

Influence of Educational Background on Stated Retreatment Choices for Suboptimal Fixed Prosthodontic Conditions

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Abstract

Purpose: The aim of this study was to compare the stated retreatment choices for defined, suboptimal fixed prosthodontic scenarios among groups of dental professionals with differing levels of education.

Materials and Methods: The study population (n = 75) comprised interns (n = 27), various categories of graduate students (n = 32), and specialist staff (n = 16) from the same institution. Participants were required to record their choices of retreatment or no retreatment for 22 suboptimal fixed prosthodontic scenarios.

Results: Participants' choices varied within and between groups, with regard to specific scenarios. Intergroup differences that were statistically significant were for faulty occlusion (p = 0.013), open margin (p = 0.019), defective root filling (p = 0.001), periapical radiolucency (p = 0.011), and improper pontic design (p = 0.005), when no signs and symptoms, no caries, or no inflammation were present. The results confirm the widely-acknowledged variability in decision making that exists among dental professionals in general.

Conclusion: The tendency for a significantly more interventive approach by those on a training pathway focused on imparting primarily clinical/technical skills than those enrolled in more conventional, academically-based programs, suggests that an educational dimension cannot be overlooked in the characterization of dentists' stated retreatment decision choices.

Research has shown that variations exist in the diagnoses and treatment decisions dentists make in a variety of clinical situations.¹⁻⁴ In a restorative context, such variations have been shown to occur equally whether dentists are asked to examine patients, radiographs, or extracted teeth.⁵⁻⁷

Differences in clinical decision-making affect the costeffectiveness and cost-benefit of oral healthcare, with an impact for both the individual patient and the population at large,⁸ and yet they remain poorly understood.⁹ Indeed, there is a perception that clinical decisions tend to be made intuitively, even idiosyncratically,¹ and that dentists do not share a common decision-making process.¹⁰

While substantial financial resources and research efforts have been expended toward improving people's oral health behaviors, the complex subject of dentists' clinical decisions and attitudes has received less attention. However, interest is growing, from a realization that the way in which dental practice is commonly undertaken can be improved.¹¹ Further, if an evidence-based approach to oral healthcare delivery is to gain wider application, it is important to understand what factors will influence dentists' ability to modify their clinical practices,¹² and, in so doing, attain a situation in which more defined and reproducible treatment choices can be made.¹³

A variety of dentist, patient, and treatment system factors have been suggested to account for variability in decisionmaking, some of which have been found to be of importance in empirical research.⁷ Dentist factors include biases, and personal and practice-related characteristics. For personal characteristics, skills/diligence, age/experience, knowledge, and tolerance for uncertainty have been mentioned.¹⁴ Specifically, differences in dentists' educational background^{8,15,16} and differing levels of work experience¹⁷⁻²⁰ could be influential in the process. Variations in endodontic retreatment choices have been demonstrated with respect to education, notably among dental students from different countries,^{21,22} dental students from schools in the same country,²³ and between groups of dentists and endodontists.^{4,24,25}

In prosthodontics, large variations have been found among dentists regarding their ranking of patient-related criteria when deciding treatment in hypothetical clinical scenarios.²⁶⁻²⁹ Fixed prostheses are more favorably accepted by patients, but incur

biologic costs, as well as carrying the risk of technical complications. Their survival rates have been reported as good, ranging in general practice settings from 65 to 68% after 15 to 22 years,^{30,31} with secondary caries and mechanical failures as the most frequent reasons for needing further treatment.^{30,32} What the influence of differing types of higher educational programs might be on retreatment decisions in cases of such complications is not clear.

Saudi Arabia is a country undergoing rapid expansion in oral healthcare services. The provision of prosthodontic services is also widespread, with a correspondingly strong call among dental professionals to engage in prosthodontic practice. Over the years, various higher training pathways have been put in place, culminating in a situation today in which educational programs of different designs, in prosthodontics and in related disciplines, coexist at the same institution. This environment seemed useful for investigating the possible influence of educational differences on prosthodontic retreatment decision-making.

The aim of this study was to evaluate stated retreatment choices, in defined, suboptimal fixed prosthodontic scenarios, among groups of Saudi dental professionals in the same educational setting, undergoing, or who had undergone, various programs of prosthodontic or related discipline training, or those who had had no such training. By this means, the hypothesis that the participants' stated retreatment decisions are independent of educational history and/or status was tested.

