

# Dental Implant Hygiene and Maintenance Protocols: A survey of oral health practitioners in Australia

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### Abstract

**Purpose:** Dental implant care and maintenance is of critical importance as implants grow in popularity as a tooth replacement option. The purpose of this study was to investigate the implant-related training and clinical practices of oral health practitioners (OHPs) in Australia regarding oral hygiene instructions (OHI) and maintenance protocols, and to better understand their role in providing peri-implant services.

**Methods:** A 42-item web-based survey was forwarded to the members of the Dental Hygienists Association of Australia and the Australian Dental and Oral Health Therapists' Association. Survey items included participant's demographics, types of peri-implant services provided in the workplace, implant-related information sources, peri-implant diagnostic preferences, implant maintenance protocols and oral hygiene instructions (OHI) for dental implants. Descriptive statistics were used to analyse the data. Comparisons were made with a similar survey of the implant maintenance preferences of general dentists in Australia.

**Results:** One hundred fifty-four Australian OHPs completed the electronic survey (n=154). Nearly all respondents (96.7%) considered implant home hygiene and peri-implant health to be strongly associated. Dental qualification (64.9%) and association-sponsored professional development courses (50.6%) were the most common sources of implant assessment/management information. Brushing (88.7%) and the use of an interdental brush (78.1%) were the most popular implant-specific OHI provided. All of the respondents reported performing oral hygiene assessments around dental implants; 94.0% performed supragingival cleaning, 67.5% subgingival cleaning, 55.0% treated peri-implant mucositis and 38.4% peri-implantitis. Dental floss (80.9%), rubber-cup prophylaxis (59.6%), plastic/carbon cures (52.5%) and plastic-tipped ultrasonics (43.3%) were the most common devices used for implant maintenance.

**Conclusion:** Australian OHPs reported providing peri-implant services generally in agreement with the current literature and demonstrated a greater focus on prevention as compared with Australian dentists. Oral health practitioners in Australia expect to be highly involved in dental implant maintenance care and provide the majority of preventive, periodontal and OHI services in their workplaces.

**Keywords:** dental implant maintenance, oral hygiene instruction, peri-implantitis, professional development, dental hygienists, dental therapists, oral health therapists, oral health practitioners

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### Introduction

Dental implant care and maintenance is of critical importance as implants gain in popularity and a greater understanding of the rates of peri-implant disease is established. A recent meta-analysis identified the weighted mean prevalence of mucositis at the patient level to be between 43-46.8% and peri-implantitis to be between 19.8-22%.<sup>1,2</sup> Peri-implantitis appears to have a non-linear and

accelerating mode of progression<sup>3,4</sup> and its prevalence appears to be correlated with increased number of years in function.<sup>2</sup> Regular, ongoing assessments of dental implants is widely recommended to detect peri-implant pathology,<sup>5-7</sup> by utilizing diagnostic tools and procedures firmly established in the literature.<sup>8,9</sup> These tools include visual assessments, pocket depth probing, checking for suppuration, bleeding on probing

and other inflammatory signs, and evaluating radiographic bone levels. The incorporation and performance of these clinical procedures by dental practitioners in clinical practice has been infrequently investigated; however, dental hygienists in the United States (US) have been previously surveyed regarding their clinical and knowledge-seeking practices.<sup>10</sup>

Professional and at-home plaque control practices are critical in managing peri-mucositis,<sup>11</sup> a precursor to peri-implantitis.<sup>12</sup> The quantity and quality of literature to support patient-performed implant hygiene care practices is poor, with no standardized plaque control protocol within peri-implant management research to date. Professional treatment protocols for maintaining peri-implant health are also lacking,<sup>13</sup> and treatment procedures for mucositis<sup>11</sup> and peri-implantitis<sup>14</sup> are not well established. Studies vary widely regarding disease criteria<sup>15</sup> and control group procedures, and lack long-term follow-up.<sup>16-18</sup> Although interventions are often successful, entire treatment protocols, including individual debridement, anti-infective, surgical, and antibiotic procedures, frequently lack comparison to control procedures, making their actual efficacy unknown.<sup>16,19</sup> Standardised diagnostic and inclusion criteria for peri-implant epidemiological research studies were only recently proposed by Renvert et al. in 2018.<sup>9</sup> Therefore, dental practitioners may vary widely in their preferences for oral hygiene care instructions and implant management protocols, in addition to their willingness to treat more severe peri-implant conditions.

