

# Oral hygienists' self-perceived competence on completion of a blended learning course in local anaesthesia at a South African university.



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## SUMMARY

### Introduction

The expanding scope of practice of oral hygienists require universities to offer courses that would enhance their skills. Aim and objectives: To determine the self-perceived competence of oral hygienists to deliver local anaesthesia (LA) after completion of a blended-learning course.

### Design

This was a descriptive, prospective study.

### Methods

Data were collected at two stages, using self-administered questionnaires 1) immediately after the face-to-face component of the course and 2) after the final assessment when participants had had the opportunity to deliver LA in their practices. Results and conclusions: All participants (n=25) were female, aged 26-55 years (mean=44 years). The most positive aspects of the course were the engagement with lecturers (90%), accessibility of notes (90%) and video clips (96%). At the end of the face-to-face period, participants (n=25) reported as having the knowledge (100%), skill (76%) and confidence (84%) to administer LA. Results from the second questionnaire (n=19) however, indicated lower scores for

## ACRONYMS:

HPCSA : Health Professions Council of South Africa.

LA : Local Anaesthesia.

the same parameters. This could be explained by limited opportunity to practise LA prior to completion of the second questionnaire. The self-perceived competence of the participants and the practice dynamics appear to be determining factors as to whether LA is employed in their working environments.

## INTRODUCTION

In South Africa, the course leading to qualification in the profession of oral hygiene has evolved from a two year diploma, initiated in 1974, to a three year Bachelor's Degree in Oral Health. Concomitantly, the clinical scope of practice was expanded in 2000<sup>1</sup> and 2013.<sup>2</sup> Oral hygienists who wish to practise to the full in these revised scopes are required to attend the relevant courses at accredited universities. On successful completion, their registration is updated with the regulatory body, the Health Professions Council of South Africa (HPCSA), and they may then practise accordingly. In addition to these expanded scopes, independent private practice for oral hygienists was introduced in 2012.<sup>3</sup> This allows for the transition of the oral hygienist from the current legislation of supervised practice, to the independent private practitioner. One requirement for independent private practice is the completion of the 2000 Scope of Practice which includes the administration of local anaesthesia.<sup>4</sup> These changes are intended to capacitate the profession with greater autonomy in its role within the broader dental field.

The development of the profession of oral hygiene in South Africa over the past 20 years reflects the maturation of the profession globally.<sup>5-7</sup> Continuing education, through short courses, is a feature of all professions in the health sciences.<sup>8</sup> The purpose is for practitioners to keep abreast

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of progress in their fields, and ultimately to provide quality care to patients.<sup>5, 9-12.</sup>

These practitioners re-enter higher education as adult learners. They may have different motivations for returning, and may be at different levels of preparedness for academic study. Adult learners typically require direct connections between their studies and goals.<sup>13</sup> However, they are capable of persistent application and independent learning if bolstered by the possibility that their anxiety about success may be addressed by their instructors.<sup>13</sup> This challenges universities to use methodologies and technologies to meet the needs of adult learners as well as to satisfy the objectives of the extended education.<sup>14</sup>

Blended-learning, as a teaching and learning methodology, encompasses traditional face-to-face and e-learning by using the advantages of both methods.<sup>15</sup> Traditional learning is considered vital in building a sense of community<sup>16</sup> and e-learning has the potential to transcend time and space boundaries and to improve convenience and effectiveness for individual and collaborative learning.<sup>17</sup> Interactive education, in addition, can enhance participant activity and provide an opportunity to practise skills which could improve professional practice to a greater extent than would didactic sessions.<sup>18,19</sup> In supporting adult learning, Mattheos et al. (2010)<sup>14</sup> suggest that “interactivity”, “flexibility”, “continuity” and “relevance to learners’ practice” are major characteristics of a successful continuing education programme.

Ultimately the learning programme should ensure that the practitioner is competent with respect to the knowledge, skills, attitudes and values that would enable him/her to improve health outcomes for the patient.<sup>20</sup> In assessing competence, objective assessment tools are regarded as the gold standard. Self-perceived competence, however, does provide an indication of the levels of skill and knowledge, together with an assessment of the motivation to maintain and improve those skills.<sup>21, 6</sup> For this study, self-perceived competence encompasses the dimensions of knowledge of, attitudes to, and skills to perform local anaesthesia.<sup>6, 21</sup>

Including local anaesthesia in the scope of practice of oral hygienists aligns South Africa with international trends.<sup>5,6,10,22</sup> The administration of local anaesthetic by oral hygienists was found to be associated with factors such as positive outcomes for their practice, as well as having a high value placed on the procedure<sup>5</sup>, together with enhanced respect.<sup>5,10,23</sup> Hygienists showed confidence in their perceived competence to perform the procedure,<sup>6</sup> and this contributed to the manner of delegating tasks in their practice environments.<sup>6</sup>

In South Africa, short continuing education courses have been offered on the 2000 Scope of Practice<sup>1</sup> since 2001. There is, however, no published literature on the perceived competency of oral hygienists after completion of these continuing education courses.

