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# Effect of COVID-19 on training and mental health of oral medicine residents in North America

Shaiba Sandhu, BDS, DDS,<sup>a</sup> Vidya Sankar, DMD, MHS,<sup>b</sup> Hervé Y. Sroussi, DMD, PhD,<sup>c</sup> and Alessandro Villa, DDS, PhD, MPH<sup>d</sup>

**Objective.** The objective of this study was to assess resident and faculty perception of the effect of the coronavirus disease 2019 pandemic on the training experience, education, and psychological well-being of oral medicine (OM) residents.

**Study Design.** An anonymous 16-item online questionnaire was e-mailed to faculty and residents of all Commission on Dental Accreditation—accredited OM residency programs in North America. Survey questions asked about the pandemic's effect on resident educational, clinical, and research activities and the well-being of the residents. Survey data were collected using Qualtrics XM.

**Results.** Forty participants (52.5% residents and 47.5% faculty members) responded to the survey. Regarding the effect on clinical activities, 67.5% reported 50% or less reduction in patient volume seen by residents at its worst during the pandemic. With respect to educational activities, most reported a complete switch of didactic training (85.3%), academic examinations (60%), and off-site resident rotations (45%) to a virtual platform. Research activities were affected the most; 55% reported complete cessation for some time. Thirty-three percent perceived a negative effect, 18% perceived no effect, 11% perceived a positive effect, and 38% were unsure regarding the effect of coronavirus disease 2019 on resident morale. Despite the interruptions in the clinical, research, and educational activities, 62.5% expected on-time resident graduation.

**Conclusion.** Despite constraints due to the pandemic, OM residency programs successfully continued clinical activities, didactic training, and research productivity through virtual means and a hybrid delivery care model while supporting their residents' morale. (Oral Surg Oral Med Oral Pathol Oral Radiol 2022;133:34–41)

The recent coronavirus disease 2019 (COVID-19) pandemic has had a significant effect on oral health services and clinical education, in part because these entail working in close proximity to oral secretions and the use of aerosol-generating devices.<sup>1,2</sup> Additionally, strict isolation strategies such as social distancing and stay-at-home orders affected the delivery of patient care and clinical and didactic training and adversely affected faculty and trainees' mental health and well-being.<sup>2-5</sup>

At the beginning of the pandemic, in order to limit severe acute respiratory syndrome coronavirus 2 transmission and also to conserve personal protective equipment for those on the frontline offering medical care to patients severely affected by COVID-19, the American Dental Association recommended most dental education institutions limit dental services to emergency care only.<sup>6,7</sup> In contrast to general dental practice, the

specialty of oral medicine (OM) is the discipline of dentistry primarily entailing diagnosis and management of oral mucosal abnormalities as well as oral manifestation of systemic and infectious diseases and thus does not routinely involve aerosol-generating procedures. To maintain continuity of care, several OM practices were successful in adopting a hybrid model with telemedicine services and the provision of in-person visits when necessary.<sup>8,9</sup>

In most postgraduate dental residency programs, didactic activities transitioned to virtual academic sessions, national educational/research conferences were postponed or canceled, and the procedure of standardized examinations was modified to adopt remote technology.<sup>5,10</sup> The disruption of educational activities, the challenge of training in an uncertain environment of constantly evolving quarantine, patient care and travel guidelines along with sudden social isolation, and fear of contracting the virus/fear of infecting family members may have also affected resident psychological well-being.<sup>11</sup> The actual effect and degree to which these restrictions affected OM programs are largely based on anecdotal experience from a single

<sup>a</sup>Oral Medicine Resident PGY-3, Division of Oral Medicine and Dentistry, Brigham and Women's Hospital, Department of Oral Medicine, Harvard School of Dental Medicine, Boston, MA, USA.

<sup>b</sup>Associate Professor, Division of Oral Medicine, Tufts University School of Dental Medicine, Boston, MA, USA.

<sup>c</sup>Associate Professor, Department of Oral Medicine, Harvard School of Dental Medicine, Division of Oral Medicine and Dentistry, Brigham and Women's Hospital, Boston, MA, USA.

<sup>d</sup>Associate Professor, Department of Orofacial Sciences, University of California San Francisco School of Dentistry, San Francisco, CA, USA.

Corresponding author. E-mail address: [shaiba\\_sandhu89@yahoo.com](mailto:shaiba_sandhu89@yahoo.com)

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## Statement of Clinical Relevance

The oral medicine residency programs of North America demonstrated resiliency amidst the pandemic through adoption of a hybrid patient care model and virtual education platforms that ensured successful continuity of residents' didactic, clinical, and research training while supporting their morale.

institution or a small groups of institutions.<sup>12</sup> The aim of this study was to assess the effect of the COVID-19 pandemic on the training experience, education, and psychological well-being of OM residents. Specifically, we investigated the experiences and perceptions of the residents and the faculty members from all Commission on Dental Accreditation (CODA)-accredited OM residency programs in North America during the COVID-19 pandemic.