Dental hygienists, dental therapists and oral health therapists, are collectively known as oral health practitioners in Australia. As of April, 2018, there were 4,467 oral health practitioners (OHPs) registered to practice in Australia<sup>22</sup> and 37.8% of Australian dentists indicated that they employed an OHP.<sup>23</sup> Services typically provided by OHPs both in the United Kingdom<sup>24-26</sup> and in Australia<sup>27</sup> have been identified as predominantly preventive.<sup>27</sup> In a study comparing private general dental practices in Adelaide, South Australia it was found that dentists who employed dental hygienists delegated many preventive and periodontal services to this OHP and had a significantly higher proportion of periodontal-focused services performed in their practices.<sup>28</sup> However, none of these cited studies differentiated the provision of periodontal versus peri-implant preventive and maintenance care, which may differ due to the less established care and maintenance protocols. The purpose of this study was to better understand the role Australian OHPs play in dental implant maintenance protocols by investigating their training, perspectives and clinical preferences in providing peri-implant oral hygiene

instructions, diagnostic and maintenance care as compared with previously surveyed Australian dentists.

## Methods

After considering the current literature on dental implant maintenance, a survey was developed in the Periodontics Department of the University of Melbourne Dental School to gather initial data on trends in implant dentistry information sources and treatment provision by OHPs in Australia. The survey was adapted from a web-based questionnaire previously used for general dentists by the same research group.<sup>29</sup> Survey design and validity testing were conducted by the periodontics department faculty, and ethics approval was granted by the Health Sciences Human Ethics Subcommittee of The University of Melbourne. Five topic areas from the previous survey were replicated for inclusion in the adapted instrument: demographics (8 items), sources of implant-related assessment, maintenance and oral hygiene instruction (OHI) information (3 items), opinions regarding the correlation between patient home hygiene and peri-implant health (1 item), preferred implant-specific OHI, and diagnostic and implant maintenance procedures provided (18 items). Respondents were also asked to indicate their structured dental practice working relationships and the roles of the various dental practitioners in providing preventative, periodontal and implant procedures in their primary workplace setting (12 items). Most items involved selection of one or more multiple-choice responses. Respondents were able to provide additional information if their preferred response did not appear as one of the multiple-choice options.

The survey, hosted on SurveyMonkey (San Mateo, CA, USA), was distributed by email to the members of the Dental Hygienists Association of Australia (1,100 e-mail addresses) and the Australian Dental and Oral Health Therapists' Association (1,772 email addresses), the national professional associations for OHPs in Australia. These professional associations were chosen for the survey distribution as they are the largest representative bodies for OHPs in Australia; the national practice registration body does not allow access to the registry database for research purposes. Following the initial email invitation to invitation to participate, a reminder was sent at four weeks and a prize drawing was conducted to encourage participation. Responses were collected over a three-month period in 2018. Data were described using SPSS statistical software, version 23.0 (SPSS, Chicago IL, USA), and compared to findings from a similar survey of general dentists in Australia (n=303)<sup>29</sup> with Chi-square tests performed (significance set at 0.05).

## Results

### Demographics and practice roles

A total of 154 Australian OHPs completed the survey (n=154) for an estimated minimum response rate of 5.4%, as some respondents may have belonged to both the Dental Hygienists Association of Australia and the Australian Dental and Oral Health Therapists' Association. The majority of respondents were female (92.9%), with a mean age of 38.4 years; had attained their dental qualification(s) from an Australian university (90.9%) and on the average, had been qualified since 2005. Most OHPs (79.9%) worked exclusively in a private practice located in a metropolitan area (59.1%).

