

## ORIGINAL ARTICLE

# COVID-19 pandemic: Students' perspectives on dental geriatric care and education

Mario Brondani DDS, MSc, MPH, PhD | Leeann Donnelly BSc, MSc, PhD

Faculty of Dentistry, University of British Columbia, Vancouver, British Columbia, Canada

**Correspondence**

Mario Brondani, DDS, MSc, MPH, PhD, Associated Professor, Faculty of Dentistry, University of British Columbia, 116/2199 Wesbook Mall, Vancouver, BC, Canada, V6T 1Z3.

Email: [Brondani@dentistry.ubc.ca](mailto:Brondani@dentistry.ubc.ca)

**Abstract**

**Objectives:** With the emergence of the COVID-19 pandemic in Canada and the curtailment of clinical and face-to-face university instruction in British Columbia on March 16, 2020, the opportunity arose to explore how third- and fourth-year undergraduate dental students critically considered the impact of the pandemic on education and the practice of dental geriatrics.

**Methods:** All third- and fourth-year undergraduate dental students within a dental geriatric module were asked to provide a written guided reflection on the question: "In your opinion, what factors make outbreaks (or pandemics) like COVID-19 relevant to the practice of dental geriatrics?" Reflections were gathered from March 12 to May 8, 2020. Thematic analysis was conducted to identify and interpret patterns of meaning within the reflections by means of an interactive coding process.

**Results:** A total of 115 reflections, between 291 and 710 words each, were received from 56 third-year (62.5% male) and 59 fourth-year (42.6% male) students. Five main themes emerged: experiencing uncertainties, frailty as a moderator, constraints in accessing care, preparedness protocol, and redefining care. The frequency in which the same codes, categories, and themes were assigned varied from 16 to 140 times.

**Conclusions:** Students' reflections highlighted the effects of the pandemic, not only on their education but also on frail older adults themselves and the profession of dentistry in general. Further studies are warranted to explore how this curtailment might impact educators' approaches to geriatric education, as well as the way graduating students will set up their practices and approach geriatric care in the future.

**KEYWORDS**

dental public health, education, geriatric dentistry, reflection, research methodology qualitative

## 1 | INTRODUCTION

The current novel coronavirus disease 2019 (COVID-19) is caused by the severe acute respiratory syndrome

coronavirus-2 (SARS-CoV-2),<sup>1</sup> first identified in Wuhan, China, in December 2019.<sup>2</sup> It was then declared a pandemic by the World Health Organization on March 11, 2020. As of July 10, 2020, COVID-19 has spread to more

than 200 countries and territories, caused over 580,000 fatalities, and infected more than 12 million individuals globally. The COVID-19 fatality rate seems to be higher among frail older adults compared with younger individuals in Canada; frail older adults also remain at a higher risk for severe complications from COVID-19.<sup>3</sup> Frailty is a common clinical syndrome that carries an increased risk for poor health outcomes due to a decline in function and the ability to cope with everyday life and stressors.<sup>4</sup> Frailty also has a significant association with poor oral health,<sup>5–7</sup> while numerous oral diseases have an important systemic impact on frail older adults.<sup>8</sup> Although most dental diseases are largely preventable, many older adults, particularly those who are frail, experience poor oral health and reduced quality of life.<sup>9,10</sup> The relevance of frailty to dental care is well understood and is usually the core content of most dental geriatric curricula worldwide<sup>11</sup> and in Canada.<sup>12</sup> Undergraduate dental geriatric education should “facilitate the acquisition of specialized knowledge and skills and influence the formation of professional attitudes towards the elderly<sup>13</sup>” while blending didactic content, clinical care, and reflection.<sup>14</sup> This is the case for the dental geriatric curricula at the University of British Columbia (UBC) in Vancouver, Canada, where the content is distributed over multiple 50-minute sessions, 26 for third-year and 10 for fourth-year undergraduate students.<sup>12,14</sup> Along with didactic content, pairs of third-year students shadow a dentist providing care to frail adults at the university dental clinic for half a day, while pairs of fourth-year students provide a full day of hands-on care to frail adults residing in long-term care (LTC) facilities.<sup>14</sup> Although UBC’s third-year geriatric dental care program activities began on January 7, 2020, and fourth-year activities began on September 4, 2019, the COVID-19 pandemic directly impacted all patient care, which was canceled on March 11, 2020. Whereas the didactic content continued to be delivered online for the remainder of the term, many third- and fourth-year students did not have the opportunity to participate in the geriatric care activities. In turn, third- and fourth-year students were asked to critically reflect, in writing, on the following question: “In your opinion, what factors make outbreaks (or pandemics) like COVID-19 relevant to the practice of dental geriatrics?” This study aimed at exploring the extent to which third- and fourth-year undergraduate dental students critically considered the impact of COVID-19 on education and the practice of dental geriatrics.

