Patient perspectives on teledentistry and face-to-face doctor interaction during orthodontic treatment

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Patient perspectives on teledentistry and face-to-face doctor interaction during orthodontic treatment

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Dentistry at Virginia Commonwealth University.

By
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May, 2021
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Abstract

PATIENT PERSPECTIVES ON TELEDENTISTRY AND FACE-TO-FACE DOCTOR INTERACTION DURING ORTHODONTIC TREATMENT.

By: Jackson Griffeth, D.M.D.

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Dentistry at Virginia Commonwealth University.

Virginia Commonwealth University, 2021


Department of Orthodontics

Purpose: Orthodontic patients were surveyed to determine the perceived value of doctor-to-patient face-to-face interaction, the desire for convenience and attitudes toward specific uses of teledentistry.

Methods: Participating private practice orthodontists emailed the survey to active patients. 75 self-pay patients from VCU Orthodontic clinic were also invited to complete the survey. Patients 18 years or older were asked to complete the survey regarding their own treatment. Parents of patients under age 18 were asked to complete a separate survey regarding their child’s treatment. Questions asked patients about the importance of face-to-face interaction with their orthodontist and their preferences for the inclusion of teledentistry in their treatment. Responses were compared based on patient characteristics (adult vs child, braces vs clear aligners, etc.) using chi-square tests.
**Results:** 388 respondents from 8 orthodontic practices participated in the survey. 85% of parents considered face-to-face interaction to be important and 85% said that their child’s treatment fit conveniently in their schedule. Adult responses were 86% and 89%, respectively. Adult preference for face-to-face was significantly higher than parents (83% vs 78%, P=0.038). Adults treated with clear aligners were less likely to strongly agree that their treatment fits conveniently in their schedule (51% vs 76% in braces, P=0.0490) and were more likely to be interested in utilizing teledentistry (27% vs 18% in braces, P=0.0429).

**Conclusion:** Most orthodontic patients prefer to be seen face-to-face. This is due to a high value placed on face-to-face interaction with the orthodontist. Most patients do not consider their treatment inconvenient. Patients prefer that teledentistry be used to enhance communication as opposed to replacing face-to-face interaction. Implementation of teledentistry in orthodontics should be applied on a patient-to-patient basis with continued emphasis on the doctor-patient relationship.
Introduction

The relationship between doctor and patient is one of unique importance. Patients entrust doctors with their health and doctors have a fiduciary duty to their patients. The Hippocratic Oath describes the duty to honor patient trust by respecting the patient’s vulnerability and by practicing medicine with expertise and sound judgement.¹ This relationship remains profoundly significant. Medical studies have consistently shown that relational aspects of care such as good rapport, clear communication and trust are the most important factors in patient satisfaction and treatment outcomes.²–⁴ Likewise in dentistry, it has been shown that patient satisfaction is strongly correlated with good communication.⁵,⁶ Patients typically visit their orthodontist every 6-8 weeks over the course of their treatment. The relationship formed between the patient and the doctor, reinforced by these face-to-face interactions, has historically been the most important factor in patient satisfaction with orthodontic treatment.⁷,⁸

The introduction of new technology has led to an evolution of the doctor-patient relationship. Until recently, physical interaction between doctor and patient was inherent in treatment.⁹ Today’s technology, however, allows a doctor to diagnose, prescribe, treat and follow up without ever meeting face-to-face.¹⁰,¹¹ In dentistry and orthodontics, patients may now be reached and monitored remotely utilizing digital communication and imaging platforms.¹²–¹⁵ Termed “teledentistry”, this technology has the potential to save patients time, increase access
for patients who travel long distances and allow orthodontists to provide more frequent
instruction and encouragement to improve compliance and hygiene. In pursuit of these and
other benefits, technology developers and many health providers are quickly adopting telehealth
practices.

Patient satisfaction with new telehealth practices is not entirely known. Many studies on
telemedicine performed in the last two decades show favorable results on patient satisfaction, while others also continue to show that patients prefer face-to-face interaction with their
doctor. Studies in other fields including pharmacy and dentistry have shown beneficial uses for tele-services. However, new concerns are also raised by teledentistry
including decreased rapport between doctor and patient, unclear licensing and legal policies, and compromised diagnostic capability. Teledentistry is rapidly developing in orthodontics but few studies have been performed regarding its efficacy and no studies have evaluated patient preferences for its use.