A majority of OHPs (80%) reported that understanding the pathological process (90.3%), peri-implant tissue assessment (81.2%) and the maintenance of peri-implant health (85.1%) were within their scope of practice. About half considered that the treatment of peri-implant mucositis (50.0%) or peri-implantitis (50.6%) were within their scope of practice, however the respondents indicated that they played a smaller role in diagnosing peri-implant status (<40%) as compared to periodontal status (>70%). Provision of dental implant related services by practitioner type is shown in Table I.

### Implant related education and training

Nearly two-thirds (64.9%) of respondents reported learning clinical procedures for implant assessment and management as part of their registrable dental qualification, followed by nearly one-half (50.6%) reporting continuing professional development (CPD) programs organised through professional associations. Other common sources of training and information were colleagues (48.1%), work-based mentorship (39%) and journal articles (42.9%). Only 16.9% of OHPs cited CPD sponsored by universities, followed by implant companies (14.3%) and hands-on courses (13.0%) as implant management and assessment information sources. When reporting sources of information for OHI for dental implants, similar rates were found. Compared to general dental practitioners (GDPs) who were similarly surveyed,<sup>29</sup> OHPs cited significantly higher rates of multiple information sources ( $p=0.001$ ). Sources of information for implant assessment, management and OHI are shown in Table II.

### Implant oral hygiene practices

Nearly all respondents (98.1%) indicated seeing patients with implants in their clinical practice setting. A majority (63.6%) considered the link between implant home hygiene

**Table I. Provision of implant related services by dental provider type (n=143)\***

		OHP alone %	Dentist** %	In-house specialist %	External referral %
Routine examination	Examination of new patient	9.1	80.4	9.1	1.4
	Examination of returning patient without implant(s)	21.0	72.7	4.9	1.4
	Examination of returning patient with implant(s)	16.8	75.5	6.3	1.4
Diagnosis	Diagnosis of periodontal disease	70.6	18.2	10.5	0.7
	Diagnosis of peri-implant health	38.5	53.2	8.4	0.0
	Diagnosis of peri-implant mucositis	29.4	58.0	10.5	2.1
	Diagnosis of peri-implantitis	23.8	59.4	11.2	5.6
Initial debridement, maintenance or treatment	No periodontal disease or implant	91.6	5.6	2.1	0.7
	Periodontal disease, no implant	91.6	2.8	4.2	1.4
	Peri-implant health	93.0	4.9	0.7	1.4
	Peri-implant mucositis	51.7	20.3	7.7	20.3
	Peri-implantitis	25.2	25.2	13.3	36.4
Provision of OHI	No periodontal disease or implant	97.2	2.8	0.0	0.0
	Periodontal disease, no implant	97.9	2.1	0.0	0.0
	Peri-implant health	97.2	2.8	0.0	0.0
	Peri-implant mucositis	83.9	10.5	1.4	4.2
	Peri-implantitis	77.6	9.8	3.5	9.1

\* n varies as some respondents did not see dental implant patients in their main workplace

\*\* Also includes dentists when consulted by OHP

**Table II. Sources of information for clinical implant assessment/management procedures and implant OHI for oral health care providers (OHPs) and general dental practitioners (GDPs)**

	OHP implant assessment and management information sources* %	OHP implant OHI information sources %	GDP implant OHI information sources %	<i>p</i> -value**
	(n=154)	(n=154)	(n=303) <sup>29</sup>	
Registrable qualification	64.9	63.6	38.0	<0.001
University-based CPD	16.9	(26)† 100.0	(115)† 58.3	—
Association/society CPD	50.6	(78)† >100.0	(184)† 59.8	<0.001
Implant-company CPD	14.3	(22)† 59.1	(188)† 45.2	0.015
Hands-on course	13.0	11.7	6.9	—
Work-based mentorship	39.0	36.4	24.4	0.007
Colleagues	48.1	46.8	35.0	0.015
Journal articles	42.9	36.4	36.6	—
Textbooks	27.9	15.6	15.8	—
No source cited	0.6	0	6.6	0.001

