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# Employer and graduate perceptions of the competency of University of Otago dental graduates

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## Abstract

**Background and objectives:** New Zealand dental graduates must achieve competency requirements set by the Dental Council of New Zealand. We investigated self-perceived clinical competence among recent dental graduates and the perceptions of their employers, with a focus on periodontology.

**Methods:** An electronic questionnaire-based survey method was used, based on the Qualtrics® survey platform. Separate questionnaires asked employers and graduates to rate their competencies. The questionnaires were anonymous and data for graduates and their employers were not matched for analysis. The sampling frame included 62 employers and 317 recent graduates who attended the annual New Zealand Dental Association Employment Fair on at least one occasion from 2015 to 2019. Data were analysed descriptively using the IBM Statistical Package for Social Sciences.

**Results:** Responses were received from 46 (15%) of recent dental graduates and 14 employers (23%). Employers rated the competence of recent graduates lower than did the graduates themselves. Employers rated graduates 2 years after graduation to be more competent in performing various dental procedures independently, compared to those with less than 2 years of working experience. None of the employers rated recent dental graduates to be competent in performing implant placement independently but all rated them to be competent in performing basic periodontal procedures such as scaling.

**Conclusion:** The information obtained will guide curriculum adjustments in order to facilitate better training for dental graduates in preparation for entering the workforce. These findings suggest the current University of Otago dental curriculum could be further improved in several disciplines (including periodontology) as suggested by recent dental graduates and their employers. Furthermore, increasing clinical exposure to a range of dental procedures would be beneficial in preparing dental graduates for practice in the workforce.

## Introduction

The Dental Council of New Zealand accredits and monitors dental training programmes in New Zealand, upon the advice of an accreditation committee (Dental Council of New Zealand, 2019). Upon graduating with a Bachelor of Dental Surgery (BDS) degree, dental

graduates are expected to be competent to manage most cases within the scope of practice of a general dental practitioner. The University of Otago is the sole New Zealand educational institution providing prescribed qualifications for general dental practice in New Zealand (Dental Council of New Zealand, 2018), and thus holds great responsibility in training and shaping the next generation of dentists in this country. Thus, it is important to evaluate and, where needed, develop the Bachelor of Dental Surgery curriculum at the University of Otago.

Despite the importance of the issue, little recent literature has evaluated the competence of new dental graduates and explored areas of weakness in the current BDS curriculum. A 2016 survey on self-confidence levels of final year dental students in New Zealand prior to BDS graduation found that high self-confidence was reported by a large majority for fundamental general dental treatments such as sealant restorations (96.6%), full mouth scaling (93.1%) and radiography (94.8%). Slightly fewer reported high self-confidence in periodontal diagnosis (79.3%) and root planing (62.1%), and very few had high confidence in the restoration of implants (10.5%) or in surgical extraction of teeth (12.1%) (Murray and Chandler 2016).

Varying confidence levels in general periodontal procedures have been reported among dental graduates from Hong Kong (Yiu et al., 2012). In a sample of 160 Hong Kong graduates some 96% felt confident in treating early periodontal disease, 95% were confident in performing oral hygiene instruction, diet analysis, preventive treatment and deep scaling and 93% felt capable of undertaking root planing. On the other hand, sizeable proportions claimed to be poorly prepared for more complex procedures such as periodontal surgery for pocket management (61%, n=99) and crown lengthening (78%, n=123).

A publication titled "Curriculum development in final year dentistry to enhance competency and professionalism for contemporary general dental practice" discussed revision of the Bachelor of Dental Surgery (BDS) final year curriculum at the University of Otago. The study reported positive feedback regarding course and teaching evaluations (Friedlander et al., 2019). Clinical practice, didactic teaching and teaching methodologies were discussed. An interactive lecture was the only teaching method listed for dental implantology, compared with other clinical themes that

also included case-based learning or hands-on teaching (Friedlander et al., 2019).