There are many practical applications of teledentistry in orthodontics. Prospective
patients may take a virtual office tour on a practice website and set up a virtual consultation.
During treatment, doctors have the option to utilize remote monitoring technology. This
technology significantly changes the traditional way of interacting, providing a new avenue of
communication between in-person visits as well as potentially decreasing the number and
frequency of in-person visits. The use of teledentistry may also extend from routine
monitoring to helping patients address orthodontic emergencies at home and following up with retention once treatment is complete. A recent unexpected utilization of teledentistry was the
management of patient care during the COVID-19 pandemic, when in-person appointments were suspended in most states in the United States for 10-12 weeks. Most doctors were able to
establish a line of communication with patients, continue active treatment and provide service. These new systems of communication which were implemented out of necessity during the pandemic could become the preferred means of communication for the future.

While electronic communication enables people to connect, it lacks the emotional value of face-to-face communication, which permits recognition of verbal and physical cues. Orthodontic treatment can be a long process, demanding of a good relationship to maintain motivation, compliance and guidance. As technology continues to evolve and improve, each orthodontist will need to decide how to use teledentistry appropriately to best serve his or her patients. There is a lack of data regarding patient desires for the use of teledentistry in orthodontics, yet this information is of critical importance to identify opportunities and challenges as we seek to provide our patients with the best possible care and service.
Methods

Orthodontists in the Virginia Orthodontic Education and Research Foundation (VAOF) network were invited via email to participate as a site in the study. The VAOF network consists of 116 practicing orthodontists distributed across the United States. Participating orthodontists emailed a link to the survey to their active patient base. 75 self-pay patients from the Virginia Commonwealth University Orthodontics clinic were also invited to complete the survey. The survey consisted of 10 demographic questions followed by 19 original statements for which respondents were asked to indicate their agreement using a 5-point Likert scale. The scale ranged from “Strongly Disagree” to “Strongly Agree” and the questions were designed to: 1) Determine the perceived value of doctor-to-patient face-to-face interaction, 2) Discover how this interaction is prioritized with desire for convenience and 3) Discover attitudes toward specific uses of teledentistry in orthodontics. The survey branched depending on if the patient was an adult or a minor in order to tailor the questions appropriately. Parents of patients under age 18 were asked to complete the survey regarding the treatment of their child. The term “parent” was used to generically refer to both parents and guardians. Based on the answer to the first question in the demographics section asking who was in treatment: “Please indicate if you or your child is currently in orthodontic treatment (or both),” respondents were directed to the appropriate version of the survey. If the respondent indicated that they were in treatment along with a child,
they completed both sections of the survey. The complete survey is available in the Appendix. Survey responses were collected between the months of June 2020 to September 2020. The survey was administered electronically through Research Electronic Data Capture (REDCap, Nashville, TN) hosted by Virginia Commonwealth University. REDCap is a secure web application used to build online surveys and databases. The survey was entirely anonymous, voluntary, and no identifiers were collected. Participants could stop answering questions and withdraw from the study at any point until they submitted their survey. Once submitted, there would be no way to withdraw since there was no way to identify their responses. Study approval was granted by the VCU IRB (HM20018509).

Responses were summarized using descriptive statistics (counts, percentages) and compared using chi-square tests to determine if associations with could be made between perceptions and preferences towards teledentistry and patient characteristics (adult vs child, braces vs. clear aligners, etc). Fisher’s exact test was used for comparisons that resulted in small cell counts. All analyses were performed in SAS EG v.8.2 (SAS Institute, Cary, NC). The significance level was set at 0.05.
Results

A total of 377 individuals responded to the survey. Among all respondents, 31% were receiving treatment for themselves (n=116), 67% had a child receiving treatment (n=253), and 2% were both in treatment and had a child in treatment (n=8). The majority of respondents were female (85%) and were in the age range of 35-54 (71%). Most of the children in treatment were 13-17 years old (66%) and there was roughly an equal distribution of males (43%) and females (55%). Adults in treatment were mostly female (78%) and equally distributed in age ranging from 18-24 to 65+. The treatment modality was significantly different between children and adults (P<0.0001), with 81% of children being treated with braces and 68% of adults receiving clear aligner therapy. Complete demographics are given in Table 1.

