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Examining the Experiences of US Dentists during the First Wave of the COVID-19 Pandemic: Implications for Policy and Practice

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Abstract: (1) Background: As an emerging topic, no known study to date has described interviews with US dentists regarding their experiences during the beginning of the coronavirus disease 2019 (COVID-19) with regard to office closures and their implications for both the dentists and the patients they serve, especially among dentists in their first decade of work and new to practice ownership roles. Therefore, the purpose of this study was to describe the experiences of early-career US dentists during the initial stages of the COVID-19 pandemic. (2) Methods: This study utilized a semi-structured interview protocol and employed qualitative descriptive methodology. SPSS 26 and NVivo12 were utilized for data analysis. (3) Results: In April 2020, a total of 12 early-career US dentists completed the interview study protocol. The study sample majority was male (67%), with a mean age of 32 (range = 30–37) and an average of 6 years of dental practice experience (range = 5–10). Participants completed phone interviews with the research team. In summary, three organizing themes emerged: (1) Dentistry during COVID-19: Experiences during the first wave, (2) Long-term concerns regarding COVID-19, and (3) COVID-19 professional communication and dental research. (4) Conclusions: The chief findings of this study are dentists' long-term concerns for the profession post-COVID-19. Research must still determine how to best prepare for future infectious disease outbreaks with regards to safeguarding the health of the dental workforce and maintaining the oral health of patient populations.

Keywords: COVID-19; dentistry; public health; interviews; PPE

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1. Introduction

Coronavirus disease 2019 (COVID-19) is a respiratory illness that began spreading throughout the globe in early 2020, with over 547 million confirmed cases and nearly 6.4 million deaths to date [1]. While the full scope of the clinical presentation of COVID-19 is yet to be fully described, serious complications are most common among adults 65 years and older and among individuals with underlying cardiac conditions, pulmonary disease, and diabetes [1]. In the United States, state and federal mandates to close businesses and shelter-in-place caused the State Dental Societies and American Dental Association (ADA) to formally recommended that dentists close their offices to all but emergency care. Primary announcements of this decision began in mid-March 2020 [2] at the state-level, with subsequent formal recommendations from the ADA communicated on 1 April 2020. In total, US-based dental offices were closed for weeks to months, with offices reopening for routine care on a state-by-state basis with the most recent "Interim Reopening Guidance for Dental Settings" provided by the US Center for Disease Control updated on 18 June 2020 [3].

Office closures around the globe have not only been for the protection of patients' health but also for dental providers and staff [4]. "Dentists [and support staff including hygienists and assistants] are among the highest risk for transmission and contraction of the virus" as COVID-19 is transmitted through aerosol spray from individuals' mouths [4,5].

Also of concern for the dental community is the world-wide shortage of personal protective equipment (PPE), which protects both dental staff and patients alike and is essential to minimize the risk of transmission of COVID-19 and other diseases. As an emerging topic, no known study to date has examined US dentists' experiences during COVID-19 with regard to office closures, care of emergency patients, personal protective equipment (PPE) changes, and the short- and long-term concerns for the dental profession following COVID-19. This topic is of particular importance to early-career dentists who, from a public health standpoint, require support during their transitional years to independent practice given literature documented concerns regarding dentists' "short career expectancies", "early professional burnout", and issues with practice viability [6].

Therefore, the purpose of this study was to describe the experiences of early-career US dentists during the beginning of the COVID-19 pandemic. Through thematic analysis, the study details the perspectives shared by dentists with regard to the impact of COVID-19 on their dental practice and the oral health of their patient populations.

2. Materials and Methods

This study utilized qualitative descriptive methodology, employing a semi-structured individual interview protocol for data collection. Prospective research study participants were recruited from throughout the US using a direct approach, including purposive sampling with additional snowball sampling technique employed via word of mouth through practitioner relations. The interviews were not anonymous as the principal investigator's professional network was utilized to recruit participants. The research study team (JRS, SDS) determined the inclusion criteria of practicing dentists in the United States, which included both practice owners and associates, general dentists, and specialists. The study team purposefully ensured that early-career dentists in a variety of practice settings were included in the research design. For the purposes of this study, early career is defined as dentists with 10 or fewer years of dental experience post-graduation. The primary investigator and clinician on the study team (JRS) was responsible for participant recruitment. Both research study team members were responsible for data collection, data analysis, and writing. At the completion of the 9th interview, the research study team convened to discuss initial findings from interviews 1–9 and reached consensus that the study's main organizing themes had been identified. In keeping with qualitative methodology best-practices, three subsequent interviews were conducted to confirm that data saturation had been reached with the achievement of "informational redundancy" [7].