\* Multiple selections permitted      \*\**p*-values <0.05 shown

† Attended this type of CPD implant training; percentage citing it as a source of OHI was calculated based on attendance

and peri-implant health to be “very strong” followed by one-third (33.1%) who indicated it to be “strong.” The most common OHI for a single implant-supported restoration provided by OHP respondents included the use of a toothbrush (88.7%), interdental brush (78.1%), interproximal flossing (66.2%) and circumferential flossing (62.3%). When compared to GDPs who were similarly surveyed,<sup>29</sup> OHPs were significantly more likely to recommend an interdental brush ( $p=0.029$ ), circumferential dental flossing ( $p<0.001$ ) and oral irrigator ( $p<0.001$ ). Implant specific oral hygiene instructions by OHPs and GDPs are shown in Table III.

While a majority of the OHP respondents (75.2%) repeated the OHI at every review or recall appointment, 21.4% repeated OHI only if signs/symptoms of peri-implant disease were present. The OHI frequency preferences differed significantly overall from the GDPs previously surveyed,<sup>29</sup> particularly regarding regular repetition ( $p<0.001$ ). Out of the three suggested communication methods, OHPs were most likely to demonstrate the OHI (96.6%) to their patients and while 49.0% asked the patient to demonstrate following instruction, both practices were significantly more frequent than the GDPs who were surveyed.<sup>29</sup> Oral hygiene instruction frequency and communication preferences by provider are shown in Table IV.

### ***Professional maintenance protocols***

Nearly all of the OHP respondents (99.4%) expected to be involved in peri-implant maintenance and expressed the belief that they had a role to play in implant patient care. The majority of respondents who see implant patients (96.7%) also reported performing implant checks and diagnostic procedures. Over 95% reported performing assessments of implant oral hygiene, soft tissues, pocket depths, bleeding on probing or suppuration; 85% reported assessing recession or implant mobility. Of the respondents performing implant checks, all diagnostic procedures were performed at significantly higher rates by OHPs than GDPs surveyed (Table V). The types of implant maintenance procedures provided, (supra- or subgingival implant cleaning during maintenance, treatment of peri-implant mucositis or peri-implantitis), decreased with increasing complexity of the type of procedure. All procedure types were provided at significantly higher rates by OHPs than the GDPs similarly surveyed. When asked whether they would treat or refer mucositis, 12.6% of OHPs did not treat or refer peri-implantitis; proportions similar to the GDPs surveyed (Table V).

A small proportion (6.6%) of OHPs who see implant patients did not use any implant-specific instruments or techniques in professional maintenance, significantly lower



**Table III. Post-restoration implant-specific oral hygiene instructions for a single implant-supported restoration and implant specific diagnostic procedures by provider type**

	OHPs who see patients with implants %	GDPs %	<i>p</i> -value*
	(n=151)	(n=303) <sup>29</sup>	
Brushing	88.7	86.5	—
Flossing	66.2	73.9	—
Superfloss™ (Oral-B®; Procter & Gamble Co., Cincinnati, OH, USA)	50.3	41.9	—
Interdental brush	78.1	68.3	0.029
Circumferential flossing	62.3	41.3	<0.001
Oral irrigator	34.4	17.8	<0.001
Mouthwash	16.6	14.5	—
Topical agent	2.6	1.0	—
None of the above techniques	3.3	3.0	—
	OHPs performing implant checks %	GDPs performing implant checks %	<i>p</i> -value*
	(n=146)	(n=291) <sup>29</sup>	
Oral hygiene assessment around implant	100.0	97.3%	0.043
Soft tissue visual assessment	99.3	94.5	0.014
Pocket depth probing	96.6	82.1	<0.001
Assessment of bleeding on probing	97.3	88.7	0.002
Assessment of suppuration	95.2	73.9	<0.001
Recession measurement	85.6	56.0	<0.001
Assessment of implant mobility	84.9	70.4	0.001

*p*-values <0.05 shown

than the GDPs surveyed (19.1%, n= 303; *p*<0.001). Among the OHPs who used implant specific techniques (n= 141), flossing was the most popular (80.9%), followed by rubber cup/brush prophylaxis (59.6%) and plastic/carbon curettes (52.5%). Plastic ultrasonic scaler tips (43.3%) were more than twice as popular as stainless-steel ultrasonics (19.9%). GDPs surveyed were more likely to use rubber cup prophylaxis (*p*=0.004) and stainless-steel ultrasonics (*p*<0.001), while OHPs were significantly more likely to use air-powder polishing, plastic ultrasonics and titanium curettes (*p*≤0.001). Peri-implant procedures/treatment and techniques used in professional maintenance by provider type are shown in Table V.