Table 1: Respondent and Patient Demographics

<table>
<thead>
<tr>
<th>Who is being treated</th>
<th>n</th>
<th>%</th>
</tr>
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<tbody>
<tr>
<td>Myself</td>
<td>116</td>
<td>31%</td>
</tr>
<tr>
<td>My Child</td>
<td>253</td>
<td>67%</td>
</tr>
<tr>
<td>Both</td>
<td>8</td>
<td>2%</td>
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<thead>
<tr>
<th>Respondent Age</th>
<th>n</th>
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<td>3%</td>
</tr>
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<td>25-34</td>
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<td>8%</td>
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<td>35-44</td>
<td>120</td>
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<td>45-54</td>
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<tr>
<td>55-64</td>
<td>41</td>
<td>11%</td>
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<tr>
<td>65+</td>
<td>26</td>
<td>7%</td>
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<tbody>
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<td>Male</td>
<td>47</td>
<td>12%</td>
</tr>
<tr>
<td>Gender</td>
<td>Child Age</td>
<td>Community Size</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
</tr>
<tr>
<td>327</td>
<td>80</td>
<td>23</td>
</tr>
<tr>
<td>Prefer not to answer</td>
<td>10</td>
<td>6%</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3%</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Drive Time Home to Orthodontist</td>
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<tr>
<td>Under 10 minutes</td>
<td>136</td>
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<tr>
<td>36%</td>
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<tr>
<td>10-20 Minutes</td>
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<tr>
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<td>20-45 Minutes</td>
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<td>17%</td>
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<td>Over 45 Minutes</td>
<td>17</td>
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<td>Community Size</td>
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<td>Town/Small City (2,500-50,000)</td>
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<td>Metropolitan (&gt;500,000)</td>
<td>90</td>
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<tr>
<td>Child Age</td>
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<tr>
<td>8-12</td>
<td>80</td>
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<tr>
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<tr>
<td>Child Gender</td>
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<tr>
<td>Female</td>
<td>142</td>
<td></td>
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<tr>
<td>Prefer not to answer</td>
<td>7</td>
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<tr>
<td>3%</td>
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<td></td>
</tr>
<tr>
<td>Child Treatment Modality</td>
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<tr>
<td>Clear aligners (Invisalign or similar)</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Braces</td>
<td>198</td>
<td></td>
</tr>
<tr>
<td>Expander, Herbst or other orthodontic appliance</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Adult Patient Respondents (n=124)</td>
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<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>Prefer not to answer</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
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<tr>
<td>18-24</td>
<td>13</td>
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<tr>
<td>10%</td>
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<td></td>
</tr>
<tr>
<td>25-34</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>15%</td>
<td></td>
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<tr>
<td>35-44</td>
<td>27</td>
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</tr>
<tr>
<td>22%</td>
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<tr>
<td>45-54</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>13%</td>
<td></td>
<td></td>
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<tr>
<td>55-64</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65+</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>19%</td>
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</tr>
<tr>
<td>Treatment Modality</td>
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<td></td>
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<tr>
<td>Clear aligners (Invisalign or similar)</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td>Braces</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Expander, Herbst or other orthodontic appliance</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
Children in Treatment

Parents reported that regular face-to-face interaction with their child’s orthodontist was important (85%) and that it fit conveniently around other demands in their schedule (86%). 61% agreed or strongly agreed that they would feel comfortable communicating via video and similarly via text (62%) with their child’s orthodontist. When asked if they were interested in utilizing telemedicine for their child, only 25% of respondents agreed or strongly agreed and 74% agreed or strongly agreed to the statement that they preferred face-to-face interaction. These preferences were not significantly associated with the age of the child. There were, however, significant associations with the treatment modality for the child (clear aligners vs. traditional braces). Although only 24 respondents had children in clear aligners, those respondents were more interested in utilizing teledentistry for their child’s treatment (P=0.0268), with 42% agreeing or strongly agreeing compared to just 23% of those with children in braces. There was also a marginally significant association with the agreement to preferring face-to-face interaction with the orthodontist (P=0.0661), with 13% of those whose child was in clear aligners disagreeing compared to 3% of those in braces. A summary of parent responses is given in Figure 1.
Figure 1: Parent Preferences for Child Patients

