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California Denti-Cal Coverage and Periodontal Maintenance Compliance in a Dental School Patient Population: A Retrospective Study

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ABSTRACT

Background: Financial burden associated with supportive periodontal therapy (SPT) is a significant hindrance toward compliance. In 2018, the California Department of Health Care Services included SPT as a new fully covered benefit in their dental program (Denti-Cal). The objectives of this retrospective study were to elucidate the impact of DentiCal advantage on periodontal health and compliance with SPT.

Methods: Records of patients (2018–2019) receiving care at Loma Linda University School of Dentistry were surveyed. Dentate individuals with a diagnosis of periodontitis were identified. Data gathered on patient demographics, payment type/insurance coverage, periodontal treatment procedures, and periodontal health measures. Patients were grouped based on payment modality. Descriptive and comparative statistics were used for data analysis.

Results: A total of 2864 patient records diagnosed with periodontitis were identified. Approximately 47.42% completed initial periodontal therapy: Denti-Cal (n = 279), conventional insurance (n = 223), and uninsured (n = 770). In all groups combined, 58.41% of patients did not receive any SPT visits, 32.7% of patients were erratic compliers (1–2 visits during the study period) and only 8.89% of patients showed reliable compliance (3 or more visits during the study period). Percentage of individuals successfully placed on SPT, frequency of visits during the study period and periodontal health measures were statistically comparable among the 3 payment groups.

Conclusions: Eliminating financial barriers alone is not sufficient to improve either compliance with periodontal maintenance or measures of periodontal health.

Practical Implications: Effective utilization of Denti-Cal benefits can be a great asset in developing a successful periodontal maintenance program serving low-income individuals.

Introduction

Periodontitis, a destructive disease affecting the tooth supporting structures, is an important cause of tooth loss.¹ Periodontitis is an inflammatory disease initiated by accumulations of periodontopathic bacteria in the dentogingival region.² Management of periodontitis involves improving oral hygiene, controlling gingival inflammation and if feasible surgically correcting the damage caused by the disease process.³ The long-term success of periodontal therapy hinges on follow-up periodontal care.^{3–5} Supportive periodontal therapy (SPT, formerly referred to as periodontal maintenance, dental insurance code D4910) is a therapeutic procedure that follows initial periodontal therapy and continues at varying intervals for the life of the dentition.⁶

Periodontal maintenance involves periodic assessment of periodontal status, oral hygiene motivation, and subgingival debridement to disrupt microbial buildup and removal of new calculus formation.⁶ A plethora of studies (academic and private practice) demonstrated that periodontitis patients who

undergo initial periodontal therapy without follow-up supportive care continue to show signs of recurrent periodontitis and some tooth loss.⁷⁻¹¹ Patients who undergo periodontal treatment without SPT show a mean annual adjusted tooth loss rate of 4.7%.⁸ By contrast, tooth loss in patients undergoing longterm SPT is on average one tooth per patient every 10 years.¹² The initiation and continuation of SPT relies heavily on patient compliance. Unfortunately, previous studies showed that most periodontitis patients do not fully comply with recommended periodontal follow-up care.¹³⁻¹⁶ Most patients seen in private periodontal practices do not follow regular maintenance schedules.¹⁷ Unmaintained patients had higher negative aggression scores, a higher incidence of stressful life events, and less stable personal relationships in their lives.⁷ Surgical patients complied with maintenance therapy nearly twice as frequently as those who did not have surgery.¹⁵ Surprisingly patients with a poor periodontal prognosis tended to comply less often than those with more favorable prognosis.¹⁶

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While factors influencing patient compliance with SPT are not yet fully understood, the financial burden associated with follow-up long-term periodontal care is a significant hindrance toward compliance.¹⁴ Approximately 25% of adult Americans lack dental insurance coverage.¹⁸ For patients with insurance coverage, most traditional plans partially cover (with patient copayment) only two SPT visits per year. The California Medical Assistance Program (Medi-Cal) is the California implementation of the federal Medicaid program serving lowincome individuals. Medi-Cal provides dental coverage for qualified patients and families within California. The Medi-Cal dental benefits program is commonly referred to as Denti-Cal. As of January 1, 2018, the California Department of Health Care Services included SPT (periodontal maintenance, D4910) as a new fully covered dental benefit for eligible adult members 21 years and older. The California health care program provides four full coverage SPT visits per year for two years following initial periodontal therapy.