Others have investigated the competence and confidence of dental students/graduates in various dental disciplines (Yiu et al., 2012; Razak et al., 2008; Yusof et al., 2010). Two studies compared perceptions of dental graduates and their employers (Razak et al., 2008; Yusof et al., 2010). Published studies were not discipline-specific (with the exception of endodontics) and do not specifically consider competence in periodontic procedures. Furthermore, most current literature relied on the self-perception of dental graduates regarding their competence. Past evidence indicates that curriculum evaluation based on self-assessments may produce unreliable results (Razak et al., 2008). However, with more experience in the dental field and a more objective perspective, the employer of a recent dental graduate should be able to provide valuable insights regarding this matter.

The aims of this study were to investigate perceptions of clinical competence among both recent dental graduates and established clinicians who have employed recent graduates in general dental practice. The focus was on competence in periodontology. The objective of this study was to gather information to guide curriculum review and facilitate better training for dental graduates in preparation for entering the workforce.

## Methods

This study was approved by the Sir John Walsh Research Institute and received ethical review from the University of Otago Human Ethics Committee (reference number D20/081). Two electronic questionnaires with similar questions, one for recent graduates and one for those who have employed recent graduates (or otherwise engaged them as an independent contractor, hereafter referred to as employers), were formulated with the Qualtrics® platform (Qualtrics, Provo, UT, USA), version July 2020. Contact details of the recent dental graduates and employers who attended the NZDA Employment Fair from years 2015 to 2019 were obtained from the New Zealand Dental Association (NZDA). Those who were not practicing in New Zealand were excluded. In total, 62 employers and 317 recent graduates were identified. The questionnaires were circulated to participants in the form of electronic mails which contained information regarding the study and the link to fill out the questionnaires. Participation was voluntary and the responses were kept anonymous. Data were collected and grouped over a duration of 6 weeks, from 5th August 2020 to 18th September 2020. A reminder email was sent three weeks following the initial invitation.

Participants were asked to indicate the year of their primary dental degree, location (city) of current workplace and type of primary dental setting. Graduates were also asked to estimate the average hours they worked per week and frequency of performing a range of different dental procedures in clinical practice, using a 4-point-Likert scale. The options provided were “never”, “rarely (less than once a month)”, “occasionally (1-9 a month)” and “regularly (10+ monthly)”. These paired

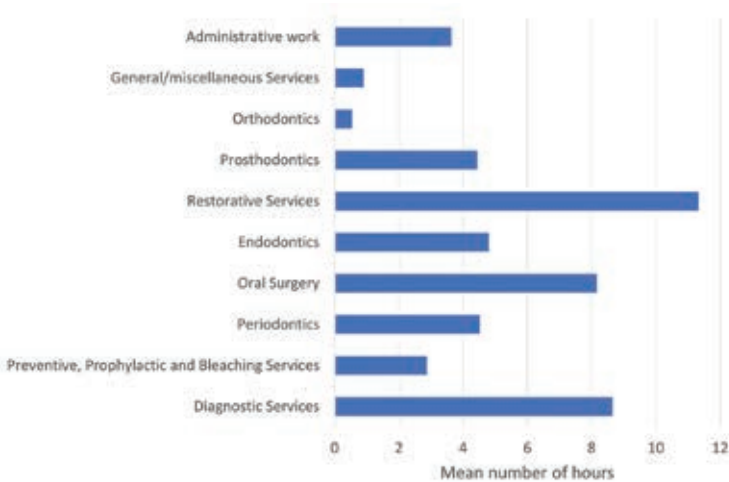
questionnaires consisted of questions which allowed recent graduates and their employers to rate or self-rate the competency of recent dental graduates in specific periodontal procedures as well as a range of other dental procedures. The level of competency was classified as “not competent”, “could do under supervision” and “competent to perform independently”. The employers were asked to choose up to five recent graduates they employed in order to rate their overall competence as a percentage, with 50% to be a passing level of competence; they were asked to state the year of graduation for each graduate. Open-ended questions allowed employers and recent graduates to give their feedback on how dental training could be improved at the University of Otago. The respondents were asked their opinion on the need for recent graduates to undergo further training in periodontal procedures and other procedures after graduation.