**MATERIALS AND METHODS**

**Study population**

We conducted a survey-based study to assess resident and faculty perceptions of the effect of the COVID-19 pandemic on the training, education, and well-being of residents in the CODA-accredited OM residency programs in North America. This study was approved by the Massachusetts General Brigham Institutional Review Board (Protocol No. 2020P003806).

**Survey instrument and data collection**

A 16-item online survey questionnaire was developed using Qualtrics XM (Seattle, WA). The survey was e-mailed to the faculty and residents of CODA-accredited OM residency programs in North America. To maintain anonymity, no identifiers, including the Internet protocol address of the participants, were collected. All participants gave their implied consent through participation in the study. The survey was open from January 23, 2021, through April 23, 2021.

The study endpoints included the evaluation of the pandemic’s effect on the education (both clinical and didactic) of the OM residency programs and its perceived effect on the mental well-being of the residents. Questions asked about the demographic characteristics of the respondents; characteristics of the OM residency

**Table I.** Demographic characteristics of 40 survey respondents and their oral medicine programs

<i>Demographic characteristics (N = 40)</i>	<i>n</i>	<i>Percentage</i>
<b>Role in the program</b>		
Program director	7	17.5
Faculty	12	30.0
Resident PGY-1 level	10	25.0
Resident PGY-2 level	6	15.0
Resident PGY-3 level or higher	5	12.5
<b>Training environment of the program</b>		
Dental school setting	23	57.5
Hospital-based setting	16	40.0
Other	1	2.5
<b>Program size</b>		
1-3 residents	10	25.0
4-6 residents	16	40.0
7-9 residents	14	35.0

PGY, Postgraduate Year.

programs; faculty member/resident perceptions of the effect on resident educational, clinical, and research activities; and overall well-being of the residents. Some questions allowed for free-text answers. The detailed survey questionnaire is available in Appendix SI.

**Data analysis**

Descriptive statistics, including quantitative analysis of the valid responses, were analyzed. For the multiple-choice questions, the missing responses were omitted and the valid responses were included in the final sample for that question; as a result, the total sample/n

**Table II.** Effect of the COVID-19 pandemic on residents’ educational, clinical, and research activities

<i>Effect on resident activities (N = 40)</i>	<i>n</i>	<i>Percentage</i>
<b>Didactic activities</b>		
Remain unchanged, continue in-person	1	2.4
Conducted partially in-person and partially through virtual platform	4	10.0
Completely switched to virtual platform	35	85.3
On hold indefinitely	0	0.0
<b>Academic examinations and assessments</b>		
Remain unchanged and continue in-person	3	7.5
Conducted both in-person and virtually	13	32.5
Conducted through a virtual platform only	24	60.0
On hold indefinitely	0	0.0
<b>Clinical activities</b>		
Remain unchanged, continue in-person	7	17.5
Residents involved in both in-person and telehealth consultations	33	82.5
Residents involved in telehealth consultations only	0	0.0
Residents not assisting with clinical activities	0	0.0
<b>Reduction in patient volume seen by residents (at worst)</b>		
No reduction in clinical patient interactions	6	15.0
Decrease in <50% of clinical patient interactions	27	67.5
Decrease in 51%-75% of clinical patient interactions	3	7.5
Decrease in >75% of clinical patient interactions	4	10.0
<b>External rotations</b>		
Remain unchanged, continue in-person	17	42.5
Conducted partially in-person and partially through virtual platform	2	5.0
Completely switched to virtual platform	18	45.0
On hold indefinitely	3	7.5
<b>Research activities</b>		
Remain unchanged	17	42.5
Held for some period but resumed now	2	5.0
Delays in research activities	18	45.0
On hold indefinitely	3	7.5

COVID-19, coronavirus disease 2019.

varied for different questions. For the free-text answer questions, the content of each response was reviewed and summarized.

**RESULTS**

**Respondents’ characteristics**

A total of 40 individuals (52.5% residents and 47.5% faculty members) from CODA-accredited OM programs in North America responded to the online survey. Most of the participants belonged to a dental school–based OM program vs a hospital-based setting (57.5%; n = 23). Most respondents were from programs had 4 to 6 residents (40.0%; n = 16), followed by larger programs with 7 to 9 residents (37.5%; n = 15) and smaller programs with 1 to 3 residents (22.0%; n = 9) (Table I).