The interview guide utilized in this study design was developed to capture both the retrospective and prospective perspectives of dentists during COVID-19 (Figure 1). This interview guide, semi-structured in design, allowed for consistency from interview to interview while allowing for variability by employing open-ended questions with additional probes to ascertain the individual experience of each interviewed dentist, irrespective of variations in practice structures, areas of specialty, and patient populations. All research study team members approved the final draft of the interview guide. Developed interview guide questions allowed the research team to capture each dentists' demographic characteristics and work experience and experience with COVID-19 from the time they first became aware of the virus.

Thinking Retrospectively, Examination of Experiences During COVID-19

Tell us about your experience beginning with when you first learned of COVID-19.

When did your office formally close and what was the process?

Tell us about emergency care you have provided since COVID-19.

Tell us about any changes you made or plan to implement with regards to PPE during COVID-19.

Dental Practice Following COVID-19

What are the implications of COVID-19 for your staff?

With regard to your dental practice, what are your short-term concerns? Long-term concerns?

What are the implications of COVID-19 for the oral health of your patients and community? Do you think patients will hesitate/delay visits?

As a clinician, what research you would like to see regarding COVID-19 and dentistry?

What support would you like to see from governing bodies including the American Dental Association and your State Dental Society?

Finally, what further comments related to COVID-19 and dentistry would you like to share with us?

Figure 1. Interview Study Guide.

Institutional Review Board approval was obtained from DePaul University, Chicago IL, USA. All research study team members were registered with CITI. Following IRB approval, the research study team recruited dentists via email and phone to participate in the study protocol. Each study interview was conducted by both investigators as a team. Each interview lasted 15–20 min. At the onset of the interview, the research methodologist (SDS) walked the study participant through the IRB approved information sheet describing the study design and purpose and acquired oral consent for participation. The audio recording was then begun. The research methodologist then asked the study participant their demographic characteristic information. Following this general information, the primary investigator clinician (JRS) on the study team conducted the formal interview, walking each study participant through the formal questions described in the interview guide, clarifying responses, and asking approved probing questions as necessary. Interview questions focused on office closings, emergency care provided, changes to personal protective equipment, staffing, the implications of COVID-19 on the oral health of their patients, and dental practice following COVID-19. The research study team debriefed following each of the 12 interviews.

Audio recordings of each interview were uploaded into a secure cloud storage environment for data storage. Transcription of the audio files was completed by Rev, a professional

online transcription company. Each audio file was transcribed verbatim into a Microsoft Office Word document by a Rev-employed transcriptionist. The primary investigator clinician reviewed each written transcript with the coinciding audio file to ensure accuracy for data verification purposes. Study participant demographic characteristics were analyzed by the research methodologist utilizing SPSS 26 (SPSS 26, IBM Corp, Arkmonk, NY, USA). Interview data was qualitatively analyzed, utilizing thematic analysis employing NVIVO 12.5.0 software (QSR International Pty Ltd., Burlington, MA, USA). The research study team members first examined the transcripts independently to identify preliminary organizing themes before then discussing and refining organizing themes to ensure consistency and reach consensus.

3. Results

A total of 12 dentists completed the interview study protocol in this preliminary examination of the experiences of early-career US dentists during the initial stages of the COVID-19 pandemic. Study participants' characteristics are described in Table 1. The study sample majority was male (67%), with a mean age of 32 (range = 30–37) and an average of 6 years of dental practice experience (range = 5–10). Study participants were predominantly general practitioners (75%) who owned their own practices (58%) with an average of seven operatories (range = 4–14). Participants qualitatively described their professional perspectives and dental practice experiences during the COVID-19 pandemic in phone interviews with the research study team members. In summary, three organizing themes emerged, as illustrated in Tables 2–4: (1) Dentistry during COVID-19: Experiences during the first wave, (2) Long-term concerns regarding COVID-19, and (3) COVID-19 professional communication and dental research.