We hypothesized that resolving financial hardship through the California health care program (Denti-Cal) would promote compliance with SPT and improve periodontal health. The objectives of this retrospective study were to identify the impact of Denti-Cal coverage on compliance with SPT, and to identify the effect of Denti-Cal extended coverage on periodontal health.

Materials & Methods

The study protocol was reviewed and approved by the Institutional Review Board. The records of all dental patients receiving care at Loma Linda University School of Dentistry, Loma Linda, CA (period: January 1, 2018 (initiation of Denti-Cal coverage) – December 31, 2019 (prior to COVID-19 lock-downs)) were surveyed. Each patient had to meet the following inclusion criteria to be included in the study sample: 18 years or older, a diagnosis of periodontitis, accessible medical and dental records, and a recent periodontal charting. The sampling process involved acquiring data from all available dental records of patients who satisfied study requirements. Patients without a diagnosis of periodontitis were excluded.

Records of dentate individuals with a diagnosis of periodontitis (American Academy of Periodontology 2017 classification)¹⁹ who satisfied study inclusion criteria were identified. The following data was collected: payment type/insurance coverage, scaling and root planing (D4341 or D4342) treatment dates, periodontal reevaluation date, periodontal maintenance (D4910) dates, surgical pocket reduction (D4240/D4241 or D4260/D4261) dates, demographics (age, gender, and race), covariates (American Society of Anesthesiologists (ASA) physical status classification system, cigarette smoking, employment status, zip code), and periodontal disease diagnosis. To assess most current outcome of periodontal therapy, latest SPT point plaque score (PI), bleeding on probing (BOP), and probing depth (PD) were retrieved.

Statistical Analysis

The study utilized a convenience sampling method to include all possible available records. The post hoc power was ~ 90%

and the probability of type II error was 10%. Patients were grouped based on payment modality into three groups: Denti-Cal, conventional insurance, and uninsured. Patient compliance with periodontal maintenance was defined based on number of SPT visits during the study period (0 (none), 1 visit, 2 visits, 3 visits and ≥ 4 visits). PI%, BOP% and PD ≤ 4 mm counts were calculated for each patient. Zip code data was converted to geographic coordinates to estimate driving distance to school. The distributions of all continuous measures were positively skewed. We used non-parametric tests for data analyses. Significant differences among the groups for continuous measures were determined using the Kruskal-Wallis test using ranks and for categorical variables using the likelihood-ratio chi-squared test. Ordinal regression analysis was used to assess the association between frequency of maintenance visits with type of payment while adjusting for covariates (e.g., demographics, cigarette smoking, ASA, surgical therapy and distance to school).

Results

In the period between 2018–2019 a total of 2864 patients at LLUSD were diagnosed with periodontitis and were treatment planned for initial periodontal therapy including scaling/rootplaning. Approximately 47.42% fully completed initial periodontal therapy and underwent a reevaluation visit. Most patients who completed a reevaluation visit were self-pay uninsured patients (n = 770, 60.53%). Denti-Cal patients came distant second (n = 279, 21.93%) and other insurance patients who completed reevaluation, only 550 (40.50%) continued therapy in a periodontal maintenance program.

Table 1 summarizes characteristics of patients who completed reevaluation. Patients significantly differed on age, gender, ethnicity, employment and distance to school between the three payment groups. Cigarette smoking, ASA status, periodontal disease diagnosis and surgical therapy were comparable between the three payment groups. On average, only 3% of all patients who completed the reevaluation visit underwent surgical pocket management; percentage of insured patients was slightly higher than uninsured patients. Uninsured patients were older than Denti-Cal and other insurance patients. Denti-Cal patients had more females than both uninsured and other insurance patients. Caucasians were the most numerous uninsured patients. Employment was highest among other insurance patients. Uninsured patients tended to live farther from school than insured patients.

In all three groups combined, a substantial number of patients (58.41%) did not receive any SPT visits, 32.7% of patients were erratic compliers (1–2 visits during the study period) and only 8.89% of patients showed reliable compliance (3 or more visits during the study period). Figure 1 presents frequency of maintenance visits by payment type during the study period. Percentage of individuals placed on SPT, and frequency of visits during the study period were statistically comparable between the three payment groups.