**Effect on resident educational, clinical, and research activities**

Most of the respondents (67.5%; n = 27) reported <50% reduction in the patient volume seen by their residents (including both in-person and virtual consultations) at its worst during the pandemic. At no point was there a total interruption in clinical activity in any of the programs (Table II). By April 2020, didactic training was switched to a virtual platform by most of

the respondents’ residency programs, with 85.3% (n = 35) reporting a complete switch, 10% (n = 4) reporting a partial switch, and only 2.5% (n = 1) declining the shift to a virtual platform as didactics continued in person. A similar trend was seen in the administration of academic examinations. In lieu of social distancing, 60% (n = 24) of respondents reported shifting of all academic examinations/assessments to a virtual platform, 32.5% (n = 13) reported a hybrid model of both virtual and in-person examinations, and 7.5% (n = 3) reported no change in the process of in-person examinations (Table II).

Whereas 55% (n = 22) of participants, including 9 of 19 faculty members and 13 of 21 residents, reported a halt in resident research activities for some time with subsequent resumption, 30% (n = 12; 5/19 faculty, 6/21 residents) continued to report delays in the research activities at the time the survey was completed. With respect to the external/off-site resident rotations, 7.5% (n = 3) reported an indefinite hold, 42.5% (n = 17) reported continued in-person external rotations, and 45% (n = 18) reported completing off-site rotation requirements through virtual platforms (Table II). Despite the interruptions in the clinical, research, and educational activities, 62.5% (n = 25; 10/19 faculty, 15/21 residents) expected on-time graduation of the

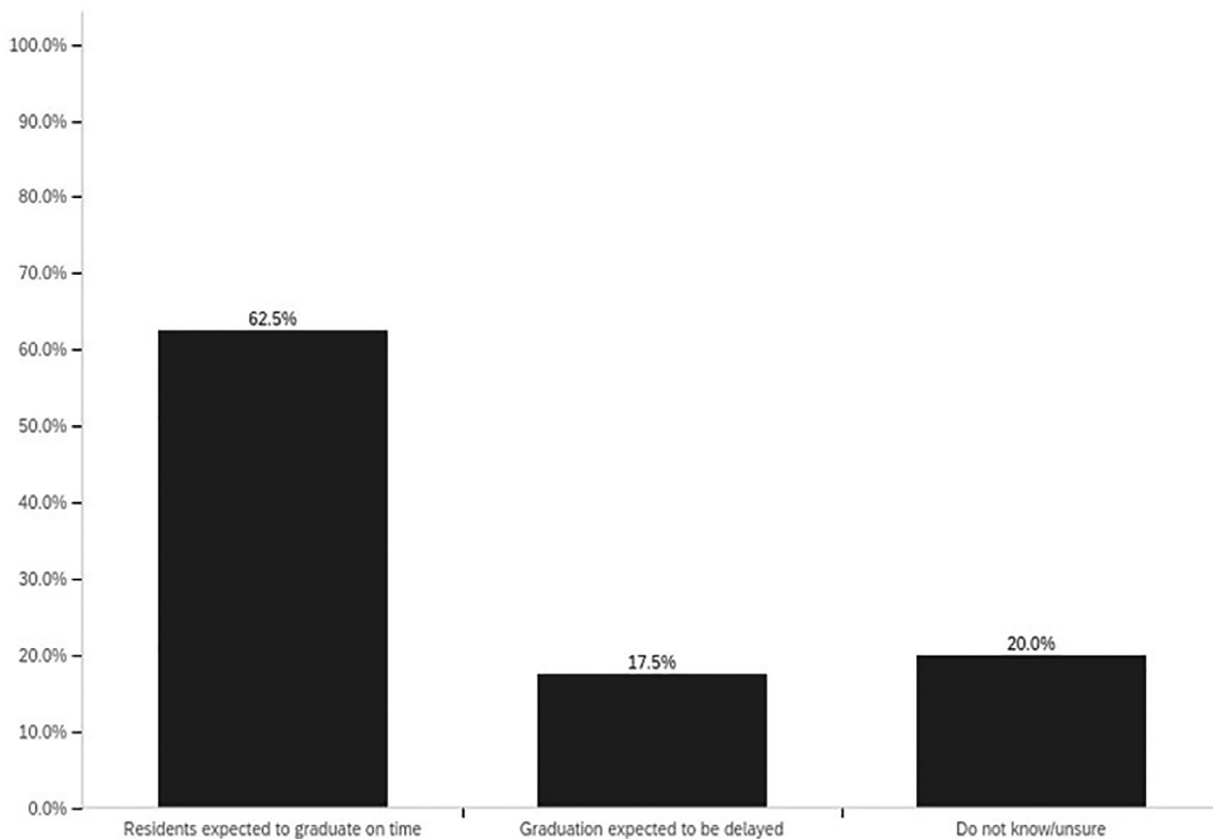


Fig. 1. Perception of the coronavirus disease 2019 pandemic’s effect on resident graduation.