Table 1. Summary of Study Participant Characteristics.

Participant Characteristic		***No. (%)***
Sex		
	Male	8 (67%)
	Female	4 (33%)
Age		
	Mean	32
	Range	7; 30–37
Years of Experience		
	Mean	6
	Range	5, 5–10
Area of Practice		
	General Practitioner	9 (75%)
	Specialist	3 (25%)
Position		
	Owner	7 (58%)
	Associate	5 (42%)
Size of Practice		
	Mean number of Operatories	7
	Range	10; 4–14

Table 2. Dentistry during COVID-19: Experiences during the first wave.

Office Closures
"Well, it kind of felt like the rug was pulled out from underneath us to be honest, there was very little time to prepare. I remember I got the [closure] email...at 5:30 in the morning when I was getting ready for work. [We had to] get our first patients who were already on their way out the door home and then cancel everyone from there [forward]."
"Every hygienist and assistant was on a phone calling patients, from either their operatories or a desk phone to get all the patients rescheduled or canceled at that time and [there was] uncertainty of how everyone was going to get paid. It was chaotic that first day, very chaotic, but they managed to go through the plan that each person was responsible for their own schedule and calling those patients to move them out to after April 8th, so that was chaotic."
"On Friday we talked about it and then implemented it over the weekend. So, it was... abrupt."

Table 2. *Cont.*

Emergency Care Provided
"As a practice...we saw a number of patients the first two weeks via teledentistry. But then as [it] got pushed to a longer stay-at-home order, I have not felt comfortable letting patients go that long without being seen if they're in pain. So I've been going in on an as-needed basis, that could mean [a few] patients a week, it could mean 12 patients a week and working with one assistant, the same assistant every time and triaging the needs there and providing whatever definitive care I can at that time."
"I have just done phone triage. I've had number of patients call. They express their symptoms [and I] talk it through with them. A couple have sent pictures, things like that . . . "
"Lots of phone conversations, [I] have called in some antibiotics... gone in to see people for exam and X-rays. I have good endodontists in town who are seeing people who are swollen and are in severe pain. For extractions, our local oral surgeon is seeing [a] . . . few people, so I have done a few of those when necessary. But as far as temporary crowns [coming] off, I have urged people to get their own temporary cement, when possible, and if that has failed and they're in pain, I have gone in."
"We've handled emergencies mainly over the phone. I have a front desk employee go into the office every day, checking any voicemail. With emergencies, we will see patients either in office or, depending on their emergency, refer them to a specialist for immediate care."
PPE
"When we get going again, if we can get N95 masks we're going to use [them] with disposable class one masks over those...We'll change out the class one masks between patients, but we will use the N95 throughout the day just because there is a significant shortage, and they are a lot more costly. The assistants and the hygienists will [also] be using face shields, which they're all for."
"We talked with our hygiene coordinator and [asked] what she thought. So, it wasn't just a 'This is how we're doing it from now on.' We wanted all levels of our staff to [be involved with PPE decision-making]."
"If the new standard PPE are these hair nets, face shields, N95 super masks, gloved up. Are the patients going to be afraid and not trusting that it's safe to go back? You know, if you're looking like you're coming out of a hazmat environment."
"We've obtained some N95 masks...we have not made any plans for a long-term change on PPE. I'm concerned about the adequacy of any PPE and cross-contamination in a dental office, whether it would be sufficient at this point or not. I can protect myself and my staff, but if there's two patients in the office and we're doing cleanings on [them], I'm not sure we can protect those patients from each other."
"It seems like we're going to have to have a really good supply of level three surgical masks, face shields, [and] gowns available for people. Eye protection will be a must."
Impact of COVID-19 on Staff
"It's going to be hard to get [staff] over the fear of getting sick to get them back to work. Even though we're doing all of these things PPE-wise, are they going to be able to get past that fear of getting sick and come back to work? I don't know."
"They are very much concerned that we have the adequate PPE, making sure we can implement social distancing and how are we going to change the flow of our days when we get back...there's a lot of potential for cross contamination with the dentist moving from room to room so frequently."
"The only ones concerned are the hygienists...because a lot of the research has them at the top of the list [to] be the first ones to get the virus. We'll probably put in a protocol of no ultrasonic scalers, try to cut down on the aerosols, hopefully mostly hand-scaling, and go from there."
"My staff seems to be willing to go back when we are deemed essential and when our practice thinks it's safe for us to go back."
"Everyone seems to be coping well. I think it's a varying degree. Some very worried, others not so much, more concerned about when we'll get back to work. Others worried about their safety and wellbeing [when we do get back to work]."
Short-Term Concerns
"So I think there will be a lot of changes as far as staying with a patient, which cuts down on your efficiency and your ability to see many patients in a day...even spreading out patients between chairs as opposed to being stacked right next to each other might be an issue that we see in the near future."
"I think the biggest short-term concern would be the wave of orthodontic emergencies we'll have... breakages and losing progress due to things moving in an uncontrolled manner. Also, dealing with the heavy [patient] load in a bottleneck fashion...we've got to get everybody back in and that's piled up and compounded."
"One of the biggest short-term concerns [with reopening] is getting PPE, not getting priced gouged on it and having enough for everybody. I think my biggest concern this week is even if we say, 'Okay, the offices can open on [specific future date]', I don't know that we will be able to, because I don't know if we'll have the PPE."
"Short term concerns would be... how apprehensive patients will be to come in and if we'll be able to fill our schedules like [we] once were."
"I believe there'll be some hesitation. I don't think that our overall office flow will be, hopefully, greatly impacted, due to the backlog of patients that has been rescheduled, but I do anticipate there being some fear and pushback from patients and possibly delaying appointments to later in the year."
I mean, I guess the biggest thing is just the delay in care. I mean, we can't tell people that you are 100% safe here and there's no way you're going to potentially get it or spread it or whatever by being here. You can't ever eliminate 100% of risk.

