Implementation of the 2017 Classification of Periodontal and Peri-Implant Diseases by Clinical Dental Hygienists

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ABSTRACT

Purpose The World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions introduced a new framework for categorizing periodontal and peri-implant diseases and conditions in 2017. The purpose of this study was to investigate the current implementation practice and factors impacting implementation of the 2017 Classification of Periodontal and Peri-Implant Diseases by clinical dental hygienists.

Methods Survey research was conducted in an online format with a non-probability sample of clinical dental hygienists recruited via social media and snowball sampling (n = 255). Components of the survey included personal, environmental, and behavioral factors along with intention to implement the classification of periodontal staging and grading system into patient care. Data analysis included descriptive statistics, correlation, and regression.

Results The survey completion rate was 71% (n=181). Environmental factors (β=.352, $p < .001$) and personal factors (β = .469, $p < .001$) were positively associated with the intention to implement the 2017 periodontal disease classification system. In contrast, behavioral factors (β = .011, $p = .889$) and highest degree earned (β = .079, $p = .151$) were not significant predictors. For the intention to attend continuing education courses on the new classification system, both behavioral factors (β = .388, $p < .001$) and personal factors (β=.299, $p = .003$) were significant. However, environmental factors (β = –.048, $p = .535$), years in practice (β = –.041, $p = .506$), and familiarity (β = .066, $p = .402$) were not significant predictors.

Conclusion Results demonstrated that both environmental and personal factors significantly influenced the intention to implement the 2017 periodontal disease classification system among clinical dental hygienists. To enhance integration, efforts should be made to focus on improving personal motivation and addressing the environmental/workplace factors.

Keywords clinical dental hygienists, periodontal diseases, periodontal classification, periodontal staging and grading, guideline implementation

NDHRA priority area, **Client level: Basic science** (clinical decision support tools).

Submitted for publication: 10/26/2025; accepted after revision: 1/8/2025

INTRODUCTION

Periodontal diseases pose a significant global oral health burden, affecting a substantial portion of the population globally.[1] According to the World Health Organization, approximately 19% of adults are affected by severe periodontal diseases, with an estimated 3.5 billion individuals suffering from oral diseases.[1] In the United States (US), 42% of adults aged 30 years or older have periodontitis, and disease severity increases with age. The National Health and Nutrition Examination Survey found that 7.8% of these affected adults experience severe periodontitis.[2] The impact of periodontal disease extends beyond the oral cavity and has been linked to multiple systemic conditions including cardiovascular diseases, chronic obstructive pulmonary disease, diabetes, obstructive sleep apnea, COVID-19 complications, cognitive disorders, and pregnancy complications.[3–6]

To address periodontal diseases effectively, a framework for classification is needed. The first periodontal classification dates back to 1942 (Orban)[7] and was later adopted by the American Academy of Periodontology (AAP).[8] Over time, the system underwent numerous updates to incorporate emerging evidence and advancements in periodontology.[8] In 2017, a collaborative effort between the AAP and the European Federation of Periodontology (EFP) brought together experts from around the world to create a new classification system for periodontal and peri-implant diseases and conditions based on best scientific evidence.[9] This system integrated a multidimensional staging and grading approach, modeled on oncology frameworks, to comprehensively assess disease severity, complexity, and progression risk, enhancing clinical decision-making and patient care.[10–12]

Staging involves assessment of the severity, complexity, and extent of periodontitis. Severity of disease includes evaluation of interproximal clinical attachment loss, radiographic bone loss (RBL), and tooth loss due to periodontitis.[9,10] Determining the complexity of disease includes assessment of probing depths, type of bone loss (e.g., horizontal or vertical), furcation involvement, and occlusal trauma.[9,10] Assessment of the extent of disease includes localized, generalized, or molar/incisor patterns.[9,10] Once the stage is determined, the next step is the grading which includes evaluating the rate of disease progression and grade modifiers such as tobacco use or glycemic control.[9,10] Accurate staging and grading influence the approach to treatment, the potential outcome, and stability of the patient's periodontal condition.[10] This framework also facilitates personalized treatment planning, with the goal of improved patient outcomes.[9]

Although the 2017 periodontal classification system was intended to establish a global standard of care for the diagnosis and treatment of periodontal diseases, its implementation in clinical practice has been varied and inconsistencies in diagnosis have been identified in the literature.[13–17] These inconsistencies have been attributed to several factors, including differences in the clinical background, experience, and proficiency among dental professionals.[16,18,19] Additionally, regional practices and standards of care, cultural values, and socioeconomic status may play a significant role in influencing the implementation of periodontal treatments.[16,18,19] Educational training is another key factor, as variations in curriculum and access to continuing education (CE) courses can influence how well professionals are able to apply new guidelines.[20,21]

Challenges to implementing clinical guidelines in other health care professions suggests common barriers that may be encountered including a lack of understanding or knowledge about the guidelines, resistance to change, and insufficient training.[22,23] To address some of these challenges as they relate to the new classification system, the AAP made all the papers from the 2017 World Workshop open access.[9] The AAP has also created resources like downloadable materials for clinicians to use chairside to facilitate the classification process.[24] In addition, multiple publications have been disseminated to provide decision-making algorithms to help classify periodontal disease along with clinical practice guidelines for treatment of the different stages of periodontitis.[17,25,26] Furthermore, widespread CE

courses have been offered to equip clinicians with the knowledge and tools needed to effectively use the new classification system. It is worth noting that this classification system may be referred to by the year of the workshop (2017) or the year of the publication of the guidelines (2018).[24,27] For the purposes of this paper, the classification system is referred to as the 2017 periodontal classification system.

