

A Chairside Aid for Shared Decision Making in Dentistry: A Randomized Controlled Trial

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Abstract: The concept of shared decision making (SDM) is an important emerging trend in clinical medicine but has received little or no attention in the dental literature. Decision aids can play a useful role in SDM by helping patients and clinicians choose among reasonable alternative treatment options. The purpose of this study was to develop and test an Endodontic Decision Board (EndoDB) for chairside use to help clarify treatment alternatives, benefits, risks, prognosis, and costs when root canal therapy or extraction of a tooth was indicated. The hypothesis was that the use of the EndoDB would lead to improved patient knowledge, greater satisfaction with the decision-making process, and no difference in anxiety when compared to the standard discussion and informed consent process (usual care). The EndoDB was tested in a randomized controlled trial in a postgraduate endodontics clinic. After treatment discussion, a brief questionnaire was completed by the patient to measure knowledge, satisfaction, and anxiety. Patients in the EndoDB group ($n=32$) demonstrated a small, but statistically significant, increase in knowledge (t -test; difference $=+0.37$; $p=0.03$) compared to the usual care group ($n=35$). There was no difference between groups in the measures of satisfaction or anxiety (Mann-Whitney U-test; $p>0.05$). Decision aids may emerge as a useful tool to facilitate SDM and evidence-based clinical practice.

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Patient preferences for dental treatment alternatives are mostly unknown. In a comprehensive review of articles published in the last thirty years on decision analysis in dentistry,¹ sixty-seven articles were identified but only two included an analysis of patient utilities in the clinical decision-making process. Patients' attitudes about the cost of treatment alternatives are rarely considered.² The emerging mandate in dental education to teach and practice evidence-based dentistry will require a better understanding of patient preferences in addition to application of the best available evidence and clinical judgment.³ The 1995 Institute of Medicine report, *Dental Education at the Crossroads*, acknowledges the need for development of a dental health care delivery system that focuses on patient-centered care and recommends an educational system in which "patients' preferences and their social, economic, and emotional circumstances are sensitively considered."⁴

The concept of shared decision making (SDM) is an important emerging trend in clinical medicine but has received little or no attention in the dental

literature. Frosch and Kaplan⁵ define SDM as a process in which the patient and clinician consider outcome probabilities and patient preferences and reach mutual agreement on the appropriate health care decision. Their review of the literature strongly suggests that most patients want to be involved in the decision-making process (treatment decision) but often prefer to leave actual problem-solving tasks (diagnosis and treatment details) to the clinician. Most patients desire information regarding their disease condition, but individual preference for degree of involvement in the decision-making process is highly variable.⁶ Decision aids may be useful tools to assist in communicating relevant information but should be adaptable for use with patients that have different needs for information and desire for involvement in the decision-making process. Shared decision making may also require health care providers to develop communication skills that are often believed to be lacking.⁷ In addition to the ethical and legal reasons for accurate and complete disclosure of relevant risks, benefits, and treatment alternatives,

treatment outcomes may be improved when patients are more involved in the decision-making process.^{8,9}

Dental professionals are most often concerned with the technical aspects of dental treatment while patients tend to place a higher value on symptomatic relief of oral disease.¹⁰ Patients and dentists can be expected to hold different attitudes about the value of potential treatment outcomes. Patient perceptions of oral health and disease are strongly related to acceptance of proposed treatment, and subsequent compliance is dictated by a patient's psychological and economic preferences.¹¹ It is important for health professionals to understand potential differences between their personal preferences and patient preferences for various treatment options. Shared decision making (SDM) is a model for actively engaging patients in the clinical decision-making process by providing patients with the best currently available clinical evidence regarding expected treatment outcomes and allowing for the clarification of patient and practitioner preferences.