Materials and methods

Study population

Participants were selected to include all the dental professionals working or training in prosthodontics or restorative dentistry, in addition to the interns, at the College of Dentistry, King Saud University, Riyadh, Saudi Arabia (Table 1). Apart from the interns, who were from the most recent class of graduating dental students from the same institution, all others were at, or beyond the level of postgraduate education: postgraduate students (PG) were enrolled in 3-year full-time master's degree programs in either prosthodontics or restorative dentistry;

Table 1 Sample composition and characteristics

		Ge	nder	Numbe	Number of years in profession*						
Group	n	Male	Female	<5 Years	5–10 Years	>10 Years					
Intern	27	16	11	27	0	0					
PG	10	0	10	5	5	0					
SBARD	10	5	5	3	6	0					
Sp-Rest	12	9	3	2	9	0					
Sp-Pros	16	14	2	1	1	14					
Total	75	44	31	38	21	14					

*Number of years in the professions was not available for one participant from each of the SBARD and Sp-Rest groups. Saudi Board in Advanced Restorative Dentistry (SBARD) were undergoing 4-year full-time residency training under the supervision of the Saudi Health Council; and specialists in restorative dentistry (Sp-Rest) and specialists in prosthodontics (Sp-Pros) were full-time members of the academic staff, for example, assistant professors, etc., of the Departments of Restorative Dental Sciences (comprising Operative Dentistry, Endodontics and Dental Materials) and Prosthetic Dental Sciences (comprising Fixed and Removable Prosthodontics) of the College, respectively.

Questionnaire

The study was carried out by means of a structured questionnaire that had been pretested by five dentists who were mainly engaged in clinical practice (these individuals were not included in the study), and revised as necessary. The questionnaire was presented to each participant after he/she had been individually approached and fully briefed on the purpose of the project. Assurances were given on confidentiality of identity, as well as on the fact that there were no "right" or "wrong" answers that were being sought or monitored. The questionnaire comprised two parts:

- 1. Background information, including gender, professional level/status, and length of experience as a dentist.
- 2. Eleven commonly-occurring conditions relating to an existing fixed restoration, each of which might typically be considered to be of substandard quality, and each of which had the option to be with/without clinical, and/or patientperceived problems, were listed on a separate sheet, with each condition allowing for its variants (e.g., faulty occlusion with or without symptoms), and each, in turn, allowing for a positive or negative response regarding retreatment. No diagrammatic representations were included. With all variants included, there were 22 clinical conditions relating to a fixed restoration that might be considered compromised (Appendix). Participants were asked to state their choice for retreatment in the following manner: "In each of the following conditions, please state your preference whether or not to retreat with a new fixed restoration." The possibility of further information being needed by the participant before a preference could be made was also allowed for, through the inclusion of a third "depending on other factors" option. The same patient vignette as follows: "the patient has no other notable clinical conditions, and is one you are likely to see within the next two years" applied to all cases.

Data analysis

Data were analyzed in frequency tables, and differences between groups by educational background, gender, and number of years in the profession were tested using the chi-square test. All significance levels were set at 5%, and statistical analyses were performed on an IBM Personal Computer using SPSS version 12 (SPSS, Chicago, IL).

Results

A total of 89 questionnaires were distributed to the entire eligible group at the institution, of which 75 were returned, giving

PG = postgraduate student; SBARD = Saudi Board for Advanced Restorative Dentistry resident; Sp-Rest = specialist in restorative dentistry; Sp-Pros = specialist in prosthodontics.

