

Anxiety, Stress, Depression, and Patients' Responses to Periodontal Treatment: Periodontists' Knowledge and Professional Behavior

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Background: Anxiety, stress, and depression affect the use of health care services, treatment decision-making, and responses to periodontal treatment. This study explored periodontists' confidence in detecting patient anxiety, stress, or depression, as well as their knowledge concerning the relationships between these factors and patients' pain, use of pain medication, and wound healing after periodontal treatment. In addition, this research surveyed if (and which) special accommodations were offered when treating patients with high levels of anxiety, stress, or depression.

Methods: Data were collected from 171 members of the American Academy of Periodontology (response rate = 34.41%). Most respondents were male (82.2%), white (88.2%), and practiced in solo practices (60.9%).

Results: The respondents were more knowledgeable about the effects of anxiety and stress on pain, the use of pain medication, and wound healing than about the impact of depression on these outcomes. They agreed more strongly with statements that they were more confident in their ability to perceive when patients were anxious and stressed than when they were depressed. They also offered more special accommodations for patients with anxiety and stress than for patients with depression.

Conclusions: The respondents were significantly less knowledgeable about the impact of depression on patients' responses to periodontal treatment than about the effect of anxiety and stress. Given the evidence concerning the relationships among depression, pain, pain medication use, and wound healing, it is important to educate periodontists about the role of anxiety and stress and the significance of depression on their patients' responses to periodontal therapy. *J Periodontol* 2007;78:64-71.

KEY WORDS

Anxiety; depression; pain; stress; treatment; wound healing.

In 1995, the Institute of Medicine¹ published a report about the future of dental education. One of the strongest themes developed in this report was the call to educate more patient-centered providers. One question is whether this recommendation is as applicable to the field of periodontology as it is to general dentistry. Most periodontists might agree that patient-provider communication is a key factor for a successful practice. However, it also is important to explore whether surgically oriented practitioners understand the significance that psychosocial factors have on their patients' responses to periodontal treatment. Therefore, the objectives of this research were to explore whether periodontists 1) are knowledgeable about how three psychosocial factors (i.e., anxiety, depression, and stress) affect their patients' responses to periodontal treatment, 2) are confident in their ability to recognize these psychological states in their patients, and 3) are willing to consider the significance of these factors in their professional practice by offering special accommodations for patients who are anxious, depressed, or stressed.

Anxiety and affective disorders, especially depression, are among the most prevalent mental disorders in adults in the United States. In addition, ~35% of the United States population >18 years of age experiences adverse health effects

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that are due to stress.² Depression ranks in the top 10 causes of disability worldwide.³ In a study covering a 40-year span, Murphy et al.⁴ showed that chronic depression has maintained a consistent prevalence of ~5% since 1970. Depression has been associated with anxiety.⁵ According to the Surgeon General's Report on Mental Health,² depression and anxiety disorders affect twice as many women as men.

The Role of Anxiety in Dentistry

The role of anxiety in dentistry is complex and powerful, as described convincingly in the monograph by Milgrom et al.⁶ Dental anxiety/fear is quite prevalent among children and adults; it prevents patients from seeking dental care and affects their treatment decision making.⁷ Research showed that dental anxiety causes patients to cancel, miss, or arrive late for dental appointments.⁶ Research investigating patient responses to surgery showed that patients with increased preoperative anxiety and greater expectations of pain experienced greater postoperative pain.⁸ Patients who were given psychological interventions aimed at reducing anxiety/stress reported significantly less postoperative pain when undergoing periodontal surgery compared to patients who did not receive these interventions.⁹ Research also showed that patients who learned about non-pharmacological strategies to manage pain used less pain medication.¹⁰ In general, there is a close relationship between anxiety and pain; anxiety even may be considered a predictor of pain.^{11,12}

Research also showed that there is empirical support for the hypothesis that anxiety affects wound healing. For example, patients using relaxation-guided imagery exhibited less anxiety and less wound inflammation following surgical procedures than patients not using these techniques.¹³ George et al.¹⁴ and George and Scott¹⁵ demonstrated that giving surgery a more positive meaning improved patients' acceptance of their condition, made their expectations more positive, and reduced their anxiety about recovery; these resulted in improved wound healing. Recent research by Johannsen et al.¹⁶ showed that higher levels of anxiety impaired wound healing and were associated with an increase in the severity of periodontal disease.