The aim of this study, therefore, was to determine the self-perceived competence of oral hygienists in local anaesthesia after completion of a blended-learning course. The objectives were to determine participants’ profile, their concerns prior to starting the course, their experiences of

the learning programme, their self-perceived competence to administer local anaesthetic, and the use of local anaesthesia in their practice environments. The results may be used to inform any review of the blended-learning course in local anaesthesia.

## MATERIALS AND METHOD

The study was conducted at the Faculty of Dentistry, University of the Western Cape (UWC) between July and September 2016. The study population was a single cohort of oral hygienists attending a continuous education course on the 2000 Scope of Practice<sup>1</sup>. A blended-learning approach was used. The course structure consisted of: pre-course reading; a one week face-to-face component, and assessments. The local anaesthesia component was embedded within this course (see Table 1).

**Table 1:** LA course structure

1. Preparation for the course
<ul style="list-style-type: none"> <li>• Course material to revise basic anatomy and an online self-assessment was loaded onto the UWC e-learning platform (iKamva) two weeks prior to the face-to-face component.</li> <li>• PowerPoint lectures, animated audio-visual files and links to other audio-visual material related to injection techniques were loaded to the iKamva site prior to the formal lectures.</li> </ul>
2. Face-to-face component of the course
<ul style="list-style-type: none"> <li>• Lectures, audio-visual presentations with explanations of techniques; practice on simulators, and demonstration on a simulated patient in a laboratory setting (8 hours); clinical application (11 hours).</li> <li>• Formative assessments included (immediate feedback was provided at the face-to-face sessions):               <ul style="list-style-type: none"> <li>◦ A test on ‘Emergency Medicine’ prior to being allowed to do a number of LA procedures on patients in the oral surgery clinic,</li> <li>◦ A clinical assessment on a patient on the last day of the face-to-face period. Participants who were unsuccessful attended an intervention and retook the assessment,</li> <li>◦ An online theoretical assessment within one week of completing the face-to-face period.</li> </ul> </li> </ul>
3. Course completion
<ul style="list-style-type: none"> <li>• After successfully completing the face-to-face component, participants were provided with a logbook to record LA procedures performed within their practice environment.</li> <li>• A summative online assessment was done six weeks after the face-to-face period, after which successful participants could register their expanded functions with the HPCSA.</li> </ul>

This was a descriptive, prospective study. The sample comprised participants registered for the course (n=25). Two questionnaires were used, one to evaluate perceptions of the process (Questionnaire 1), and the second, perceptions of the outcome (Questionnaire 2).

The questionnaires consisted of open-ended and closed questions. The first questionnaire was self-administered and was completed on the last day of the face-to-face component. Information related to participant demographics; their views on local anaesthesia being included in the scope of practice; their concerns prior to starting the course and their experiences of the learning programme. Their self-perceived competence to administer local anaesthetic was sought. Participants were asked to respond to statements regarding their

experiences of teaching and learning on a three point Likert type data of 'yes', 'no' and 'to some extent'. Their perceived competence was rated on a five point Likert type data ranging from 'definitely', 'yes', 'not sure', 'no', and 'definitely not'. Open-ended questions allowed participants to elaborate on their experiences and perceptions. Completed questionnaires were deposited at a central point to ensure confidentiality and anonymity.

The second questionnaire using Google Forms was made available to participants two months after completion of the face-to-face component. At this time, participants had successfully completed the summative assessment and had had the opportunity to administer local anaesthetics in their practices. Questions enquired about the administering of local anaesthesia in their work environments, their perceived competence in the techniques, and their perception of the value of local anaesthesia in their practice environments. The same five point Likert type data was used in the closed questions.

Ethics approval was obtained (Humanities and Social Sciences Research Ethics Committee: reg. HS/16/8/14). At the introduction of the local anaesthesia component of the course, participants were informed of the related research project. They were informed of the purpose of the study and that their feedback would inform the review of the module. They were informed that participation was optional, and that their responses (should they participate) would be anonymous and confidential. They were also informed that they could withdraw from the study at any point, without being disadvantaged.