Next, in a series of regression models we investigated the association of payment type with frequency of SPT visits while adjusting for other factors that may influence

	Uninsured (Self-pay)	Denti-Cal Coverage	Other Insurance	
	n = 770	n = 279	n = 223	p-value
Age	71 (61–79)	60 (50–67)	67 (53–74)	0.0001
Range	27–99	20–94	26–95	
Gender (male %)	52.08	39.43	48.88	0.001
Ethnicity %				0.0001
White	40.78	24.73	33.18	
Latino	18.70	26.16	19.28	
Black	7.01	7.17	14.80	
Asian	2.86	4.30	5.83	
Other	2.86	3.94	4.04	
Undisclosed %	27.79	33.69	22.87	
Cigarette Smoking %	8.18	8.24	8.97	0.93
ASA %				0.06
1	28.27	37	28.77	
11	71.60	63	70.78	
111	0	0	0	
IV	0.13	0	0.46	
Periodontal diagnosis %				0.32
Healthy Reduced	6.76	3.36	4.07	
Reduced with Gin. Inflammation	9.75	5.46	8.72	
Periodontitis Local stage I	1.73	2.94	1.74	
Periodontitis Local stage II	3.77	4.20	4.65	
Periodontitis Local stage III	5.35	6.30	7.56	
Periodontitis General stage I	13.21	17.65	18.60	
Periodontitis General stage II	30.03	31.93	30.23	
Periodontitis General stage III	22.96	21.43	16.28	
Periodontitis stage IV	6.29	6.72	8.14	
Periodontitis Molar/Incisor	0.16	0.00	0.00	
Surgical therapy %	2.47	3.94	4.04	0.31
Employment %	4.29	4.30	48.88	0.0001
Distance to school %				0.02
<25 miles	64.16	72.76	70.85	
25–49 miles	27.27	21.51	20.18	
50–74 miles	5.58	5.02	7.17	
≥75 miles	2.99	0.72	1.79	

Data are presented as median (interquartile range) or percentage. p value gives the probability that the groups differ in either Kruskal-Wallis test using ranks or chi-square test for proportions.



Table 1. Patient characteristics.

Figure 1. Frequency of periodontal maintenance by type of payment. Data are presented as percentage. Chi-square test for proportions showed comparable distribution of maintenance visits among the three groups (likelihood ratio 5.29, p = 0.72).

compliance with recommended periodontal follow-up care. Multivariate analyses confirmed the lack of association between type of payment with frequency of maintenance visits (Table 2). Age, ethnicity and surgical therapy independently associated with SPT compliance. Older patients showed greater compliance than younger patients (Figure 2a). Caucasians and Blacks showed greater compliance than other ethnicities (Figure 2b). Patients who underwent periodontal surgical therapy showed greater compliance than those who didn't (Figure 2c).

Finally, we assessed the impact of payment type on measures of periodontal health. Oral hygiene (PI%), gingival bleeding (BOP%) and number of periodontal deep pockets(\geq 4 mm) were comparable among the three payment groups (Table 3).

Discussion

This study showed for the first time that eliminating financial barriers alone through a state healthcare benefits program had no impact on patient compliance with periodontal maintenance and frequency of maintenance visits. Furthermore, eliminating financial burden did not improve periodontal health. Age, ethnicity and surgical therapy influenced compliance with periodontal maintenance. Older patients showed greater compliance than younger patients. Caucasians and Blacks showed greater compliance than other ethnicities. Surgical patients showed greater compliance than nonsurgical patients. Our findings increase awareness of the challenges involved with developing a successful SPT program and utilization of available California state healthcare benefits.

Periodontitis is an inflammatory disease initiated by a dysbiotic microflora.² Periodontopathic subgingival bacteria trigger host inflammatory responses resulting in the destruction of the tooth supporting structures.²⁰ Over 47% of adult Americans have periodontitis.²¹ Major signs of periodontitis

 Table 2. Ordinal regression analysis assessing the association between frequency of maintenance visits with type of payment while adjusting for covariates.

Factors	Model 1	Model 2	Model 3	Model 4
Payment modality	3.17	0.02	2.93	0.13
Age		16.77*		12.11*
Gender		0.18		0
Ethnicity		29.24*		27.06*
Employment			0.34	0.44
Smoking			0.06	0.29
ASA			10.29*	1.98
Surgical therapy			35.43*	33.81*
Driving distance			2.16	2.57

Data presented as chi-square. *p < 0.01.