The purpose of this study was to examine the current practice and the factors impacting the implementation of the 2017 periodontal classification system by clinical dental hygienists. The study aims were: 1) Measure the utilization of the 2017 periodontal classification system by clinical dental hygienists; 2) Measure the behavioral, environmental, and personal factors influencing the implementation of the 2017 periodontal classification system; 3) Examine the relationships between factors impacting implementation and demographic/work characteristics; 4) Model the factors predicting the intention to use/implement the 2017 periodontal classification system.

METHODS

A cross-sectional survey research design was chosen for this study. The survey was hosted on an online platform (Qualtrics[xm]; Qualtrics International, Provo, UT, USA) utilizing a non-probability sample of dental hygienists employed in clinical practice. The MCPHS University Institutional Review Board (IRB) granted this study an exempt status and assigned protocol number IRB-2022-2023-129.

Sample Population

A non-probability sample of clinical dental hygienists were invited to participate in the survey through social media and snowball sampling. Inclusion criteria were being a dental hygienist with at least one year of experience providing patient care for at least one day per week, the ability to read English, and access to complete an online survey. Dental hygienists with less than one year of treating patients a minimum of one day a week, the inability to read English or the inability to access an online survey were excluded from participation.

A power analysis (G*Power) for the most conservative planned statistical tests (t-test, unequal groups, two-tailed) using a medium effect size (d = 0.50, α=.05) and 80% power, suggested a minimum sample size of n=172. Adjusting for an expected attrition of 30%, the recommended sample size was n=250.

Instrument

The final survey instrument consisted of 59 items categorized into five sections: demographics (14 items), environmental factors (19 items), behavioral factors (6 items), personal factors (12 items), and intentions (8 items). To measure environmental and behavioral factors, a 6-point Likert-type scale was utilized, ranging from 1 “extremely unlikely” to 6 “extremely likely”. Conversely, the scales for personal factors and intentions were designed as a 4-point Likert-type scale, with responses ranging from 1 “strongly disagree” to 4 “strongly agree”.

The widely applied Social Cognitive Theory (SCT) framework was used for the survey development to explain the interaction of factors impacting human behavior.[28] For this study, the Wood and Bandura SCT model of organizational management was used to explore the effect of the environmental, behavioral, and personal factors on intention to implement the 2017 periodontal classification system.[28] The survey development process started with generation of items based on the literature, clinical experience, and discipline expertise. Since the classification system may be known by either the year of the world workshop (2017) or by the year of the publication of the guidelines (2018) it was decided to use the descriptor 2017/2018 periodontal classification system in the survey. A panel of 10 experts consisting of dentists, including a periodontist, and dental hygienists were asked to participate in assessing content validity. Content validity was calculated at the item level (item content validity index, I-CVI) and the sub-scale level (summary content validity index, S-CVI/Ave).[29] Panel members were asked to score the relevance of each survey question on a scale of 1 to 4 (1 = not relevant and 4 = highly relevant). The I-CVI for each item retained in the survey met the minimum .78 cut-off. The S-CVI for sub-scales were

as follows: environmental factors (93.6%), behavioral factors (94.2%), personal factors (98.3%), and intention (91.3%). Reliability was assessed using Cronbach's alpha with the following outcomes: environmental factors (α=86.3), behavioral factors (α=86.0), and personal factors (α=79.4). and intention (α=84.8). For internal validity analysis the intention items were divided into implementation (α=80.3) and pursuing education items (α=80.2). Cronbach's alpha values for all scales suggested good internal reliability. The survey was piloted with 10 individuals who met the study's inclusion criteria to assess readability and functionality. Feedback received from the pilot participants was used to refine the survey instrument prior to dissemination.

Procedure

Recruitment of participants for the survey was conducted through social media sites including LinkedIn, Instagram, dental hygiene professional Facebook pages (35 pages including various countries such as the US, Canada, Austria, and United Kingdom), and snowball sampling. Permission was sought from administrators of relevant Facebook domains to post invitations on their home pages. In addition, the invitation to participate was sent to state dental hygiene associations with a request to disseminate the invitation among their members.