Fyffe and Kay¹² used a standard gamble questionnaire to assess utilities for four different states of tooth health held by the general public and dentists. The standard gamble technique poses a series of hypothetical questions to determine the value (utility) a patient places on a given health state or outcome. The average utilities for dentists were found to be consistently higher than the general public. Gibbard and Zarb,¹³ in a prognosis study of single tooth dental implants, report factors that are significant to health care professionals may not be important to patients. Even among groups of dentists and dental specialists, the thresholds for treatment vary widely and may depend more on personal values than objective analysis of treatment costs, prognosis, risks, and alternatives.^{14,15} Matthews et al.¹⁶ discuss several of the most common patient preference measurement techniques including rating scales such as a visual analogue scale, standard gamble, time trade-off, and contingent valuation (also known as willingness to pay). Each of these tools may be useful for eliciting patient utilities. However, all of these techniques are of limited value as a chairside tool for assisting patients and clinicians in the decision-making process.

Levine et al.¹⁷ introduced a decision board (DB) instrument to help inform patients with breast cancer about the benefits and risks of adjuvant chemotherapy. The DB is a visual aid used in a bedside or chairside consultation environment and presents information regarding probabilities of treatment out-

comes and quality of life associated with treatment choices. Validity and reliability of the DB instrument were established by testing the instrument on healthy women volunteers prior to clinical use with cancer patients. The DB was well accepted by patients and health care providers. The authors state that the DB enhances patient involvement and satisfaction with the decision-making process by providing unbiased information to supplement physician-patient communication. In addition, the DB is relatively inexpensive and could be modified for other types of diseases and clinical decisions. Matthews et al.¹⁶ describe the DB as an instrument used to transfer information available from clinical research to the patient. They report that use of DBs would be appropriate to assist patients with decision making in dentistry although, to date, this instrument has not been used in dental health care.

Decision aids can play a useful role in shared decision making by helping patients and their physicians choose among reasonable treatment options.¹⁸ A systematic review of decision aids for patients making decisions about health treatment or screening options demonstrated that decision aids produced higher knowledge scores, lower decisional conflict scores, and more active patient participation in the decision-making process without increasing patient anxiety.¹⁹ Decision boards represent a viable option for facilitating SDM.⁵

Our hypothesis is that the use of a chairside endodontic decision board (EndoDB) will lead to improved patient knowledge, greater satisfaction with the decision-making process, and no difference in anxiety when compared to the standard discussion and informed consent process (usual care). The purpose of our study was to develop an EndoDB for chairside use to assist patients and clinicians in the decision-making process and to test this instrument in a randomized controlled clinical trial.

Methods

A draft EndoDB was developed and distributed to University of Illinois at Chicago College of Dentistry faculty in the Departments of Endodontics, Periodontics, Oral Surgery, and Restorative Dentistry for feedback regarding accuracy and clarity. In addition, a member of the College of Medicine Department of Medical Education with special expertise in clinical decision making and two College of Dentistry behavioral scientists reviewed the

draft EndoDB and offered suggestions. Estimated costs for each treatment option were based on the current College of Dentistry (COD) fee schedule. COD fees are approximately 60 percent of private practice fees; this percentage is relatively consistent across the different specialties and procedures. Prognosis for each treatment option was based on a review of the current literature. Potential risks and benefits were derived from a review of informed consent forms and discussions with general dentists and dental specialists.

The EndoDB went through two revisions based on feedback from experts in clinical dentistry and behavioral science. Modifications to the draft instrument were made to improve accuracy and clarity. The final EndoDB (Figure 1) is believed to provide a concise and valid portrayal of prognosis, benefits, risks, and costs for the various treatment options based on review by a group of experts. The research protocol and all supporting documents (consent form, EndoDB, and patient questionnaire) were submitted to the University of Illinois at Chicago Institutional Review Board, and approval was obtained (IRB #2002-0555).

The primary outcome variables were knowledge of treatment options (knowledge), satisfaction with the decision-making process (satisfaction), and anxiety about treatment choice (anxiety) under conditions in which root canal treatment or extraction was indicated. The independent variable was the use of the EndoDB compared to the standard discussion and informed consent process (usual care).