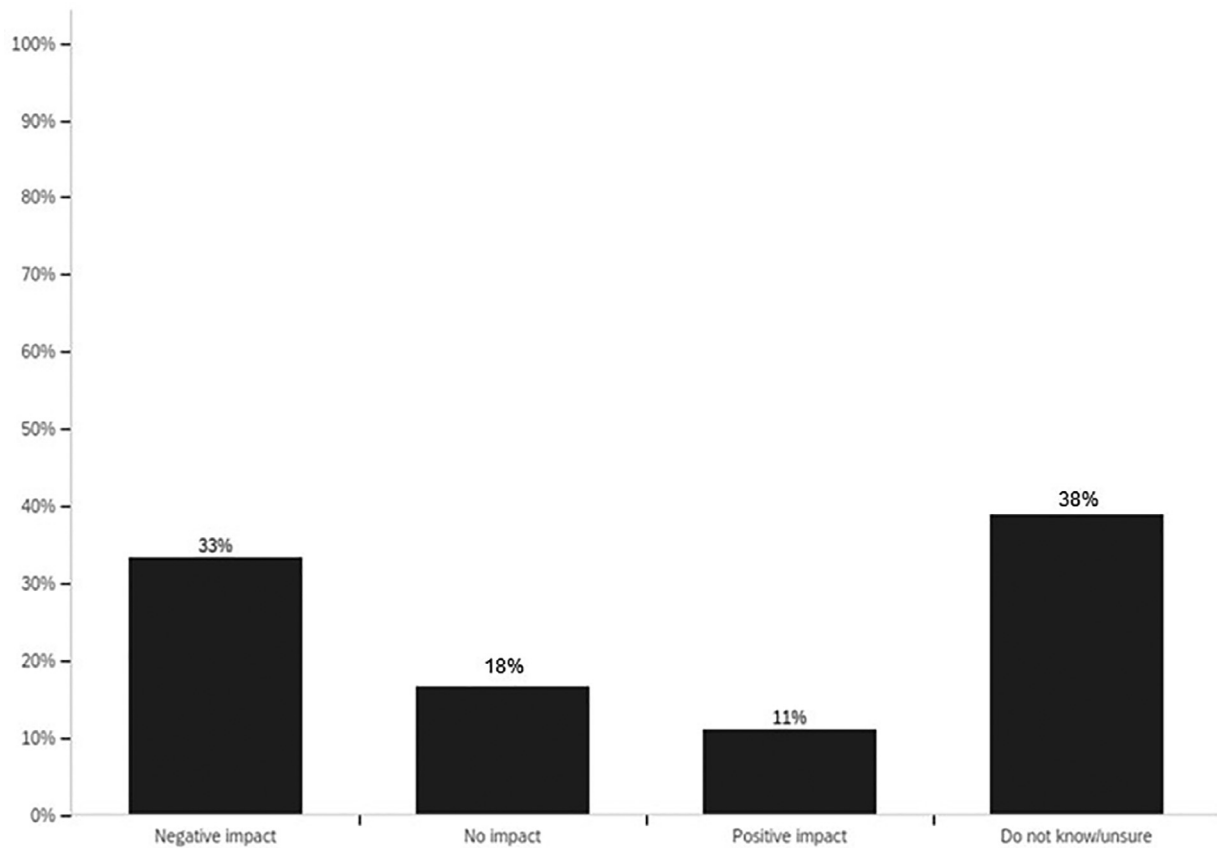


Fig. 2. Perception of the coronavirus disease 2019 pandemic's effect on resident morale.

residents and the remaining cohort either expected a delay in graduation or was unsure (Figure 1). Of the 10 respondents who were unsure of the timely graduation of the residents, half witnessed a <50% reduction in patient volume and the other half reported a 50% to 75% reduction in patient volume. On the other hand, the reduction in patient volume was found to be variable for the 5 respondents who perceived a delay in graduation.