The Role of Stress in Dentistry

Recent research also demonstrated that stress plays an important role in predicting the severity of pain, periodontal disease,^{17,18} and wound healing.¹⁹⁻²¹ For example, Montgomery and Bovbjerg¹⁹ showed that presurgical distress contributed to patients' post-surgical outcomes, including pain intensity. Periodontal disease was affected by stress and patients' ability to use effective coping methods.^{20,21} In addition, there is growing evidence that stress affects wound healing. According to a study by Rozlog et al.,²² patients

experiencing stress were slower in their recovery from periodontal surgery compared to patients not experiencing stress. In addition, healing following periodontal surgery was impacted negatively by patients' inability to use effective coping mechanisms.²³ In 2004, Takada et al.²⁴ showed that increased stress modulated the progression of periodontal inflammation. This probably resulted from an increase in interleukin-1, -4, and -8, which, in turn, resulted in greater periodontal destruction.²⁵ The research on the relationship between stress and wound healing covers a wide spectrum of studies, from research conducted by Kiecolt-Glaser et al.²⁶ in 1995 on the effect of stress on reduced cellular immune responses and, as a consequence, delayed healing of punch biopsies to extensive research findings on the relationship between chronic stressors (e.g., caring for a debilitated relative) and delayed wound healing.²⁷

The Role of Depression in Dentistry

In addition to the research on the relationship between anxiety and stress with pain and wound healing, research documented that there is a relationship between depression and oral health²⁸⁻³⁰ and between depression and pain and wound healing. Studies by Eremenko et al.³¹ and by Arpino et al.³² showed that depression was correlated directly with postoperative pain and the amount of analgesics needed to alleviate pain. Patients whose depression was treated with antidepressants reported a decreased severity of postoperative pain compared to depressed patients without medication.³² Field et al.³³ found that patients receiving therapeutic massages prior to burn debridement reported less pain, decreased depression, and better long-term outcomes. Eggen³⁴ showed that depressed patients were likely to report more pain and to use more pain medication than non-depressed patients.

Research showed that depression is related to the amount of pain patients reported^{31,32} and the amount of medication used,³² and it also affected patients' wound healing. Cole-King and Harding³⁵ established that depressed patients displayed delayed wound healing compared to non-depressed patients. In addition, Elter et al.³⁶ found that clinical depression had a negative effect on periodontal treatment outcome 1 year after treatment. In a study exploring factors affecting patients with different types of periodontitis (rapidly progressive periodontitis, chronic periodontitis, and no significant periodontal destruction), depression was a significant factor in distinguishing among patients in these three groups.³⁷

In summary, given the fact that anxiety, stress, and depression are quite prevalent among adults in the United States and that these psychosocial conditions clearly affect patients' pain perception, their use of pain medication, and wound healing, it seems important

to explore whether periodontists 1) are knowledgeable about the relationships between these psychosocial factors and patients' responses to treatment, 2) are confident in their ability to identify anxious, stressed, or depressed patients, and 3) modify their interactions and treatment for these patients by offering special accommodations.

MATERIALS AND METHODS

This research was approved by the Institutional Review Board for the Health Sciences at the University of Michigan.