## Discussion

At the time of the survey, Australian OHPs (dental hygienists, dental therapists, oral health therapists) could only provide dental services within a structured professional relationship with a dentist.<sup>30</sup> Nearly all of the OHP respondents (99.4%) in this study expected to be involved in peri-implant maintenance and believed that they had a role to play in implant patient care. Respondents also demonstrated a positive preventative attitude regarding dental implants with 96.7% considering the link between implant home hygiene and peri-implant health to be strong. The provision of OHI (>97%) and periodontal debridement (>91%) by OHPs in this study was comparable to those of a subset of dental hygienists working with GDPs, in a survey of periodontal service provision in Victoria, Australia.<sup>31</sup> Results from this study provide initial insight into the provision of implant-specific diagnosis, peri-implant maintenance and OHI by different practitioner types in the practices employing OHPs.

Dental practitioners provide services according to their scope of practice. The relatively recent addition of implantology to dental practice impacts the variety of education sources, including the dental qualifications, dental association/society CPD and the work environment sources most commonly reported in this study. An interesting finding in this study was the much lower attendance reported from university-based and implant-company provided CPD as compared to professional association provided CPD. This may represent differences in availability or accessibility of programs from continuing professional education providers, and is similar to the university-based program attendance of the previously surveyed GDPs.<sup>29</sup> There are implications for the ongoing development of implant education in Australia based on the findings from this study and perhaps more professional development courses need to be made available to OHPs.

Inclusion of implant OHI in implant

**Table IV. OHI frequency and communication preferences**

Implant OHI	OHPs who provide implant OHI %	GDPs who provide implant OHI %	<i>p</i> -value*
	(n=145)	(n=289) <sup>29</sup>	
<b>Frequency preference</b>			
Repeat at every recall or review	75.2	57.4	<0.001
Repeat only once at next recall or review	3.4	13.5	
Repeat only if signs/symptoms present	21.4	27.0	
Do not repeat	0	2.1	
<b>Instruction method</b>			
Describe to the patient	73.8	76.5	—
Show the patient	96.6	84.1	<0.001
Ask the patient to demonstrate after instruction	49.0	36.3	0.011

\**p* values <0.05 shown

**Table V. Peri-implant procedures/treatment provided, and instruments/techniques used in professional maintenance**

	OHPs who see patients with implants %	GDPs %	<i>p</i> -value*
	(n=151)	(n=303) <sup>29</sup>	
Supragingival/superficial implant prosthesis cleaning during recall/periodontal maintenance	94.0	77.9	<0.001
Subgingival debridement of implants/implant surface during recall/periodontal maintenance	67.5	35.0	<0.001
Treatment of peri-implant mucositis	55.0	41.9	0.009
Do not treat nor refer for peri-implant mucositis	10.6	14.5	—
Treatment of peri-implantitis	38.4	18.2	<0.001
Do not treat nor refer for peri-implantitis	12.6	16.5	—
	OHP maintenance instruments/techniques %	GDP maintenance instruments/techniques %	<i>p</i> -value*
	(n=141)	(n=245) <sup>29</sup>	
Floss	80.9	76.3	—
Rubber cup/brush with prophylaxis paste	59.6	73.9	0.004
Air powder polishing/prophylaxis	29.8	9.8	<0.001
Stainless steel ultrasonic scaler	19.9	38.0	<0.001
Plastic ultrasonic tips	43.3	26.5	0.001
Stainless steel curettes	16.3	15.5	—
Plastic/carbon curettes	52.5	43.3	—
Titanium curettes	29.8	12.7	<0.001
Topical antimicrobials	39.7	32.2	—
Interdental brush (volunteered answer)	2.1	—	—
Superfloss™ (volunteered answer)	1.4	—	—