#### Perceived effect on resident morale

When asked about the effect of COVID-19 on the morale of the residents, 38% (n = 15) of the respondents expressed uncertainty and 33% (n = 13) acknowledged a negative effect of the pandemic (Figure 2), with a mean negative effect score of 3.75 (on a 1-10 sliding scale, where 1 denotes a minimal effect and 10 denotes the maximal effect). Among factors negatively influencing resident morale, the fear of loved ones contracting the COVID-19 virus ranked the highest (27.6%), followed by the fear of residents contracting the virus (21%) and the feeling of isolation (17%) (Table III). The 3 most common factors positively influencing resident morale during the pandemic included the support of fellow residents (25.4%);

support of family, friends, or community (23.5%); and support and guidance from the program's leadership (19%; Table III). Most of the respondents (57.5%; n = 23) indicated adequate resident access to mental health resources, 10% (n = 4) reported limited access, 2.5% (n = 1) reported no access, and 27.5% (n = 11) expressed uncertainty. Among the mental and well-being resources available to the residents, virtual counseling services were the most predominant (Figure 3).

#### DISCUSSION

In this study, we report on the effect of the COVID-19 pandemic on training experiences and the perceived mental well-being of OM residents across North America. Quarantine restrictions imposed to limit virus transmission during the pandemic led to a substantial decrease in patient visits to OM clinics in hospitals, dental schools, and private practice settings.<sup>7,8</sup> A multi-center study conducted to evaluate the effect of the COVID-19 pandemic on cancer center-based OM practices in Brazil, Canada, and the United States showed a 51.5% reduction in patient volume in hospital-based OM clinics.<sup>13</sup> Our study also showed a

**Table III.** Factors influencing resident morale during the COVID-19 pandemic (respondents selected all that apply; total responses = 76)

<i>Survey choices (option of multiple selections) (N = 76)</i>	<i>No. of responses</i>	<i>Percentage</i>
<b>Factors negatively influencing resident morale</b>		
<b>Fear of contracting the virus</b>	16	21.0
<b>Fear of loved ones contracting the virus</b>	21	27.6
<b>Feeling of isolation</b>	13	17.1
<b>Financial insecurity</b>	9	11.8
<b>Lack of guidance from departmental leadership</b>	5	6.5
<b>Fear of hiring freeze for graduating residents</b>	8	10.5
<b>Other (free-text response)</b>	4	5.2
<b>Priority of vaccination given to medical residents instead of dental residents</b>		
<b>Lower quality of training</b>		
<b>Closed libraries</b>		
<b>Changing research projects</b>		
<b>Factors positively influencing resident morale</b>		
<b>Support of family, friends, or community</b>	24	23.5
<b>Support and resolve of fellow residents</b>	26	25.4
<b>Support and guidance from program leadership</b>	20	19.6
<b>Internal motivation to lead in difficult times</b>	16	15.6
<b>Efforts at maintaining personal well-being</b>	15	14.7
<b>Other (free-text response)</b>	1	0.9
<b>Sense of mission and teamwork</b>		

COVID-19, coronavirus disease 2019.

decline, with 67% of respondents indicating a 50% or less reduction in patient volume seen by residents.

Amidst the challenge of maintaining regular OM services while limiting the risk of exposure to COVID-19, OM programs across North America were relatively quick to shift to a virtual platform for carrying out most patient-related activities.<sup>9,14</sup> This shift provided residents with the opportunity to continue to be actively involved in the patient history intake/interview process (including obtaining a history of present illness and past medical history) and to contribute to patient workup (including virtual examination, arriving at a differential diagnosis, and formulation of an appropriate treatment plan, where possible). In comparison to other dental specialties, it may have been more feasible for OM to adapt to telehealth principally because the patient interview for diagnosis and management of conditions such as dry mouth, burning mouth

syndrome, or craniofacial pain remains the same. However, for conditions involving soft tissue or tooth pathology, the virtual clinical examination process may be suboptimal, impeding the ability of the residents to learn the necessary skill of comprehensive tactile assessment.<sup>9,14</sup> Moreover, patients may still require in-person procedures for definitive diagnosis, including biopsies of oral mucosal conditions.

A hybrid model of patient care (combination of telemedicine and in-person consultation) was adopted, and 82% of our study respondents reported continuous active involvement of residents in both telehealth and in-person consultations. Telehealth allowed for continuity of patient care, the ability to triage and prioritize patients' needs, and continuation of resident clinical activities without complete cessation at any point during the pandemic.<sup>9,14</sup>