Table 2 Frequency distributions of	f retreatment choices	for suboptimal fixed	prosthodontic	conditions	by groups
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		Intern		PG		SBARD		Sp-Rest		Sp-Pros		Total		
Condition/group		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	p
1	Faulty occlusion													
	+Signs/symptoms	27	0	9	1	10	0	11	1	14	1	71	3	0.509
	-Signs/symptoms	12	15	3	6	8	0	2	7	5	3	30	31	0.013*
2	Open margin													
	+Caries	27	0	10	0	10	0	10	1	16	0	73	1	0.214
	-Caries	23	3	8	2	9	0	5	6	12	3	57	14	0.019*
3	Fractured porcelain													
	+Complaint	24	3	9	1	9	1	9	1	13	2	64	8	0.998
	-Complaint	7	20	5	5	4	3	7	4	6	6	29	38	0.190
4	Defective root filling													
	+Signs/symptoms	26	1	9	1	9	1	10	2	15	0	69	5	0.449
	-Signs/symptoms	4	23	0	10	7	2	2	8	5	8	18	51	0.001**
5	Overextended root filling													
	+Signs/symptoms	23	4	6	4	8	2	8	3	13	1	58	14	0.303
	–Signs/symptoms	1	25	0	10	1	8	0	10	3	8	5	61	0.078
6	Periapical radiolucency													
	+Signs/symptoms	25	2	9	1	9	1	7	4	12	1	62	9	0.154
	–Signs/symptoms	17	10	6	3	4	6	1	8	10	2	38	29	0.011*
7	Substandard post													
	Inadequate post space	15	12	2	6	3	6	8	4	7	7	35	35	0.323
	Overprepared post space	5	22	1	9	3	7	2	8	5	11	16	57	0.694
8	Mismatched shade													
	Anterior crown	23	4	8	1	9	0	10	1	14	2	64	8	0.813
	Posterior crown	3	24	0	9	0	7	2	7	3	10	8	57	0.343
9	Overcontoured restoration													
	+Gingival inflammation	25	2	9	0	9	0	11	1	15	0	69	3	0.615
	–Gingival inflammation	16	2	2	7	7	1	6	4	11	4	42	27	0.060
10	Biologic width violation													
	+Bone resorption	25	2	9	0	9	0	11	1	13	2	67	5	0.674
	-Bone resorption	17	10	5	4	7	1	6	4	10	4	45	23	0.636
11	Improper pontic design													
	+Inflammation	27	0	9	0	9	0	11	1	16	0	72	1	0.272
	-Inflammation	6	21	0	7	4	4	1	9	8	4	19	45	0.005**
Total		27		10		10		12		16		75		

*Significant; **highly significant.

PG = postgraduate student; SBARD = Saudi Board for Advanced Restorative Dentistry resident; Sp-Rest = specialist in restorative dentistry; Sp-Pros = specialist in prosthodontics.

a response rate of 84%. Failure among respondents to answer single questions, namely internal nonresponse, was negligible: only one of each of the SBARD and Sp-Rest respondents did not include the number of years in the profession. When a respondent's selection was subject to needing further information, the response was not included in the analysis.

Sample composition indicated uneven distributions of males and females, and number of years in the profession, within the groups (Table 1). Percentage frequencies of responses to all clinical situations according to professional level are listed in Table 2. Variations in responses for a given clinical condition were noticed within most of the groups as well as among groups, although there were a few cases of near-conformity—open margin with caries and improper pontic design with inflammation, for which all but one respondent said that they would retreat. The only statistically significant intergroup differences in retreatment choices were seen in the clinical conditions of faulty occlusion, open margin, defective root filling, periapical radiolucency, and improper pontic design, and for each of which when no signs and symptoms, no caries, or no inflammation were present (Figs 1–5). Neither gender nor number of years in the profession had any effect on the variations observed.

Discussion

The groups making up the study population were neither similar nor large in size. They did, however, comprise a significant proportion (84%) of the target population in the same institution. While this was useful in terms of testing the hypothesis that



Figure 1 Percentage frequency distribution of retreatment/no retreatment choices for Q. 1 (faulty occlusion without signs/symptoms) among the groups, and for the total population (N = 75) (PG = postgraduate student; SBARD = Saudi Board for Advanced Restorative Dentistry resident; Sp-Rest = specialist in restorative dentistry; Sp-Pros = specialist in prosthodontics).

participants' stated decisions are independent of educational background, the findings cannot be generalized to the entire prosthodontically-orientated professionals in Saudi Arabia.

The key characteristic of the paper patient case method as applied in this study is that the patient is, of course, absent, indeed, nonexistent. While this precludes the observer from picking up potentially important cues from other aspects of a "live" presentation, it has the advantage of controlling precisely those background variables, even if some "artificiality" is so introduced. What neither of these approaches can avoid, however, is the likelihood that what people say they do in a situation and what they actually do can be quite different.^{33,34} Clearly, this study cannot claim to have clarified this last point.