## 2 | METHODS

This study was approved by UBC’s Behavioural Research Ethics Board (# H20-00013 and # H19-01005). We received

**TABLE 1** Frequency distribution of student demographics according to the academic year, gender, and completion of the dental geriatric activity

Academic year	Gender: N (%)	Dental geriatric activity: Yes/ NoN (%)
Year 3—Class of 2020/21 (56 students)	Male—35 (62.5)	Y—19 (54.3)
	Female—21 (37.5)	N—16 (45.7)
		Y—9 (42.8)
		N—12 (57.2)
		<b>56 (100)</b>
Year 4—Class of 2019/20 (59 students)	Male—25 (42.4)	Y—15 (60.0)
	Female—34 (57.6)	N—10 (40.0)
		Y—22 (64.7)
		N—12 (35.3)
		<b>59 (100)</b>

written reflections from all 56 third-year and 59 fourth-year undergraduate students as part of a mandatory assignment for the required dental geriatric modules. In year 3, the dental geriatric reflection was worth 25% of the module’s final grade, while in year 4 it was worth 30%; reflections were assessed formatively (not shown here). Students (N = 2) who failed to submit a reflection had to complete a supplemental assignment at the discretion of the module coordinator. Of note, 28 third-year and 38 fourth-year students had the opportunity to experience the respective geriatric activities before March 11, 2020. Students were instructed to write a reflection ranging from 300 to 1000 words, and use at least 1 literature reference they judged relevant (forth-year only) while pondering on general and geriatric dentistry, and on dental education (all students). Reflections were submitted to the first author (M.A.B.) by means of email between March 12 and May 8, 2020, as part of the modules’ required assignments and were de-identified for the thematic analysis. Only gender, class year, and whether the student had participated in the geriatric activities were attached to each reflection (Table 1).

As a qualitative inquiry method was used, de-identified reflections were independently and then interactively analyzed, in the order they were received, by the 2 authors, who are mid-career researchers and instructors for the undergraduate dental and dental hygiene students. We proceeded with the interpretation of patterns of meaning within the reflections via coding. Coding refers to an inductive process of identifying ideas (in the form of a word or short phrase) in the text, searching for concepts, and finding relations between them—similar codes are then grouped into categories and, finally, related categories make up a main theme,<sup>9,15,16</sup> as shown in Table 2. Conference calls and electronic communication were used by the 2 authors to discuss the codes, categories, and themes identified and to reach a consensus. Given the number of

TABLE 2 Examples of the coding process used in this study

Reflection excerpt	Codes (N)	Categories (N)	Themes (N)
The spread of viruses such as SARS-COV-1 and -2 have been shown to be through aerosols that [are] produced during most dental procedures. These aerosols may be stable in the air for a while and may be facilitating the spread of disease. If dentistry were to increase its access to care to older adults in LTC facilities, the creation of aerosols must be addressed and corrected. But how? Negative pressure rooms may be used to keep air from spreading away from the treatment facility. But how is this feasible in the context of nursing homes?	Aerosol generating procedures (16) Spread of the disease (99) Access to care (129) Need to offer care (90) Addressing the risks (68) Solution (76)	Dental treatment (71) Risk of transmission (140) Virus viability (16) How to? (39) Feasibility (19)	<b>PREPAREDNESS PROTOCOL (86)</b> <b>EXPERIENCING UNCERTAINTIES (95)</b>

N: Refers to the number of times the same codes, categories and themes were assigned throughout all the 115 reflections by the researchers. A reflection can have the same codes and/or categories and/or themes assigned more than once if they were identified multiple times. In turn, some of the numbers shown surpassed the actual number of reflections submitted.