It was clear that parents would rather have their child see the orthodontist face-to-face (78%), with 32% interested in using it to replace some of their child’s visits and very few interested in replacing almost all of their child’s appointments with teledentistry (2%). However, 63% of parents would be interested in using teledentistry to enhance communication between normal office visits (Figure 2). Those responses were not significantly different between parents of children aged 8-12 and 13-17, nor between parents with children in braces and with clear aligners. There was a marginally significant difference in the interest of replacing almost all appointments based on treatment modality (P=0.0532). For parents with a child in clear aligners, 12.5% (3/24) agreed or strongly agreed compared to just 2% of those whose child was in braces (3/192).
Only 29% of parents agreed or strongly agreed that they would like to take a virtual tour of the office before their first visit, 20% would feel comfortable with their child’s orthodontist checking progress through pictures, and 16% reported preference for seeing a provider who offered teledentistry as an option; 44% of parents were neutral on this topic. Complete responses are given in Figure 3.
Parents were also asked to report on perceived convenience and comfort with replacing specific appointments (consult, retainer check, emergency) with a remote video call (Figure 4). Only 32% of parents agreed that replacing an emergency appointment would be convenient, while 24% and 26% agreed for retainer checks and consult appointments, respectively. A similar trend was seen with comfort in replacing the emergency appointment at 21%, 20% for the consult appointment, and 13% for the retainer check.
Adult patients reported that regular face-to-face interaction with their orthodontist was important (86%) and that it fit conveniently around other demands in their schedule (89%). About half of the respondents (55%) agreed or strongly agreed that they would feel comfortable communicating via video and similarly via text (54%) with their orthodontist. When asked if
they were interested in utilizing telemedicine for their treatment, only 26% of respondents agreed or strongly agreed and 86% agreed or strongly agreed to the statement that they prefer face-to-face interaction. There were significant differences in some responses based on the adult’s treatment modality (braces vs clear aligners). Adults in clear aligners were less likely to strongly agree that the treatment fits conveniently around the other demands in their schedule (51% vs 76%, P=0.0490). Those in clear aligners were also more likely to be interested in utilizing teledentistry, with 27% agreeing or strongly agreeing compared to 18% of those in braces (P=0.0429). There was a significant association between the patient’s drive time to their orthodontist and how conveniently they felt that their treatment fit around the other demands in their schedule (P=0.0089). Only 81% of respondents who drove 10-20 minutes agreed or strongly agreed that their treatment fit conveniently, compared to 97% of those who drove more than 20 minutes and 90% of those who drove less than 10 minutes to their orthodontist’s office. The size of the community in which the patient resides was not significantly associated with any responses. A summary of adult patients’ responses are given in Figure 5.
Figure 5: Adult Patient Preference for Treatment

Only 32% of adult patients agreed or strongly agreed that they would like to take a virtual tour of the office before their first visit, 22% would feel comfortable with their orthodontist checking their progress through pictures, and 22% reported preference for seeing a provider who offered teledentistry as an option; 46% were neutral on this offer. Complete responses are given in Figure 6.
It was clear that adult patients would rather see the orthodontist face-to-face (83%), with 31% interested in using it to replace some of their visits and very few interested in replacing almost all of their appointments with teledentistry (9%). However, 54% would be interested in using teledentistry to enhance communication between normal office visits (Figure 7). The only response that differed significantly by treatment modality was the preference for seeing the orthodontist face to face ($P=0.0108$). While the majority of patients with clear aligners still agreed or strongly agreed (78%), 16% were neutral and 5% disagreed or strongly disagreed. This is compared to 91% of patients in braces who agreed or strongly agreed, 6% who were neutral, and 3% who disagreed (none strongly disagreed). We also investigated the associations with these preferences and the drive time to the orthodontist’s office and the size of the community the respondent lives in. None of the responses were associated with the community size. There was, however, a significant association with the drive time to the orthodontist’s office.
Respondents who reported being 10-20 minutes from the office were more likely to agree or strongly agree that they would be willing to use teledentistry to decrease their number of appointments (47% vs 21% for patients over 20 minutes away and 23% for patients under 10 minutes away). Those who drove more than 20 minutes or less than 10 minutes were more likely to indicate they were neutral to decreasing the number of appointments (46% for <10 and 53% for >20 compared to 19% for 10-20 minutes).