Upon opening the invitation link, potential participants were directed to the informed consent page for the voluntary survey. Individuals who chose not to participate could exit the survey. No incentives were offered for participation. The survey was designed to maintain participant confidentiality, with no collection of personal information or email addresses. The survey platform settings were configured to allow only one response per participant and participants were prevented from altering their answers after submission. The survey link was available for approximately nine weeks (May 7 to July 17, 2023) and weekly reminders were posted on the social media group pages. After closing the survey, the data were downloaded into a spreadsheet for analysis using a statistical software program (SPSS27®; IBM Corp., Armonk, NY, USA).

Statistical Analysis

Categorical variables were summarized using cumulative frequencies, while continuous and ordinal variables were characterized by calculating appropriate measures of central tendency (mean, median) and variability (standard deviation, interquartile range); 95% confidence intervals for proportions and the mean were reported. The distributions of all variables were examined for statistical assumptions such as normality and co-linearity. Variables were evaluated for transformation to address non-normal distribution concerns or a non-parametric approach. Detected outliers were removed (1.5*IQR); however, if the results were similar when outliers were included, those cases were included in the main analysis. Participants with fewer than 80% of complete responses were eliminated from the analysis. For the main variables (behavioral, environmental, personal factors and intention), responses needed to be 100% complete or they were eliminated from analysis.

A correlation analysis (Pearson or Spearman) was used when appropriate, as well as chi-square tests of independence, multiple regression (linear, logistic, ordinal, multinomial), and t-tests or ANOVA. In situations where the distribution did not match the assumptions for the normal model, a non-parametric equivalent (Wilcoxon U, Kruskal-Wallis) was used. When multiple statistical tests were used, proper adjustments to family wise error (e.g., Bonferroni) were applied. The acceptable alpha level for hypothesis testing was .05, and all measures of effect size (e.g., 95% CI, R2, Phi Coefficient, Cohen's d) were computed and reported.

RESULTS

A total of 255 participants opened the survey link. Of these, 181 respondents completed at least 80% of the demographic and work characteristic items and 100% of the SCT and intention components of the survey for a 71% completion rate. Participants were evenly distributed with about 25% in each age category from 21 to 60 years. The majority were female, White, and non-Hispanic Latino (83% to 97%). About one half

had an associate or entry-level dental hygiene degree with a similar number reporting their highest degree level earned was a bachelor's degree. The greatest percentage of respondents had practiced dental hygiene for one to ten years (40%) with a majority employed in private practice (77%) and working 25 to 40 hours per week (71%). Participant demographics are shown in Table I.

Use of the 2017 periodontal disease classification

About two-thirds (59.7%) reported using the 2017 periodontal disease classification in their practice setting while 46.4% reported both being familiar with the 2017 classification system and using it exclusively to classify patients with periodontal disease (Table I). Another 19.9% were aware of the classification system and in the process of integrating it in their patient care. About one-third (33.2%) were either not aware of the 2017 classification system or were aware of it but were not using it. This percent was similar to those who reported either using older classification systems or no classification system (38.7%). A collaborative approach involving dentists and dental hygienists to determine which periodontal classification to use was reported by nearly half of the participants (47%). In about 40% of responses, dental hygienists were responsible for deciding which periodontal disease classification to use in the clinical setting.

Implementation factors

When respondents were asked to rate the environmental factors influencing their use of the 2017 periodontal disease classification system, the majority of the respondents (87%) indicated that they would be *moderately or extremely likely* to use the classification system if their employer supported its implementation. Following on this theme, about 65% of respondents indicated it would take additional training to implement the 2017 classification system, but its use would lead to better patient outcomes. The range of environmental or workplace factors influencing the implementation of the periodontal disease classification system are shown in Table II.

When respondents were asked to rate the behavioral factors influencing whether they would implement the 2017 periodontal disease classification system, nearly half (47.0%, n=85) of the participants rated it as *extremely likely* that attending a CE course about the 2017 periodontal classification system would provide them with the knowledge and skills necessary to implement, develop evidence-based periodontal treatment plans, and communicate with patients and other providers (Table III).

A majority of the participants *agreed or strongly agreed* they have a professional responsibility to learn the 2017 periodontal classification system to provide the current standard of care to their patients (92.4%) and that it would increase their professional competence (89.5%). Most respondents also *agreed or strongly agreed* that implementing the classification system would improve accuracy and consistency of the periodontal diagnosis for patients (91.2%). About one-third (31%) of respondents *agreed or strongly agreed* the 2017 periodontal classification system should only be implemented in periodontal practices (Table IV).

A larger percentage *agreed or strongly agreed* they would take a CE course to learn the 2017 periodontal classification system within six months if their employer paid for the course (90.6%) versus if they had to pay themselves (64.6%). The majority (93%) also *agreed or strongly agreed* they would take a CE course if their employer implemented the 2017 periodontal classification system in the dental office (Table V).