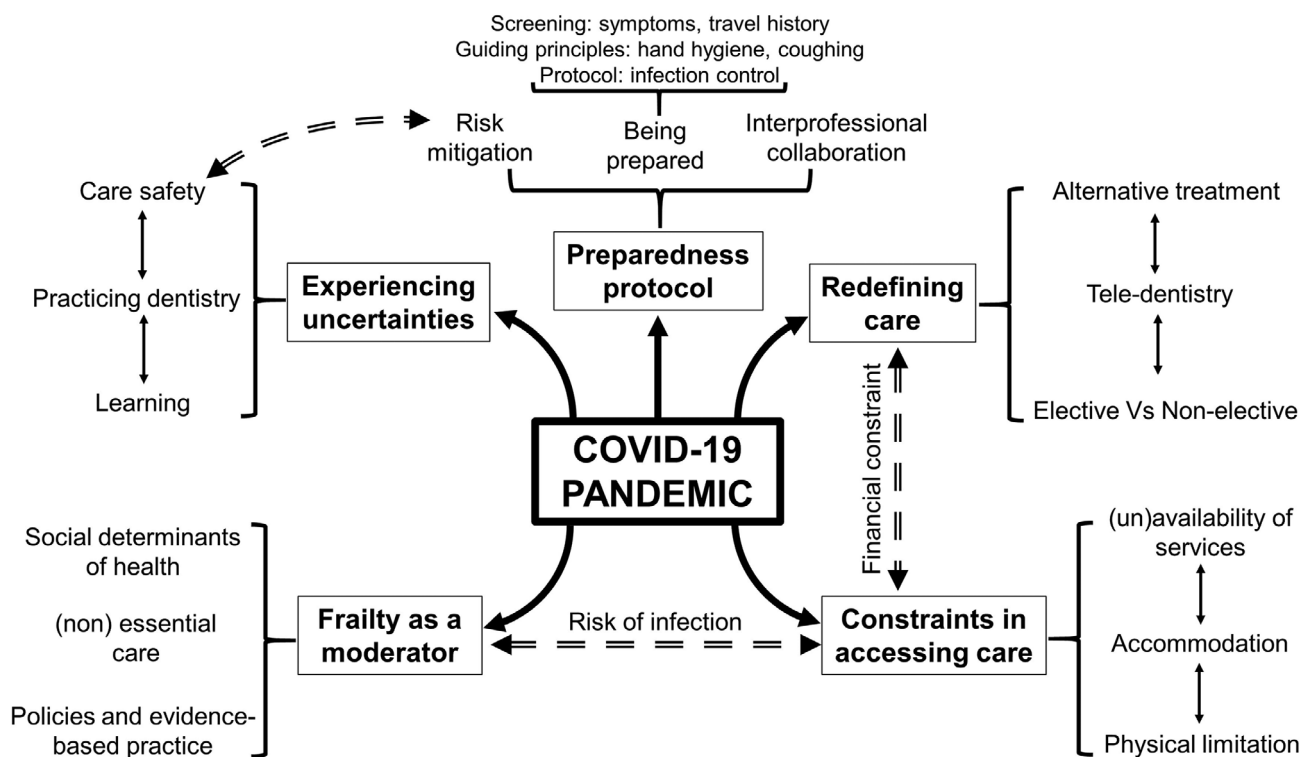


FIGURE 1 Thematic map from the 115 reflections

reflections, excerpts were used only to illustrate a given code, category, or theme while attempting to offer some variation on the students' academic year, gender, and geriatric experience.

### 3 | RESULTS

All 115 reflections ranged from 291 to 710 words and were analyzed thematically via a continuous coding process

between March 12 and June 5, 2020. Five main themes emerged from the reflections: experiencing uncertainties, frailty as a moderator, constraints in accessing care, preparedness protocol, and redefining care. For illustrative purposes only, we tallied the number of times the main themes (and codes and categories) were assigned within all 115 reflections, as suggested for content analysis, but did not perform any statistical evaluation of these frequencies.<sup>17</sup> The main themes overlap in meaning and relevance, and are mapped in Figure 1 with their relation to

the COVID-19 pandemic indicated via single solid arrows. Figure 1 also shows that each theme is composed of their respective categories and codes, as applicable. Some categories within the same theme are linked via solid double arrows to denote a mutable relationship. The dashed double arrows show a reversible relationship between themes mediated by a specific code (e.g., risk of infection, financial constraint), or between categories (e.g., care safety and risk mitigation). The frequency in which the same codes, categories, and themes were assigned varied from 16 to 140 times; the same codes and/or categories and/or themes could be assigned more than once in the same reflection.