Figure 7: Adult Patients’ Interest in Use of Teledentistry for Appointments

Adult patients were also asked to report on perceived convenience and comfort with replacing specific appointments (consult, retainer check, emergency) with a remote video call (Figure 8). Only 29% of adult patients agreed that replacing an emergency appointment would be convenient, while 23% and 22% agreed for retainer checks and consult appointments, respectively. A similar trend was seen with comfort in replacing the emergency appointment at 27%, 14% for the consult appointment, and 18% for the retainer check.
Comparing Adult Patient and Parent Responses

With regard to the utilization of teledentistry to enhance, reduce, or replace in-person appointments, both groups felt similarly. The differences in agreement about using teledentistry to enhance communication between appointments \((P=0.1090)\) and decreasing the number of appointments \((P=0.1609)\) were not statistically significant. However, there were significant differences in responses about replacing almost all appointments \((P=0.0029)\) and overall preference for seeing the orthodontist face-to-face \((P=0.0376)\). Although both groups predominantly disagreed or strongly disagreed with replacing almost all in-person appointments with virtual appointments \((69\% \text{ for adult patients}, 85\% \text{ for parents})\), 9\% of adult patients agreed
or strongly agreed compared to just 2% of parents. 83% of adult patients and 78% of parents of child patients agreed or strongly agreed to preferring face-to-face visits. 12% of adults and 18% of parents were neutral on this topic. There were also significant differences in how conveniently treatment fit within the other demands in the respondent’s schedule (P=0.0024), with 8% of parents disagreeing or strongly disagreeing that it is convenient compared to only 2% of adult patients. Overall, both groups still agreed or strongly agreed that the treatment was convenient (89% for adults and 85% for parents). When asked if regular face-to-face appointments were important, there was a significant difference between adult patients and parents of children in treatment (P=0.0430), but both groups still predominantly agreed or strongly agreed that face-to-face interaction was important. For adult patients, 60% strongly agreed and 27% agreed compared to 45% of parents of children in treatment who strongly agreed and 40% who agreed. Despite these minor differences, 87% of adult patients and 85% of parents of children in treatment still agreed that face to face is important. Comparisons between adult patients and parents can be seen in Figure 9.
Orthodontists have an increased technical capability to treat patients remotely and minimize in-person interaction with teledentistry. There is a perceived demand among patients for these services, but a lack of literature on patients’ actual preferences. This study aimed to discover how adult patients and parents of child patients prioritized the value of face-to-face interaction with their orthodontist and the desire for convenience, as well as gauge interest in specific applications of teledentistry in orthodontics.
Our sample was reflective of a typical orthodontic private practice patient base,\textsuperscript{36} consisting of two-thirds parents of children and one-third adults in treatment. Children were mostly treated with braces, and were roughly split between males and females. Adults were mostly treated with clear aligner therapy and were mostly females. The most common guardian to respond regarding the child’s treatment was female.

Our findings were remarkably consistent across both groups with a clear preference for face-to-face interaction. This preference can be most attributed to the high value placed on face-to-face interaction. This is consistent with prior studies in medicine, dentistry and orthodontics which have shown that the doctor-patient relationship is the most important factor in patient satisfaction.\textsuperscript{3,6–8} The majority of respondents in both groups were comfortable communicating with the orthodontist virtually. Neither group, however, was comfortable with their progress being checked virtually instead of in-person. This suggests that patients ascribe a higher level of quality to in-person evaluation than to virtual, and desire this high level of quality in their treatment. Olson et al. showed that patients who seek treatment by an orthodontist instead of direct-to-consumer or a general dentist tend to do so because of the quality of treatment.\textsuperscript{37} Orthodontists are specialty-trained and singularly focused in their practice, generally representing the highest level of expertise among patients’ provider options. Patients choosing to be treated by an orthodontist desire service of the highest quality and expertise and they believe that is found face-to-face.

One of the most commonly cited benefits of teledentistry and telehealth in prior studies was patient convenience,\textsuperscript{18,22,23} yet our study found that the vast majority of patients and parents consider their treatment to fit conveniently within the other demands in their schedule. This was slightly less true of parents, who usually need to coordinate two sets of schedules to drive the
child to the appointment, but was still almost 90% of parents. One possible explanation for our findings on convenience is the elective nature of orthodontics compared to other fields of medicine and even dentistry. Most people can wait to seek orthodontic treatment until they have a schedule that permits. However, this does not explain the rising popularity of direct-to-consumer orthodontic companies driven mostly by the desire for a convenient orthodontic option. It is important to note that our study surveyed private practice patients and not the general public. When surveying the general public, Olson et al. found that a significant portion of those who selected direct-to-consumer aligners for their treatment were people who would not have otherwise sought treatment from an orthodontist. It is important for the modern-day orthodontist to recognize the distinction between these types of patients. Orthodontists may decide to extend their reach to the direct-to-consumer market by offering a similarly styled treatment option based on convenience, but should be sure to also maintain in-person treatment options rich with face-to-face interaction for those seeking the highest quality treatment.