Table 3. Long-term concerns regarding COVID-19.

COVID-19's Impact on Oral Health Disparities
"[I'm] mindful of patients who would be considered high risk like the elderly or patients that we know have hypertension or uncontrolled diabetes."
"Lower socioeconomic status [patients are] definitely going to be hit the hardest [and] they're most likely the people that are still working [outside of the home]."
"I do think that this will affect [our patients] dental health, which will affect their overall health. [As] dental disease progresses, we know it doesn't get better without intervention. There will definitely be some implications... particularly when I think of perio. There's a huge oral systemic connection with periodontal disease and we have all of these patients who aren't getting medical care or oral healthcare. I think there's going to be a lot of very unhealthy people when we come out of this."
"People with hypertension, diabetes, elderly, older populations, they would be the ones that I'd be most concerned with. Do we delay their treatment depending on what their needs are? Do we delay their treatment as long as we can until they have access to a vaccination, or they've had the disease themselves and have the antibodies? That would be the group that I worry about the most."
"So far, the people who haven't wanted to come in [for emergency care] are the elderly, which I understand because the mortality rates are so much higher for them . . . They're scared to come in."
"I think when we get back to work, I think we're going to see a big increase in caries and obviously tooth pain and things like that because I think oral health is going to be minimized during this time. Everybody's so focused on the coronavirus that their [oral health has been] pushed back...A lot of people, they have a normal routine. They get up, shower, brush their teeth. Go to work, come home, eat dinner, brush their teeth, go to bed. Being out of a routine, is everybody brushing their teeth every day anymore?"
"I'm expecting the elderly population to be most apprehensive about coming back."
Practice Viability and Financial Concerns
"I think this will definitely slow down the growth of the office...being closed for a month and a half. I'm also concerned with how [COVID-19] is going to impact the economy. And when we do return [to work], if people are still going to be scheduling new patient exams quite at the same level."
"Predicting a downturn in money spent on dental care because everyone right now is facing hardship."
"Obviously with a recession or downturn in the economy, more elective procedures will decrease, so I believe there will be a year to two to three lag on production just because instead of crowns, people will be doing large fillings and trying to get by a little bit more."
"Keeping my staff employed . . . [in] the long term we have a large practice and keeping it viable for the next five years [is a concern]. Cashflow."
"I think there's going to be just a huge economic impact and I'm a little scared for that."
"Patients are fearful for their health, but they're also fearful of the economic impact. People aren't spending money and when it comes to healthcare costs, it seems dentistry is generally one of those things that [gets] put towards the bottom of the list for a lot of people, so I think we're going to see a recession."
"Is [re-opening] going to be worth it money-wise? . . . Are you going to be able to stay open?"
"Is the practice still going to be around when it's all over? That's really the major long-term concern."
"Long-term concerns for me is just dentistry in general. Is it going to be the same as what it was, what we planned for when we graduated or went into the dental field? With a lot of people losing their jobs or being furloughed and [everyone's] disposable income is dwindling or... nonexistent. When we do open up are people going to see dentistry as something that they need, that they're going to get the work done? We can open back up, but if nobody has the money or is interested in getting the work done, we're still highly effected by what the virus did."
"[If] we lose enough patients [and] end up having to let some staff go, how does that affect our cash flow long-term?"
"Obviously, the economy is going to take a downturn and I think with orthodontics being somewhat considered elective, I'm not sure what that's going to do as far as effecting my specialty and this practice that I've been investing in and buying into for the last six and a half years. You know, the student debt load that we all carry and just the financial plans that you have. I think that's the biggest long-term concern."
COVID-19 as a Precedent
"If [infectious disease outbreaks] become more of a regular issue...what [they may] do is force everyone to close their doors . . . That's my long-term concern. What kind of precedent [does COVID-19] set moving forward? What is deemed a [nationwide] emergency? It just sets a precedent business-wise in the future [that dental offices could] close... you could possibly go out of business."
"How many of these PPE [changes for] infection control are going to become permanent changes versus temporary?"
"Long term... looking to the end of the year, I think everyone is wondering if there will be another [COVID-19] outbreak. I think down the road... everyone is going to be a little more cognizant of the spread of this type of virus or any type of virus that could affect our office because this is something that I don't think anyone expected, a shutdown of all dental offices. So, I think that'll be something on our minds and something that the [governing bodies] should be paying attention to as well."

