them in patient care are like learning how to ride a bicycle (Figure 1). Initially, it takes someone skilled in the process to help you learn to pedal and steer; this is analogous to learning from trainer faculty members or academic librarians how to navigate databases and locate relevant, quality literature. With repeated practice, EBD becomes easier and begins to seem intrinsic in clinical case-based problems, much like riding a bicycle unassisted. As the process becomes second nature, effective use and application of EBD to patient care become invigorating, much like speeding along a path or riding without hands. The study indicated that, to develop a culture of evidence-based education and practice, we need to reinforce the knowledge, skills, attitudes, and behaviors of our educators so they can best educate students and empower them with this skill of lifelong learning. By assessing the perceived needs of PTEs, dental schools can incorporate targeted calibration sessions to improve the confidence and skills of these novice educators.

Although the data in this study were limited to a single institution, it was reflective of issues presented in earlier studies. It helped us identify areas of faculty concerns and examine venues to improve the frequency of EBD application and hopefully the PTEs' confidence. Another limitation to this study was that data were collected via self-report measures, which can be susceptible to a degree of respondent bias. Additionally, a cut-off score of 7 to determine EBD proficiency was selected to be consistent with the minimum acceptable evaluation criteria of this institution. As such, other institutions may use different criteria to determine EBD proficiency and/or

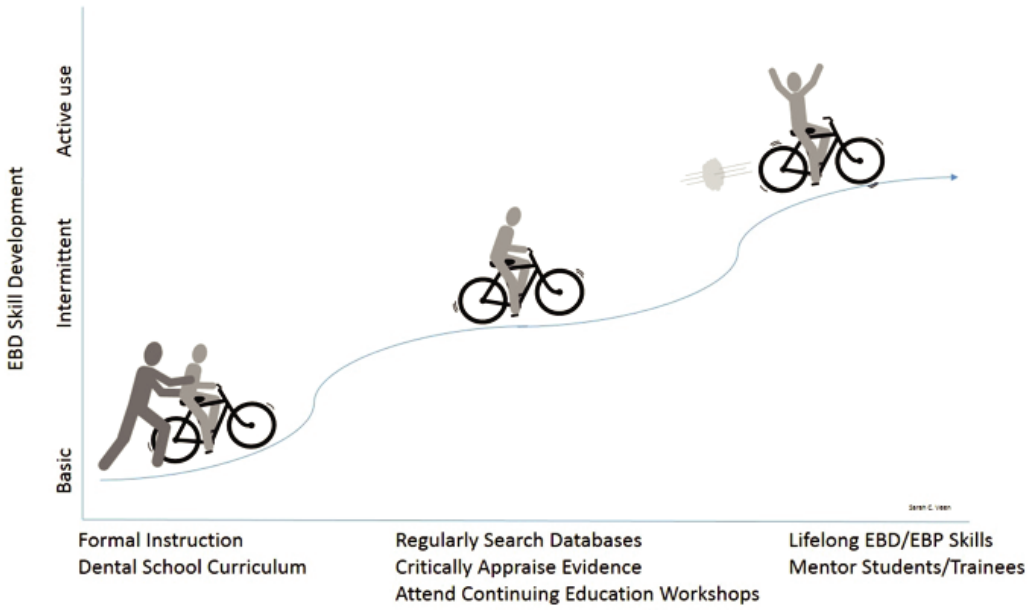

Figure 1. Progressive development of evidence-based dental skills

different measures including objective, rather than self-report, of knowledge, skills, and behaviors. Consequently, our findings may not be generalizable to other institutions or across other assessment methods. Future studies may explore these matters.

Conclusion

A majority of the PTEs in this study reported feeling strongly about the importance of EBD in quality patient care and actively used EBP. However, they identified a limitation in how frequently they systematically, objectively, and critically appraised the literature despite perceiving themselves to have the knowledge and skills to do so. Almost two-thirds of the PTEs indicated they had prior EBD training, but a majority of them received it during formal calibrations sessions within our university rather than continuing education credits. This study reconfirms the need to provide new faculty members with the skills and proficiency to effectively and confidently train students in lifelong EBD skills and practices.

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