Another commonly touted benefit of teledentistry in orthodontics is the ability to reduce the number of patient appointments. Reducing patient appointments may benefit the orthodontist by reducing practice overhead and increasing efficiency. True benefit for the patient must also be considered. Our study revealed that some patients were interested in reducing the number of appointments, but most were not. In fact, most patients were interested in using teledentistry to enhance communication in between regular office visits. Our results suggest that implementation and scope of teledentistry should be considered on a patient-to-patient basis.

Associations between treatment modality and patient preferences were measured. Compared to those in braces, patients in clear aligners were less likely to agree that their
treatment fit conveniently in their schedule, more interested in utilizing teledentistry, and less likely to prefer seeing the orthodontist face-to-face. Clear aligner treatment typically requires less physical manipulation by the orthodontist in comparison to braces treatment.\textsuperscript{13,15} This may be a motivation for patients who choose to be treated with clear aligners. Patients may associate clear aligner treatment with advanced technology and convenience or seek the convenience of a direct-to-consumer aligner model of treatment but with the oversight of an orthodontist. The large majority (almost 80%), however, of clear aligner patients still preferred face-to-face interaction.

An interesting association was found between the drive time to the patient’s orthodontist and their interest in teledentistry. Patients whose drive time was between 10-20 minutes to their orthodontist were over twice as likely to be interested in using teledentistry to decrease their number of appointments as patients who drove <10 minutes or >20 minutes. It was surprising to find that this trend was not observed in patients with a drive time over 20 minutes. All practices that participated in our study were in urban and suburban areas and therefore it is likely that patients driving over 20 minutes had closer options in their choice of an orthodontist. These patients’ choice of orthodontist was probably more heavily influenced by other factors than drive time and therefore drive time had less of an impact on their preferred number of appointments.

Our study was completed in the months directly following the reopening of orthodontic practices after the nationwide shutdown due to the COVID 19 pandemic. One might assume that patients would be uncomfortable with face-to-face interaction and more desirous of teledentistry services during the pandemic, but our results revealed the opposite. It is intuitive to think that our results would have been even stronger toward face-to-face interaction prior to the pandemic. On the other hand, it is also possible that the pandemic strengthened our results. Frustration with
digital communication, feelings of isolation and the desire to move forwards with suspended orthodontic treatment may have actually increased patients’ desire to be seen in-person. Moving forward, it is hard to totally predict how COVID 19 will change the provision of orthodontic treatment. Teledentistry has been enormously beneficial in a time of quarantine and social distancing and it may continue to be a great service for patients that are sick or uncomfortable with social engagement, but it is clear from our study that a strong preference for face-to-face interaction with the orthodontist still remains.

There were eight participating orthodontists in our study, representing the west coast, southwest and the southeast. Practices represented a large range of city populations, from 50,000-850,000. Despite our broad sample, a potential limitation of our study was the lack of representation from every geographical area. Other study limitations are the unknown effect of the pandemic on our results and the potential of selection bias in our sample because of our survey distribution method. Our original study design included paper surveys to be distributed consecutively to patients and parents by the orthodontist’s front desk staff member, but conversion to an electronic format was necessary to limit physical contact during the pandemic. Since the survey was distributed via email, it is possible that individuals who are less comfortable with technology and teledentistry were less likely to complete the survey. Inclusion of these individuals would likely have only strengthened the trends we observed in our results.

While convenience is likely to be desired by most, if not all, of our patients, there are other important motivations to consider such as quality of care, comfort, value and rapport with the orthodontist. There are numerous uses for teledentistry in orthodontics, some of which are desired by certain patients. Our study surveyed private practice patients, who typically make a
significant investment to improve their smile with orthodontics. These patients want the expertise and quality of care associated with seeing an orthodontist face-to-face.
Conclusion

Among most private practice orthodontic adult patients and parents of child patients…

- Regular face-to-face interaction with the orthodontist is preferred and considered to be important.
- Patients do not consider their treatment to be inconvenient.
- Teledentistry is most appropriately utilized to enhance communication as opposed to replacing face-to-face interaction.
- Patients do not consider convenient nor are comfortable with replacing their consult, retainer check or emergency appointments with teledentistry. This is most true of consults with adult patients and retainer checks with parents of child patients.
References


13. Kravitz ND, Burrus B, Butler D, Dabney CW. Teledentistry, Do-It-Yourself Orthodontics,


Appendix

Survey
Face-to-face interaction and teledentistry in orthodontics.