Notwithstanding a few near-consistencies in stated retreatment decisions by the study population (i.e., open margin with caries and improper pontic design with inflammation), the key finding was the otherwise widespread variation within and between groups regarding the decision to retreat cases of suboptimal fixed prosthodontic clinical outcomes. In the first place, this general inconsistency concurs with differences noted among dentists in the factors they regarded as important in deciding on treatments in simulated prosthodontic scenarios.²⁶⁻²⁹ Similar patterns of decision-making inconsistency have also been noted in other areas of dentistry, for example, restorative dentistry,^{3,7,35} endodontics,^{4,15,21-25} and oral surgery.² Secondly, because this study was not concerned with the selection of a particular treatment among given options once the decision to intervene was made, it could not confirm that specific treatment selection is also liable to variation as is the decision to intervene, as shown elsewhere.^{21,23,35}

It has been stated that the personal characteristics of dentists relevant to our understanding of treatment variation are skills/diligence, age/experience, knowledge, and tolerance of uncertainty.¹⁴ While many of these factors still remain only vaguely understood, the present study focused on knowledge, as reflected in level of professional educational attainment. Gender was also compared but displayed no differences; neither did experience, as interpreted from number of years in the profession. Elsewhere, differences in treatment choices have been shown to be associated with age,^{18,20} although it is not clear whether such differences are due to clinical experience or to a historical context.³⁶ Nevertheless, the number of years in profession showed no association with treatment choices.

In the present study, there were some cases of near-uniformity in stated retreatment choices, which, not surprisingly, occurred when biological consequences or patient discomfort were a feature. In contrast, most disagreements in the decision to intervene were in cases that did not cause overt biological damage or patient discomfort. For example, decisions on intervention in cases of faulty occlusion without symptoms showed an almost even split among members of all groups except SBARD students, all of who felt a need to retreat with a new restoration (Fig 1). The latter group showed a similar retreatment tendency for the case of open margin without caries (Fig 2), and that



Figure 2 Percentage frequency distribution of retreatment/no retreatment choices for Q. 2 (open margin with no caries) among the groups, and for the total population (N = 75) (PG = postgraduate student; SBARD = Saudi Board for Advanced Restorative Dentistry resident; Sp-Rest = specialist in restorative dentistry; Sp-Pros = specialist in prosthodontics).

of defective root filling with no signs and symptoms (Fig 3). In the endodontic scenario described, monitoring rather than initiating retreatment is, in fact, a more common practice unless the crown itself is slated for replacement.³⁷

From these observations, the approach favored by SBARD students is suggestive of a more aggressive one, and one that has elsewhere been seen in younger, less experienced practitioners.³⁶ It may also be suggestive of a lower tolerance for uncertainty in terms of perceived outcome if left untreated, yet it may equally be one that is less attuned to risk-benefit evaluation. Some clinicians are said to display confidence, perhaps even overconfidence, in being able to improve on the given condition.³⁸ On the other hand, an interventive stance could be explained by a failure on the part of the clinician to directly link the reasons for restoration failure with the reasons for replacement, thus perpetuating the cycle of restorations being replaced without knowing what alterations are needed to ensure that the fault is not likely to be present again in the new restoration. However, such a view seems to be at variance with another report that dentists use a strategy aimed at minimizing "losses" rather than maximizing "gains,"39 and instead of focusing on what might be gained through retreatment, they focus instead on "doing no harm," thus favoring a low-risk approach.²³ To what extent the latter approach limits potential benefits to patients is not known.

Notwithstanding the foregoing discussion, a more interventive approach may speak to the influence of an educational model. Programs can be based on the "clinical-technical" training aspect (i.e., one that places relatively little emphasis on academic aspects and omits any research component) or the more conventional postgraduate degree design (i.e., with a strongly academic flavor as well as an original research requirement), and both such programs are run at the same institution. Inasmuch as the SBARD program is less academically-structured, and without a research requirement, stereotyping and inculcating a degree of paternalism, can, perhaps inadvertently, become part of the philosophy.^{40,41} In the circumstances, is a "the treatment fits the patient" compared to a "the patient fits the treatment" approach an outcome to be expected?³⁹ Increasingly, prosthodontic treatment needs assessment that is based largely on technical considerations is being superseded by one that includes the impact of dental ill health upon individuals, the degrees of functional impairment caused, and the perceptions, attitudes, and expectations of patients to treatment.⁴² While this was not an aspect investigated in this study, the patterns of decision-making found confirm the ongoing controversy in prosthodontic treatment planning.

Somewhat against the trend that they had demonstrated in other scenarios, the majority of SBARD students, as well as Restorative Specialists, saw little reason to retreat with a new crown the case of periapical radiolucency with no signs and symptoms (Fig 5). Even more surprisingly, more than onethird of Restorative Specialists chose not to retreat with remake the case of periapical radiolucency, even in the presence of existing signs and symptoms (Table 2). It can be speculated that this group may prefer to manage the endodontic problem



Figure 3 Percentage frequency distribution of retreatment/no retreatment choices for Q. 4 (defective root filling without signs/symptoms) among the groups, and for the total population (N = 75) (PG = postgraduate student; SBARD = Saudi Board for Advanced Restorative Dentistry resident; Sp-Rest = specialist in restorative dentistry; Sp-Pros = specialist in prosthodontics).