### 3.1 | Experiencing uncertainties

The concept of feeling uncertain or unsure surfaced in 59 reflections. The impact of the COVID-19 pandemic on the uncertainty of learning was expressed by a concerned male third-year student who had not participated in the geriatric program activities and commented that “as the classes moved online, that is not a major loss, but we will no longer have the hands-on care experience – and I question if that can be replaced by just thinking about it ... reflection of a hands-on experience should build on one another.” For a male fourth-year student who was involved in the geriatric program activities, there was definite uncertainty about graduating in the midst of a pandemic and the amount of clinical care experience received: “I haven’t been able to perform the number of clinical procedures I would like to ... with graduation around the corner, will I feel competent to provide all the care patients will need?”

One female fourth-year student who participated in the geriatric program activities, reflected on the uncertainty around safety:

“If dentistry were to increase access to care to older adults in long-term care facilities, the creation of aerosols must be addressed and corrected. But how? Negative pressure rooms may be used to keep air from spreading away from the treatment facility, but that is not feasible in the context of nursing homes I don’t think.”

Uncertainties on how the current pandemic situation will impact the practice of dentistry also surfaced within the reflections, as students referred to flattening of the curve:

“As we aim at flattening the curve, it is understandable the measures in place mostly aim

to decrease face-to-face and physical contact. Dentistry is all about that, so I’m not sure how and when the practice of dentistry will return to normal as before the pandemic.” (female third-year student who had participated in the geriatric program activities).

### 3.2 | Frailty as a moderator

Given the inherent characteristics of the patients that are cared for in these 2 dental geriatric models, frailty was weaved throughout 101 reflections. According to a female third-year student (who had not participated in the geriatric program activities), the issues of frailty, policies, and evidence-based practice go hand-in-hand:

“Some of the geriatric population may present with co-morbidities, polypharmacy, and [a] decline in overall health ... and frailty further puts them at a much higher risk to contract the novel coronavirus. It becomes prudent to continuously stay up-to-date on federal and provincial policies and current evidence-based protocols from the scientific community, in order to provide appropriate care.”

Frailty also surfaced when considering the social determinants of health. Students reflected on various factors that can positively or negatively influence frailty in geriatric populations, including education, social support, and healthcare policies.

For another female fourth-year student who did not have a chance to experience the geriatric program activities, the issue of dentistry being essential surfaced because “all non-essential services are curtailed, but is dentistry essential? If you are in pain, [it] probably is, but if you are a little behind your annual check-up, probably not – although, if you consider a frail older adult at risk for aspiration pneumonia [who] needs [a] cleaning, that might be a different story.” A male third-year student also questioned the idea of essential services by referring to the timeframe of events that took place in March 2020 in British Columbia (this student did participate in the geriatric program activities):

“Non-essential [care] was discouraged – but not really ceased – on March 16 by the British Columbia Dental Association, 5 days after the WHO declared COVID-19 a pandemic, while our UBC clinical care rotations involving frail older adults were ceased earlier on. But it was only on March 23rd, 12 days after the pandemic declaration, that dentists were required

to only treat urgent dental care as I understood.”

### 3.3 | Constraints in accessing care

The barriers and limitations in accessing dental care for older adults were discussed in one way or another in all reflections. Many students commented on the fact that upon retirement, the vast majority of individuals lose their employer-paid extended health benefits and might not afford oral health care. A third-year student, who participated in the geriatric program activities, mentioned that the pandemic might have added yet another layer of complexity to accessing care when “some patients might already have difficulties in finding a dentist who would see them on a regular basis, from not being able to accommodate their needs to not accepting new patients”. There was also the issue of service availability as 49 students mentioned that some practicing dentists might not feel comfortable in seeing frail older adults. Financial and other constraints aside, frailty was again a compounding factor in physically accessing care according to a male third-year student who was not able to participate in the geriatric dentistry activities:

“[h]aving access to a dental office may have already been difficult before the pandemic for patients who are too frail to go [out] ... and while the main goal is to delay unnecessary treatment and provide help via telephone, geriatric patients are often among those more likely to require urgent dental care.”

### 3.4 | Preparedness protocol

The idea of being prepared was mentioned in 86 reflections, including “being prepared to deal with closing your office and losing income” (female fourth-year student who had not been involved in the geriatric program activities). Twenty-nine reflections offered specific examples of procedures likely to be included on a preparedness protocol, from “screening yourself, your staff, and your patients for flu-like symptoms, difficulty breathing, fever, etc.”; to including “a question in your intake form about personal and family travels within and outside Canada in the past 2 weeks”; and assigning “a designated operator for patients who are suspect[ed] to have, or have been diagnosed with, SARS-CoV-2”.