A patient questionnaire was developed to measure knowledge, satisfaction, and anxiety. Five questions were used to measure knowledge (Figure 2). The difference in mean number of correct answers for each group was compared with a t-test. For the purpose of sample size calculation, the minimum important difference between groups was set at one additional question answered correctly for the EndoDB group. The standard deviation was estimated to be one question, power=0.80, and $p<0.05$. The minimum sample size for the knowledge variable was determined to be seventeen subjects per group.

Satisfaction and anxiety were both measured using a seven-point Likert scale. The responses were treated as ordinal data and analyzed with a Mann-Whitney U-test. The expected difference between groups was set at "1" unit on a scale of 1 to 7, standard deviation=one unit, power=0.80, and $p<0.05$. The minimum sample size for each group was determined to be forty. Satisfaction was measured with

the question: "How satisfied were you with the explanation of your treatment options (not the actual treatment)?" Anxiety was measured with the question: "Did the explanation of treatment options make you more or less anxious about the treatment?"

Four second-year residents in the Advanced Specialty Program in Endodontics were recruited to participate as the clinicians for this study. Residents first met with the principal investigator (P.I.) to discuss the general nature of the study and explain the patient questionnaire and envelope for residents to record information. Residents then enrolled forty consecutive patients that met all inclusion criteria into the study. This was considered the initial "run-in" part of the study to establish base line values prior to introduction of the EndoDB. The residents then participated in a focus group with the P.I. to discuss the EndoDB and perform a calibration exercise.

Subjects for the clinical trial were recruited by the endodontic residents from the pool of patients referred to the postgraduate endodontics clinic for root canal treatment. Patients assigned to the postgraduate endodontics clinic have been through a preliminary screening and/or treatment planning process, and it has been determined that root canal treatment for one or more teeth is indicated. Minors, non-English-speaking patients, and patients who lack the capacity to understand or make their own medical treatment decisions (e.g., patient with advanced Alzheimer's disease) were excluded from the study. All other patients were asked to participate in the study. Four computer-generated randomization lists (one for each resident) were prepared by the P.I. Each resident used the list to assign patients to one of the two groups. Allocation was concealed from patients. Postgraduate residents presented the benefits, risks, prognosis, and costs associated with the treatment alternatives using either the standard informed consent process (usual care) or the EndoDB. Subjects completed the questionnaire after treatment discussion but before treatment was started. The patient placed the completed questionnaire into the envelope and sealed it. The resident then entered the appropriate information (EndoDB or usual care, treatment option selected, estimated cost, and prognosis) on the outside of the envelope and returned it to the P.I.

The data were collected in two phases beginning in January 2004 and ending in May 2004. Prior to residents' exposure to the EndoDB, forty consecutive patients were asked to participate in the study by completing the patient questionnaire following the standard treatment discussion and informed con-

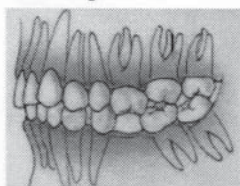
Your dentist has advised you that your tooth has an inflamed or infected pulp (nerve) and needs treatment. You have five options. Each option has different benefits, risks, costs, and probable outcomes.

No treatment



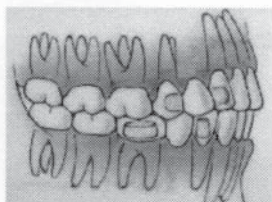
- No time is required other than the consultation.
- No cost other than the consultation fee.
- There is about a 50% chance that this tooth will cause you significant discomfort and/or a serious infection over the next five years.
- 50% chance of keeping this tooth for five or more years.