**Table 1.** Comparison of demographic characteristics of dental graduates and their employers (brackets contain column percentages unless indicated otherwise)

	Number of dental graduates (percentage)	Number of employers (percentage)
Year of graduation		
2019	9 (19.6)	-
2018	16 (34.8)	-
2017	7 (15.2)	-
2016	10 (21.7)	1 (7.1)
2015	4 (8.7)	1 (7.1)
2014	-	-
2013	-	1 (7.1)
Before 2008	-	11 (78.7)
Location of practice		
Northland	1 (2.2)	1 (7.1)
Auckland	6 (13.0)	3 (21.4)
Waikato	5 (10.9)	2 (14.4)
Bay of Plenty	3 (6.5)	-
Gisborne	1 (2.2)	-
Hawke's Bay	1 (2.2)	-
Taranaki	3 (6.5)	-
Manawatu-Wanganui	4 (8.7)	1 (7.1)
Wellington	11 (23.9)	2 (14.4)
Tasman	1 (2.2)	-
Nelson	-	-
Canterbury	3 (6.5)	1 (7.1)
Otago	3 (6.5)	-
Southland	1 (2.2)	1 (7.1)
Other	3 (6.5)	3 (21.4)
Type of practice		
Privately-owned practice	25 (54.3)	8 (57.2)
Institution (e.g. NZDF, DHB, Iwi)	12 (26.1)	5 (35.7)
Others	9 (19.6)	1 (7.1)
Total	46	14

Data were entered electronically and analysed using IBM Statistical Package for Social Sciences (SPSS) for Windows version 25.0 (IBM Corp, released 2017, Armonk, NY). As this project was designed to generate hypotheses around perceived competence and not designed for direct comparisons between the two groups that were surveyed, statistical analysis was limited to descriptive statistics.

**Results**



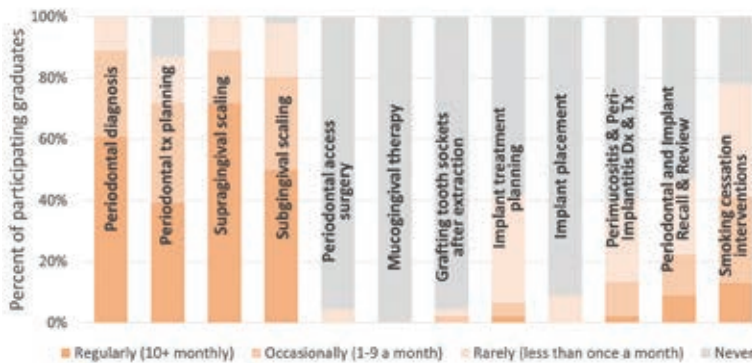
**Figure 1.** Time spent on a range of dental procedures in an average week among recent dental graduates (prior to COVID-19).

Responses were received from 46 recent dental graduates and 14 employers, representing 15% of recent dental graduates and 23% of employers. Participating graduates all completed their primary dental degree from years 2015 to 2019; a third of participants had graduated in 2018 (34.8%). Most employers (78.7%) had graduated prior to 2008 with their primary dental degree. More than half of the dental graduates that participated in the survey worked in a privately-owned practice (54.3%); the remainder worked in institutions (26.1%) or other practice settings (19.6%). Employers who took part in the study mostly worked in a privately-owned practice (57.2%) followed by institutions (35.7%) and other practices (7.1%).

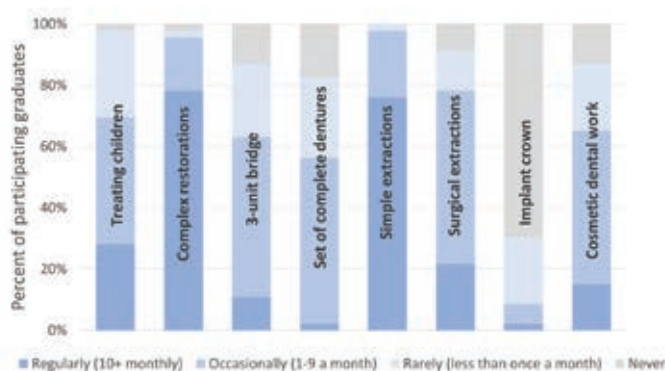
The mean number of hours spent by recent dental graduates on a range of dental procedures in an average week are shown in Figure 1. Recent dental graduates worked an average of 37.5 hours per week. In an average week, most of their time was spent on restorative services (11.5 hours) followed by diagnostic services (8.7 hours), oral surgery (8.2 hours), endodontics (4.8 hours), periodontics (4.5 hours), prosthodontics (4.5 hours), administrative work (3.7 hours) and preventive, prophylactic and bleaching services (3 hours). The least amount of time was spent on orthodontic procedures, with a mean of 0.5 hours per week.