\**p*-values <0.05 shown

training was reported in higher frequencies by the OHP respondents as compared with the GDPs previously surveyed.<sup>29</sup> This may reflect the expected OHP preventative focus from education through to clinical practice which, by comparison, may indicate the need for a greater emphasis on prevention in the implant education system available to GDPs. Differences between implant OHI sources cited by OHPs and GDPs may also be due to the later mean graduation year (2005 for OHPs compared to 1998 for GDPs<sup>29</sup>) and the team-focused OHP work environment which encourages work-based mentorship and learning.

Patient-performed implant hygiene forms a critical part of mechanical plaque control, and is considered the standard of care for mucositis management along with professional plaque control.<sup>11,12</sup> OHPs in this study demonstrated a strong understanding of the close link between implant home hygiene and peri-implant health. However, there are no evidence-based patient-performed protocols related to preventative efficacy<sup>16,32</sup> nor an established standard hygiene control for clinical research<sup>33</sup> reported in the literature. Dental practitioners may be inferring their implant OHI preferences based on the periodontal literature or their own clinical experiences. In this study, the interdental brush was the most commonly recommended interdental cleaning method, in agreement with the current periodontal literature, deeming it the most efficacious interdental cleaning method,<sup>34</sup> although evidence for peri-implant efficacy is limited.<sup>35</sup> While interproximal flossing and circumferential flossing were the second and third most frequently recommended techniques, the use of dental floss has recently been identified as a possible peri-implantitis risk factor in implants with exposed rough surfaces, due to the retention of floss fibers.<sup>36</sup> The higher recommendations of circumferential flossing and oral irrigator use by OHPs, as compared to GDPs, may be due to the promotion of these techniques in the dental hygiene literature.<sup>37</sup>

Nearly all OHP respondents demonstrated the recommended OHI technique, significantly more than the GDPs surveyed,<sup>29</sup> and more in agreement with the OHI communication efficacy literature, where intra-oral demonstration has been shown to be more effective than written or verbal explanation.<sup>38</sup> OHP respondents were also more likely than GDPs to ask their patients to demonstrate the technique, a possible contribution to a higher internal locus of control, which has been shown to be important in changing oral hygiene behaviors.<sup>39,40</sup> While the majority of OHPs respondents were generally more prevention focused in repeating OHI at every recall/review appointment compared to GDPs,<sup>29</sup> nearly one-quarter of both groups only repeated OHI when signs/symptoms of disease were present.

Repetition of individualised OHI is strongly recommended in the prevention of periodontal disease,<sup>41,42</sup> and all practitioners should reinforce pre-emptive implant OHI over the long-term, especially considering the challenges of treating peri-implant disease.<sup>14</sup>

Diagnostic procedures for peri-implant monitoring are well-established in the literature<sup>8,9</sup> and OHPs in this study performed them at high rates (>90%). Similar proportions of OHPs (10%) and GDPs (17%) surveyed reported either not treating nor referring cases of peri-implant mucositis or peri-implantitis. Given the potential severity and difficult management of peri-implantitis,<sup>15,43</sup> timely coordinated management by all practitioners and appropriate referrals should be reinforced in clinical practice and education programs. Possible reasons for this finding are unknown and should be investigated in the future. In general, the OHP respondents provided comprehensive implant diagnostics and all types of peri-implant maintenance, using implant-specific instruments/techniques, at significantly higher rates than the GDPs similarly surveyed.<sup>29</sup> Provision of peri-implant diagnosis, maintenance and treatment of peri-implant pathologies in a general dental practice may vary widely depending on whether OHPs are employed in the practice. Findings from this study may reflect a greater focus on preventative care by OHPs, as expected from their role in clinical practice. Further research is needed to investigate why GDPs do not have an equally preventative, implant-specific attitude towards implant maintenance care, especially considering that less than one-half of all Australian GDPs (37.8%) employ an OHP and GDPs are responsible for maintaining implant patients on their own.<sup>23</sup>