Respondents

During the summer of 2005, a survey was mailed to a random sample of 500 members of the American Academy of Periodontology (AAP). Three surveys could not be delivered, and 171 members responded (141 males, 28 females, and two missing data for gender); the response rate was 34.41%. The respondents ranged in age from 31 to 66 years (average age, 50.36 years; SD: 8.630). They were predominantly white (88.2%) and practiced in solo practices (60.9%). An analysis of the institutions where the respondents received their graduate training in periodontics showed that 11.7% were located in AAP district 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont; the province of Quebec and maritime provinces of Canada); 4.1% were located in district 2 (Delaware, District of Columbia, Maryland, Pennsylvania, and West Virginia and the following cities and counties of Virginia: Alexandria, Falls Church, Fairfax City, Vienna, Arlington County, and Loudon County); 16.4% were located in district 3 (Alabama, Florida, Georgia, Kentucky, Missouri, North Carolina, South Carolina, Tennessee, Guam, Virgin Islands, and Virginia [excluding those included in district 2]); 17% were located in district 4 (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, North Dakota, Ohio, South Dakota, and Wisconsin; provinces of Ontario and Manitoba, Canada); 12.3% were located in district 5 (Arizona, Colorado, Louisiana, Nebraska, Oklahoma, Puerto Rico, and Texas); 11.1% were located in district 6 (Alaska, Arizona, California, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming; provinces of British Columbia, Alberta, and Saskatchewan, Canada); 6.4% were located in district 7 (New Jersey and New York); and 11.7% were located in district 8 (Federal Dental Services and employees of the Federal Government, including all branches of federal services, both civilian and military). Approximately 10% of respondents did not report the institution where they received their graduate training.

Procedure

The survey was mailed with a cover letter by the dean of the School of Dentistry, University of Michigan, that

explained the purpose of the study and requested return of the survey anonymously in a self-addressed, stamped return envelope.

Materials

The survey was three pages long. The first page contained questions concerning the respondents' socio-demographic and educational background as well as their practice characteristics. The second page consisted of 24 statements with a five-point answering scale ranging from 1 = "disagree strongly" to 5 = "agree strongly." These statements were used to assess the respondents' knowledge concerning the impact of anxiety, stress, and depression on patients' responses to periodontal treatment; their confidence in detecting anxiety, stress, and depression in their patients; and how well their education prepared them to consider these issues. More specifically, three statements each were concerned with the relationship between these psychological states and perceived pain ("There is a relationship between anxiety [depression/stress] and perceived pain."), the use of pain medication ("Patients that have lower anxiety [depression/stress] levels will use less pain medication."), wound integrity ("Patients will present with better wound integrity if they experience less anxiety [depression/stress]."), the provider's confidence in detecting these states ("I am confident in my ability to perceive when my patients feel anxious [depressed/stressed]."), and the degree to which dental education had prepared the provider to treat patients with these states ("Dental school prepared me well for treating patients with high levels of anxiety [depression/stress].") (Fig. 1).

The last page inquired about the respondents' professional behavior when treating patients with anxiety, stress, and depression. The respondents were asked whether they used special techniques ("Are there any special techniques you use with patients that may be experiencing high levels of anxiety [depression/stress]?"), offered special scheduling arrangements, gave special instructions before the treatment, or had specific pharmacological considerations when treating these patients. Besides asking, in a yes/no format, whether the respondents engaged in these activities, open-ended follow-up questions asked for a description of the special techniques, scheduling arrangements, instructions, and pharmacological considerations that they used.

Statistical Analyses

Analyses of variance were used to compare average responses on the five-point answer scales for the questions concerned with anxiety versus depression versus stress. It was assumed that these variables were measured on an interval measurement scale.

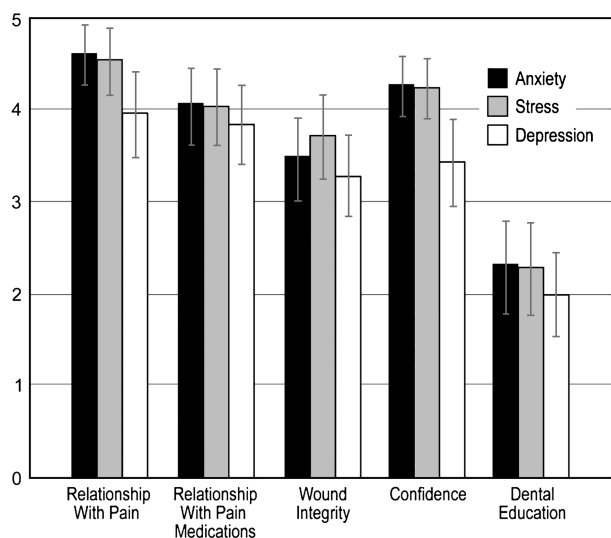


Figure 1.