Relationships between implementation and demographics

Limited variability for race, ethnicity, and gender prevented their use for correlation analysis. No relationships were found for intention for education or implementation of the periodontal classification and the following variables: US region, entry level degree, age, hours worked per week, or type of classification system currently used. For highest degree earned, there was a statistically significant difference for intention to implement between the master's and associate degree ($p=.018$) groups; while there was no

Table I. Demographics and use of the 2017 periodontal classification system (n= 181)

Category	n	%
Age		
21-30	37	20.4
31-40	49	27.1
41-50	44	24.3
51-60	38	21.0
61-70	9	5.0
71-80	1	0.6
Gender		
Female	175	96.7
Male	3	1.7
Race		
White	151	83.4
Black or African American	5	2.8
Asian	13	7.2
2 or more races	8	4.4
Ethnicity		
Hispanic or Latino	8	4.4
Not Hispanic or Latino	166	91.7
Regions in the US		
West	48	26.5
South	21	11.6
Midwest	34	18.8
Northeast	54	29.8
Reside outside the U.S.	2	1.1
Entry-level degree in dental hygiene		
Certificate	4	2.2
Diploma	9	5.0
Associate degree	99	54.7
Bachelor's degree	63	34.8
Other	3	1.7

Category	n	%
Highest degree earned		
Diploma	6	3.3
Associate degree	59	32.6
Bachelor's degree	83	45.9
Master's degree	28	15.5
Doctoral degree	1	0.6
Other	4	2.2
Primary practice setting(s)		
Private practice (general practice or periodontal practice)	140	77.3
Corporate/Dental Service Organization (DSO)	15	8.3
Federally Qualified Health Center (FQHCs)/Community Health Center	7	3.9
Government (e.g., military, Veterans' Affairs, Indian Health Service)	2	1.1
Alternate setting (e.g., Mobile, Hospital, Congregate living)	5	2.8
Other	10	5.5
Average hours worked per week		
1-8	2	1.1
9-16	14	7.7
17-24	27	14.9
25-32	56	30.9
33-40	73	40.3
41+	7	3.9
Years in practice		
1-10	73	40.3
11-20	51	28.2
21-30	29	16.0
31-40	20	11.0
41-50	7	3.9

Category	n	%
Periodontal disease classification system currently used in your practice		
The 1989 periodontal classification	5	2.8
The 1999 periodontal classification	36	19.9
The 2017/2018 periodontal classification	108	59.7
Do not use a periodontal classification	29	16.0
Other	1	0.6
Familiarity with the 2017/2018 periodontal classification system		
I am not aware the 2017/2018 periodontal classification is available	9	5.0
I am aware of the 2017/2018 periodontal classification, but I am not using it in my practice	51	28.2
I am aware of the 2017/2018 periodontal classification, and I am in the process of integrating it into my practice	36	19.9
I am classifying patients with periodontal diseases exclusively using the 2017/2018 periodontal classification	84	46.4
Who is responsible for determining the periodontal disease classification system used in your clinical practice setting?		
Dentist	21	11.6
Dental hygienist	72	39.8
Collaboration (dentist and dental hygienist)	85	47.0
Other	2	1.1

Table II. Environmental factors influencing implementation (n=181)

Question	Extremely unlikely	Moderately unlikely	Slightly unlikely	Slightly likely	Moderately likely	Extremely likely
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
If my employer supported implementing the 2017/2018 periodontal classification system I would use it with patients.	6 (3.3)	1 (0.6)	7 (3.9)	10 (5.5)	32 (17.7)	125 (69.1)
My employer would not support using the 2017/2018 periodontal classification system due to making the appointment longer.	80 (44.2)	32 (17.7)	22 (12.2)	17 (9.4)	12 (6.6)	18 (9.9)
My employer would not support using the 2017/2018 periodontal classification system due to loss of productivity.	90 (49.7)	26 (14.4)	26 (14.4)	15 (8.3)	11 (6.1)	13 (7.2)
My employer would not support using the 2017/2018 periodontal classification system due to lack of familiarity.	54 (29.8)	25 (13.8)	24 (13.3)	33 (18.2)	20 (11.0)	25 (13.8)
My dental hygiene colleagues in other offices do not use the 2017/2018 periodontal classification system in patient care.	15 (8.3)	8 (4.4)	29 (16.0)	41 (22.7)	58 (32.0)	29 (16.0)
The other dental hygienists in my office do not use the 2017/2018 periodontal classification system.	42 (23.2)	16 (8.8)	20 (11.0)	19 (10.5)	27 (14.9)	56 (30.9)
If I use the 2017/2018 periodontal classification system other dental providers in my office will be confused by my periodontal assessment.	35 (19.3)	26 (14.4)	28 (15.5)	35 (19.3)	35 (19.3)	22 (12.2)
If I use the 2017/2018 periodontal classification system other dental hygienists in my office will be interested in learning from me.	12 (6.6)	11 (6.1)	22 (12.2)	63 (34.8)	39 (21.5)	34 (18.8)
If I use the 2017/2018 periodontal classification system patients will be upset because it may lead to a different treatment recommendation.	57 (31.5)	36 (19.9)	33 (18.2)	33 (18.2)	14 (7.7)	8 (4.4)
If I use the 2017/2018 periodontal classification system patients will leave the practice because it may lead to a different treatment recommendation.	82 (45.3)	41 (22.7)	26 (14.4)	21 (11.6)	6 (3.3)	5 (2.8)