Moreover, the various references to being prepared highlighted the importance of having a protocol or guiding ideas for safely providing care during a pandemic. For

numerous students, including a female third-year student who did participate in the geriatric program activities, risk of transmission also surfaced when considering dental office environments, as

“the dentist should determine if a dental complaint is an emergency or if it can be dealt with on a quick visit that does not generate aerosols, or even over the phone, so that risk of transmission is eliminated”.

Aerosols, in particular, surfaced in 16 reflections as a potential venue for the spread of SARS-CoV-2 that the practice of dentistry currently faces. Students further alluded to the fact that, if aerosols likely spread by means of saliva droplets, they should be avoided or minimized during the pandemic.

### 3.5 | Redefining care

A total of 71 students suggested providing alternative treatment options during the pandemic, mostly in terms of “offering a good and stable temporary treatment and avoiding invasive procedures until we know more about the pandemic” (female third-year student who was able to participate in the geriatric program activities). Along the lines of alternative, yet efficacious, treatment, a male fourth-year student who did not have the opportunity to partake in the geriatric program activities mentioned the opportunity to favor less invasive procedures when considering the generation of aerosols. Such an opportunity was echoed by 23 other students who commented on the use of less invasive techniques, including silver diamine fluoride, as an alternative to “drill and fill” treatments, to produce minimal amounts of aerosols and saliva droplets. In fact, students considered such techniques a silver lining for the profession during these stressful times.

Students also reflected on the need to perhaps redefine how some aspects of dental care will be delivered during the current pandemic. According to 1 male fourth-year student, who had not been involved in the geriatric program activities, this redefinition hinges upon needs, as some of the care “might not necessarily need a face-to-face interaction if the patient just want[s] to ask a question or refill a prescription”. This opportunity directly addresses tele-dentistry, as mentioned by 11 other students as “opportune” to address concerns that do not need face-to-face interactions. For 1 female third-year student, who was able to participate in the geriatric program activities, “there seems to exist a renewed interest in tele-dentistry as a tool to stay in touch with patients and manage certain care during the time of physical distancing.”

## 4 | DISCUSSION

Guided reflections have long been used at UBC's Faculty of Dentistry, allowing students to gain additional learning from a given activity.<sup>12,14</sup> The thematic analysis from 115 reflections highlighted the effects of the COVID-19 pandemic—not only on student education, but also on frail older adults themselves and the profession of dentistry in general—as undergraduate dental students experience uncertainties, ponder frailty, comment on the constraints in accessing care, and offer ideas around preparedness protocols and how they might redefine dental care (as depicted in Figure 1).

In terms of experiencing uncertainties, particularly in their education, students reflected on the timeline of class curtailment at UBC starting in March 2020, which has had a significant impact on their learning. The majority of universities and dental schools around the world suspended activities to minimize transmission of the virus.<sup>18,19</sup> This meant that instruction had to quickly switch to online learning. Although fully online and distant learning courses have been used for decades,<sup>20</sup> it is relatively new in dental education.<sup>21</sup> While most didactic material can be distributed online, direct contact between students, instructors, and patients remains essential to the dental curriculum—not only to develop clinical skills, but also to foster professionalism by means of mentorship and interpersonal interactions.<sup>21</sup> Not surprisingly, some students were concerned about their own clinical competency, because hands-on experience cannot be replaced by solely reflecting on the activities.

Some students also discussed the fact that there is a need for preparedness protocols for dental care during the COVID-19 pandemic, given that dentistry seems to have the highest risk of SARS-CoV-2 infection of any profession.<sup>19,22</sup> Although Alharbi et al. concluded that there might not exist readily acceptable universal guidelines on preparing for the provision of dental care during the unfolding of any pandemic,<sup>23</sup> proposed standards for dental care have started to emerge related to COVID-19.<sup>19,22,24,25</sup> As these protocols are being made available, students pondered some of the items or factors that could be incorporated into them, from avoiding or minimizing the generation of aerosols,<sup>22</sup> to using a designated dental operator for COVID-19-infected patients only.<sup>26</sup> Interestingly, no student mentioned the use of an assistant, even though a 4-handed technique is believed to be beneficial for controlling infection according to Meng et al.<sup>27</sup> In terms of aerosols specifically, guidance might come from the 2003 SARS outbreak, where dental care was provided under strict personal protection equipment, with measures to reduce or eliminate the production of droplets and