The First Questionnaire was completed on the last day of the local anaesthesia contact session. Study information and consent letters were attached to the questionnaires and distributed to the oral hygienists. Those participating could complete these questionnaires in their own time and deposit the completed documents and consent forms in depositories placed in designated areas. In the Second Questionnaire, Google Forms was set up with an information letter and a tick box for consent. Participants who chose to participate were directed to the questionnaire which was also made available by email (with a return email address of an independent recipient to ensure anonymity).

Data were entered and analysed using the STATA/IC<sup>12</sup>. Open-ended questions were themed and coded. Frequency distributions were generated. The Spearman's correlation coefficient was used to determine the strength of the relationship between variables. Statistical significance was set at  $p < 0.05$ .

## RESULTS

### Demographics

The results below relate to the process indicators (Questionnaire 1)

Participant profile and concerns prior to the face-to-face period.

### Participant profile

The response rate was 100%. All participants were female, aged between 26 and 55 years (mean=44; SD 6.9). English was the first language of 16.7%, second language

of 70.8% and third language of 12.5% of participants. Twenty-four participants had a Diploma in Oral Health obtained between 1980 and 2002, while one participant had a Degree in Oral Health. Areas of employment included general practice (68%), specialist practice (16%), public health sector (8%) and 'other' (4%). Experience in Information Technology included the use of the internet (96%), email (80%) and Facebook (37%).

## Results of Questionnaire 1

### Participant concerns

Concerns specific to the administering of local anaesthetic ranged from: inability to identify anatomical landmarks, mastering the skill of intra-oral injections, and injuring the patient. Concerns around learning were the ability to cope with the academic aspect of the module, anxiety about studying after a long break, and coping with the English medium. Concerns expressed as 'fear', 'anxiety' and being 'overwhelmed' were noted in the following statements. "Scared of injecting a person in the wrong place, causing permanent damage"; "Nervous whether I would cope with the anatomy, will I be able to admin (sic) LA". Participants also reported that patients may be sceptical of the ability of the oral hygienist to administer local anaesthetic; that time would be required to allow development of confidence to do the procedure; and that the dentist may not be available to render the necessary support.

### Participant engagement with and experience of the learning programme

A large number of participants (>90%) found the pre-course reading, feedback sessions and video clips useful in developing competence. Participants elaborated on positive experiences (Table 2) such as lecturer availability, expertise, and interest in teaching students, noted by comments such as, "I feel very confident administering local anaesthesia", "The lecturers put it across beautifully and they were very accommodating and patient with all the students". Negative experiences ("no", "to some extent" responses in Table 2) included insufficient time and opportunity to practise the skill, and a lack of integrating theory with practice. These were noted by comments such as "I am feeling more confident, but think more clinical practice is necessary".

In response to the question on how their concerns prior to the commencement of the course were addressed, three themes emerged. These were:

1. The organisation and planning;
2. The teaching staff; and
3. The teaching format.

Participants elaborated on the above with reference to the availability of study material; having excellent, knowledgeable and patient teachers; and a format of explanations followed by demonstrations. Their views were highlighted by the following comments: "Tell-show-do method was very effective in helping me understand and implement practices"; "adequate information was given, techniques explained very well and my fear dispelled"; "With all the lectures it all made sense"; "The practical made sense and helped with theory".

### Participants' views on the teaching methods

The most useful methods were the face-to-face teaching in the classroom and in the clinical environment; the

**Table 2:** Experiences of the learning programme

Statements on teaching and learning of LA	Yes %	No %	To some extent %
<b>Opinions of the pre-course online assessment (n=25)</b>			
1. I did the online self-assessment prior to the course	76	76	4
2. The online self-assessment was useful to prepare for the LA course	75	12.5	12.5
<b>Participant engagement with resource material (n=25)</b>			
3. I read the material placed on iKamva prior to the course	76	4	20
4. Reading the material prior to the course was useful in preparing for LA	96	0	4
5. The PowerPoint lectures during the face-to-face period were useful in making me understand LA	88		12
6. I went through the lecture material provided after the lectures	84	0	16
7. The video clips were useful to my understanding of the application/content of LA	96	4	0
8. The video clips were useful to my understanding of the administering of LA	88	12	0
9. Watching the video clips helped develop my confidence to administer LA	84	0	16
<b>Participant engagement with lecturers</b>			
10. Lecturers' response to questions clarified aspects that I was not clear on (n=24)	92		8
11. Feedback sessions were useful in developing skills of LA (n=21)	90.5	4.8	4.8
12. Feedback sessions were useful in developing confidence to administer LA (n=20)	90	5	5