Table II. Environmental factors influencing implementation (n=181) *(Continued)*

Question	Extremely unlikely	Moderately unlikely	Slightly unlikely	Slightly likely	Moderately likely	Extremely likely
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
If I use the 2017/2018 periodontal classification system patients will be happy because we are using the most current evidenced-based classifications.	13 (7.2)	3 (1.7)	22 (12.2)	62 (34.3)	33 (18.2)	48 (26.5)
Implementing the 2017/2018 periodontal classification system will require additional training for dental staff.	12 (6.6)	8 (4.4)	12 (6.6)	32 (17.7)	58 (32.0)	59 (32.6)
Implementing the 2017/2018 periodontal classification system will require updating patient records and treatment plans.	15 (8.3)	8 (4.4)	22 (12.2)	38 (21.0)	47 (26.0)	51 (28.2)
Implementing the 2017/2018 periodontal classification system for my patients will increase patient referrals to our office because we are using the most current evidence-based information.	37 (20.4)	31 (17.1)	45 (24.9)	37 (20.4)	15 (8.3)	16 (8.8)
Implementing the 2017/2018 periodontal classification system for my patients will help to build patient trust and confidence in our office.	14 (7.7)	11 (6.1)	26 (14.4)	60 (33.1)	39 (21.5)	31 (17.1)
Implementing the 2017/2018 classification system will lead to better patient outcomes, including improved periodontal disease management and prevention.	6 (3.3)	5 (2.8)	12 (6.6)	39 (21.5)	59 (32.6)	60 (33.1)
Implementing the 2017/2018 periodontal classification system will result in changes to billing and coding procedures.	25 (13.8)	20 (11.0)	35 (19.3)	46 (25.4)	28 (15.5)	27 (14.9)
Implementing the 2017/2018 periodontal classification system will result in confusion for the front desk staff when completing insurance forms.	41 (22.7)	23 (12.7)	31 (17.1)	34 (18.8)	32 (17.7)	20 (11.0)
Implementing the 2017/2018 periodontal classification system may require changes in treatment protocols and patient education materials.	17 (9.4)	12 (6.6)	14 (7.7)	66 (36.5)	40 (22.1)	32 (17.7)

Table III. Behavioral factors influencing implementation (n=181)

	Extremely unlikely	Moderately unlikely	Slightly unlikely	Slightly likely	Moderately likely	Extremely likely
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Attending a CE course about the 2017/2018 periodontal classification system would provide me with the knowledge and skills I need to develop evidence-based periodontal treatment plans for my patient.	1 (0.6)	2 (1.1)	8 (4.4)	25 (13.8)	33 (18.2)	112 (61.9)
Attending a CE course about the 2017/2018 periodontal classification system would provide me with the knowledge and skills I need to implement the new guidelines into our practice.	1 (0.6)	4 (2.2)	5 (2.8)	26 (14.4)	41 (22.7)	104 (57.5)
Attending a CE course about the 2017/2018 periodontal classification system would provide me with the knowledge to discuss staging and grading with my patients.	2 (1.1)	1 (0.6)	2 (1.1)	28 (15.5)	51 (28.2)	97 (53.6)
Attending a CE course about the 2017/2018 periodontal classification system would provide me with the ability to better communicate with other dental practitioners.	2 (1.1)	2 (1.1)	7 (3.9)	32 (17.7)	53 (29.3)	85 (47.0)
Educating my patients about the 2017/2018 periodontal classification system will result in a positive response from my patients.	6 (3.3)	11 (6.1)	12 (6.6)	57 (31.5)	49 (27.1)	46 (25.4)
Educating my patients about their periodontal disease based on the 2017/2018 periodontal classification system would increase patients' confidence in my care.	8 (4.4)	4 (2.2)	15 (8.3)	52 (28.7)	50 (27.6)	52 (28.7)

Table IV. Personal factors influencing implementation (n=181)