Periodontists' average responses concerning the role of anxiety, stress, and depression when treating periodontal patients and their educational experiences concerning the importance of psychosocial factors. The answers were given on a scale from 1 = "disagree strongly" to 5 = "agree strongly."

Chi-square tests were used to analyze the frequencies of responses to the questions answered with "yes" versus "no." Correlational analyses were used to assess whether there were significant relationships between periodontists' background characteristics and their responses concerning the role of psychosocial factors.

RESULTS

The first objective was to assess whether periodontists were knowledgeable concerning the degree to which anxiety, stress, and depression affect their patients' responses to periodontal treatment. As can be seen in Figure 1, the respondents agreed strongly with the statements that there is a relationship between anxiety and pain (five-point answer scale; mean = 4.64) and between stress and pain (mean = 4.57). However, although they agreed that there is a relationship between depression and pain (mean = 3.94), this average score was significantly lower than the other two means ($P < 0.001$). The same pattern of responses was found for the responses to the statements concerning the relationships between anxiety, stress, and depression and the use of pain medication (4.19 versus 4.07 versus 3.80, respectively; $P < 0.001$) and wound integrity (3.50 versus 3.71 versus 3.32, respectively; $P < 0.001$). For all three patient outcome variables (pain, use of pain medication, and wound integrity), respondents agreed more strongly with the statements that anxiety and stress affected these out-

comes than with the statements that there was a relationship between depression and these outcomes.

The second objective was to determine whether the periodontists were confident in their abilities to recognize anxiety, stress, and depression in their patients. Their confidence level was rather high when they responded to the statements concerning detecting anxiety (mean = 4.31) and stress (mean = 4.29) (Fig. 1). However, confidence in their ability to identify depressed patients was significantly lower (mean = 3.45; $P < 0.001$).

One potential reason for the differential responses might be a lack of education concerning the effects of depression on patients' responses to treatment in a dental office. The periodontists' responses to the statement, "Dental school prepared me well to treat patients with high levels of depression" was rather low (mean = 2.01), which indicated that they disagreed with this statement on average. The responses concerning depression were significantly lower than the responses to the statements concerning anxiety (mean = 2.38) and stress (mean = 2.34; $P < 0.001$) (Fig. 1). Overall, the periodontists did not believe that their dental education had prepared them well for treating patients with high levels of anxiety, stress, and depression.

The third objective was to determine how many periodontists were willing to consider the significance of these factors in their professional practice by using special techniques when treating patients who are anxious, stressed, or depressed. Four questions assessed the respondents' professional behavior. The first question asked whether the periodontists used special techniques when treating patients with anxiety, stress, and depression. As can be seen in Table 1, 87.7% of the respondents used special techniques when treating patients with high levels of anxiety, 78.9% used special techniques when treating patients with high levels of stress, but only 46.2% used special techniques when treating patients with high levels of depression.

Three more specific questions asked whether the providers used special scheduling arrangements, special instructions, or special pharmacological techniques when treating these three groups of patients. Significantly more providers used these techniques with anxious and stressed patients than with depressed patients. Special scheduling arrangements were made by 50.9% of providers for anxious patients, by 40.9% for patients with high stress levels, and by only 26.3% for patients with depression. More providers indicated that they gave special instructions to anxious patients (55.6%) than to stressed patients (41.5%) or depressed patients (26.3%). This pattern also was found concerning pharmacological techniques used (anxious patients, 80.1%; stressed patients, 60.8%; depressed patients, 26.3%).

In addition to analyzing the frequencies of answers to these four questions, a sum score was computed by adding up the “yes” responses to the four questions. Table 2 shows that the providers offered, on average, 2.84 special accommodations for patients with anxiety, 2.32 special accommodations for patients with stress, but only 1.32 accommodations for patients with depression ($P < 0.001$).