Extraction and no tooth replacement



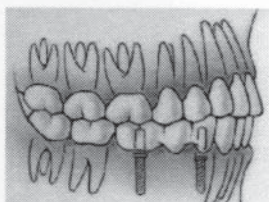
- One to three appointments will be required.
- The cost is about \$50 to \$260.
- The infection will be cured but there is a moderate risk that your other teeth will move and you will lose some chewing ability.
- 0% chance of keeping this tooth for five or more years.

Extraction and placement of a bridge



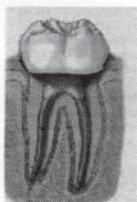
- Five to seven appointments over three to four months will be required to replace the missing tooth
- The cost is about \$1500 to \$2000.
- The infection will be cured. The teeth on either side will be shaped to attach the bridge. The bridge will look and function almost as well as your natural tooth.
- 95% chance of keeping this tooth replacement for five or more years.

Extraction and placement of an implant



- Seven to eight appointments over nine to 10 months will be required to replace the missing tooth.
- The cost is about \$1850 to \$2000.
- The infection will be cured. There is a slight chance of discomfort, infection, and/or failure of the implant to attach to the bone. The implant will look and function like your natural tooth.
- 95% chance of keeping this tooth replacement for five or more years.

Root canal treatment



- Four to six appointments over three to four months will be required for treatment.
- The cost is about \$900 to \$1100.
- The infection will be cured although there is a slight risk of short-term discomfort and a slight future possibility that the infection will return and the tooth may need additional treatment.
- 90% chance of keeping this tooth for five or more years.

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Figure 1. The final EndoDB

List of the five knowledge questions from patient questionnaire:

1. What is the approximate chance of success for your treatment? _____ %
2. About how much will it cost for all treatment associated with this tooth? \$ _____
3. What do you consider to be the major benefit of your treatment?

4. What is/are the major risk(s) associated with your treatment?

5. Do you feel that you were given enough information to make the best treatment choice (circle one)?
YES NO

Figure 2. Five knowledge questions from the patient questionnaire

sent process (usual care). This part of the study was used to establish baseline data for the usual care informed consent process since it is possible that residents' training in the use of the EndoDB would alter their subsequent usual care informed consent patient discussions. All forty patients agreed to participate in the study, but only thirty-two questionnaires were useable. Several residents did not initially understand the need for entering data on the envelope and placing the matched questionnaire into the proper envelope. After residents' training in the use of the EndoDB, eighty consecutive patients presenting for care in the postgraduate endodontics clinic were assessed for eligibility. Seventy patients met the inclusion criteria and were randomly assigned to either the experimental group (EndoDB) or control group (usual care). Sixty-seven questionnaires were properly completed and useable for the study. A Participant Flow Diagram is presented in Figure 3.

Postgraduate residents in the Department of Endodontics provided the root canal treatment and administered the EndoDB. Appropriate treatment was provided regardless of the patient's decision to participate in the study. There was no penalty for refusing to participate. Patients who choose to participate received a \$10 fee reduction for the treatment or a \$10 credit to their account (patient's choice). Patients filled out the questionnaire after discussion of treatment options and prior to the initiation of treatment. The patient placed the form in the envelope. On the outside of the sealed envelope, the resident entered:

group (usual care or EndoDB), treatment option selected, predicted prognosis, and estimated cost. There were no patient or resident identifiers on the patient questionnaire or the envelope. The questionnaire results were therefore completely anonymous. For data analysis, forms were removed from the envelopes and group identifier information (pre-trial, UC, or EndoDB) was masked prior to scoring. The P.I. discreetly observed residents as they administered the EndoDB to ensure consistency of presentation.

