The Dentist's Communicative Role in Prosthodontic Treatment

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Purpose: Dentist-patient verbal communication is important for patient satisfaction. The aim of this study was to investigate the dentist's role in the provider-patient relationship as to verbal communication and patient satisfaction with the treatment outcome in prosthetic dentistry. The dentist-specific properties were analyzed in random coefficient modeling. ***Materials and Methods:*** Sixty-one dentist-patient pairs were followed through 61 prosthodontic treatment periods. The treatment performed was fixed prosthodontic restorations on teeth or implants. One encounter at the end of each treatment period was tape recorded. The verbal communication on the recordings was analyzed using an interaction analysis instrument. Various measures of communication were used, summarizing the variational pattern of verbal interaction. Two different aspects of the patient satisfaction concept were used as dependent variables: cure (overall patient satisfaction with prosthodontic treatment), and care (patient satisfaction with a particular dental encounter during the prosthodontic treatment period). ***Results:*** In the multilevel model for care, the dentist variance was mostly explained by the communication variables. In the cure model, there was no dentist variance. The communication patterns used by the dentists thus influenced patient satisfaction in a short-term perspective but not in an intermediate perspective. ***Conclusion:*** Patient evaluation of the care during an encounter is dependent on the dentist's verbal communication activity during the encounter, but this communication has no impact on the patient evaluation of overall prosthetic treatment outcome in the intermediate time perspective. *Int J Prosthodont 2004;17:666–671.*

A number of different factors contribute to an efficient clinical outcome in prosthetic dentistry. Accurate diagnosis and a strict treatment protocol have proven to predict good long-term survival rates for prosthodontics.[1,2] Even if the prosthetic treatment is of excellent clinical quality, some patients will still not be satisfied. Patient satisfaction with prosthetic dentistry seems to have a multicausal character.[3,4] In addition to factors directly related to comfort and function, several other patient factors seem to influence the final treatment outcome. These factors include patient personality, attitude, and expectations and dentist-patient verbal communication.[5–8]

However, the other party in the relationship, the dentist, has not been studied in these respects. Still, some authors regard the clinician as being extremely important to the final treatment outcome in prosthetic dentistry, and they should therefore not be neglected in outcome assessment.[9] Technical routines and dentist skills are in fact strongly correlated to prosthetic treatment outcome.[6,9–12] One of the many skills a dentist has to practice to achieve a good, predictable treatment outcome is communication.[13–15]

It has been stated that there is a communication gap between patients and dentists that likely causes patient dissatisfaction,[16] and clinician communication skills have consequently been shown to be important in

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limiting patient dissatisfaction in dentistry.[17,18] It has also been shown in a multivariate model that dentist-patient verbal communication dimensions (eg, information exchange from the patient and dentist points of view) are important for patient satisfaction with treatment outcome in an intermediate time perspective. A weakness of this multivariate model specification is the exclusion of dentist-specific properties to avoid the ecologic fallacy.[5] As there are more patients than dentists, dependency is introduced between those patients who have a common dentist. In effect, an analysis of dentist variables means crossing a level of analysis, necessitating random coefficient modeling, such as multilevel models. The bivariate differences observed (eg, between male and female dentists) in the previous study indicate that there are good reasons for performing an analysis with such analytic methods.[5]

The aim of the present study was to find an answer to the question of what role the dentist might have in the provider-patient relationship, with special concern for patient satisfaction with the treatment outcome in prosthetic dentistry. More specifically, the study applied multilevel modeling to investigate if the satisfaction with care, satisfaction with cure, and total number of utterances during an encounter were related to dentists' characteristics and verbal communication.

Material and Methods

Sixty-one dentist-patient pairs (61 patients and 15 dentists) were followed through prosthodontic treatment periods at three Swedish specialist clinics for prosthetic dentistry during 1998 and 1999. One encounter at the end of each treatment period was recorded. Dentist ages were 37 to 55 years (mean 45 years). Ten dentists were men (mean age 45 years), and 5 were women (mean age 46 years). The dentists worked with patients on average 30 hours per week and had regular daily contact with other dentists at their clinics.

Of the 61 patients, 51% were men (mean age 53 years), and 49% were women (mean age 54 years). Data concerning the length of the treatment periods and amount of fixed prosthodontic work performed were collected from the patient records at the time the treatment period was finished. The mean length of the treatment period was 20 months (range 1 to 51 months). The patients and dentists met a mean of 14 times before the prosthodontic restorations were placed (range 3 to 46 times). Ten patients received treatment in three or four quadrants. Forty patients received prosthodontic treatment in two quadrants. Eleven patients received prosthodontic treatment in only one quadrant. The prosthetic treatment comprised either implant- or tooth-supported prosthodontics. The type of treatment and number of quadrants were used as independent variables in the various analyses.