Figure 4 Percentage frequency distribution of retreatment/no retreatment choices for O. 11 (improper pontic design without inflammation) among the groups, and for the total population (N = 75) (PG = postgraduate student; SBARD = Saudi Board for Advanced Restorative Dentistry resident; Sp-Rest = specialist in restorative dentistry; Sp-Pros = specialist in prosthodontics).



Figure 5 Percentage frequency distribution of retreatment/no retreatment choices for Q. 6 (periapical radiolucency without signs/symptoms) among the groups, and for the total population (N = 75) (PG = postgraduate student; SBARD = Saudi Board for Advanced Restorative Dentistry resident; Sp-Rest = specialist in restorative dentistry; Sp-Pros = specialist in prosthodontics).

by accessing the root canals through the crown, with a later repair of the crown. The propensity for educators in Operative Dentistry (which could be considered equivalent to restorative dentistry) to rely on adhesive techniques for repairs as opposed to conventional remakes has recently been reported.⁴³ Thus, not surprisingly, restorative specialists were the most conservative among the groups in terms of risk-taking, as reflected in their reluctance to intervene in cases where no frank damage had occurred and no complaints were lodged by the patient. SBARD students, as has been seen, represented the other extreme, being greater risk-takers. Prosthodontists, while seemingly also willing to take some risks with interventions, were not as aggressive as SBARD students.

It has been stated that knowledge is a function of initial professional education and subsequent formal and informal learning.¹⁴ From the continuing education literature, it appears that straightforward educational interventions are the least effective of all available means to influence practitioners' clinical behavior, and even a computer-based educational intervention aimed at improving the reliability of decision-making makes little difference to the level of agreement achieved.³ Further, the effectiveness of educational strategies, such as computeraided learning, audit, and feedback, aimed at better implementation of clinical guidelines could not be confirmed in a recent study;⁴⁴ however, besides the educational factor, personal value systems that are partly derived from teachers and colleagues would likely also have contributed to the systematic variations noted in the present groups, as could factors like the complexities of the procedure, the perception of risk attributable to the procedure, and the prior clinical experience of the dentist in similar clinical situations. All of this highlights the need for further research in this important area.

Conclusions

Within the limitations of the study design, the following conclusions may be made:

- The wide variation observed within and between groups of dental professionals about their stated preferences for retreating defined suboptimal fixed prosthodontic conditions confirms a trend that has previously been shown in other clinical scenarios.
- The distinct differences in patterns of decision-making by the group enrolled on a nondegree, clinically-oriented training pathway compared to groups following more academically-based programs refutes the hypothesis that variations in treatment decisions are independent of educational background.

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Appendix: Questionnaire

In which clinical conditions would you decide to redo a cast restoration?

Yes No Depend on Other factors (Please specify): e.g., esthetic outcome, patient's complaint, satisfaction, and previous treatment experience)

_ __

- A restoration designed in a faulty occlusion
- With signs and symptoms
- No signs and symptoms
- Open margin
- · With caries
- o Without caries

•	Fractured porcelain		
0	Patient is not complaining	 	
•	Substandard root canal treat-	 	
•	ment		
0	Defective seal		
Ŭ	-With signs and symptoms	 	
	-No signs and symptoms		
0	Over filled root canal filling		
	-With signs and symptoms	 	
	-No signs and symptoms	 	
0	Periapical radiolucency		
	-With signs and symptoms	 	
	-No signs and symptoms	 	
•	Substandard post and core		
	quality		
0	Short post extension into	 	
	The root structure	 	
0	Over prepared post space		
	(Weakening the root struc-	 	
	ture)		
•	Mismatching restoration		
	color		
0	In case of anterior crown	 	
0	In case of posterior crown	 	
•	Overcontoured restorations		
0	With gingival inflammation	 	
0	Without gingival inflamma-	 	
	tion		
•	A restoration violating the bi-		
	With sizes of hours and in		
0	With signs of bone resorption	 	
0	tion	 	
	Improper pontic design		
•	With signs of inflammation		
0	Without signs of inflamma	 	
U	tion	 	
	uon		

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