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Evidence Based Practice: Assessing the educational outcome

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Abstract

Healthcare providers and patients strive for optimal outcomes with a growing trend to embed the principles of evidence-based practice (EBP) into mainstream care delivery by practicing dentists. The foundations of future best practice are built at dental school. How do we evaluate the outcome of an EBP syllabus?

This study describes the use of the KACE assessment tool to assess the learning outcomes of final year DDS students who had completed an EBP program. The use of a validated instrument to measure four dimensions, knowledge, attitudes about it, familiarity with sources for accessing evidence and confidence in critical appraisal skills can be an important outcomes assessment tool.

90 dental students from the final year completed the questionnaire in 2016. 84% demonstrated good knowledge of evidence hierarchy. 92% agreed of the value to future practice and improvement in quality of patient care with 88% agreeing with the value of it as an integral part of a dental school curriculum. Students demonstrate confidence in appraising study design, recognizing bias, generalizability and value of the research report. However, even with electronic access to databases, when it came to accessing evidence over 75% would ask a friend with less than 25% consulting the Cochrane Database.

The outcome of the training had been positive in providing the skills for EBP. The use of a validated tool ensured the graduating students received a good foundation to provide their future patients with the best clinical evidence for optimal and cost-effective dental care.

Keywords

Evidence Based Dentistry (EBD), Evidence Based Practice (EBP), Knowledge, Attitudes, Access, and Confidence Evaluation (KACE)

Title

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Running Title

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Introduction

Healthcare providers and patients strive for optimal outcomes with a growing trend to embed the principles of evidence-based practice (EBP) into mainstream care delivery by practicing dentists. The foundations of future best practice are built at dental school. How do we evaluate the outcome of an EBP syllabus?

Methods

This study describes the use of the KACE assessment tool to assess the learning outcomes of final year DDS students who had completed an EBP program. The use of a validated instrument to measure four dimensions, knowledge, attitudes about it, familiarity with sources for accessing evidence and confidence in critical appraisal skills can be an important outcomes assessment tool.

Results:

90 dental students from the final year completed the questionnaire in 2016. 84% demonstrated good knowledge of evidence hierarchy. 92% agreed of the value to future practice and improvement in quality of patient care with 88% agreeing with the value of it as an integral part of a dental school curriculum. Students demonstrate confidence in appraising study design, recognizing bias, generalizability and value of the research report. However, even with electronic access to databases, when it came to accessing evidence over 75% would ask a friend with less than 25% consulting the Cochrane Database.

Discussion

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Key words

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Introduction

As we strive to improve the standard of care and ultimately patient outcomes, best practices across the nation and the world has led to embedding of the principles of evidence-based practice into mainstream care delivery by practicing dentists. Evidenced Based Practice (EBP) is the integration of clinical expertise, patient values, and the best research evidence into the decision-making process for patient care. ¹ Clinical expertise refers to the clinician's cumulated experience, education and clinical skills. The patient brings to the encounter his or her own personal preferences and unique concerns, expectations, and values. The best research evidence is usually found in clinically relevant research that has been conducted using sound methodology.^{1,2}

Evidence-based dentistry (EBD) was officially recognized in the United States in 2001 with the adoption of the American Dental Association's (ADA's) Policy on Evidence-Based Dentistry, which provided a definition of EBD and clearly defined guidelines. The ADA's definition is by far the most comprehensive, as it captures the core elements of EBD. They define it as "an approach to oral health care that requires the judicious integration of systematic assessments of clinically relevant scientific evidence, relating to the patient's oral and medical condition and history, with the dentist's clinical expertise and the patient's treatment needs and preferences."³

EBD's recognition has since grown, and, in 2006, ADA's representative, Daniel Meyer, stated, "the need for an evidence-based approach to oral healthcare and the practice of dentistry is greater than ever."⁴ Indeed the ADA has taken a leadership role in creating the ADA Center for Evidence Based

Dentistry, a database of systematic reviews and resources to facilitate good practice. The American Student Dental Association (ASDA) supports the ADA to promote bridging the gap between research and dental practice. In 2010 the Commission on Dental Accreditation Standards for Dental Education Program adopted Standard 2-9 (“*Graduates must be competent in the use of critical thinking and problem-solving, including their use in the comprehensive care of patients, scientific inquiry and research methodology*”) and 2-21 (“*Graduates must be competent to access, critically appraise, apply, and communicate scientific and lay literature as it relates to providing evidence-based patient care*”).⁵ In response to both standard 2-9 and 2-21 and following a careful review of the previous course content, an improved EBD course was developed as part of the Integrated Clinical Science and Clinic Practice strands of the Doctor of Dental Surgery (DDS) program at XXX school of Dentistry at University of the XXX (XXX-DS). The EBD program begins during the first quarter of the second year. It comprises a twelve-hour didactic lecture course, which is spread evenly amongst the three ten week quarters. During this time, students learn the procedures, steps and skills involved in practicing EBD. Niederman and Badovinac identify five steps in clinical decision making that the evidence-based dentist must be involved in.⁶ The XXX-DS twenty-four-month EBD program educates students in these steps utilizing a flipped classroom and problem based case discussion approach.