The recordings were made with equipment placed in the ordinary dental office room. All participants were informed that the visit would be recorded and were given the opportunity to decline participation. The study base, recording bias, interaction analysis instrument used (Roter Interaction Analysis System [RIAS]–Dental), and coding procedure have been reported in previous studies.[19,20] A local research ethics committee approved the study before its commencement.

The seven dimensions of verbal communication found to summarize the variational pattern of verbal interaction in prosthetic dentistry were used as measures of communication. These dimensions are described in detail in a previous paper.[21] They are:

1. Emotional exchange, describing both supportive and nonsupportive, negative emotional exchange between dentists and patients
2. Information exchange–patient horizon, describing mainly task-focused informational exchange, primarily from the patient's horizon
3. Relation-building exchange, describing a verbal relation-building strategy comprising greetings, friendly statements, and small talk
4. Information exchange–dentist horizon, describing dentists' information-gathering strategy as well as dentists' verbal behaviors favoring the proceedings of the encounter
5. Administrative and counseling exchange, describing dentists' and patients' information-gathering behaviors about the administration, clinical routines, and paperwork
6. Task-focused exchange, describing mainly patient information-giving behaviors and dentist back-channeling behaviors
7. Socioemotional exchange, describing mainly emotional communication, but also dentist-patient information-seeking behaviors in the form of closed-ended questions

Two separate questionnaires were presented to the patients at two different times during the treatment period; consequently, two different aspects of the patient satisfaction concept were constructed. From an intermediate time perspective, "patient satisfaction with treatment outcome" was defined; this was called "cure," general patient satisfaction with the overall prosthodontic treatment. From a short-term perspective, "patient satisfaction with care" was defined; this was called "care," patient satisfaction with a particular dental encounter during a period of prosthodontic treatment.

The basis for the development of the care measure was a questionnaire distributed to the patients

immediately after the recorded encounter. This questionnaire contained 11 questions, 8 of which were derived from the Dental Visit Satisfaction Scale,[22] a nine-item scale specially designed to assess patient perception of and satisfaction with the dentist during a specific visit. Three questions were constructed to assess patient evaluation of the dentist-patient communication and the dentist's stress level. The items were summarized into a scale with a range of 29 to 40.

The basis for the development of the cure measure was a questionnaire distributed to the patients twice during the treatment period—once before the treatment began and once 3 months after the treatment was completed. Patients were asked almost the same questions both times, and the latter questionnaire was mailed to them. The two questionnaires comprised questions about the patients' view of their oral health status before and after treatment and the extent to which this status affected their overall well-being and daily life. The items were summarized into a scale with a range of 11 to 44.

For the final construction of both satisfaction variables, factor analysis was used to ensure unidimensionality of measures. The construction of the satisfaction variables is described in detail in a previous paper.[5]

Statistical Method

The hierarchic statistical models, or multilevel modeling, could be regarded as an extension of ordinary least squares (OLS) regression. However, the existence of a nonzero interunit correlation, resulting from the presence of more than one residual term in the model, means that traditional estimation procedures, such as OLS, were inapplicable.[23,24] The multilevel modeling technique yields regression coefficients that are interpretable in the usual way (ie, as unit change in the dependent variable). In addition, an estimate is given of the variance remaining on each level, in this case on the dentist and patient levels, as a dentist has several patients. The change in variance can be calculated between a null model without explanatory variables and models introducing dentist and patient variables, respectively. Expressing the change in percentage gives a measure of explained variance. For each model, a coefficient can be calculated (–2LL). The change in that coefficient is chi-square distributed, with degrees of freedom as the number of added variables – 1. This change offers a significance test of the model similar to the *F* test in OLS regression.[25]

The variables included in the models were as follows:

- Patient gender (categoric)
- Dentist gender (categoric)
- Dentist-patient age difference (in years)
- Quantity of prosthetic treatment (No. of quadrants)
- Implant-retained prosthetic treatment (categoric)
- Emotional exchange (No.)
- Information exchange–patient horizon (No.)
- Relation-building exchange (No.)
- Information exchange–dentist horizon (No.)
- Socioemotional exchange (No.)
- Task-focused exchange (No.)
- Care (patient satisfaction with care during an encounter)
- Cure (patient satisfaction with treatment outcome)

The unit ranges for the dependent variables were calculated by simple additive indices of the component questions in the questionnaires. There is no natural unit, but the range must be considered in judging the sizes of the regression coefficients in Tables 1 and 2. The models were constructed following a kind of stepwise block strategy. First, a null model was run without independent variables. Then, a model that only includes the individual attributes (eg, patient and dentist gender, dentist-patient age difference, quantity of prosthetic treatment, type of treatment)—the individual model—was run. Finally, a communication model that includes all the variables of the null and individual models and the dentist-patient verbal communication dimensions (variables) described in the previous section was run.