Recent dental graduates were asked how frequently they performed specific periodontal procedures and other dental procedures in clinical practice. These findings are shown in Figures 2 and 3. More than 50% of recent graduates regularly carried out periodontal diagnosis, supragingival scaling and subgingival scaling. On the other hand, greater than 50% of recent graduates never performed implant treatment planning, diagnosis and treatment of peri-mucositis and peri-implantitis, or periodontal and implant recall and review. More than 95% of recent graduates never performed periodontal access flap surgery, mucogingival therapy, grafting of tooth sockets after extractions or implant placement. In regards to other dental procedures, greater than 75% of recent dental graduates regularly performed simple extractions and complex restorations, but 70% of recent dental graduates had never placed an implant crown.

All recent dental graduates perceived themselves competent in independently performing supragingival scaling, over 1 in 5 perceived themselves competent in periodontal diagnosis, treatment planning and in subgingival scaling, while fewer than 1 in 20 felt competent with more complex periodontal procedures such as periodontal access flap surgery, mucogingival therapy, grafting tooth sockets after extraction and implant placement. All recent dental graduates perceived themselves competent in independently



**Figure 2.** Frequency of periodontal procedures carried out by recent graduates.



**Figure 3.** Frequency of other (non-perio) procedures carried out by recent graduates.



**Table 2.** Ratings of competence of recent graduates in dental procedures (number report % of ratings; plain text = immediately after graduation, italics = 2 years after graduation)

	Employers			Graduate self-rating		
	Not competent	Competent under supervision	Competent for independent practice	Not competent	Competent under supervision	Competent for independent practice
<b>Periodontal procedures</b>						
Periodontal diagnosis	0 0	43 0	57 100	4 0	4 0	92 100
Periodontal treatment planning	8 0	71 17	21 83	0 0	24 10	76 90
Supragingival scaling	0 0	0 0	100 100	0 0	0 0	100 100
Subgingival scaling	0 0	31 8	69 92	0 0	4 19	96 81
Periodontal access surgery	85 42	15 50	0 8	56 66	44 29	0 5
Mucogingival therapy	92 50	8 50	0 0	64 81	36 14	0 5
Grafting tooth sockets after extraction	75 37	17 36	8 27	60 62	36 33	4 5
Implant treatment planning	77 25	23 67	0 8	40 24	44 62	16 14
Implant placement	100 54	0 46	0 0	80 76	16 24	4 0
Dx/Tx of Peri-mucositis/Peri-Implantitis	61 8	39 67	0 25	32 10	52 33	16 57
Periodontal and Implant Recall and Review	16 0	69 50	15 50	16 9	44 43	40 48
Smoking cessation interventions	0 0	46 33	54 67	0 5	20 33	80 62
<b>Other dental procedures</b>						
Treating children	9 0	64 23	27 77	4 0	12 10	84 90
Complex restorations	61 0	0 0	39 100	0 0	0 5	100 95
3-unit bridge	23 0	54 17	23 83	8 5	24 24	68 71
Set of complete dentures	23 8	77 42	0 50	4 9	24 24	72 67
Simple extractions	7 0	39 8	54 92	0 0	0 0	100 100
Surgical extractions	61 0	39 33	0 67	8 0	40 43	52 57
Implant crown	54 25	46 33	0 42	20 19	56 48	24 33
Cosmetic dental work	23 0	62 25	15 75	4 5	16 24	80 71

performing simple extractions. All but one felt competent with complex restorations and 9 in 10 felt competent in treating children. Around half reported that they could perform surgical extractions and place implant crowns under supervision. Over half perceived themselves to be independently competent in treating children, performing complex restorations, 3-unit bridges, set of complete dentures, surgical extractions and cosmetic dental work.