Results

Knowledge of treatment options was measured on a scale of "0" to "5," with the score representing the total number of correct answers to five questions (Table 1). A statistically significant difference between groups was found using ANOVA ($p=0.03$). An independent samples t-test was performed to compare the EndoDB group to the Usual Care (UC) group, and the difference was also statistically significant ($p=0.03$). Subjects in the EndoDB group

Table 1. Knowledge

Group	N	Mean	Std Dev
Pre-trial ("run-in")	32	4.09	1.03
EndoDB	32	4.63	0.55
Usual Care (UC)	35	4.26	0.78

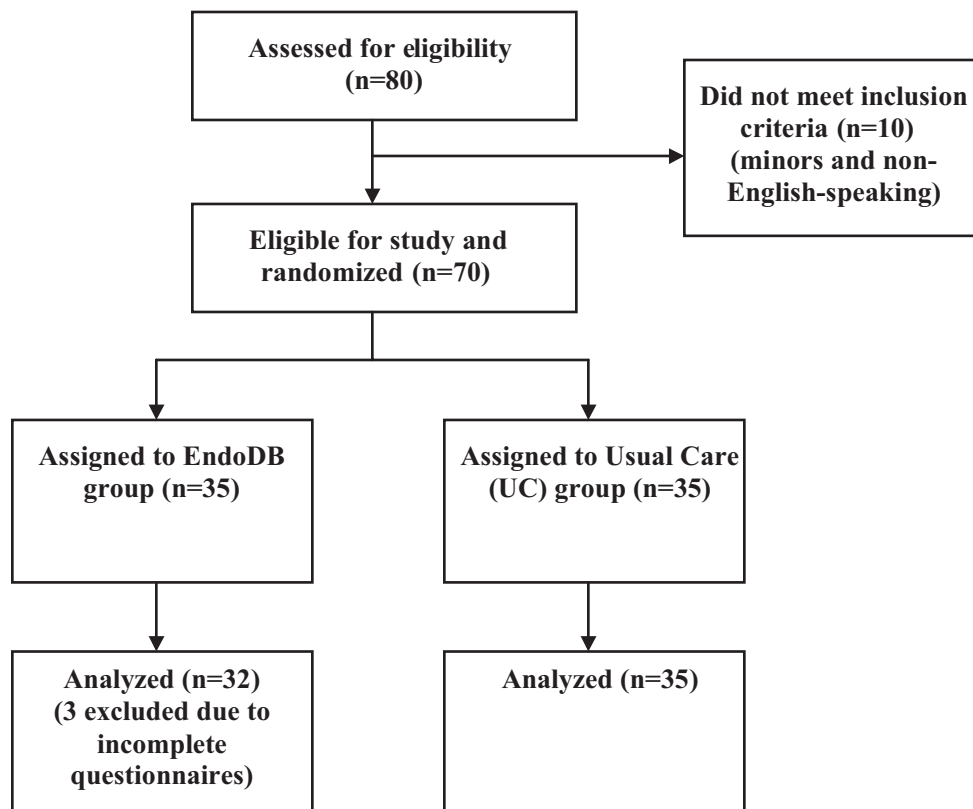


Figure 3. Participant flow diagram

scored 0.37 points higher on the knowledge scale. No significant difference was found between the pre-trial (“run-in”) group and the trial Usual Care group ($p=0.47$).

The five knowledge questions were analyzed separately to determine if specific questions were more or less likely to be answered correctly in the EndoDB group (Table 2). Patients in the EndoDB group correctly answered questions #1, 2, 3, and 4 more frequently than patients in the UC group. The largest differences were observed with question #1 (14 percent) and question #2 (20 percent). These two questions related to prognosis and cost, respectively. However, even the 20 percent difference found between groups for question #2 was not statistically significant (Chi-square test, $p=0.07$) with the sample size in this study.

Satisfaction with the decision-making process was measured by response to question #6 using a seven-point Likert scale (Table 3). A higher number indicated a higher level of satisfaction with the

decision-making process. There was no significant difference between groups using the Mann-Whitney Rank Sum Test ($p=0.82$).

Anxiety was measured by response to question #7 using a seven-point Likert scale (Table 4). A lower number indicated less anxiety about the treatment choice. There was no significant difference between groups using the Mann-Whitney Rank Sum Test ($p=0.27$).