aerosols via high-volume aspiration,<sup>28</sup> and using negative pressure floor-to-ceiling closed operatories.<sup>29</sup> This same guidance can be used for emergency dental care during the COVID-19 pandemic, where dental professionals felt a moral duty to reduce or eliminate routine dental care to curtail the spread of the virus,<sup>24</sup> adding constraints in accessing care for most patients. Although it is unknown if these measures will continue to be in place after the COVID-19 pandemic, many dental offices had to close their doors, at least temporarily.<sup>30</sup> The negative financial implications of closing dental practices during this outbreak was mentioned by some students and echoed in recent studies.<sup>31,32</sup>

Redefining care was another issue particularly relevant for dental students when generally considering the dental profession and SARS-CoV-2.<sup>19,22</sup> Students did hint at a silver lining, where the profession was given the opportunity to favor and advocate for less invasive and conservative treatments<sup>33</sup> that can be performed in relative aerosol-free environments, along with tele-dentistry.<sup>34,35</sup> As advised by Berlin-Broner and Levin, “when dental treatment delivery has switched to emergency mode, we should use the situation as a reminder for clinicians and patients to think about the dental hierarchy of needs”.<sup>36</sup> Frailty, as a moderator of comorbidities in older adults, seems to place them at a much higher risk for severe complications from COVID-19,<sup>37</sup> particularly those institutionalized in nursing homes<sup>38</sup>; unfortunately, older adults still account for the highest number of deaths in Canada. Yet, we found it surprising that no reflections identified the need to address oral health policies and guidelines for those living in LTC facilities, from lack of daily oral care, low staffing levels, poor compensation for healthcare workers, and issues monitoring quality of care<sup>39</sup> that are not occurring only because of COVID-19. While many students recognized that they must stay up-to-date on information and be a knowledgeable source for their staff and patients to consult, such a need did not arise in the context of health promotion or advocacy activities. Dental professionals should take a more proactive role in ensuring safe daily oral care for LTC residents, given the negative health outcomes from a lack of appropriate oral care.

The full experience of geriatric dentistry was curtailed for the graduating class of 2020, and although there was didactic content and reflection,<sup>12,14</sup> some students will graduate without a full clinical care experience involving frail patients in an LTC environment. If a second wave of COVID-19 does occur, the same might happen for the graduating class of 2021. Further studies are warranted to explore how this clinical curtailment might impact the way graduating students set up their future practices. As suggested by Elangovan et al.,<sup>40</sup> although the COVID-19 pandemic has caused disruptions, it also “brought to

light several avenues that ... can strengthen our dental education system to better cope with future unexpected scenarios". As professional educators, we must take the opportunity presented to us and innovate our teaching, from online learning to simulation, critical reflection, and tele-dentistry training, as advocated by Marchini and Ettinger.<sup>35</sup>

This study is not without limitations. A single student cohort from 1 university, albeit from 2 different classes, was included; therefore, generalizations are not warranted. It is possible that students who experienced the dental geriatric program activities had a different view of the impact of COVID-19 on dental care compared with those who did not; however, such differences were not explored. Although the question posed for reflection was about pandemics like COVID-19, students likely answered the question based solely on SARS-CoV-2; other pandemics with different transmission routes and disease patterns might not have been considered. As reflections were a mandatory part of the course, students might have written about issues and facts that they thought the module coordinator would appreciate rather than their own interpretations and ideas. To maintain brevity and focus, this study reported on a small number of themes from the reflections; we are currently working on follow-up publications addressing some of the additional themes. Although we offered some information on the frequency of themes or ideas expressed, we did not use 1 of the forms of content analysis that would require documenting the frequency distribution of individual words.<sup>17</sup>

## 5 | CONCLUSIONS

Undergraduate dental geriatric education has value in assisting with the acquisition of knowledge and skills when blending didactic content, clinical care, and reflection. However, hands-on care was curtailed at UBC in March 2020 due to the COVID-19 pandemic and this led to students being asked to critically reflect upon this event. The thematic analysis from 115 submissions highlighted the effect of this pandemic—not only on student's education, but also on the impact to frail older adults themselves and the dentistry profession in general—as undergraduate dental students experience uncertainties, ponder frailty, consider constraints in accessing care, offer ideas regarding preparedness protocols, and suggest ways to redefine dental care. Further studies are warranted to explore how this curtailment might impact educators' approaches to teaching, as well as the way graduating students set up their practices and approach dental geriatric care in the future.