sequencing of lectures followed by practical application in the clinics; the use of video clips and; access to video clips in their own time. The different teaching and learning formats reinforced and consolidated important concepts pertaining to local anaesthesia. Lecturer interest in student learning, excellence in presentation and patience was emphasized with comments, such as, "Practical and videos together with understanding the anatomy (sic)"; "Teaching in classes made it personal and could elaborate on points that we did not understand"; "very nice teachers"; "made the global picture to a more understanding level, great".

The least useful teaching method was the simulated local anaesthesia model, consisting of battery operated jaws with 11 anaesthetic contact sensor points. Being orientated to injection techniques on a colleague, compared with practicing on the simulated local anaesthesia model, was reported to be more useful in developing skills and confidence to inject a patient.

#### Views on the inclusion of local anaesthesia within their scope of practice

All participants responded positively to the inclusion of local anaesthesia within the scope of practice of the profession. They noted an increased autonomy for the profession, greater independence in patient management, the provision of more comprehensive patient care,

improved patient comfort, and an improved efficiency in patient flow as noted by the following comments: "Expand our boundaries and make it easier to apply our knowledge and to be of great help in the practice"; "It is fantastic broadening our scope in these areas"; "Will only empower us".

#### Self-perceived competence to administer local anaesthesia

At the time that the questionnaire was administered, all participants had successfully completed the formative aspect of the assessment. The scales of 'no' and 'definitely not' were excluded as there were no reported values for these scales. All (100%) responded to having the knowledge and felt it important to have the right and competence to administer local anaesthesia (Table 3).

Perceived knowledge, competence and skills in local anaesthesia (Table 3: statements <sup>1-3</sup>) were used as a measure for self-perceived competence. The composite of self-perceived competence showed a very strong correlation between local anaesthesia clinical skills ( $r_s=0.919$ ,  $p=0.0005$ ) and local anaesthesia confidence ( $r_s=0.911$ ,  $p=0.0005$ ); and a "strong" correlation between local anaesthesia skills and LA knowledge ( $r_s=0.768$ ,  $p=0.0005$ ). A "very weak" ( $r_s=0.00-0.19$ ) relationship between most of the experiences of participants (Statements <sup>1-9</sup>) of the learning programme and their perceived competence, with the

**Table 3:** Self-perceived competence to administer local anaesthesia immediately after the face-to-face component (n=25).

Statement	Definitely	Yes	Not sure
1. I have the confidence to administer LA in my clinical environment	20%	64%	64%
2. I have the theoretical knowledge to administer of LA in my clinical environment	32%	68%	0%
3. I have the clinical skills to administer LA in my clinical environment	24%	52%	24%
4. As an oral hygienist I feel it is important to administer LA in my clinical environment	44%	56%	0%

exception of 'engagement with lecturers' (Statements<sup>10,11,12</sup>) which was found to be "weak" (rs=0.20-0.39). Participants' self-confidence as a component of their self-perceived competence was "moderately" (rs=0.40-0.59) associated with 'engagement with lecturers'.

## QUESTIONNAIRE 2

### Practices and perceptions of local anaesthesia

Administering of local anaesthesia in practice environment (n=19).

The response rate to the second questionnaire was 76% (n=19). Eighty-four percent (84%; n=16) reported that they administered local anaesthetic in their work environment. Participants reported that they used local anaesthesia for deep scaling and root planing (75%), restorative procedures (25%), management of tooth sensitivity (19%), removal of splints (6%) and orthodontic debanding (6%). The most common injection technique used was mandibular infiltration (n=16) followed by maxillary infiltration (n=13) and the mandibular block (n=11). None of the participants reported unsuccessful outcomes in the administration of local anaesthetic.

### Perceived competence to administer local anaesthesia

\*Responses of 'yes' and 'definitely' were combined.

Participants' perceptions of their competence were lower after having had the opportunity to work in practice after the face-to-face period. However, the data was not matched for the two questionnaires and therefore statistical analysis was not performed. The view that administering of local anaesthetic added value to their work environment and that there was a need for oral hygienists to administer it, was not shared by all participants.