You are invited to participate in a research study investigating patient perspectives on teledentistry and how face-to-face interaction with your orthodontist affects your overall treatment experience. All responses are anonymous and no personal identifiers will be collected. Your participation in this study is voluntary. You may stop answering questions at any point and withdraw from the study at any point. The survey should take 15-20 minutes to complete. For the purpose of this study we ask that you specify whether you are answering questions based on treatment for yourself or your child. If you elect to participate, please read and follow the information on the next page.

We thank you for your willingness to participate in this study.

If you have any further questions, you may contact the research team at:

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griffethj@vcu.edu  
(678) 617-9725
Demographic Questions

1. Please indicate if you or your child is currently in orthodontic treatment (or both):
   - [ ] Myself
   - [ ] My child
   - [ ] Both

2. Please indicate your age:
   - [ ] 18-24
   - [ ] 25-34
   - [ ] 35-44
   - [ ] 45-54
   - [ ] 55-64
   - [ ] 65+

3. If you are completing this survey for your child, please indicate his or her age:
   - [ ] 0-7
   - [ ] 8-12
   - [ ] 13-17
   - [ ] 18+
   - [ ] N/A

4. Please indicate your gender:
   - [ ] Female
   - [ ] Male
   - [ ] Prefer not to answer

5. Please indicate your child’s gender:
   - [ ] Female
   - [ ] Male
   - [ ] N/A

6. Please specify your ethnicity:
   - [ ] Asian/Pacific Islander
   - [ ] Black or African American
   - [ ] Hispanic or Latino
   - [ ] Native American
   - [ ] Non-Hispanic Caucasian
   - [ ] Other

7. Please indicate the highest level of education you have completed:
   - [ ] Not graduated from high school
   - [ ] High School/GED
   - [ ] AA/ Some College
   - [ ] Bachelor’s Degree
   - [ ] Education beyond Bachelor’s degree

8. Please indicate the size of the community you live in:
   - [ ] Small town (less than 2,500)
   - [ ] Town/Small city (2,500-50,000)
   - [ ] Large city (50,000-500,000)
   - [ ] Metropolitan (>500,000)

9. Please indicate the driving time from your home to your orthodontist:
   - [ ] Under 10 minutes
   - [ ] 10-20 minutes
   - [ ] 20-45 minutes
   - [ ] Over 45 minutes

10. Are you currently employed?:
    - [ ] Yes, full-time
    - [ ] Yes, part-time
    - [ ] Homemaker
    - [ ] No

11. Please indicate the type of orthodontic treatment you are receiving (if applicable):
    - [ ] Clear aligners (Invisalign or similar)
    - [ ] Braces
    - [ ] Expander, Herbst or other orthodontic appliance
12. Please indicate the type of orthodontic treatment your child is receiving (if applicable):

- [ ] Clear aligners (Invisalign or similar)
- [ ] Braces
- [ ] Expander, Herbst or other orthodontic appliance

13. How long have you or your child been in treatment?

- [ ] 0-3 months
- [ ] 4-12 months
- [ ] 12+ months

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**Necessary information to complete the survey**

- **Section A is for parents of patients.** If you are completing this survey about the treatment of your child please continue directly below.
- **Section B is for adult patients:** If you are completing this survey about your own treatment only please skip ahead to page 5.

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**Section A. Questions regarding the treatment of your child.**

In this survey, “teledentistry” refers to the use of technology to communicate with your orthodontist away from the office. Means of communication may include video conferencing, text, phone or smartphone app. Teledentistry can be used for photo sharing, reminders, problem solving, and support in between regular office visits. For patients using clear aligners (Invisalign, etc.) it may be used to replace some office visits.

Please answer all questions as “Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree, or Not Applicable.”

<table>
<thead>
<tr>
<th>Question</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Not Applicable</th>
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<tr>
<td>1. Regular face-to-face interaction with my child’s orthodontist during treatment is important to me.</td>
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<td>2. Currently, my child’s orthodontic treatment fits conveniently around the other demands in my schedule.</td>
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<td>3. I am interested in utilizing teledentistry for my child’s treatment.</td>
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<td>4. I would feel comfortable communicating with my child’s orthodontist via…</td>
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<td>b) Text</td>
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<td>c) I prefer face-to-face interaction.</td>
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</table>
5. I would feel comfortable with my orthodontist checking photos of my child’s progress instead of checking in-person.