The COVID-19 pandemic led to significant changes in didactic training and examination practices in the medical and dental education curriculum through embarkment on virtual academic platforms.<sup>15,16</sup> Our survey results showed a similar shift in the OM academic training, with 85% of the respondents reporting a complete switch of the didactics to virtual platforms, mainly by March to April 2020. One of the advantages of virtual didactic training included inviting expert guest speakers from across the globe and recording lectures/conferences.<sup>17</sup> A study conducted to evaluate the effectiveness of webcast lectures in comparison to live lectures in medical education showed that medical students in the 2 groups performed equally on the written examination but those in the webcast group performed better in the objective structured clinical examination tests, indicating that lectures given through virtual platforms may be equally or more effective than live lectures.<sup>18</sup> However, the virtual didactic courses cannot replicate certain important facets of traditional classroom format such as in-person class discussions and the development of interpersonal connections.<sup>19</sup> The virtual learning platform may have its fair share of pros and cons, but it appears that the virtual didactic training in part made it possible for residents to potentially meet their graduation requirements. This is evident from our survey results indicating that the majority felt that the pandemic would not interrupt the timely graduation of the residents, a result similar to that of an observational study on COVID-19 pandemic's effect on medical residents within the Western Connecticut Health Network.<sup>20</sup>

The aspect of OM resident training that appeared to be most affected by the pandemic was residents' research activities (lab-based experiments, clinical research, electronic health records, thesis submission, defense, etc.). There were delays and interruptions in the research activities, with more than half of our study respondents reporting complete cessation of research activities for some period. Changing research projects possibly because of



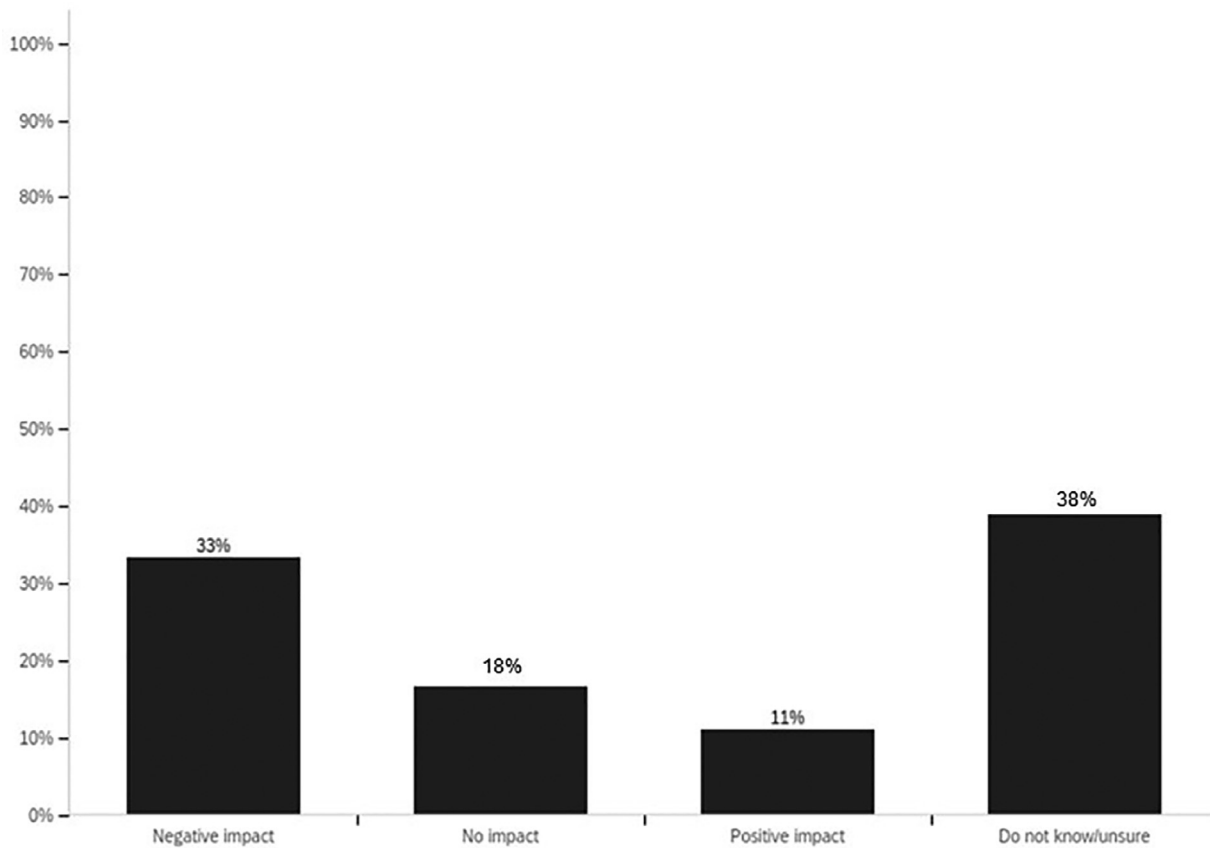


Fig. 3. Mental health and well-being resources available to residents during the coronavirus disease 2019 pandemic.

feasibility issues also seemed to be a factor negatively affecting resident morale. The development of quality virtual learning experiences and remote research practices including virtual research meetings may be one of the important considerations for many OM residency programs during the pandemic.