	Strongly disagree	Disagree	Agree	Strongly agree
	n (%)	n (%)	n (%)	n (%)
Attending a CE course about the 2017/2018 periodontal classification system would increase my confidence level in providing the highest standards of care for my patients.	4 (2.2)	15 (8.3)	62 (34.3)	100 (55.2)
Attending a CE course about the 2017/2018 periodontal classification system would provide me with the confidence to discuss staging and grading with my patients.	3 (1.7)	8 (4.4)	70 (38.7)	100 (55.2)
Attending a CE course about the 2017/2018 periodontal classification system would build and maintain my professional reputation as a knowledgeable and skilled practitioner.	3 (1.7)	11 (6.1)	63 (34.8)	104 (57.5)
I have a professional responsibility to learn the 2017/2018 periodontal classification system to provide the current standard of care to my patients.	1 (0.6)	12 (6.6)	55 (30.4)	113 (62.4)
I believe that not implementing the 2017/2018 periodontal classification system may result in non-compliance with the current standards of care, potentially leading to legal and ethical consequences.	5 (2.8)	54 (29.8)	68 (37.6)	54 (29.8)
I believe implementing the 2017/2018 classification system will improve the accuracy and consistency of periodontal diagnosis for my patients.	3 (1.7)	13 (7.2)	85 (47.0)	80 (44.2)
I believe that implementing the 2017/2018 classification system will improve communication and collaboration with other dental professionals.	3 (1.7)	24 (13.3)	85 (47.0)	69 (38.1)
I believe that implementing the 2017/2018 periodontal classification system will increase patient satisfaction and trust, leading to increased referrals to our practice.	8 (4.4)	53 (29.3)	83 (45.9)	37 (20.4)
I believe that learning and using the 2017/2018 periodontal classification system will enhance my professional competence and career growth as a dental hygienist.	3 (1.7)	16 (8.8)	71 (39.2)	91 (50.3)
I believe that I can learn the 2017/2018 periodontal classification system effectively in my practice.	1 (0.6)	30 (16.6)	73 (40.3)	77 (42.5)
I believe the 2017/2018 periodontal classification system should only be implemented in periodontal practices.	60 (33.1)	65 (35.9)	28 (15.5)	28 (15.5)
I believe the 2017/2018 periodontal classification system is complex and challenging to use.	18 (9.9)	54 (29.8)	81 (44.8)	28 (15.5)

Table V. Intention to implement (n=181)

	Strongly disagree	Disagree	Agree	Strongly agree
	n (%)	n (%)	n (%)	n (%)
I intend to learn and implement the 2017/2018 periodontal classification system within six months.	5 (2.8)	38 (21.0)	73 (40.3)	65 (35.9)
If my employer implements the 2017/2018 periodontal classification system in the dental office, I will take a CE course to learn the classifications within six months.	2 (1.1)	12 (6.6)	87 (48.1)	80 (44.2)
I intend to attend a CE course about 2017/2018 periodontal classification system even if I have to pay for it myself.	22 (12.2)	42 (23.2)	69 (38.1)	48 (26.5)
I intend to attend a CE course about 2017/2018 periodontal classification if paid for by my employers.	3 (1.7)	14 (7.7)	78 (43.1)	86 (47.5)
I intend to attend a CE course about 2017/2018 periodontal classification system if offered in person.	6 (3.3)	29 (16.0)	83 (45.9)	63 (34.8)
I intend to attend a CE course about 2017/2018 periodontal classification system if offered online with the content self-paced.	6 (3.3)	31 (17.1)	75 (41.4)	69 (38.1)
I intend to attend a workshop or training session on the 2017/2018 periodontal classification system in the next three months.	17 (9.4)	85 (47.0)	52 (28.7)	27 (14.9)
I intend to incorporate the 2017/2018 periodontal classification system into my daily practice in the next three months.	13 (7.2)	53 (29.3)	46 (25.4)	69 (38.1)

Table VI. Regression analyses predicting implementation and educational intentions

Predictor*	B	β	t	*p*	B	β	t	*p*
	Model 1: Implementation				Model 2: Educational Intentions			
Constant	-1.46		-4.30	< .001	-0.52		-1.48	0.14
Behavioral factors	0.01	0.01	0.14	0.89	0.39	0.39	5.39	< .001
Environmental factors	0.37	0.35	5.83	< .001	-0.05	-0.05	-0.62	0.54
Personal factors	0.91	0.47	5.70	< .001	0.30	0.30	3.00	0.00
Highest degree	0.09	0.08	1.44	0.15				
Years in practice					-0.04	-0.04	-0.67	0.51
Familiarity					0.07	0.07	0.84	0.40
R^2	0.53				0.43			
Adjusted R^2	0.52				0.41			
F	46.63			< .001	24.60			< .001

* B = unstandardized regression coefficient; SE B = standard error of the coefficient; β = standardized regression coefficient.

statistically significant difference between associate and bachelor's degree ($p = .458$) or bachelor's and master's degree ($p = .227$) groups. More years in the field were statistically significantly associated with lower intention to seek more education ($p = .05$). In terms of familiarity, those familiar and using the classification system have a higher intention to seek education ($p < .001$).