Table 4. COVID-19 Professional Communication and Dental Research.

Governing Bodies Communication and Guidelines	
	"We need some direction from our governing bodies to reassure us that this can be done in a safe manner, and then I think ultimately it will be on individual offices to use their discretion and figure out what works best and is appropriate for their office for personal protection and wellbeing of the patients."
	"I think we need to advocate for access to PPE. We've been leaned on heavily by the medical world to donate our self-purchased PPE, which [I was] happy to do and proud to have helped with. However, we're taking a double hit financial[ly]... [cash] flow has stopped and we're going to have to try to start that back up, but on top of that we're then trying to access PPE so that we can be open to the public and serve them in a safe manner. That's a rarity right now as far as getting your hands on the right equipment. We donated so much of our equipment [that] we won't be able to function at normal capacity and we can't get the [PPE] we need to do the procedures we have to do."
	"I'd really like to see regulations and recommendations for the [PPE] changes that need to take place as soon as possible so that we can get those things up and running because if say [we] can return to work within a couple of days, financially that might be tempting, but if you don't have all the proper safeguards in place, then you can't open anyway. I think that creates a stagger where some offices will be ready to go, others will have to make modifications and won't be able to open their doors, which creates confusion for patients...some frustration or they switch their dental homes because of it. Why not be getting [prepared] while we can since there's not much else we can do at this time?"
	"[The national dental society] have done a good job of really being on top of sending out alerts via text and email and trying to keep their members in the loop as much as they can...part of it is [COVID-19] is just an everchanging elusive thing. They don't want to put out statements that they have to retract later."
	"I would like [the State Dental Society] to show us what a dental office will look like six months from now, in terms of how they expect it to function. So what [should] a general practitioner's office look like from appointment scheduling to patients [arriving] at the door, to patient at the [front] desk, to chair treatment and check out? What does that look like? what are the expectations? Practical implementation of [guidelines]."
	"What protocols should we have? How many people can I see in an hour? Continuing to reinforce the correct PPE."
	"When we are clear to reopen, I would like to see specific guidelines [that the governing bodies] recommend. If they're just going to open it back to elective procedures, if they still want to wait on hygiene checks, things like that...kind of the sheets they've been releasing recently about what's acceptable and what's not. It would be nice to have something to show patients right away if there's ever any concerns about what can actually be done."
	"Something more concrete. Because, they always say use your best clinical judgment...As a dentist, you feel you're alone, if somebody tells you to just use your best clinical judgment, okay, fair enough, but my clinical judgment is not the same as yours in every scenario."
	"But there are different scenarios [for urban versus rural locations]. Chicago's different than a [small town]...different than New York... different than Florida, and so I can understand that it would be challenging, but that's where I think at a state level, they could really start to dig in with some more practical things to help us get back to work."
	"[The] new laws in [US] Congress had a direct effect on our offices as small businesses as employers of less than 50 people. It was a main concern on what we would be responsible for or whether we'd be exempt as healthcare providers. So I think the [governing bodies]...were working in our corner to get things clarified and dental offices exempt, but it's still something that I've heard different opinions on, so [it's] been a little confusing."
	"The dental societies [need to] start advocating our importance as healthcare providers. I think the same thing goes for primary care physicians and all of the other physicians out there who are temporarily put out of work, it really minimizes the significance of [us] as health care providers."
Direction for Future Research	
	"[Does] high volume evacuation affect the presence of the virus in aerosols or affect the presence of aerosols in general, does it make us safer having that being used at all times? How long can it live on organic or non-organic surfaces like our hair?"
	"I would like to see how long the virus can be in the air."
	"[Does] high vacuum suction actually get rid of it or not? Probably not, but... [does it] at least cut back a significant amount?"
	"How exposed we really are to [COVID-19 as dentists]. Also, if there's really any way to, with aerosols, to get those out of the air."
	"What's going to be the protocol to actively treat somebody with coronavirus? Most effective methods to keep everybody safe."
	"Primarily, infection control. What can we do to prevent cross-contamination? [What can we do to prevent it] being passed around [the office environment], things of that nature."
	"I'd like to see evidence on [aerosols], how long these last and what type of aerosols we're spreading through the air with our hand pieces and ultrasonic units."
	"[Research on] the [effectiveness] of the different masks that we have been wearing toward stopping this [COVID-19 transmission]."