There are no standard evidence-based protocols for the treatment of peri-implantitis<sup>14</sup> or peri-implant mucositis,<sup>17</sup> nor the maintenance of peri-implant health.<sup>13,33</sup> Dental practitioners' preferred use of maintenance instruments and techniques given the uncertainty in the literature has rarely been investigated: periodontists have been surveyed in the UK, Australia<sup>21</sup> and the US.<sup>20</sup> In this study, higher usage of air-powder polishing and plastic ultrasonic tips and lower usage of stainless-steel ultrasonics by OHPs compared to GDPs is in closer agreement with the available literature supporting the efficacy of and minimal damage from air powder polishing<sup>44-46</sup> and plastic ultrasonics,<sup>46,47</sup> although recent *in vitro* studies have shown plastic debris remaining after plastic ultrasonic use.<sup>48,49</sup> However, OHPs reported higher titanium curette usage which, while not exempt<sup>50,51</sup> from metal instruments causing surface scratching *in vitro*,<sup>48,50-53</sup> may do so at lower levels.<sup>49</sup> Plastic curettes were also popular amongst OHPs in this study, although they may

be too large<sup>54</sup> or ineffective at cleaning.<sup>46</sup> Antimicrobial use was similar in this study was similar to dental hygienists in the US,<sup>10</sup> however, while chlorhexidine was recommended in the recent American College of Prosthodontists' Clinical Practice Guidelines,<sup>7</sup> its adjunctive use in clinical trials has not resulted in better treatment outcomes.<sup>55-57</sup> Current evidence-based maintenance methods should be comprehensively covered in implantology education for all practitioners.

This study had limitations. The sample size in this study was much smaller than the respondents (n=1083) in a repeatedly mailed paper survey to the same dental hygienist, and dental and oral health therapist association member lists in 2013.<sup>27</sup> Web-based surveys of dentists have been shown to have lower response rates (11%) than mailed surveys (26%).<sup>58</sup> The relatively small sample size in this study was similar to previously published research of dental implant clinical and knowledge-seeking practices of dental hygienists in the US (n=213).<sup>10</sup> With a response rate of at least 5.4% from the professional associations' member lists, a representation rate of 3.5% of the registered Australian OHPs,<sup>22</sup> results from this study were similar to other recent web-based surveys of Australian dental practitioners.<sup>29,59,60</sup> Some OHP respondents may have been members of both associations impacting the response rate. The lack of access to the Australian national registry database, limits the ability to effectively access all OHPs and the interpretation of this study findings.

In general, the demographics of the surveyed group were similar to the most recently available dental labor force report in Australia in 2012.<sup>61</sup> Participants may have self-selected based on greater interest in implantology and self-reported answers may not be completely reflective of clinical practice. Full-time or part-time employment status of respondents was not asked and may affect their involvement in implant maintenance. Although a pilot test was not conducted, the survey instrument was intended to gather initial data on implant maintenance trends in the OHP population, and provides previously undocumented insight into the training, role and attitudes of Australian OHPs in implant maintenance, and may indicate future directions for research and investigation. The structure of dental service provision in Australia in terms of the scope of practice for OHPs and the structured interprofessional relationships within dentistry may be quite different from other countries and should be considered when interpreting and comparing these results. Variations and availability of implant CPD programs for Australian OHPs and the influence of collaboration with dentists/specialists in clinical practice should be further investigated. Practitioners should be encouraged to stay abreast of the current literature as evidence for implant home care and maintenance protocols continue to develop.

## Conclusion

Australian OHPs expect to be highly involved in dental implant maintenance care and reported providing peri-implant services generally in agreement with the current literature. Oral health practitioners demonstrated a greater focus on peri-implant disease prevention as compared with Australian dentists whose involvement was higher for patients with more severe peri-implant pathologies. Oral health practitioners should continue to focus on evidence-based practices in OHI and dental implant management protocols for peri-implant disease prevention. Interprofessional collaboration, dental implant focused continuing education programs and evolving practitioner preferences for implant maintenance protocols should continue to be investigated to enhance patient outcomes.

## Disclosure

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