Discussion

“Effective” vs. “Preference Sensitive” Treatment Decisions

Health care decisions can be divided into two broad categories based on the strength of evidence available to support the intervention and the expected benefit to the patient.²⁰ “Effective” treatments are

those where the known benefits are substantial compared to the risks and where treatment will predictably improve the patient's quality of life. "Preference sensitive" treatments are those with either an uncertain benefit to risk ratio or those that are more dependent on patient values. In preference-sensitive decisions, the best decision may be unclear. Decision aids may be particularly useful in these situations to assist patients and clinicians in evaluating the best available evidence, clarify patient values, and lower decisional conflict.¹⁹ The EndoDB was designed for use as a decision aid for a preference-sensitive decision (treatment choices when root canal therapy or extraction is indicated).

Comparison to Related Studies

The use of a DB as a decision aid to assist with dental treatment decisions is a previously untested idea. Although the magnitude of benefit derived from use of the EndoDB in this study was found to be relatively modest, the findings are not inconsistent with similar research in medicine. The EndoDB yielded a small, but statistically significant, improvement in

knowledge of treatment options. Item analysis of the questions used to form the composite knowledge score suggests that the EndoDB facilitated more effective communication regarding prognosis and cost information but was a less effective tool for informing patients of relative benefits and risks.

A recent review of 131 decision aids found a consistent increase in knowledge when a decision aid was used and compared to usual care.¹⁹ Additional benefits noted with the use of decision aids were: more realistic expectations, lower decisional conflict, increased proportion of patients active in the decision-making process, and reduced proportion of patients who remain undecided after the intervention. In this same review, decision aids were found to do no better than usual care in affecting satisfaction and anxiety. These findings are consistent with the results of the EndoDB clinical trial, although the expectation was that an increase in satisfaction with the decision-making process would result from the EndoDB intervention. It is possible that a greater benefit could be realized following further development and testing of the instrument.

Table 2. Item analysis

Group	KNOWLEDGE QUESTIONS (% correct answers for each question)				
	Q #1 (% success)	Q #2 (cost)	Q #3 (benefits)	Q #4 (risks)	Q #5 (enough info?)
Pre-trial ("run-in") (n=32)	84%	66%	94%	69%	100%
EndoDB (n=32)	91%	88%	100%	91%	97%
UC (n=35)	77%	66%	97%	86%	100%

Table 3. Satisfaction

	1 very dissatisfied	2 dissatisfied	3 somewhat dissatisfied	4 neutral	5 somewhat satisfied	6 satisfied	7 very satisfied
Pre-trial ("run-in")	2	0	1	1	1	7	20
EndoDB	2	0	1	1	0	4	24
UC	1	0	0	0	0	10	24

Table 4. Anxiety

	1 much less anxious	2 less anxious	3 slightly less anxious	4 no difference	5 slightly more anxious	6 more anxious	7 much more anxious
Pre-trial ("run-in")	5	9	2	7	4	1	4
EndoDB	6	9	1	8	6	1	1
UC	6	8	1	7	4	3	6

Can the EndoDB Be Modified to Enhance Its Potential Benefit?

The most relevant outcome measure for an intervention in health professions education is improvement in quality of life, either for an individual patient, group of patients with a common condition, or society at large. In particular, the goal of an effective decision aid should be to maximize the chances of a desirable health care outcome while minimizing the risks of an adverse event.²⁰