3.1. Theme 1: Dentistry during COVID-19: Experiences to during the First Wave

The first organizing theme, Dentistry during COVID-19: Experiences during the first wave, details dentists' experiences with office closures, emergency care provided, PPE, how COVID-19 has impacted staff members, and participating dentists' short-term concerns related to reopening (Table 2).

3.1.1. Office Closures

Participating dentists unanimously described "abrupt" office closures where the decision to formally close was made quickly, as exemplified in one participant's statement that "it kind of felt like the rug was pulled out from underneath us . . . there was very little time to prepare". At the time of office closures, dentists recalled a "chaotic" environment in which staff, including "hygienist[s] and assistant[s]", were on the phone "reschedul[ing] and cancel[ing]" patients.

3.1.2. Emergency Care Provided

Participating dentists utilized "phone triage" and "teledentistry", including video and "pictures" from patients to communicate with those who contacted their offices with emergency concerns. The chief complaints in the first weeks following office closures due to the stay-at-home orders were pain and swelling. As time went on, some reported that they did not "[feel] comfortable letting patients go that long without being seen if they [were] in pain" and began to provide in-office care on an "as-needed basis". Dentists also described providing education and instruction to patients who called with non-emergent needs such as missing crowns and chipped teeth.

3.1.3. PPE

Participating dentists consistently noted implementing changes to PPE from previous practice to integrate the use of "N95 masks", double layered masks where an N95 is worn "with a disposable class one mask over" it, "face shields", "hairnets", "gowns", "eye-protection", and even disposable shoe covers. Participants discussed how practice changes in PPE were made collaboratively with staff involvement. Many noted ongoing concerns with nationwide PPE shortages and increased or unfair PPE costs.

3.1.4. Impact of COVID-19 on Staff

Participating dentists reported overwhelmingly that "staff seem to be coping well" and are "willing to go back when [dentistry] is deemed essential and [the] practice thinks it's safe". For staff members with hesitations, the main concern is "the fear of getting sick". One participating dentist reported,

> "They are very . . . concerned that we have adequate PPE, making sure we can implement social distancing and . . . change the flow of our days when we get back."

Dentists noted changes they would be making to accommodate the concerns of staff, including increased PPE measures and new protocols including the avoidance of "ultrasonic scalers" and shifting to "mostly hand-scaling" to address hygienists' concerns regarding aerosols.