Several studies have shown negative economic, social, and psychosocial effects on dental residents.<sup>16,21,22</sup> The qualitative survey questions also sought to determine the effects on OM resident morale and mental well-being. One-third of respondents perceived diminished resident morale due to the pandemic. The most substantial concern included the risk of being exposed to the COVID-19 virus, especially the fear of a loved one contracting the virus, a concern that was also shared by residents of other dental specialties.<sup>16,22</sup> Support, on the other hand, appeared to be an important factor for resident well-being during the pandemic. Residents felt supported by their fellow residents (25.4%), by loved ones and community (23.5%), and by their program leadership (19.6%). An internal motivation to lead in difficult times (15.6%) and efforts at maintaining personal well-being (14.7%) positively influenced morale. It was surprising to note, however, that 38% of our survey respondents expressed uncertainty about the effect of COVID-19 on residents' morale, which could potentially reflect a lack of open

discussion of mental health issues between residents and faculty members due to the associated stigma. Regular, transparent communication between program leadership, faculty, and residents is important in decreasing stress during difficult times such as during a pandemic.<sup>23,24</sup>

The importance of psychological support to health care workers during the pandemic has been well documented.<sup>25,26</sup> Our survey showed widespread access of OM residents to mental health resources, self-care, fitness services for residents, including counseling services, virtual individual/group fitness resources (e.g., subsidized/free membership to fitness websites, institutional fitness resources, etc.), and virtual social interactions, but it is interesting to note that one-fifth of respondents were not aware of these available psychosocial support resources. These survey results reinforce the need for increased awareness in residency programs about available psychosocial support programs.

There are some limitations to this study. Firstly, because the survey was voluntary, the results may not be generalizable for all residents across all OM residency programs. Nevertheless, this study includes responses from every experience level of residency programs and may reflect the views of a representative sample. Secondly, as with any survey-based study, it

may be subject to response bias. Residents who responded may have felt more strongly about the effect on their training experience during the pandemic. Lastly, this survey did not collect the geographic location of the respondents, so it is not feasible to make any inference about the pandemic's local severity effects.

## CONCLUSION

Herein, we report on faculty and residents' perceptions of the effect of the COVID-19 pandemic on the educational, training, and research experiences of residents enrolled in OM residency programs in North America. Despite constraints, the pandemic provided an opportunity for faculty, residents, and the program leadership to continue clinical activities, didactic training, and research productivity through virtual means and a hybrid delivery care model while maintaining resident morale through resources, support, and sense of camaradery within the residency program.

## DECLARATIONS OF INTEREST

None.

## SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.oooo.2021.09.011](https://doi.org/10.1016/j.oooo.2021.09.011).

## REFERENCES

- Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. *Acta Biomed.* 2020;91:157-160. <https://doi.org/10.23750/abm.v91i1.9397>.
- Dave M, Seoudi N, Coulthard P. Urgent dental care for patients during the COVID-19 pandemic. *The Lancet.* 2020;395:12-57. [https://doi.org/10.1016/s0140-6736\(20\)30806-0](https://doi.org/10.1016/s0140-6736(20)30806-0).
- Hattar S, AlHadidi A, Sawair FA, Alraheam IA, El-Ma'aita A, Wahab FK. Impact of COVID-19 pandemic on dental education: online experience and practice expectations among dental students at the University of Jordan. *BMC Med Educ.* 2021;21:151. <https://doi.org/10.1186/s12909-021-02584-0>.
- Li Y, Wang Y, Jiang J, et al. Psychological distress among health professional students during the COVID-19 outbreak. *Psychol Med.* 2020;51:1952-1954. <https://doi.org/10.1017/S0033291720001555>.
- Isiekwe IG, Umezudike KA, Daramola OO, Akeredolu MO, Leo-Olagbaye AA. The COVID-19 pandemic and dental residency training in Nigeria. *Eur J Dent Educ.* 2020;25:753-761. <https://doi.org/10.1111/eje.12654>.
- CDC. *Considerations for Institutions of Higher Education.* CDC; 2021.
- American Dental Association. ADA calls on dentists to postpone elective procedures. Available at: <https://www.ada.org/en/press-room/news-releases/2020-archives/march/ada-calls-upon-dentists-to-postpone-elective-procedures>. Accessed March 16, 2020.
- Lv N, Sun M, Polonowita A, Mei L, Guan G. Management of oral medicine emergencies during COVID-19: A study to develop practise guidelines. *J Dent Sci.* 2020;16:493-500. <https://doi.org/10.1016/j.jds.2020.07.016>.
- Villa A, Sankar V, Shiboski C. Tele(oral)medicine: A new approach during the COVID-19 crisis. *Oral Dis.* 2021;(Suppl 3):744-745. <https://doi.org/10.1111/odi.13364>.
- Potts JR. Residency and Fellowship Program Accreditation: Effects of the Novel Coronavirus (COVID-19) Pandemic. *J Am Coll Surg.* 2020;230:1094-1097. <https://doi.org/10.1016/j.jamcollsurg.2020.03.026>.
- Schwartz DA, Connerney MA, Davila-Molina M, Tummalapalli SL. Resident Mental Health at the Epicenter of the COVID-19 Pandemic. *Acad Med.* 2021;96:e16. <https://doi.org/10.1097/ACM.0000000000003768>.
- AAOM's Spring 2020 Newsletter: A Residents' Perspective on COVID-19 Pandemic — Brigham and Women's Hospital/Harvard School of Medicine. Available at: <https://www.aom.com/spring-2020—residents—perspective—brigham-harvard>. Accessed on May 24, 2021.
- Alves FA, Saunders D, Sandhu S, Xu Y, de Mendonça NF, Treister NS. Implication of COVID-19 in oral oncology practices in Brazil, Canada, and the United States. *Oral Dis.* 2021;27:793-795. <https://doi.org/10.1111/odi.13493>.
- Villa A, Sankar V, Shazib MA, et al. Patient and providers' satisfaction with tele(oral)medicine during the COVID-19 pandemic. *Oral Dis.* 2020.Epub ahead of print. doi:10.1111/odi.13678
- Rose S. Medical Student Education in the Time of COVID-19. *JAMA - J Am Med Assoc.* 2020;323:2131-2132. <https://doi.org/10.1001/jama.2020.5227>.
- Hung M, Licari FW, Hon ES, et al. In an era of uncertainty: Impact of COVID-19 on dental education. *J Dent Educ.* 2021;85:148-156. <https://doi.org/10.1002/jdd.12404>.
- Chick RC, Clifton GT, Peace KM, et al. Using Technology to Maintain the Education of Residents During the COVID-19 Pandemic. *J Surg Educ.* 2020;77:729-732. <https://doi.org/10.1016/j.jsurg.2020.03.018>.
- Vaccani JP, Javidnia H, Humphrey-Murto S. The effectiveness of webcast compared to live lectures as a teaching tool in medical school. *Med Teach.* 2016;38:59-63. <https://doi.org/10.3109/0142159X.2014.970990>.
- Kemp N, Grieve R. Face-to-face or face-to-screen? Undergraduates' opinions and test performance in classroom vs. Online learning. *Front Psychol.* 2014;5:1278. <https://doi.org/10.3389/fpsyg.2014.01278>.
- Ostapenko A, McPeck S, Liechty S, Kleiner D. Has COVID-19 Hurt Resident Education? A Network-Wide Resident Survey on Education and Experience During the Pandemic. *J Med Educ Curric Dev.* 2020. <https://doi.org/10.1177/2382120520959695>. Epub ahead of print.
- Isiekwe IG, Adeyemi TE, Aikins EA, Umeh OD. Perceived impact of the COVID-19 pandemic on orthodontic practice by orthodontists and orthodontic residents in Nigeria. *J World Fed Orthod.* 2020;9:123-128. <https://doi.org/10.1016/j.ejwf.2020.07.001>.
- Isiekwe IG, Umezudike KA, Daramola OO, Akeredolu MO, Leo-Olagbaye AA. The COVID-19 pandemic and dental residency training in Nigeria. *Eur J Dent Educ.* 2020;25:753-761. <https://doi.org/10.1111/eje.12654>.
- Shanafelt TD, Gorringer G, Menaker R, et al. Impact of organizational leadership on physician burnout and satisfaction. *Mayo Clin Proc.* 2015;90:432-440. <https://doi.org/10.1016/j.mayocp.2015.01.012>.
- Spalluto LB, Planz VB, Stokes LAS, et al. Transparency and Trust During the Coronavirus Disease 2019 (COVID-19)



- Pandemic. *J Am Coll Radiol*. 2020;17:909-912. <https://doi.org/10.1016/j.jacr.2020.04.026>.
25. Walton M, Murray E, Christian MD. Mental health care for medical staff and affiliated healthcare workers during the COVID-19 pandemic. *Eur Hear J Acute Cardiovasc Care*. 2020;9:241-247. <https://doi.org/10.1177/2048872620922795>.
26. Brooks SK, Webster RK, Smith LE, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet*. 2020;395:912-920. [https://doi.org/10.1016/S0140-6736\(20\)30460-8](https://doi.org/10.1016/S0140-6736(20)30460-8).