Results

In the multilevel model with the dependent variable care, the dentist variance in the null model was 0.92. There remained 0.10 in dentist variance in the communication model, meaning that 89% of the dentist variance was explained by the final communication model compared with the null model. The largest share of the variance explained on the dentist level was the step from the individual to the communication model, where 85% of the variance was explained. On the other hand, only 3% of the patient-level variance was explained by comparing the null model with the communication model. This change was mainly explained by the communication variables. In fact, the communication variables were important for the outcome variable care. Still, only 16% of the total variance of care in the null model was dependent on the dentist; the remaining 84% was dependent on the patient. Going from the null model to the individual model, this share of the total variance decreased from 16% to 13%. In the communication model, only 2% of the total variance remained as unexplained variance on the dentist level.

The models with the dependent variable cure showed that when the communication variables were put into

Table 1 Null, Individual, and Communication Models: Care

	Null model		Individual model		Communication model	
Variable	b	CI	b	CI	b	CI
Intercept	38.50	± 0.76	36.20	± 3.60	36.37	± 4.18
Patient gender	–	–	0.27	± 1.14	0.05	± 1.24
Dentist gender	–	–	0.67	± 1.50	0.42	± 1.38
Dentist-patient age difference	–	–	0.02	± 0.04	0.03	± 0.04
Quantity of prosthetic treatment	–	–	0.38	± 0.68	0.23	± 0.74
Implant treatment	–	–	0.22	± 1.20	0.19	± 1.36
Emotional exchange	–	–	–	–	–0.13	± 0.20
Information exchange–patient horizon	–	–	–	–	–0.04	± 0.10
Relation-building exchange	–	–	–	–	–0.01	± 0.06
Information exchange–dentist horizon	–	–	–	–	0.01	± 0.06
Socioemotional exhange	–	–	–	–	0.10	± 0.14
Task-focused exchange	–	–	–	–	0.11	± 0.14
Level 2, dentist	0.92	± 1.60	0.66	± 1.36	0.10	± 0.98
Variance change horizontally, dentist	–	–	28%	–	85%	–
Level 1, patient	4.71	± 1.96	4.43	± 1.84	4.56	± 1.88
Variance change horizontally, patient	–	–	6%	–	3%	–
Patient-level variance share, vertically	84%	–	87%	–	98%	–
–2LL	276.30	–	270.90	–	267.02	–
Chi-square difference, null model 4 *df*	–	–	5.40 (NS), 4 *df*	–	3.88 (NS), 5 *df*	–

b = regression coefficient unit change in dependent variable per unit change in independent variable; CI = 95% confidence interval for regression coefficient; –2LL = –2 log likelihood chi square–distributed model fit; *df* = degrees of freedom; NS = nonsignificant.

Table 2 Null, Individual, and Communication Models: Cure

	Null model		Individual model		Communication model	
Variable	b	CI	b	CI	b	CI
Intercept	20.20	± 1.60	16.60	± 9.60	16.43	± 10.50
Patient gender	–	–	2.68	± 3.14	1.30	± 3.12
Dentist gender	–	–	–0.73	± 3.52	0.53	± 3.40
Dentist-patient age difference	–	–	0.03	± 0.08	–0.01	± 0.08
Quantity of prosthetic treatment	–	–	1.02	± 1.92	1.77	± 1.88
Implant treatment	–	–	–0.54	± 3.16	–1.50	± 3.42
Emotional exchange	–	–	–	–	0.50	± 0.52
Information exchange–patient horizon	–	–	–	–	0.21	± 0.24
Relation-building exchange	–	–	–	–	–0.02	± 0.14
Information exchange–dentist horizon	–	–	–	–	–0.17	± 0.14
Socioemotional exhange	–	–	–	–	–0.19	± 0.36
Task-focused exchange	–	–	–	–	–0.04	± 0.36
Level 2, dentist	0.00	–	0.00	–	0.00	–
Level 1, patient	38.80	± 14.00	36.21	± 13.12	29.84	± 10.80
Variance change horizontally, patient	–	–	7%	–	18%	–
–2LL	396.26	–	392.05	–	380.26	–
Chi-square difference, null model 4 *df*	–	–	4.20 (NS), 4 *df*	–	11.79, 5 *df* ($P = .06$)	–

b = regression coefficient unit change in dependent variable per unit change in independent variable; CI = 95% confidence interval for regression coefficient; –2LL = –2 log likelihood chi square–distributed model fit; *df* = degrees of freedom; NS = nonsignificant.

the communication model, there was no dentist variance. Dentists' individual characteristics, prosthetic treatment modalities, and communication variables did not influence the cure variable. The patient variance in the null model was 38.80; in the communication model, it was 29.84. The change in patient variance between these models was 23%, which was statistically significant. The patients' individual characteristics and communication variables influenced the cure variable.