## ACKNOWLEDGMENTS

The authors are grateful to all the students who submitted their thoughtful reflections, making this study possible. Special thanks to Dr Angela Tether for editorial contributions. This study was funded by Genome BC's Rapid Response Funding for COVID-19 Research and Innovation Projects.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## AUTHOR CONTRIBUTIONS

Mario Brondani contributed to the study conception, design, data acquisition, and interpretation, as well as drafting and critically revising the manuscript, while Leenan Donnelly contributed to data acquisition and interpretation, and critically revised the manuscript. All authors gave their final approval and agree to be accountable for all aspects of the work.

## REFERENCES

1. Del Rio C, Malani PN. COVID-19—new insights on a rapidly changing epidemic. *JAMA*. 2020;323(14):1339-1340.
2. Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med*. 2020;382(8):727-733.
3. Center for Disease Control and Prevention. People who are at a higher risk for severe illness. 2020. <https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-at-higher-risk.html>
4. Fried LP, Tangen CM, Walston J, et al. Frailty in older adults: evidence for a phenotype. *J Gerontol A Biol Sci Med Sci*. 2001;56(3):M146-M156.
5. Hakeem FF, Bernabé E, Sabbah W. Association between oral health and frailty: a systematic review of longitudinal studies. *Gerodontology*. 2019;36(3):205-215.
6. Rapp L, Sourdet S, Vellas B, Lacoste-Ferré MH. Oral health and the frail elderly. *J Frailty Aging*. 2017;6(3):154-160.
7. Müller F. Oral hygiene reduces the mortality from aspiration pneumonia in frail elders. *J Dent Res*. 2015;94(3 Suppl):14S-16S.
8. Kane SF. The effects of oral health on systemic health. *Gen Dent*. 2017;65(6):30-34.
9. Brondani M. The voice of the elderly in accepting alternative perspectives on oral health. *Community Dent Health*. 2010;27:139-144.
10. Griffin SO, Jones JA, Brunson D, Griffin PM, PhD BaileyWD. Burden of oral disease among older adults and implications for public health priorities. *Am J Public Health*. 2012;102(3):411-418.
11. Marchini L, Ronald E, Chen Xi, et al. The state of art in geriatric dentistry worldwide. *Spec Care in Dent*. 2018;38(3):123-132.
12. Brondani MA, Chen A, Chiu A, et al. Undergraduate geriatric education through community service learning. *Gerodontology*. 2012;29:e1222-e1229.
13. Nitischke I, Reiber T, Sobotta BAJ. Undergraduate teaching in gerodontology in Leipzig and Zurich: a comparison of different approaches. *Gerodontology*. 2009;26:172-178.