Predictors of implementation intent

A multiple linear regression analysis was conducted to examine the predictors of the intention to implement the 2017 periodontal classification system. Participants currently using the 2017 periodontal classification system were removed from the analysis. Predictors used in the model included behavioral factors, environmental factors, personal factors, and highest degree (either associate or bachelor's degree). The overall regression model was statistically significant, $F(4,165) = 46.633$, $p < .001$, indicating the predictors significantly explained the variance in the intention to implement the periodontal classification tool. The model accounted for 52% of the variance in the dependent variable (adjusted $R2 = .519$, SE (standard error =.57382). Environmental and personal factors were shown to be significant predictors of the intention to implement the classification tool. Specifically, personal factors ($\beta = .469$, $p < .001$) and environmental factors ($\beta = .352$, $p < .001$) were positively associated with the intention to implement the classification system. Personal factors were a stronger predictor than environmental factors. In contrast, behavioral factors ($\beta = .011$, $p = .889$) and highest degree ($\beta = .079$, $p = .151$) were not significant predictors. Behavioral factors did not demonstrate a meaningful relationship with the intention to implement and there was no significant difference in intention between those with an associate degree and those with a bachelor's degree.

A second multiple linear regression analysis was conducted to examine the predictors of the intention to attend educational CE about the 2017 periodontal classification system. The predictors included behavioral factors, personal factors, environmental factors, years in practice, and familiarity with the 2017 periodontal classification system (categorized as familiar but not using, familiar and integrating, and familiar and using). The overall regression model was statistically significant ($F(5,164)=24.599$, $p < .001$), indicating the predictors significantly explained the variance in the intention to attend CE. The model accounted for 41% of the variance in the dependent variable (adjusted $R2 = .411$, SE = .43966). Behavioral and personal factors were significant predictors of the intention to attend educational courses or workshops. More specifically, behavioral factors ($\beta = .388$, $p < .001$) and personal factors ($\beta = .299$, $p = .003$) were positively associated with the intention to attend. In this model the behavioral factors were a stronger predictor than the personal factors. In contrast, environmental factors ($\beta = -.048$, $p = .535$), years in practice ($\beta = -.041$, $p = .506$), and familiarity with the 2017 periodontal classification ($\beta = .066$, $p = .402$) were not significant predictors of the intention to attend CE.

DISCUSSION

The 2017 classification of periodontal and peri-Implant diseases and conditions offer a standardized approach to assessing and categorizing periodontal disease and have significant implications for dental hygiene practice. As this system becomes the global standard for periodontal assessment and care, it is essential for dental hygienists to integrate it effectively into daily practice. This study sought to measure the extent to which clinical dental hygienists were utilizing the new classification system. About two-thirds of participants used the classification system in practice, but only about half reported being familiar with it, which seems inconsistent. This finding may raise concerns that the 2017 periodontal classification system is not being used correctly due to lack of knowledge. It may also be that the participants who reported being in the process of implementing it also reported using it in practice. Participants in the current study appeared to be using the 2017 classification system more than what has been reported in the literature previously (60% vs. 24%).[30] However, of greater concern were the respondents who reported

using no periodontal classification system as this leads to lack of consistency and possible inaccurate diagnosis of periodontal disease. In addition, lack of incorporating clinical practice guidelines does not align with the standard of care.[31,32]

About half of participants in the current study reported using a collaborative approach with dentists and dental hygienists jointly determining the periodontal classification, emphasizing the importance of teamwork in the effective implementation of the 2017 periodontal classification system. Nearly half of the participants reported that the dental hygienist was responsible for classifying periodontal disease, consistent with previous research.[31]

Tonetti and Sanz described a stepwise process for periodontal diagnosis using the 2017 classification system.[17] The dental hygienist is typically responsible for all aspects of the data collection and decision making with the input of a dentist for additional local factors outside of the scope of dental hygiene practice (e.g., endo-perio lesion, vertical root fracture). It is essential that dental hygienists develop proficiency in periodontal classification to ensure appropriate treatment to enhance patient outcomes. In addition, some states (Colorado, Connecticut, Maine, and Oregon) include the dental hygiene diagnosis as part of the scope of practice, thus supporting the need for dental hygienists to be competent in periodontal classification in order to provide effective non-surgical periodontal care.[33,34]

The primary environmental factor impacting implementation of the 2017 periodontal classification into practice was the employer, highlighting the role employers play in promoting the adoption of evidence-based practices in the workplace. This finding was consistent with nursing research that found lack of leadership support for use of clinical practice guidelines was a barrier to implementation.[23] Given the number of employers who are general practice dentists; it is important to understand their knowledge and application of the 2017 periodontal classification guidelines. Few studies have explored knowledge and application of the 2017 periodontal classification in practice among dentists, but in studies assessing the accuracy of periodontal diagnosis among general practice dentists the range has been shown to be 30-73%, suggesting a need for further education.[14,35]

About half of the respondents indicated that colleagues in the office and at other offices did not use the 2017 periodontal classifications. Both medical and dental research suggests that lack of colleague support may be a barrier to implementation of clinical practice guidelines.[23,36] Strategies to address environmental factors include increased education and tools designed to bridge knowledge gaps and facilitate adoption of the 2017 periodontal classification system.[17,22]