A separate, open-ended follow-up question was asked for each of the three patient groups if the respondent used special techniques when treating these patients. Table 2 provides an overview of the specific techniques the providers named. The open-

ended responses were organized into three categories: pharmacological behavior management, non-pharmacological management considerations, and other considerations (e.g., scheduling or referrals). When treating patients with anxiety and stress, pharmacological considerations were named most frequently, followed by non-pharmacological considerations. One hundred forty-six (85.4%) periodontists used pharmacological management techniques when treating anxious patients, and 97 (56.7%) used these considerations for stressed patients. However, only 29 (17.0%) providers reported using special pharmacological techniques for patients with

Table 1.

Periodontists' Use of Special Techniques and/or Other Special Considerations When Treating Patients With Anxiety, Stress, and Depression

N (%) Periodontists Who...	Anxiety	Stress	Depression	P
Use special techniques	150 (87.7%)	135 (78.9%)	79 (46.2%)	<0.001
Offer special scheduling arrangements	87 (50.9%)	70 (40.9%)	45 (26.3%)	<0.001
Give special instructions	95 (55.6%)	71 (41.5%)	43 (25.1%)	<0.001
Use pharmacological techniques	137 (80.1%)	104 (60.8%)	45 (26.3%)	<0.001
Sum of special arrangements*	2.842	2.316	1.323	<0.001

* A sum score was computed by adding up the items to which the providers had responded in a positive manner. This sum score could range from 0 to 4. A univariate analysis of variance was used to compare the three average sum scores.

Table 2.

Responses Concerning Special Techniques Used When Treating Anxious, Stressed, or Depressed Patients

Techniques Mentioned When Treating Patients With:	Anxiety	Stress	Depression
Pharmacological management considerations – total	146 (85.4%)	97 (56.7%)	29 (17.0%)
General medication	20 (11.7%)	11 (6.4%)	3 (1.8%)
Oral premedication	9 (5.3%)	9 (5.3%)	4 (2.3%)
Sedation	68 (39.8%)	48 (28.1%)	15 (8.8%)
Nitrous oxide	20 (11.7%)	16 (9.4%)	2 (1.1%)
Postoperative medication	1 (0.6%)	1 (0.6%)	1 (0.6%)
Specific medication named	28 (16.4%)	12 (7.0%)	4 (2.3%)
Non-pharmacological behavioral management considerations – total	107 (62.6%)	87 (50.9%)	59 (34.5%)
General communication	25 (14.6%)	19 (11.1%)	9 (5.3%)
Emotion-focused communication	63 (36.8%)	53 (31.0%)	39 (22.8%)
Information-focused communication	19 (11.1%)	15 (8.8%)	11 (6.4%)
Other management considerations – total	48 (28.1%)	55 (32.2%)	51 (29.8%)
Scheduling	19 (11.1%)	17 (9.9%)	12 (7.0%)
Referral	4 (2.3%)	12 (7.0%)	23 (13.5%)
Other techniques	25 (14.6%)	26 (15.2%)	16 (9.4%)

depression. The response category with the highest frequency for patients with depression was the non-pharmacological category (N = 59; 34.5%). "Sedation" was the most frequently mentioned pharmacological consideration when treating patients with anxiety (N = 68), stress (N = 48), and depression (N = 15).

Concerning the category of non-pharmacological considerations, more periodontists used these techniques when treating patients with anxiety (62.6%) and stress (50.9%) than when treating patients with depression (34.5%). Of the 107 periodontists (62.6%) who used special non-pharmacological behavior management techniques when treating anxious patients, the majority (N = 63; 39.8%) used emotion-focused techniques (e.g., "use calm voice," "reassure patient," and "use positive feedback"); fewer respondents (N = 25; 14.6%) mentioned general communication considerations (e.g., "listening" and "talking") or information-focused communication (e.g., "explanation of procedures" and "answer questions") (N = 19; 11.1%). The same pattern of responses was found concerning the special considerations used when treating patients with high levels of stress (emotion-focused: 31%; general considerations: 11.1%; information-focused: 8.8%).

Concerning "other management considerations," one interesting finding was that more providers responded that they would refer patients with depression (N = 23; 13.5%) than patients with anxiety (2.3%) or stress (7.0%). Other techniques mentioned included offering head phones to listen to music or showing movies.