In general employers gave lower scores for competence of graduates than did the graduates themselves. However, all recent graduates and employers perceived graduates to be competent in performing supragingival scaling independently. Employers rated graduates who have been working for 2 years to be more competent in all procedures compared to those with less than 2 years' experience, except for mucogingival therapy and implant placement which showed little change over time. All graduates felt competent upon graduation in performing complex restorations and simple extractions independently, but employers rated this lower (39% and 54% respectively). A small percentage of dental graduates (5%) who had been working for 2 years felt they needed supervision for complex restorations but all of the employers thought that they were competent. More employers felt recent graduates were competent in grafting tooth sockets than graduates' self-reported perception. Employers felt that after 2 years, graduates were more competent to independently undertake a range of procedures than immediately after graduation (Table 2). All the employers thought that those who have

been working for 2 or more years became capable of independently performing periodontal access surgery, mucogingival therapy and implant placement.

Respondents were asked to provide recommendations to improve dental training at the University of Otago and the need for further training in periodontal procedures and other dental procedures after graduation. Most graduates thought that they needed to undergo further training in implant treatment planning and both simple and surgical extractions. Comments related this to a lack of clinical exposure in the dental school. Other areas needing more training included management of periodontal diseases, peri-implantitis and peri-mucositis, implant placement and long-term maintenance, trauma and infections, digital dentistry, orthodontics, fixed prosthodontics, paediatric dentistry and management of unfavorable occlusions. Graduates commented that more clinical exposure in the field of periodontology and implantology should be provided in the dental school. Some suggestions included "teaching techniques for subgingival scaling", "working more with periodontal postgraduates", "clinic sessions specifically dedicated to surgical periodontal procedures and implant treatment planning and restoration of implant crowns", and "provide lectures with case studies in implantology and periodontology".

Similarly, most employers thought that recent graduates needed to undergo further training in implant treatment planning and both simple and surgical extractions, as well as implant placement

and long-term maintenance, endodontics, fixed prosthodontics and paediatric dentistry. Other fields that required further training included cariology, removable prosthodontics and endodontics. Comments by employers on the curriculum included “new graduates tend to underestimate the level of periodontal disease. Additional training in subgingival calculus should be provided”, “increased clinical exposure to oral surgery and periodontal treatment”, “more clinical experience in partial dentures”, and “more clinic time to learn procedures”.

## Discussion

Our study suggests that employers perceive recent dental graduates to be less competent in most procedures compared to the self-rated competence of graduates. The target group was identified from participants of the NZDA Employment Fair from years 2015 to 2019. This provided a good representation of recent graduates and employers from different sectors and areas of the country. The distribution of recent graduates between private practice, the public sector and other settings matched the distribution of participating employers. All participating graduates obtained their primary dental degree from the University of Otago, consistent with our aim to guide curriculum adjustments at University of Otago dental school. There was no participation from employers in the Bay of Plenty, Gisborne, Hawke's Bay, Taranaki, Otago or Tasman.

Overall, employers rated graduates to be more competent 2 years after graduation in performing various dental procedures, compared to those with less than 2 years of working experience. All of the graduates and employers rated recent graduates as competent in performing supragingival scaling. None of the employers rated recent dental graduates as competent in performing implant placement.

This study has several weaknesses and strengths. A participation rate of 15% and 23% was achieved for recent graduates and employers respectively. This is low compared to a similar study done by Razak et al. with a participation rate of 64.6% amongst employees and 96.7% amongst employers. The circulation of questionnaires coincided with the outbreak of the COVID-19 pandemic, and results were collected over a short duration of 6 weeks. No additional methods of communication were used to boost the participation rate. A previous study found that online questionnaires had an 11% lower participation rate compared to other methods for reaching targeted groups (Fan and Yan, 2010). No incentives were provided to encourage participation in the survey. New Zealand graduates now working in other countries were excluded from the survey, thus an all-encompassing survey of perceived competence of University of Otago dental graduates could not be achieved.