### Barriers and facilitating factors to performing local anaesthesia in the work environment

#### Barriers

Participants who perceived that they lacked experience and the practical skills to perform local anaesthesia, and who perceived a lack of confidence of their role in their practice, reported to administer local anaesthetic to a limited extent or not at all. They elaborated that having the theoretical knowledge did not translate to their ability to perform local anaesthesia in practice and that confidence and competence improved with time expressed by comments such as "more practical sessions would have built this"; "Neither myself, nor my employer feel I am sufficiently experienced to start doing these procedures in practice"; "Orthodontist not open to me infiltrating".

#### Facilitating factors

Participants who felt supported and were clear about their role in their work environment, appear to do the procedure even when they did not feel fully confident, highlighted in the following comments "Patients depend on you and this builds more trust"; "The need to ease discomfort and

sensitivity is very important so that I can offer a thorough treatment to patients"; "Freedom to administer LA with confidence without having to interrupt the dentist"; "I am very nervous when I do it, but I try my best"; "I'm confident as OH because I put a lot of value in our practice"; "Not dependent on waiting for the dentist".

## DISCUSSION

### Profile of participants

The participant profile affirms an interest by this group of oral hygienists, as one of the health services professions, to maintain and improve their competence over "lengthy careers and diverse practice areas"<sup>24</sup> Ryan (2003),<sup>8</sup> reported that the top motivators for engaging in continuing education by health services professionals were: developing professional knowledge, updating existing qualifications, increasing the status of the profession and demonstrating professional competence. Participants viewed the inclusion of local anaesthesia in the scope of the profession as "empowering, expanding boundaries and helping the practice" shows that attendance at the course is also seen as part of the development of their profession rather than a narrow focus on procedures. There may be other factors, such as the multiple life roles that they occupy as women,<sup>13</sup> increased remuneration, and the fact that completion of the 2000 Expanded Scope<sup>1</sup> is a prerequisite for independent private practice.

### Experience of the learning programme

Participants' experience of the blended-learning programme, generally, was positive. Their access to resources and skills to engage in this approach may have been contributed to this. These factors should be taken into account by course developers when using a blended-learning approach. Participants' pre-course concerns, to a large extent, were addressed through the quality of organisational, teaching, and teacher inputs, highlighting the views by Mattheos et al. (2010)<sup>14</sup> on the characteristics of a successful continuous education course. Personal, relational and organisational factors to support good clinical learning experiences were also reported by nursing students<sup>25</sup>.

Although simulators have numerous benefits, ranging from use on demand; prevention of unethical or unnecessary practice on patients and honing of skills in a risk free environment,<sup>26</sup> the participants of this course found the 'conduction anaesthesia model' to be of limited value. This could possibly be because the training model does not resemble the human mouth accurately enough or that the instruction in the use of the simulator was not structured within a framework as suggested by Kneebone (2005).<sup>27</sup> The interactive nature and hands-on approach used in this course appeared to be appreciated by this cohort of adult learners. This may indicate that these adult learners, who re-entered higher education many years

**Table 4:** Perceived competence to administer local anaesthetic on completion of the course

Statement	Perceptions after the face-to-face period (n=25)*	Perceptions on completion of the LA course (n=19)*
1. I have the confidence to administer LA in my clinical environment	84%	52.6
2. I have the theoretical knowledge to administer of LA in my clinical environment	100%	84.2
3. I have the clinical skills to administer LA in my clinical environment	76%	63.2
4. As an oral hygienist I feel it is important to administer LA in my clinical environment	100%	84.2
5. Administering LA in my practice has added value to the practice	-	78.4

after acquiring their qualifications, may view technology less favourably.<sup>27</sup>

The views of participants in this course highlighted the advantages of using a blended-learning approach combined with an interactive clinical component. Participants stressed that they were welcomed into the dental environment and that they had access to course material in their own time.

#### Perceived competence of participants

Participants responded positively to the availability of course material, yet there was a weak relationship between their self-perceived competence on completion of the face-to-face component and their engagement with material. The relationship between feedback and engagement with lecturers is moderate to weak. These results suggest that although participants may find the study programme positive, their self-perceived competence is influenced primarily by their engagement with lecturers through feedback and clarification of questions. Formative assessment with immediate feedback was done at different stages of the learning programme. The value of feedback in ensuring credibility and effectiveness of the learning process was also highlighted by Mattheos et al. (2010).<sup>14</sup>