14. Brondani M, Pattanaporn K. Dental students' reflections about long-term care experiences through a model of oral health. *Gerodontology*. 2017;34(3):326-333.
15. Brondani MA, Bryant SR, MacEntee MI. Elders' assessment of an evolving model of oral health. *Gerodontology*. 2007;24:189-195.
16. Feng I, Lynn K, Brondani MA, Donnelly L. Evaluating point-of-care HIV screening in dental hygiene education settings: patient, faculty, and student perspectives. *J Dent Educ*. 2018;82(8):819-827.
17. Dicle MF, Dicle B. Content analysis: frequency distribution of words. *Stata J*. 2018;18(2):379-386.
18. Coulthard P. Dentistry and coronavirus (COVID-19)—moral decision-making. *Br Dent J*. 2020a;228(7):503-505.
19. Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B. Transmission routes of 2019-nCoV and controls in dental practice. *Int J Oral Sci*. 2020;12. Article 9.
20. Allen EI, Seaman J. Changing course: ten years of tracking online education in the United States. *Sloan Consortium*. 2013. [files.eric.ed.gov/fulltext/ED541571.pdf](https://files.eric.ed.gov/fulltext/ED541571.pdf). Available at. Accessed April 22, 2020.
21. Kearney RC, Premaraj S, Smith BM, Olson GW, Williamson AE, Romanos G. Massive open online courses in dental education: two viewpoints—Viewpoint 1: massive open online courses offer transformative technology for dental education and Viewpoint 2: massive open online courses are not ready for primetime. *J Dent Educ*. 2016;80(2):121-127.
22. Gamio L. The workers who face the greatest coronavirus risk. *The New York Times*. 2020. Available at: <https://www.nytimes.com/interactive/2020/03/15/business/economy/coronavirus-worker-risk.html>. Accessed April 10, 2020.
23. Alharbi A, Alharbi S, Alqaidi S. Guidelines for dental care provision during the COVID-19 pandemic. *Saudi Dent J*. 2020. <https://doi.org/10.1016/j.sdentj.2020.04.001>. Epub ahead of print].
24. Coulthard P. The oral surgery response to Coronavirus Disease (COVID-19). Keep calm and carry on?. *Oral Surg*. 2020. <https://doi.org/10.1111/ors.12489>. 2020b. Epub ahead of print].
25. Spicciarelli V, Marruganti C, Viviano M, et al. A new framework to identify dental emergencies in the COVID-19 era. *J Dent Sci*. 2020;1-4. <https://doi.org/10.2334/josnusd.20-0208>. Epub ahead of print].
26. Prati C, Pelliccioni GA, Sambri V, Chersoni S, Gandolfi MG. COVID-19: its impact on dental schools in Italy, clinical problems in endodontic therapy and general considerations. *Int Endod J*. 2020;53(5):723-725.
27. Meng L, Hua F, Bian Z. Coronavirus Disease 2019 (COVID-19): emerging and future challenges for dental and oral medicine. *J Dent Res*. 2020;99(5):481-487.
28. Li RW, Leung KWC, Sun FCS, Samaranyake LP. Severe acute respiratory syndrome (SARS) and the GDP. Part II: implications for GDPs. *Br Dent J*. 2004;197:130-134.
29. Mitura K, Myśliwiec P, Rogula W, et al. Guidelines for the management of surgical departments in non-uniform hospitals during the COVID-19 pandemic. *Pol Przegl Chir*. 2020;92(2):48-59.
30. Dave M, Seoudi N, Coulthard P. Lancet. Urgent dental care for patients during the COVID-19 pandemic. *Lancet*. 2020;395(10232):P1257.
31. Farooq I, Ali S. COVID-19 outbreak and its monetary implications for dental practices, hospitals and healthcare workers. *Postgrad Med J*. 2020. <https://doi.org/10.1136/postgradmedj-2020-137781>. Epub ahead of print].
32. Spagnuolo G, De Vito D, Rengo S, Tatullo M. COVID-19 outbreak: an overview on dentistry. *Int J Environ Res Public Health*. 2020;17(6). <https://doi.org/10.3390/ijerph17062094>. pii: E2094. Epub ahead of print].
33. Brondani M, Wallace B, Donnelly L. Dental insurance and treatment patterns—implications to oral health outcomes. *JCDA*. 2019;85:j10.
34. Yang Y, Zhou Y, Liu X, Tan J. Health services provision of 48 public tertiary dental hospitals during the COVID-19 epidemic in China. *Clin Oral Invest*. 2020;24(5):1861-1864.
35. Marchini L, Ettinger RL. COVID-19 and geriatric dentistry: what will be the new-normal?. *Brazilian Dent Sci*. 2020;23 (2). <https://doi.org/10.14295/bds.2020.v23i2.2226>. Epub ahead of print].
36. Berlin-Broner Y, Levin L. 'Dental hierarchy of needs' in the COVID-19 era—or why treat when it doesn't hurt?. *Oral Health Prev Dent*. 2020;18(2):95.
37. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020;395(10223):497-506.
38. Centers for Medicare & Medicaid Services. Guidance for infection control and prevention of coronavirus disease 2019 (COVID-19) in nursing homes. Updated March 13, 2020. Available at: <https://www.cms.gov/files/document/qso-20-14-nh-revised.pdf>. Accessed April 24, 2020.
39. MacEntee MI, Thorne S, Kazanjian A. Conflicting priorities: oral health in long-term care. *Spec Care Dentist*. 1999;19(4):164-172.
40. Elangovan S, Mahrous A, Marchini L. Disruptions during a pandemic: gaps identified and lessons learned. *J Dent Educ*. 2020;84(11):1270-1274.

**How to cite this article:** Brondani M, Donnelly L. COVID-19 pandemic: students' perspectives on dental geriatric care and education. *J Dent Educ*. 2020;84:1237–1244. <https://doi.org/10.1002/jdd.12302>