New Zealand was put into a nationwide lockdown starting from 25th March 2020 due to the COVID-19 pandemic, which was lifted on 13 May 2020. Lockdown and alert level restrictions may have prevented or discouraged the public from attending dental clinics during this period of time. It is reasonable to conclude

that dentists had a reduced patient load this year, especially patients seeking non-urgent dental care such as mucogingival therapy and implant placement. Recent graduates who graduated in 2019 might not yet have carried out sufficient elective procedures in practice for their competence to be fairly judged. However, an important strength of this study was that the perceptions of two different groups of participants were contrasted. All of the employers that participated in the survey had obtained their primary dental degree before 2016, thus could be expected to have greater experience and better understanding of the dental field compared to recent graduates. Participation of employers offers useful insight into the expectations of a major stakeholder group regarding dental education and competence upon graduation. It is possible that recent graduates are more accustomed to the standards of competence expected in the dental school and fail to identify the difference in expectations of competence between a learning and a work environment. However, a similar study by the University of Malaya also raised the issue of skewed results that might result if an employer had encountered a less-competent graduate (Razak et al., 2008). Our questionnaire included a section where employers rated competence of up to five individual recent graduates. This allowed us to analyse perceived competence according to years after graduation.

According to a survey done by the University of the West Indies, the suggestions and insights of alumni are important as they have better understanding of the curriculum and the strengths and weaknesses of the institution where they trained, and can provide information and suggestions to improve the system (Rafeek et al., 2004). The structure of our questionnaire was designed to include most periodontal procedures in an attempt to standardize perspectives on the scope and extent of competence that should be displayed by a general dental practitioner.

We found a fairly even distribution of work hours of recent graduates for most dental tasks (Figure 1), with a similar number of hours spent on endodontics, prosthodontics and periodontics. Figures 2 and 3 break down the data into procedures of varying levels of complexity and provide a clear view of the frequency distribution of these procedures by recent graduates prior to the COVID-19 outbreak. Surgical periodontal procedures and implant placement were never or seldom carried out by recent graduates. There may be several explanations for this. These procedures were only taught through interactive lectures without any clinical exposure in University of Otago, which would not prepare dental graduates to perform these procedures with confidence immediately after graduation (Friedlander et al., 2019). It is also possible that most recent graduates or even employers perceive these procedures to be at a specialist level and do not expect recent graduates to carry out these procedures as a general dental practitioner. Furthermore, these complex periodontal procedures are only indicated for patients with severe periodontal problems, and are less frequently encountered than more routine periodontal

tasks. Other dental disciplines such as removable and fixed prosthodontic dental work (implant crowns, set of complete dentures, 3-unit-bridges) are carried out less frequently by dental graduates compared to restorations and extractions. The frequency of procedures performed was in accordance with self-perceived competence. While most graduates felt competent to perform periodontal diagnosis and supra-gingival scaling without supervision, low self-perceived competence was reported for implant-related treatments, periodontal surgery and tooth socket grafting. Similar patterns were observed in data collected from their employers, but generally with a lower perception of competence. Employers rated recent dental graduates as less competent than their self-perception. There was a match between employers and graduates for competence for implant placement (0%) and supragingival scaling (100%). All employers felt that dental graduates became significantly more competent after 2 years in the workforce. Employer ratings of competency changed according to the year of graduation; a steep increase of perceived competence occurred from year 2016 to year 2017 but decreased from year 2018 to year 2019; this was consistent across all responding employers. This finding was surprising given that the graduating classes of year 2015 and year 2016 had more work experience compared to the rest of the graduates. Two dental graduates from graduation batch 2015 and 2016 respectively were given a competence rating of 40%, which is below the passing level of competence set at 50%. Assuming equivalence amongst employers in their assessment criteria for graduates, this implies that the adjustments to the BDS 5<sup>th</sup> year curriculum at the University of Otago in 2017 resulted in higher competence and better clinical performance (Friedlander et al., 2019).