Participants' self-perceived competence was "very strongly" correlated with their self-perceived confidence and clinical skills and "strongly" correlated with their self-perceived knowledge at the end of the face-to-face component. Although all participants had successfully completed the formative assessment at that time, and were considered competent to perform the procedure under supervision of the dentist, not all participants felt that they were competent. All participants indicated that they had the knowledge to perform local anaesthesia, but approximately one quarter did not perceive that they had the skill to do so (Table 3). This was emphasised in the open-ended questions by the comments of participants regarding the requirement of more clinical time, and, that knowledge does not necessarily translate to skills. An assumption of the learning programme was that, prior to their doing the summative assessment, participants would have the opportunity to perform local anaesthesia in their practice environments under supervision of the dentist, and in so doing, improve their clinical skills. The results show that such a process may have to be formalised in further continuing education courses offered by the university.

**The use of local anaesthesia in their practice environments.** The views of the participants that oral hygienists should be able to perform local anaesthesia are consistent with

those expressed in the international literature.<sup>5</sup> In rating their competence at the end of the course, most of the group of oral hygienists (84%) considered they had the knowledge to perform local anaesthesia, yet only 60% reported as being confident they had the skill. These perceptions may indicate that it takes time to develop mastery of this clinical technique.<sup>27</sup> A concern for the professional development of these participants is that self-perceived competence is an indication of the motivation to maintain and improve skills,<sup>6, 21</sup>

Although the literature confirms it has been shown that oral hygienists can perform this procedure safely,<sup>5,10,22</sup> concerns expressed by participants and by their dentists as employers regarding patient safety are valid. Those universities providing further education for Oral Hygienists may need to consider the option of engaging the employer dentist in the courses.

The frequency of local anaesthetic being administered by oral hygienists varied by practice type, with local anaesthesia being more frequently provided in specialist periodontal practices than in general practices.<sup>5,10</sup> Oral hygienists who completed a continuing education course reported that more than 90% of dentists delegated this procedure to them. Eighty-eight percent (88%) were administering local anaesthetic within one month of completion of the course and used the procedure primarily for root planing and debridement, and where tooth sensitivity was anticipated 10 as is also reported in this study. Although the literature indicates that dental hygienists have been shown to perform this procedure safely,<sup>5,10,22</sup> concerns regarding patient safety were expressed by this cohort and their employers. This may have contributed negatively to their perceived competence,<sup>10</sup> as also reported in this study.

More than half of the oral hygienists who completed a continuing education course found; local anaesthesia to be very valuable to their practice; that employers and patients appreciated their skill, that more comfortable treatment could be provided; and that their practices ran more efficiently.<sup>10</sup> This study indicated that providing the participant the confidence and capacity to perform local anaesthesia in the practices setting, independent of the dentist, increased their work satisfaction, built patient trust, contributed to reduction of patient discomfort, and allowed treatment to be completed without the need to disturb the dentist.

#### Suggestions for the review of this course.

Course developers should consider several concerns prior to delivery of the course. Requests by the oral

hygienists for more clinical exposure during the face-to-face component and the dynamics within their own work environments should be taken into account in any review of this course. As continuing education is most often offered as short courses, it may not be possible to increase the practical time significantly during the face-to-face period. It is well documented that all learning cannot take place in the formal didactic environment, and course developers should investigate practical ways in which learning can be extended into the work environment by engaging employers.<sup>28</sup> The necessary conditions are already prescribed by the HPCSA (Board for Dental Assisting, Dental Therapy and Oral Hygiene). Such collaboration may address concerns of professional boundaries as well as to focus on how patient outcomes can be improved. This notion creates an added role for the university in advocating a dental team approach in practice, with a focus on professional development and improved patient outcomes.

A limitation of the course was that the process of facilitating the entry of participants into the work environment was not done. Continuing education involving clinical skills could potentially influence the workings of a dental practice.

#### Limitation of the study

The results should be viewed against the following: the size of the sample; the fact that the process and outcome questionnaires were not paired and thus could not be compared; and, the low response rate to the second questionnaire. The results of this study cannot be generalised to continuing education courses on expanded functions for oral hygienists or for continuing education courses in general.

## CONCLUSION

The results clearly show that the blended-learning approach was successful in developing participants' knowledge and skill to administer local anaesthesia. In spite of successful completion of the course, their self-perceived competence and work environment dynamics were determining factors to whether or not they would actually perform the procedure in practice. These factors should be taken into account when developing continuing education courses. Course developers should consider means of mediating with employers to enable the integration of oral hygienists with expanded functions into the practice environment. If not, the goals of professional development and improved patient care may not be met.

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