Figure 2. Impact of age, ethnicity and surgical therapy on frequency of periodontal maintenance. Data are presented as percentage. (a) Chi-square test for proportions showed that frequency of maintenance visits significantly differed among age groups (likelihood ratio 53.24, p = 0.002). (b) Chi-square test for proportions showed that frequency of maintenance visits significantly differed among ethnicity groups (likelihood ratio 49.20, p = 0.003). (c) Chi-square test for proportions showed that frequency of maintenance visits significantly differed by surgical therapy (likelihood ratio 42.44, p < 0.0001).

Table 3. Periodontal health measures in relation to payment type.

	Uninsured (Self-pay) n = 770	Denti-Cal Coverage n = 279	Other Insurance n = 223	p-value
Plaque score	10.5 (0-42.25)	16 (0-46.5)	15 (0–47.5)	0.28
BOP%	16 (8–30)	19 (8.5–38.5)	17 (8–31)	0.11
PD ≥4 mm	10 (4–21)	11 (4–25)	11 (4–27)	0.30

Plaque score (percent of surfaces), BOP (percent of sites), PD ≥ 4 mm (number of residual deep pockets). Data are presented as median (interquartile range). *p* value gives the probability that the groups differ in Kruskal-Wallis test using ranks.

are loss of clinical attachment, increased pocket depth and radiographic alveolar bone loss. Initial cause related periodontal therapy includes oral hygiene instructions, subgingival mechanical nonsurgical debridement, and on occasion supplemented with surgical procedures.³ Treatment objectives are to control gingival inflammation and reduce pocket depth.³ Presently there is no definitive therapy available that can cure periodontitis. The chronic nature of periodontitis and the lack of biomarkers to predict disease progression necessitates ongoing adjunct monitoring and therapies to decrease the risk of disease recurrence.²² Follow-up periodontal care (SPT) is considered the standard of care.⁶ It involves professionally administered and often repeated subgingival tooth cleaning at regular intervals.⁶ The number of residual diseased sites may help with determining recall frequency.⁵ On average, in stage II and above periodontitis patients, a three-month recall interval is supported by available evidence.⁵

Having periodontitis patients continue with recommended SPT following initial periodontal treatment could be challenging. Data from multiple periodontal specialty private practice studies showed that compliance with periodontal maintenance in general tends to be poor. Wilson et al¹⁶ reported that only

16% of patients complied with recommended maintenance schedules, 49% were erratic compliers and 34% never reported for any maintenance therapy.¹⁶ Mendoza et al¹⁴ reported that only 36% of the patient sample was found to be compliant, with the greatest patient loss in the first year of SPT.¹⁴ Galgut et al. (1991) reported that 42% of patients did not comply with the recommended periodontal maintenance treatment.²³ Demetriou et al. (1995) in a 14-year retrospective study reported that only 27.4% of the patients were in complete compliance at the end of the study period.²⁴ Checchi et al. (1994) reported that only 30% of the initial patient sample was compliant; compliance decreased as the number of years after active therapy increased.¹³ In comparison to previous reports, our patient population showed substantially lower compliance with SPT. Greater than 50% of all patients did not return for any SPT visits. Most patients (32.7%) who continued with SPT were erratic compliers and only a few patients (8.89%) showed reliable compliance.

Dental care in an educational institution is different from private practice. Appointments tend to be longer, and some patients may not be willing to spend several hours sitting in a dental chair for a periodontal tooth cleaning. In comparison

to other dental school more pressing graduation requirements, periodontal maintenance may not be on student's priority list and often provided as an afterthought when extra clinic time is available. Furthermore, the efficacy of dental students communicating the value of SPT to their patients may be ineffective. Shifts in dental student care providers with every graduating class each year likely disrupts smooth continuation of periodontal long-term follow-up care. Changes in assignments of faculty providing supervision of care to dental students further contributes to lack of an efficient periodontal maintenance program. Also, lack of coordination of periodontal care between periodontal, hygiene and general dentistry departments and confusion regarding whose responsibility is it to follow-up on patients' periodontal maintenance program adds to patient's poor compliance with periodontal maintenance in a large multidisciplined educational institution.