1. Conducting a computerized search

A pretest using the KACE tool can be performed to assess the level of understanding of the student before starting the course. Students are introduced to optimal efficiency in accessing and searching for best available evidence with which to answer the question. They are introduced to databases and develop skills to find relevant evidence. They conduct a focused search of the peer-reviewed professional literature based on an appropriate methodology.⁹ Students start to explore what constitutes the highest levels of evidence, how to apply evidence-based filters and limits when searching the literature using online resources such as MEDLINE via PubMed.

2. Critically appraising the evidence for its validity and usefulness (clinical applicability).

Once students identify the most current evidence, the next step in the process is to understand what they have and how its relevance to both patient and PICO question. Various methods of critically appraising individual research studies, meta-analyses and systematic reviews are explored.¹⁰ This helps the student to determine the strengths and weaknesses of how a study was conducted and how useful and applicable the evidence is to the specific patient problem or question being asked.

3. Applying the results of the appraisal, or evidence, to clinical practice.

Students learn how to make an association between specific treatments and outcomes or exposures, the strength of that association, and the condition of interest, i.e., patient problem or question.¹¹ The value of understanding how to present statistical information to patients in a clear and unambiguous manner helps the student in making good patient care decisions. In addition, understanding the difference between statistical and clinical significance will help in translating and determining if the findings apply to their patient.¹²

4. Evaluating the process and student performance.

Mastering the skills of evidence based decision-making takes practice and reflection.¹³ The KACE assessment tool provides an opportunity to assess the fundamental knowledge and concepts of evidence based dentistry. The KACE allows for remediation of areas that demonstrate lack of understanding of concepts.

4. Converting a patient question/problem into clinical questions– the PICO process.

Having developed and demonstrated a sound knowledge of EBD. Students are introduced to the process with a patient question or problem. The clinical question is expressed in the PICO format that identifies the *Patient Problem or Population (P)*, *Intervention (I)*, *Comparison (C)*, and *Outcome(s) (O)*.^{7,8}

Students learn that a well-constructed PICO is the key to success as they have the opportunity to utilize EBD skills with their patient pool in the main student clinic. They perform quarterly one-page Critically Appraised Topic (CAT)¹ research assignments related to a question that has arisen during the clinical treatment of one of their own patients. They develop a clinical PICO question, locate 2-3 of the highest quality and most recent research publications addressing the question, appraise them, and draw conclusions and application to their clinical practice. One assignment is completed during each ten-week quarter related to a different phase of oral diagnosis and treatment planning with a final case complete/health record audit/EBD reflective paper completed during the last quarter before graduation.

The learning objectives of the course strive to develop an understanding how to effectively use EBD, so the student can quickly and conveniently stay current with scientific findings on topics that are important to them and their patients.¹²

Materials and Methods

Approval to collect and analyze the data for the validation was obtained from the University of the XXX Institutional Review Board (IRB Protocol #16-44). No incentives were provided. The study used a validated assessment instrument developed at the University of Texas Health Science Center at San Antonio School of Dentistry (UTHSCSA-DS) to evaluate the outcomes of the EBD training delivered to the final year DDS students at the XXX School of Dentistry (XXX-DS) prior to graduation. The assessment instrument is the Knowledge, Attitudes, Access, and Confidence Evaluation (KACE).¹⁴ It is comprised of thirty-five questions that permits evaluation of dentally relevant evidence-based practice (EBP) knowledge, attitudes about EBP, familiarity with sources for accessing evidence, and confidence in critical appraisal skills.

The KACE was administered during the last ten weeks before graduation to the final year DDS class. The students had completed second year didactic course, second year clinical EBD assignment and third year EBD assignments. The final year DDS dental students were given time, 20 minutes, to complete the KACE questionnaire following a regular class. The KACE questionnaire was completed using a Scantron card; the card will not be identifiable as being completed by a specific student. To protect confidentiality participation was voluntary, and thus all subjects were self-selected. All validation data were obtained from administrations of the KACE.