3.1.5. Short-Term Concerns

In the short-term, participating general dentists described being overwhelmed by the "bottle neck" of "backlogged" patients that had to be rescheduled due to office closures. In addition, treatment needs that were present before closure could be amplified and become more urgent. They also spoke of concerns regarding patients delaying appointments due to ongoing fear of contracting COVID-19, as articulated by one participant, "We can't tell [patients] that [they] are 100% safe here . . . You can't ever eliminate 100% of risk" in a patient care environment.

3.2. Theme 2: Long-Term Concerns regarding COVID-19

The second organizing theme, Long-term concerns regarding COVID-19, details participating dentists' perspectives on COVID-19's impact on oral health disparities, practice viability, and financial concerns, as well as the profession's response to COVID-19 as a precedent for how infectious disease outbreaks impact contemporary dentistry (Table 3).

3.2.1. COVID-19's Impact on Oral Health Disparities

Participating dentists spoke of how COVID-19 may disproportionally impact the oral health of specific demographic groups within their communities of care, including "high risk" categories such as the "elderly", "those with hypertension or uncontrolled diabetes", and patients of low socioeconomic status. They described concerns regarding whether treatment of older adults should be delayed to minimize their risk of contracting COVID-19 in the dental office, noting that "they're scared to come in". One participant stated that they anticipated that delayed care due to COVID-19 would affect, not only patients' dental health, but would also have implications for their systemic health. "[As] dental disease progresses, we know it doesn't get better without intervention", they added.

3.2.2. Practice Viability and Financial Concerns

Every participating early-career dentist spoke of financial concerns surrounding the viability of their practices following COVID-19. One participant shared,

> "Long-term concerns for me is just dentistry in general. Is it going to be the same as what it was, what we planned for when we ... went into the dental field? With a lot of people losing their jobs or being furloughed, [everyone's] disposable income is dwindling or... nonexistent. When we do open up are people going to see dentistry as something that they need? We can open back up, but if nobody has the money or interested in getting work done, we're still highly effected by the [aftermath] of [COVID-19]".

Concerns about the economy going into a recession were particularly pressing for practice owners, who vocalized uncertainties surrounding reduced "new patient exams", "elective procedures", and "cash flow". Apprehension regarding the financial future of dentistry was expressed by one participant as,

> "I'm not sure what that's going to do as far as effecting my specialty and this practice that I've been investing in for the last six and a half years ... the student debt load that we all carry ... the financial plans that [we] have ... That's [my] biggest long-term concern".

3.2.3. COVID-19 as a Precedent

The final long-term concern expressed by dentists interviewed focused on dentistry in a post-COVID-19 world, questioning whether "these changes for infection control [are] going to become permanent" and if a resurgence of COVID-19 or another virus may impact dental offices into the future. As described by one participant,

> "If [infectious disease outbreaks] become more of a regular issue...what [they may] do is force everyone to close their doors. That's my long-term concern. What kind of precedent [does COVID-19] set moving forward? What is deemed a [nationwide] emergency? It sets a precedent business-wise in the future [that dental offices could] close... you could possibly go out of business".

3.3. Theme 3: COVID-19 Professional Communication and Dental Research

The third and final organizing theme, COVID-19 professional communication and dental research, describes participating dentists' retrospective and prospective perspectives of professional communication originating from the dental profession's national and state-level governing bodies, as well as participants' thoughts on future dental research surrounding COVID-19 that they feel would support their clinical practice (Table 4).

3.3.1. Governing Bodies Communication and Guidelines

Communication and guideline development from dentistry's governing bodies were the most pervasive themes in the interviews with study participants. Participants noted that governing bodies in US dentistry were highly communicative, "sending out alerts" and working to keep "members in the loop as much as they can". Participants resoundingly reported that governing bodies utilized their leadership to "advocate [dentists'] importance as healthcare providers" and "small business owners". Participating dentists also vocalized that that they would like governing bodies to help ensure dentistry's "access to PPE", especially given that many dental providers donated their PPE supplies to medical centers.