The three groups of patients reported in this study significantly differed on age, gender, ethnicity, employment status and distance to school. Our data showed that older patients, Caucasians and Blacks complied better with periodontal maintenance than other patients. Many of our older patients are retired, have flexible schedules and can afford the time to sit for long hours in a dental chair. Majority of our Black patients are females. Female patients are known to have better periodontal compliance than male patients.²³ Women in general tend to exhibit higher health consciousness compared to men and make greater use of health-care services.²⁵ Most of our Caucasian patients are employed and have dental insurance coverage provided through their employer which eases cost barriers to care and encourages compliance with periodontal maintenance. Despite significant differences in employment status and distance to school noted among the three patient groups, these factors had no impact on frequency of SPT visits. This suggests that patient commitment to care is more relevant than work schedule and distance to drive.

Our findings agree with previous studies reporting that patients who undergo periodontal surgery tend to comply better with SPT.^{16,26} Surgeries can be a stressful experience that psychologically may influence future decision-making when deciding whether to continue with follow-up care or not. In our clinic protocol, all patients who need periodontal surgical procedures after the periodontal reevaluation visit are referred to the graduate periodontal clinic for surgical management. However, very few patients in the predoctoral main clinic proceed with surgical periodontal therapy. Patients may choose not to proceed with surgical periodontal therapy due to a variety of reasons including fear of pain and discomfort, concerns about the procedure itself, financial constraints, lack of understanding about the treatment necessity, poor communication with their dental student, perceived inconvenience of multiple appointments, and anxieties about potential complications.²⁷

It was disappointing that eliminating cost barriers to care through the Denti-Cal program failed to enhance compliance with periodontal maintenance in our patient population. Likely lack of awareness of this important DentiCal benefit by providers of care (supervising faculty and students) as well as patients contributed to wasting this advantage. Beyond cost, other factors are involved in influencing patient's decision to comply with recommended health care. Examples include poor communication, lack of time, difficulty with scheduling appointments, fear of dentistry, forgetfulness, other health issues, dependence on others, and/or commute difficulties.

Our clinic management system utilizes a computerized workflow to schedule patients for SPT within 3 months from completion of initial non-surgical periodontal therapy and generates appointment reminder alerts. Still, many patients don't keep their appointments and return as scheduled. Most therapeutic failures in the management of periodontal diseases are related to behavioral problems, primarily inadequate persistence.⁴ Relevant elements that contribute to failures include a lack of drive, denial, or misinformation.²⁸ Simple facts alone cannot make up for inadequate knowledge. The dental team plays a vital part in helping patients understand the nature of periodontal disease and the value of maintaining the beneficial outcomes of initial therapy. Thus, the strategy should shift from being informative to being persuasive in a productive way. Motivation is a prerequisite for compliance.²⁸ Setting goals, giving feedback, and using psychological techniques to behavior control can all help increase adherence to prescribed periodontal care. The possibility that patients will heed advice is governed by how beneficial they believe the guidance is.²⁸ Better compliance with periodontal care is correlated with patients having well-defined goals, tracking their progress, and planning behavior modification.²⁸

The strengths of this study include a large diverse patient population ranging in age from young to old, both sexes represented, multiple ethnicities, comprehensive documentation of periodontal status and other health relevant issues. The main study limitations include a dental school patient population (which may not well represent the general public patient population), non-standardized data records, and a short follow-up period of only two years, 2018 (inception of DentiCal periodontal maintenance benefit) -2019 (before COVID pandemic disruptions). Pre-2018 data was not collected which may limit the interpretation of our findings. Despite the short study period, the relevance of eliminating cost barriers on compliance with periodontal maintenance was successfully assessed. The gained knowledge will further our understanding of the challenges involved with periodontal maintenance compliance. Future longitudinal studies to evaluate the impact of different behavior changing strategies over time on compliance with long-term periodontal care can inspire new strategies and help advance the field of periodontal health.

In conclusion, eliminating the financial barrier alone failed to improve compliance with periodontal maintenance. Factors involved with lack of compliance with periodontal maintenance go beyond financial limitations. Based on the study's findings, explanation of the relevance of periodontal maintenance should be presented and emphasized early. Effort should be made to understand patient's reluctance to recommended therapy and practical recommendations should be provided to improve compliance with recommended care. Greater patient education and awareness of available insurance coverage benefits would facilitate treatment presentation and help patients optimally utilize insurance coverage to attain better health outcomes.

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Data Sharing Statement

Data available on reasonable request due to privacy/ethical restrictions.

Ethics Statement

The study protocol was approved by Loma Linda University Institutional Review Board, approval # 5230473.

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