Results

The results of the KACE are reported in four sections;

Section 1 Knowledge of critical appraisal

Section 2 Attitudes about Evidence based Practice (EBP)

Section 3 Accessing evidence

Section 4 Confidence in critical appraisal skills.

Ninety final year DDS students out of a possible one hundred and forty three final year dental students completed the KACE. This represents 63% of the graduating DDS class.

A comparison of the KACE scores between the two schools showed that the 'after training' XXX-DS KACE scores were favorable, with similar mean and standard deviation for each of the four sections, to UTHSCSA-DS KACE scores. The comparative results from each institution, after students have completed a course in evidenced based dentistry, is shown in Table 1.

Section 1. Knowledge of Critical Appraisal

The first dimension measured by the KACE is understanding of EBP concepts. The dental student's correct responses showed that over two thirds of the respondents achieved correct answers in six out of the ten questions in this section. This section had an identical mean and standard deviation to the results from UTHSCSA-DS as shown in Table 1. The two highest correct response, Q5 asked them to best describe PICO (86/90, 95 percent correct) and Q1 asked them to choose the most correct statement related to ranking evidence (76/90, 84 percent). Interestingly, twenty percent of the respondents replied 'Don't know' to Q9 which asked about identifying factors contributing to a published study (22/90, 20 percent). Two questions, Q2 judging the highest level of evidence (36/90, 40 percent correct) and Q10 disease prevalence and incidence (32/90, 36 percent) had a low correct answer rate.

Section 2 Attitudes about Evidence based Practice (EBP)

This section used a Likert scale to measure the student's attitude to EBP. The result of this section are reported by first reviewing the scores with the five-part Likert Scale. The Likert scale was then collapsed to three columns to improve clarity. The strongly agree and agree were placed in the Yes column, the No column represent disagree and strongly disagree. The 'do not know' column contained the uncertain category that reported if the student could not respond because of lack of information, lack of experience or uncertainty. Figure 2 represents the modified results.

The results showed high positive attitude with the majority of the respondents in agreement with the statements contained in Q11 value of EBP in future dental practice (83/90, 92 percent), Q12 personally appreciate advantages of practicing EBP (80/90, 90 percent), Q20 EBP improves the quality of patient care (80/90, 89 percent) and Q13 EBP should be integral part of dental school curriculum

(79/90, 88 percent). Three quarters of the respondents were in agreement with the statements contained in Q14 Support for EBP principles greater than one year ago (67/90, 74 percent); Q15 EBP is a routine part of professional growth (69/90, 77 percent).

A third of the students agreed that it was difficult to practice EBP in the past year, Q17 (28/90, 31 percent). Two thirds of the class did agree that it was feasible to use EBP routinely when providing care in the dental school clinic (58/90, 64 percent). However, only a third of the students agreed that it had changed the way they learn Q16 (30/90, 33 percent) with nearly two thirds of the respondents indicating they did not know, Q16 (56/90, 62 percent).

Section 3 Accessing Evidence

This section asked how frequently the student accessed evidence from various sources. This section used a 5-point Likert scale; Figure 3 show these results. The data is also displayed with the often and very frequently combined to determine the most frequently used source, rarely and occasionally were combined to determine the least frequently used source and never determined a resource that was not used. The two most popular sources, by a large margin, were colleagues, other dentists or health providers (66/90, 73 percent) and the Internet, excluding Cochrane reviews (61/90, 68 percent). A quarter of those who responded would never consult the Cochrane Database (22/90, 24 percent) or a database of Critically Appraised Topics (CATs) (22/90, 24 percent). The lowest source of access for evidence would be podcasts and web conferences (5/90, 5 percent).

Section 4 Confidence in critical appraisal skills.

The last section asked about confidence in appraising different aspects of the published research report. This section used a 5-point Likert scale to assess confidence in critical appraisal skills; Figure 4. The Likert scale was reduced from 5 to 2 columns with the moderately confident, confident and very confident combined to determine if they were confident and not at all or not confident were combined to determine if they were not confident. Students responses in this section reported that nine out of ten respondent having some degree of confidence in appraising the following aspects of published research report, study design, Q30 (82/90, 91 percent), bias Q31, (81/90, 90 percent), adequacy of sample size Q32, (79/90, 88 percent), generalizability of results Q33, (84/90, 93 percent) and overall value of the research report Q35, (79/90, 88 percent). A third of the students were not confident in appropriate use of statistical test, Q34 (26/90, 30 percent).

Discussion

The object of the study was to assess the outcome of a new EBD course using a validated instrument to assess EBP knowledge, attitudes, access and confidence prior to graduation from XXX-DS. KACE provides an opportunity to review the results of the learning outcomes of the EBD course. Did we provide our newly beginning dentists with sufficient structured critical thinking activities; use of the language, principles, and processes of EBD; and opportunities for guided EBD practice? Did the program produce practitioners, who with knowledge and positive attitudes could promote and start to remove some barriers to implementing EBP?