Participants believed attending a CE course on the 2017 periodontal classification system would enhance their ability to develop evidence-based treatment plans and communicate with other providers. This aligned with the intention to attend a CE course; however, more participants indicated a willingness to attend if the employer paid for the course. Recognition of need for education was also a finding in nursing research related to facilitators of implementation of new clinical guidelines.[23] While it may be a benefit to have an employer pay for CE, it is ultimately the professional responsibility of every health care provider to maintain continued competency in delivering the standard of care.[37]

The 2017 periodontal classification system is considered to be the standard of care as it is supported by national and international professional organizations such as the AAP and the American Dental Association (ADA).[24,27] The majority of participants in this study agreed it was a professional responsibility to learn about and implement the 2017 periodontal classifications to comply with the current standard of care and improve accuracy of diagnosis. This is consistent with the professional responsibilities as outlined in the American Dental Hygienists' Association (ADHA) Code of Ethics.[37] Given dental hygienists play a primary role in identifying periodontal disease, continuous learning to enhance competency offers an opportunity for advocacy and leadership in the adoption and implementation of the

classification system. While most participants believed it was their professional responsibility to obtain education and provide the standard of care, about 30% of respondents agreed that the classifications should only be used in periodontal practices. This could lead to lack of identification or delayed diagnosis in general practice settings and suggests that there is an ongoing need to educate dental hygienists in general practice settings on their role in the diagnostic process and the value of using the 2017 periodontal classification system.

Environmental and personal factors predicted the intention to seek education and implement the revised classification system. Specifically, stronger personal beliefs and supportive environmental conditions were associated with a greater intention to learn about and adopt the 2017 periodontal classification system. These findings are consistent with a integrative review of factors facilitating intention to use clinical practice guidelines in nursing.[23] In addition, a systematic review of health care professionals' intentions and behaviors identified the major predictors of intention included beliefs about consequences, beliefs about capabilities, and social influences, which parallels this study's findings.[38] While personal factors were a slightly stronger predictor of intention to implement the guidelines in the current study, the importance of creating a workplace culture including employers and colleagues is a key factor in facilitating implementation.[39]

Behavioral and personal factors were found to be significant predictors suggesting that environmental factors had less influence in actual attendance at CE about the 2017 periodontal classification system. This finding seems appropriate given that CE is driven by the individual desire to improve clinical competence in providing evidence-based care, improving patient outcomes, and engaging in lifelong learning.[40,41] This highlights the importance of fostering intrinsic motivation and lifelong learning behaviors to encourage participation in professional development. This finding aligns with existing literature, which emphasizes that intrinsic motivation driven by personal interest and a commitment to improving patient care plays a crucial role in motivating professionals to engage in continuing their education.[42]

Limitations of the study include use of a non-probability sample recruited via social media and snowball sampling. This introduces possible self-selection and non-response bias and limits generalizability. However, Godon et al. found in a systematic review that sample sizes equal to or greater than 150 participants had significantly better results in terms of prediction of intention and this study sample exceeded this benchmark.[38] A strength of the study was the survey development based on behavior change theory and good content validity and reliability for the instrument.

Future research should attempt to recruit a more representative sample and consider expanding outreach for an international sample since the 2017 periodontal classification system was the result of a world workshop. Another area for future research may be qualitative research with clinicians who do not consistently use the 2017periodontal classification guidelines to identify personal and environmental barriers and approaches to engage them in continuing their education on the topic. Of particular interest may be future research related to the professional identity of dental hygienists and association with the use of clinical guidelines consistent with the current standard of care. Continuing to follow the implementation of the 2017 periodontal classification system longitudinally over time would also be of value along with identifying factors that facilitated implementation as this may inform efforts to implement new clinical guidelines in the future.

CONCLUSION

Personal factors and environmental/ workplace support were significant predictors of the intention to implement while personal and behavioral factors predicted the intention to seek education on the 2017 periodontal classification system. Continuing education was shown to enhance the dental hygienist's knowledge and confidence in using the 2017 periodontal classification. However, creating

supportive environments are crucial for broader adoption within the dental practice setting. Overall, the findings provide valuable insights into guideline adoption and offers a framework for promoting new classification and treatment protocols in oral health care. Further research is needed to determine the degree of implementation of the 2017 periodontal classification system and impact on patient outcomes.

DISCLOSURES

The authors have no conflicts of interest to disclose.

IMPLICATIONS FOR DENTAL HYGIENE PRACTICE

- Dental hygienists play a key role in identifying periodontal disease in general practice settings. Continuing education courses and collaborative support in the workplace have been shown to increase confidence in using the 2017 periodontal classification system, improve communication with specialists. It is essential for all dental hygienists to be able to integrate the classification system into the delivery of patient care regardless of the practice setting.
- The 2017 periodontal classification system provides dental hygienists with a guide to approach periodontal disease and conditions that addresses the disease severity, complexity and progression risk to enhances clinical decision making and patient care.
- Utilization of the 2017 periodontal classification system is considered the standard of care. Dental hygienists have a professional responsibility to maintain continued competency in all aspects of evidence-based patient care.

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