Discussion

In previous studies, analyses of the verbal communication in the prosthetic dentistry context have tried to find out what type of communication is important for treatment outcome, measured as patient satisfaction in short and intermediate time perspectives.[5] It was then shown that "information exchange–patient horizon" and "information exchange–dentist horizon" could be

related to outcome in the intermediate time perspective only. The present study tried to find out if the dentist's verbal communication during these encounters was significant for the two patient satisfaction concepts.

First, it was shown that the personal characteristics of the dentists in this study group were subordinate to the clinical context of prosthetic dentistry. The dentists' personal characteristics, together with the amount and type of verbal dentist-patient communication during the encounters, were not at all important in the patients' overall evaluation of prosthetic treatment (ie, satisfaction in the intermediate time perspective). Second, it was shown that the personal characteristics of the dentists and the dentist-patient communication variables were of importance for patient satisfaction with care (ie, satisfaction in the short-term perspective). A quarter of the variation in the patient satisfaction with care was explained by the dentist's verbal communication during the encounter.

An earlier study of the same population found no association between patient satisfaction in the short-term perspective and dentist-patient verbal communication.[5] These results do not contradict each other; they merely show that the dentists' individual characteristics and verbal communication are important in patient evaluation of the actual encounter but of minor importance for the whole prosthetic treatment.

Still, much of the variation in the amount and type of dentist-patient communication depended on the patients. The present results point out that the dentists more "passively" interacted with the patients' verbal behavior. The variance between the dentists was of importance only in respect to patient satisfaction with care. The dentists in the study group could be characterized as professional and rather "professionally similar." The patients were the focus. This homogeneity might be explained by the fact that the dentists in the study group were and had been clinically trained by a small group of specialists and worked in clinics with colleagues trained in the same specialty. However, the dentists' verbal behavior in the present study resulted in relatively more satisfied patients in the intermediate time perspective and, to some extent, in the short-term perspective, even if some variation among the dentists was shown. These results are contradicted by Hakestam[26]; however, the communication behavior per se was not measured in that study. Other studies also show that treatment outcome may vary between dentists in the same clinic.[11,27] It has also been shown that general dentists and their communication behaviors are important not only for the clinical treatment outcome in a long-term perspective, but also for patient satisfaction in a shorter perspective.[10,28] Results like these are not contradicted by the results of the present study; they merely show that in studies where verbal communication is included as an intermediate variable, the results are to a great extent dependent on the context.

The dentists in the present study are specialists, and perhaps specialist and general dentists communicate differently toward their patients. The specialists may be more homogenous than a group of general dentists in this respect. The material in the present study is strongly selected and small. The results can therefore not be generalized to other contexts in dentistry. The difficulties in comparing results between studies measuring patient satisfaction with treatment outcome must also be pointed out. These concepts are heterogeneous and are in fact not comparable, eg, the time perspectives. Since the effects in this study were measured after a relatively short time, further investigations measuring outcome in a long-term perspective should also be considered.

Comparing these results with those of another study on the same population,[5] it can be summarized that the number and type of verbal communication dimensions used during encounters in the prosthodontic context are more dependent on the patients' activity than on the dentists'. This verbal activity per se might therefore be significant for outcome in prosthetic dentistry.

Conclusion

Dentist characteristics and verbal communication are in some ways subordinate to the outcome in the context of prosthetic dentistry. Patient evaluation of the care during an encounter is dependent on the dentist's verbal communication activity during the encounter, but this communication has no impact on the patient evaluation of the overall prosthetic treatment outcome in the intermediate time perspective.

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Literature Abstract

Photoelastic analysis of the effect of palatal support on various implant-supported overdenture designs

Reduction of palatal coverage can provide greater comfort to some patients who wear maxillary implant-supported overdentures. The purpose of this study was to investigate the effect of palatal coverage on load transfer for different designs of maxillary implant- supported overdenture with photoelastic measurements. The authors fabricated three overdentures with different designs for the artificial maxilla with four implants placed (3.75 × 12 mm, 3*i*): 1. a splinted Hader bar incorporating two distal ERA attachments with an anterior clip; 2. nonsplinted Zaag 4-mm direct abutments with attachments; and 3. nonsplinted Locator 2-mm direct abutments with attachments. Loads of 111 N were applied to each individual load point location centrally and unilaterally for each design with palatal coverage and with the reduction of palatal coverage. The results showed that prostheses without palatal coverage generated higher apical stresses around implants compared to prostheses with palatal coverage. Better stress distribution was shown on splinted bar design compared to nonsplinted attachments designs. The authors suggested that increased coverage of mucosal or palatal support might be considered in overdenture treatment conditions for improved distribution of stress between implants and adjacent soft tissue support areas.

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