6. I would prefer to use teledentistry to...
   a) Enhance communication in between normal office visits.
   b) Decrease my child’s number of appointments.
   c) Replace almost all of my child’s appointments (if possible)
   d) I would rather see the orthodontist face-to-face.

7. I would prefer to see an orthodontist who offers teledentistry as a part of their treatment.

Questions #8-11 refer to the use of teledentistry to replace specific types of orthodontic appointments.

8. I would like to be able to take a virtual tour of the orthodontist’s office before visiting for the first time.

9. The consultation appointment is when you typically meet the orthodontist for the first time, discuss your treatment plan, set up financial arrangements, and ask any questions before starting treatment.
   a) Replacing my child’s consultation appointment with a remote video call would be more convenient.
   b) I would feel comfortable replacing my child’s consultation appointment with a remote video call.

10. The retainer-check appointment takes place after treatment is completed and consists of checking the fit of your child’s retainer, making sure teeth have not moved and making any necessary adjustments.
    a) Replacing my child’s retainer-check appointment with virtual, remote appointments would be more convenient.
    b) I would feel comfortable replacing my child’s retainer-check appointment with a remote video call.

11. An emergency appointment is an unscheduled appointment for resolving an emergency like a poking wire, broken bracket, dislodged appliance, or improperly fitting aligner tray.
    c) Handling emergencies at home with live video guidance would be more convenient.
    d) I would feel comfortable handling emergencies at home with live video guidance.
Section B. Questions regarding the treatment of your own treatment.

In this survey, “teledentistry” refers to the use of technology to communicate with your orthodontist away from the office. Means of communication may include video conferencing, text, phone or smartphone app. Teledentistry can be used for photo sharing, reminders, problem solving, and support in between regular office visits. For patients using clear aligners (Invisalign, etc.) it may be used to replace some office visits.

Please answer all questions as “Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree, or Not Applicable.”

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<tr>
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<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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<tr>
<td>1. Regular face-to-face interaction with my orthodontist during treatment is important to me.</td>
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<td>2. Currently, my orthodontic treatment fits conveniently around the other demands in my schedule.</td>
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<td>3. I am interested in utilizing teledentistry for my treatment.</td>
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<td>4. I would feel comfortable communicating with my orthodontist via...</td>
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<td>f) I prefer face-to-face interaction.</td>
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<td>5. I would feel comfortable with my orthodontist checking photos of my progress instead of checking in-person.</td>
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<td>6. I would prefer to use teledentistry to...</td>
<td>e) Enhance communication in between normal office visits.</td>
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<td>f) Decrease my number of appointments.</td>
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<td>g) Replace almost all of my appointments (if possible)</td>
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<td>h) I prefer teledentistry not be used at all.</td>
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<tr>
<td>7. I would prefer to see an orthodontist who offers teledentistry as a part of their treatment.</td>
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Questions #8-11 refer to the use of teledentistry to replace *specific types* of orthodontic appointments.

8. I would like to be able to take a virtual tour of the orthodontist’s office before visiting for the first time. ☐ ☐ ☐ ☐ ☐ ☐ ☐

9. The **consultation appointment** is when you typically meet the orthodontist for the first time, discuss your treatment plan, set up financial arrangements, and ask any questions before starting treatment.
   - g) Replacing my **consultation** appointment with a remote video call would be more convenient. ☐ ☐ ☐ ☐ ☐ ☐ ☐
   - h) I would feel comfortable replacing my **consultation** appointment with a remote video call. ☐ ☐ ☐ ☐ ☐ ☐ ☐

10. The **retainer-check appointment** takes place after treatment is completed and consists of checking the fit of your child’s retainer, making sure teeth have not moved and making any necessary adjustments.
    - c) Replacing my **retainer-check** appointment with virtual, remote appointments would be more convenient. ☐ ☐ ☐ ☐ ☐ ☐ ☐
    - d) I would feel comfortable replacing my **retainer-check** appointment with a remote video call. ☐ ☐ ☐ ☐ ☐ ☐ ☐

11. An **emergency appointment** is an unscheduled appointment for resolving an emergency like a poking wire, broken bracket, dislodged appliance, or improperly fitting aligner tray.
    - e) Handling emergencies at home with live video guidance would be more convenient. ☐ ☐ ☐ ☐ ☐ ☐ ☐
    - f) I would feel comfortable handling emergencies at home with live video guidance. ☐ ☐ ☐ ☐ ☐ ☐ ☐

Thank you for your time and effort in the completion of the above survey. Please feel free to leave any comments in the box below.

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