Additionally, participating dentists described their desires for further regulations and recommendations from governing bodies in great detail. In sum, participants asked that the national and international dental associations put forth plans to "show us what a dental office [should] look like . . . in terms of how they expect it to function", including a detailed plan from optimal scheduling of patient appointments, to front desk reception and check out, chair treatment, and updated PPE protocols. They asked, "what does that look like? What are the expectations?", articulating a need for "practical implementation" of thorough guidelines. Participants noted that "it would be nice to have something to show patients right away if there's ever any concerns". They also spoke about whether these guidelines might vary between urban and rural practice locations, stating that perhaps state dental societies might examine what to implement for their constituents. In sum, dentists interviewed asked for "something more concrete. Because, they always say use your best clinical judgment...As a dentist, you feel you're alone, if somebody tells you to just use your best clinical judgment, okay, fair enough, but my clinical judgment is not the same as yours in every scenario".

3.3.2. Direction for Future Research

With regard to the future direction for dental research regarding COVID-19, study participants spoke at length about research surrounding aerosols, including the effectiveness of "high volume evacuation", lifespan of COVID-19 on organic and non-organic surfaces, "how long the virus can be in the air", and the effectiveness of varying masks utilized by dental offices. Participants also postulated about the best protocol for "actively treat[ing a patient] with coronavirus" and how dentistry can "prevent cross-contamination" of COVID-19. In general, the research interests of this sample of practicing dentists focused on infection control and safety.

4. Discussion

The early-career US dentists interviewed in this study universally described abrupt office closures, a variety of emergency care provided both remotely and in-person, adoption of higher levels of PPE, and staff support as well as short-term concerns around providing treatment to patients immediately post-office closures. The chief finding of this study is these dentists' long-term concerns for the profession post-COVID-19, with future infectious disease outbreaks likely. Practice viability was expressed regarding the longevity of their businesses. They also expressed concerns that the stay-at-home and shelter-in-place orders set a precedent moving forward for what may happen again if there is a reemergence of COVID-19 or another infectious disease outbreak. These long-term concerns amongst our study participants echo the findings of Consolo et al. in a survey study of Italian dental practitioners that reported "practice closures" and "strong activity reduction" as well as "feelings of concern, anxiety, and fear" in dentists and "concerns about the professional future" and "hope for economic measures to help dental practitioners" [8]. This study also describes US dentists' concerns for how COVID-19 may exacerbate oral health disparities in low socioeconomic groups and among older adults with comorbidities. In addition, this study's qualitative findings contribute valuable narratives to the previous survey studies of dentists' experiences during COVID-19 around the world, articulating topics including anxiety, provider preparedness, and increased stress among practitioners [9–12].

Furthermore, this qualitative descriptive study shares first-hand accounts of COVID-19's impact on US dentistry, reinforcing the increased cost of providing care, challenges with implementation of safety protocols, and concerns for long term practice finances reported in Liu et al.'s examination of the pandemic's effect on dentists' workforce confidence and workflow in the US [13].

This study's strengths include its novelty as the first known qualitative examination of US dentists' experiences during COVID-19 and its descriptive design, which allowed for robust narrative data collection. However, our focus on solely early-career dentists and our utilization of purposive sampling and snowball sampling techniques, along with a modest sample size, limit the generalizability of our study findings. Therefore, our findings do not express the perspectives of all US-based dentists. However, this study adds to our collective understanding of the ways in which dental practice was impacted by COVID-19. Future research should examine the experiences of other dental practitioners by utilizing both qualitative and quantitative methods and how dental practice has further changed since the time of our data collection in spring 2020. In addition, much clinically-based and implementation-focused research remains to be done in order to determine how to best treat patients in a dental office settings in future pandemic periods.

5. Conclusions

This study describes the first known qualitative examination of US dentists' experiences during COVID-19, with regard to office closures, care of emergency patients, personal protective equipment changes, and short and long-term concerns for the dental profession. It is important that we learn from the experiences of dentists during the COVID-19 pandemic to implement strategies to support dental clinicians and their practices during infectious disease outbreaks. Dental researchers have worked hard to provide evidence of the oral systemic connection, and collectively the dentists we interviewed felt that the health of their patients was overlooked by the extended office closures. Concrete evidence-based guidelines focused on patient safety and infection control need to be developed by governing bodies so that clinicians may implement them in a timely fashion. As a profession, dentists have the difficult task of determining ethical and logical approaches to optimize the oral health of their practice communities and the viability of their small businesses simultaneously. Dental professionals are urged to remain mindful of the risks associated with providing direct patient care during infectious disease outbreaks, and must remain committed to preserving the oral health of their patients.

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