Graduates rated themselves more competent than did the employers. This difference in perception is consistent with the survey by the University of Malaya in 2008 and may be due to employers' higher expectations in quality of work (Razak et al., 2008). Most existing literature rate and measure competence of oral health providers through self-perception; the reliability of data collected from surveys with this type of design has been questioned (Razak et al., 2008). The difference in perception of competence between employers and recent graduates within 2 years of graduation from our research confirmed the previous hypothesis of poor reliability of self-perceived competence of a recent graduate.

Periodontology has received less emphasis in educational research compared to endodontics. Most surveys on the competence of new graduates and dental students in New Zealand lacked a focus on either periodontology or implantology, and comparison of data can only be done with a general rating of competence in the discipline rather than individual procedures. As current literature seldom discusses different procedures in periodontology independently, the scope of practice is often assumed to only include subgingival or supragingival scaling, and competence in other complex procedures are not taken into consideration. This would explain the higher perception

of competence reported in New Zealand (Murray and Chandler 2016) and overseas studies (Razak et al., 2008). Most participants could be under the impression that periodontal management at an undergraduate level only involves diagnosis, supragingival and subgingival scaling, potentially resulting in the higher self-perceived competence in most studies.

The survey on self-reported confidence levels of final year dental students in New Zealand in 2016 (Murray and Chandler 2016) reported that they felt low confidence with restoration of implants (10.5%) and surgical extractions (12.1%). The periodontal procedures that were included in their survey were periodontal diagnosis (79.3%), root planing (62.1%) and full mouth scaling (93.1%). Those who graduated in 2016 would have had more than 2 years of working experience in July 2020 when our questionnaire was circulated. Self-reported competence from this group of participants was higher, with 81% confidence in subgingival scaling, and 100% confidence in supragingival scaling and periodontal diagnosis. The high self-perceived competence is supported by employers, who rated them with similar or higher competence.

The study conducted by the University of Hong Kong in 2012 reported that 73% of respondents felt well prepared in periodontology, but there was a difference in confidence between surgical procedures such as crown lengthening or periodontal surgery compared to preventive procedures such as deep scaling or root planing (Yiu et al., 2012). Our survey found similar results for self-perceived competence for supragingival scaling (100%) and for subgingival scaling (89%). However, we found low self-perceived competence (2%) for periodontal access surgery or mucogingival therapy (2%), which was markedly less than that reported for similar procedures by Yiu et al. (2012).

Participants from our survey were asked to comment on areas in periodontology and other disciplines that require further training to achieve acceptable competence. Most responses focused on oral surgery, with frequent mentions of insufficient experience provided in simple and surgical extractions during clinical training in University of Otago. By comparison, we received fewer comments on periodontology from employers and recent graduates alike, which may be an indication of a lower interest in this discipline compared to other dental disciplines. There were a number of comments on implant assessment, planning, placement and maintenance, with suggestions to include other teaching methods in the curriculum to achieve a better learning outcome. Suggestions regarding curriculum improvement included more clinical exposure of complex procedures such as surgical periodontal procedures, implant treatment planning and restoration of implant crowns; undergraduates seldom experience these procedures in the dental school clinics. In addition, employers commented on the need for further training of recent graduates in basic cariology and pediatric dentistry. According to employers, new graduates tend to underestimate the level of periodontal disease and the spread of caries. Most comments proposed an

increase in clinical exposure to implantology, periodontal treatment and oral surgery.

### Conclusion

This study examined the perceived competence of University of Otago dental graduates from the Class of 2015 to 2019 and their employers' perceptions in performing specific periodontal procedures and other dental procedures. Employers rated new graduates as less competent than their self-perceived rating, however employers also reported that graduates achieved competence 2 years after graduation. The findings of this study suggest that in addition to adjustments to be made in the current curriculum for several disciplines of dentistry, greater clinical exposure should be provided, especially in implantology, periodontal treatment and oral surgery, to prepare dental graduates for practice in the workforce. Our findings also suggested that new graduates need opportunities for clinical hands-on training to expand their skills after they graduate and enter the workforce.

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