The EndoDB developed in this study is now ready for further refinement. First, it would be useful to know what information patients really want and need to make informed decisions. Information needs as defined by patients is the most appropriate starting point.⁹ As previously noted, an individual patient's desire for knowledge and discussion of treatment options is highly variable and difficult to predict.⁶ Patient autonomy in the decision-making process is an important legal and ethical requirement; however, it is known that some patients do not desire an active role in making decisions regarding their own health.²¹ Therefore, a simple screening tool to help determine desire for information would be useful in customizing the treatment discussion for each patient. Second, for patients who desire active involvement in the decision-making process, the specific content needs should be determined. In the EndoDB study, a panel of dental experts, not patients, determined what information was relevant and important. Focus groups with patients could be used to discover the type and amount of information patients would like to receive. Third, a full color electronic version of the EndoDB could be developed and easily updated as needed. Connection to a touch sensitive panel (AKA "tablet PC") would allow for real time drawing and customization of the figures and notes. Finally, greater attention should be given to the evaluation instrument used in this study. In particular, did the one-page questionnaire accurately measure knowledge, satisfaction, and anxiety? Further development and testing of the EndoDB should include efforts to establish reliability and validity of the questionnaire instrument.

Patients seen in the postgraduate endodontics clinic were prescreened but still could choose an option other than root canal treatment and crown after the discussion and consent process (none of them did). Introducing the EndoDB at an earlier stage in the treatment planning process could have a greater

impact on actual decision making, but this will need to be tested in a subsequent trial. We used knowledge, satisfaction, and anxiety as surrogate measures for our real outcome of interest (improved shared decision making), but we acknowledge that the quality of the shared decision-making process is multifactorial and not easily defined.

Decision Boards in Dental Education

Decision aids, and in particular decision boards, could have multiple uses in health professions education and could facilitate the goal of evidence-based clinical practice. Communication skills are a core competency for health care professionals.⁷ Shared decision making requires excellent communication skills and can be facilitated by the use of decision aids such as the EndoDB. The principle of patient autonomy is central to the clinical use of a decision board. However, perhaps of even greater value to health professions students is the learning that will occur during the development of a decision aid. A general principle of adult learning is that the responsibility for learning shifts from the teacher to the student. In addition, adult learners benefit from active engagement and perceived relevance of the learning assignment.²² The first step in the development of a decision board or similar decision aid is the identification of a relevant clinical decision making problem. The next step, a student-directed systematic review of the literature, could be considered an important scholarly activity for health professions students and residents.²³

Even in the absence of a significant measurable benefit for the patient, students' educational needs could be well served by the process of developing a decision board. In dental education, many common clinical scenarios are ripe for the development of decision boards. For example, the relative benefits, risks, and costs of prophylactic third molar extraction, nonsurgical vs. surgical approaches for the treatment of periodontal disease, choice of dental restorative materials, and benefits of widely accepted (but sometimes unproven) preventive measures would all be good subjects for development of a decision board.

The hypothesis that student-directed development of decision boards could be an effective educational tool is untested. However, the process is similar in many ways to problem-based learning

(PBL). The rationale and psychological basis of PBL have been well described by Norman and Schmidt.²⁴ Shuler described the recent implementation of a PBL curriculum at a U.S. dental school and advocates PBL as an excellent strategy to prepare dentists for the challenges of present and future clinical practice.²⁵ However, a recent analysis of PBL cases at a major North American medical school suggests that students may be directed to focus more on the “problem” and not on patient preferences for treatment.²⁶ If this finding is supported by subsequent research, the argument for student development and use of decision board type instruments may become even more compelling. Decision boards are designed to present the best available evidence but even more important, decision boards encourage open communication between clinician and patient and the explicit consideration of patient preferences for treatment options.

Conclusions

This study explored the use of a novel decision aid for use in clinical decision making in dentistry. The EndoDB yielded a small, but statistically significant, improvement in patient knowledge of treatment options. Decision boards may emerge as a useful tool in health professions education to facilitate SDM and evidence-based clinical practice.