DISCUSSION

High levels of anxiety, stress, and depression affect patients' pain perception, their use of pain medication, and wound healing.⁸⁻³⁷ The connection between the body and mind is a topic of much controversy. However, it seems justified to suggest that psychosocial factors induce the activation of the peripheral sympathetic system and the adrenal medulla. When these stimulations are sustained, they can result in the release of glucocorticoids and mineralocorticoids, which have direct effects on cellular physiology, and lead to reduced wound healing and immune response.³⁸ Therefore, considering ways to reduce anxiety, stress, and depression in patients should be part of the treatment considerations. Although this research did not analyze which specific techniques would be the most successful in bringing about a positive change in the patients' psychosocial status, it seems obvious that various pharmacological and non-pharmacological techniques could be used to reach this objective.

This study suggests that providers have a better understanding of the relationships between anxiety and

stress and treatment outcomes than the role of depression on their patients' responses to treatment. Providers were less confident in their abilities to detect depression in their patients than in their abilities to detect anxiety and stress. In addition, their repertoire of professional responses when treating patients with high levels of anxiety and stress seems to be richer than when they approach the treatment of patients with depression. Given the ample evidence of the significance of these psychosocial factors on patient response to treatment, it seems important to educate providers about these relationships. Providers should be aware that they can detect depression from non-verbal cues (e.g., body posture and facial expression) and verbal statements (e.g., patients make pessimistic statements that reflect a sense of hopelessness or exhibit a general negativity). In addition, they should be aware that depression has oral implications, such as xerostomia, and it can have an impact on the patient's motivation to engage in good oral hygiene practices and use oral health care services.²⁸⁻³⁰

Based on the responses to the question about whether dental schools had prepared the respondents to consider these matters, dental school curricula should increase coverage of these topics in their education of future health care providers. However, practitioners need to receive more information about these topics as well. Therefore, it seems important to develop continuing education programs and educational materials about these matters that can be accessed easily by busy providers. Kloostra et al.³⁹ investigated the relationships among anxiety, stress, and depression and pain perceptions; the use of pain medication; and wound healing following periodontal surgery. Of the three psychosocial factors, depression had the most significant impact on pain perceptions, the use of pain medication, and wound healing. Despite the findings that depression has the greatest impact, the present study showed that depression was the least appreciated psychosocial factor by practicing periodontists. Periodontists reported that they believed that depression had a significantly lower degree of impact on their patients' responses to treatment compared to the roles of anxiety and stress. They believed that depression had the lowest correlation with pain, pain medication use, and wound healing. They were least confident in their abilities to detect it and reported the fewest special techniques used when treating patients with depression. Given the prevalence of depression and the evidence concerning the relationship between depression and treatment outcomes, it seems important to increase efforts to educate periodontists about depression. Therefore, undergraduate and graduate dental school curricula should cover these issues, raise providers' awareness about these matters, and provide them with the knowledge and

skills needed to respond in the best professional way when treating patients with high levels of anxiety, stress, and depression.

One limitation of this study is the relatively low response rate (34.41%), which clearly is at the low end of the acceptability range.⁴⁰ However, one might argue that the periodontists who responded to this self-administered survey were more interested in this topic than the periodontists who did not return the survey. If this assumption is correct, the findings might overestimate the degree to which periodontists are aware of the significance of psychosocial factors when treating their patients.

CONCLUSIONS

Research showed that anxiety, stress, and depression have a clear relationship with patients' responses to surgical and non-surgical treatment. Although periodontists seem to have a basic understanding of the role of anxiety and stress in their patients' responses to treatment, the ways to detect it in their patients, and how to respond to it, it seems justified to argue that their awareness, knowledge, and skills concerning depression are significantly lower. Therefore, it seems crucial to educate periodontists about the role that psychosocial factors can play in the treatment process, especially the impact of depression on patient response to treatment. Periodontists reported that their dental education had not prepared them well to consider the role of psychosocial factors, such as depression, when treating patients. Educational changes seem necessary.

In addition, given the evidence about how positive coping mechanisms and enhanced perceptions of positive outcomes increase a patient's level of wound healing,¹¹ future research should focus on developing targeted interventions that periodontists could use to improve their patients' treatment outcomes, and, thus, their quality of life during treatment.

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