The knowledge of critical appraisal is primarily taught during the initial didactic component and it was good to see that the majority of the respondents demonstrated good understanding of the 'mechanics' of EBD. They could correctly demonstrate four basic phases of asking evidence-based questions (framing an answerable question from a clinical problem) then searching the available evidence and ranking the evidence. However, when it came to assess its validity and then using the "best" evidence to inform decisions regarding care, two-thirds of the respondents did not have either the necessary knowledge or ability to do so. This would be one area that needs further development in the program. One approach to improving performance in this area could be to use a tool such as the Critical Appraisal Skills Programme (CASP) which has developed a number of worksheets with a structured series of questions that could help students determine the strengths and weaknesses of how a study was conducted and how useful and applicable the evidence is to the specific patient problem or question being asked.^{15,16,17}

It was interesting to discover the respondents have very positive attitudes about EBP, particularly the value of EBP in future dental practice, they personally appreciate advantages of practicing EBP and the resultant improvements in the quality of patient care. They supported EBP principles greater than one year ago and believed it should be a routine part of professional growth and integral part of dental school curriculum. However, a third of respondents had found it difficult to practice EBP in the past year, but the majority did agree that it was feasible to use EBP routinely when providing care in

the dental school clinic. However, only a third of the students agreed that it had changed the way they learn but the majority did not know. As students' critical thinking and EBD skills are still developing plus, they are at an early stage of their dental career, they may not have had the ability to fully utilize these skills, so may not appreciate the usefulness of these lifelong learning skills. The high positive attitude of our new graduates does bode well for the promotion of EBP. In a study done in Kuwait it was concluded that the overall awareness of EBD amongst dentists was low, even though more than half of them reported that they generally practice it.¹⁸ Another studies carried out to evaluate EBP among a group of Malaysian dental practitioners reported that one of the barriers to practicing EBD was lacking knowledge of EBP concepts and critical appraisal skills plus they had not been introduced to EBP at dental school but believed it was an important part of the curriculum.¹⁹ It was interesting to note that even after completing the course nearly three quarter of those responding would either access evidence from a colleague or the Internet as the primary source. A similar study carried out amongst general dental practitioners currently practicing in the North West of England had found that when faced with clinical uncertainties sixty percent of general dental practitioners turned to friends and colleagues for help and advice.²⁰ Even though the respondents are primarily composed of millennial and are willing to access evidence from the Internet, only a small number would access the Cochrane Database. The Cochrane Collaboration is an international organization whose overall aim is to build and maintain a database of up-to-date systematic reviews of randomized controlled trials of health care and to make these readily accessible electronically. It has been described as being one of the most significant clinical advances since the creation of the National Institutes of Health in the U.S.²¹ The program may not have placed enough emphasis on professional resources. A guided exercise of where to access and activities to encourage the use of these online resources, which will be readily available following graduation, would be an appropriate addition to the program.⁷ It may be worth considering developing an icon that could be placed on all operatory computers, so that students could rapidly access this resource. EBP does increase the effectiveness of dental care but has faced many obstacles.²² A qualitative study was carried out to assess the obstacles among the Flemish (Belgian, Dutch-speaking) dentists experience in the implementation of EBP in routine clinical work. Their findings suggested that educators should provide communication skills to aid decision-making, address the technical dimensions of dentistry, promote lifelong learning, and close the gap between academics and general practitioners (dentists) in order to create mutual understanding.²³ 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.²⁴ A key to successful EBP is to have the necessary knowledge and skills that can only be developed by means of deliberate practice derived from reading and searching for scientific articles together with clinical application.^{24,25}

Conclusion

In the age of easily accessible information for the public, all clinical decision-making is subject to external scrutiny rather than to just professional or peer-review as in the past. As educators, we have an important role to play in effectively communicating the skills to aid decision-making, addressing the technical dimensions of dentistry, promoting lifelong learning, and closing the gap between academics and general dentists. The KACE tool is a valuable aid for the educator in developing and assessing the learning outcomes. A pre-course test would have been helpful in activating learning and assisting the students in self-directed learning of skills to practice evidence-based dentistry. KACE provided a method to assess content outcomes and influence students to prepare them to use the best clinical evidence and judgment for optimal and cost-effective dental care. This effective tool can be replicate and implanted at other institutions

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Appendices

1. KACE Assessment Tool
2. Critical Appraised Topic Worksheet
3. Critical Appraised topic Rubric