REFERENCES

1. Rohlin M, Mileman PA. Decision analysis in dentistry—the last 30 years. *J Dent* 2000;28(7):453-68.
2. Edwards MJ, Brickley MR, Goodey RD, Shepherd JP. The cost, effectiveness and cost effectiveness of removal and retention of asymptomatic, disease free third molars. *Br Dent J* 1999;187(7):380-4.
3. Ismail AI, Bader JD, Kamerow DB. Systematic reviews and the practice of evidence-based dentistry: professional and policy implications. *J Am Coll Dent* 1999;66(1):5-12.
4. Dental education at the crossroads: summary. *J Dent Educ* 1995;59(1):7-15.
5. Frosch DL, Kaplan RM. Shared decision making in clinical medicine: past research and future directions. *Am J Prev Med* 1999;17(4):285-94.
6. Benbassat J, Pilpel D, Tidhar M. Patients' preferences for participation in clinical decision making: a review of published surveys. *Behav Med* 1998;24(2):81-8.
7. Towle A, Godolphin W. Framework for teaching and learning informed shared decision making. *BMJ* 1999;319(7212):766-71.
8. Stewart MA. Effective physician-patient communication and health outcomes: a review. *CMAJ* 1995;152(9):1423-33.
9. Coulter A, Entwistle V, Gilbert D. Sharing decisions with patients: is the information good enough? *BMJ* 1999;318(7179):318-22.
10. Kay EJ, Nuttall NM, Knill-Jones R. Restorative treatment thresholds and agreement in treatment decision-making. *Community Dent Oral Epidemiol* 1992;20(5):265-8.
11. Bellamy CA, Brickley MR, McAndrew R. Measurement of patient-derived utility values for periodontal health using a multi-attribute scale. *J Clin Periodontol* 1996;23(9):805-9.
12. Fyffe HE, Kay EJ. Assessment of dental health state utilities. *Community Dent Oral Epidemiol* 1992;20(5):269-73.
13. Gibbard LL, Zarb G. A 5-year prospective study of implant-supported single-tooth replacements. *J Can Dent Assoc* 2002;68(2):110-6.
14. Reit C, Kvist T. Endodontic retreatment behaviour: the influence of disease concepts and personal values. *Int Endod J* 1998;31(5):358-63.
15. McCaul LK, McHugh S, Saunders WP. The influence of specialty training and experience on decision making in endodontic diagnosis and treatment planning. *Int Endod J* 2001;34(8):594-606.
16. Matthews DC, Gafni A, Birch S. Preference based measurements in dentistry: a review of the literature and recommendations for research. *Community Dent Health* 1999;16(1):5-11.
17. Levine MN, Gafni A, Markham B, MacFarlane D. A bedside decision instrument to elicit a patient's preference concerning adjuvant chemotherapy for breast cancer. *Ann Intern Med* 1992;117(1):53-8.
18. Barry MJ. Health decision aids to facilitate shared decision making in office practice. *Ann Intern Med* 2002;136(2):127-35.
19. O'Connor AM, Stacey D, Entwistle V, Llewellyn-Thomas H, Rovner D, Holmes-Rovner M, et al. Decision aids for people facing health treatment or screening decisions. *Cochrane Database Syst Rev* 2003(2):CD001431.
20. O'Connor AM, Legare F, Stacey D. Risk communication in practice: the contribution of decision aids. *BMJ* 2003;327(7417):736-40.
21. Schneider C. Autonomy: theory & the real world. In: Protecting human subjects—U.S. Department of Energy, Office of Biological and Environmental Research 2004(Summer):13.
22. Spencer JA, Jordan RK. Learner centred approaches in medical education. *BMJ* 1999;318(7193):1280-3.
23. Lang TA. The value of systematic reviews as research activities in medical education. *Acad Med* 2004;79(11):1067-72.
24. Norman GR, Schmidt HG. The psychological basis of problem-based learning: a review of the evidence. *Acad Med* 1992;67(9):557-65.
25. Shuler CF. Application of problem-based learning to clinical dental education. *J Calif Dent Assoc* 2002;30(6):435-7, 440-3.
26. Kenny NP, Beagan BL. The patient as text: a challenge for problem-based learning. *Med Educ* 2004;38(10):1071-9.