Evaluation of Intraoral Imaging for Asynchronous Teledentistry in Pediatric Patients

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Introduction

In the history of dentistry, examining a patient for a dental exam has always been something that requires an in-person visit at a dental office setting. Yet, especially with the concept of remote work ever so popular since the pandemic, dentistry has started considering ways of examining the patient remotely, seeking ways to examine patients without an in-person interaction, saving time and increasing access to dental care for those distant from a dental facility.

The American Dental Association (ADA) defines teledentistry as "the use of telehealth systems and methodologies in dentistry." The ADA explains that teledentistry includes patient care and oral health education using two main modalities: synchronous and asynchronous. Synchronous teledentistry involves a live interaction between a patient and a provider using technology such as a live video. Asynchronous teledentistry involves recording and storing health information–such as radiographs, photographs, videos, digital impressions–in a secure database and sending it over to a provider, who then uses the received information to evaluate the patient and provide service and recommendations at a separate time.

One method of asynchronous teledentistry is taking extraoral and intraoral photos using an intraoral camera, a small device with a camera that can be inserted into the mouth to capture images of different structures of the mouth. These images can later be evaluated by a provider at a distant site. The provider then uses the images to form a treatment plan based on findings — all of which happens without the provider having to be with the patient in person. Although remote methods of dental exams are not quite utilized today, studying and evaluating its effectiveness will allow dental providers to consider implementing intraoral imaging into their practice.

In order to evaluate whether intraoral imaging is an effective method of asynchronous teledentistry, one needs to gather information from not just the providers but also the patients regarding their opinion on the intraoral imaging experience. This study attempts to make this assessment by carrying out a survey of patients after taking intraoral imaging for distant site exam and treatment planning. The survey will evaluate factors like convenience and comfortability of an intraoral camera.

Study Objectives

The aim of this 12-month controlled prospective study is to assess the pediatric patients' evaluation of the effectiveness of intraoral imaging and comfortability of the intraoral camera used through a questionnaire survey, as a way of implementing asynchronous teledentistry in a diverse population of children in New York, U.S.

Methods

Subjects

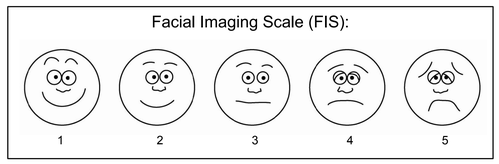
Children, 5-16 years old, who present for recall visits at clinics affiliated with St. Barnabas Hospital were considered for this study. The parents or legal guardians of the patients were given information about the study and given the opportunity to participate. A total of 32 subjects participated for the study.

Patient Selection
Inclusion Criteria: Children between ages 5-16 who present for a recall visit. Other demographic factors, including gender and ethnicity will not be used to determine inclusion.
Exclusion Criteria: Children under age 5 or over age 16. Children with severe dental anxiety/fear. Patients who fall under Frankl Scale category I.

Data Collection

All patients who fit into the inclusion criteria and present to the clinic for a recall visit were asked to have intraoral imaging completed with an intraoral camera. Participants were shown images of their teeth on screen as they were captured using an intraoral camera during the dental visit. Once all images had been captured and reviewed with the participants, a study questionnaire was given to each participant to be completed. The questionnaire consisted of both multiple-choice and open-ended questions regarding their opinions of the efficiency of intraoral imaging and comfortability of the equipment used. The survey included a facial image scale to assess comfortability.

Participants who had reading and writing capabilities completed the survey on their own. If the participants were not capable of reading and/or comprehending the questions due to age, either the parent or the provider read out the surveys to them to ensure they understand the questions being asked, and the parent or provider wrote down the reported responses.



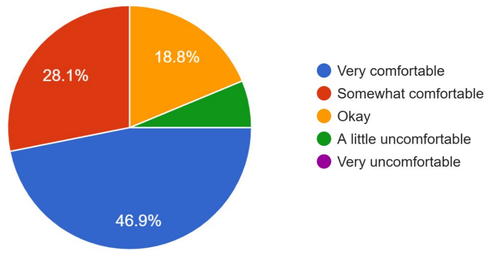
Statistical Analyses

The frequencies of collected data were described using categorical variables. The data was analyzed and compared among different responses, and key trends were identified. The question that asks if there is anything that should be changed with the intraoral camera was eliminated from the presented data due to a predominant response of "No" and one response of "Don't know." Data was collected from 32 participants.

Results

1. Comfortability of the Intraoral Camera

Figure 1
How comfortable were you with the camera in your mouth?



2. Opinion on the Usage of Intraoral Camera During Dental Visit

Figure 2
Did the camera make your dental visit more pleasant?

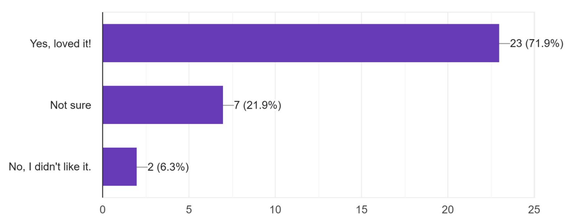


Figure 3
Do you think the camera will help you have healthier teeth?

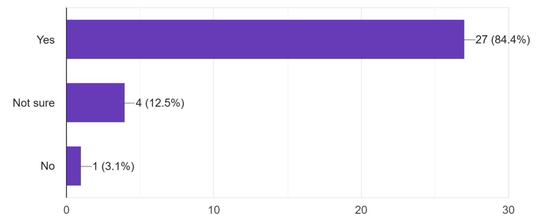
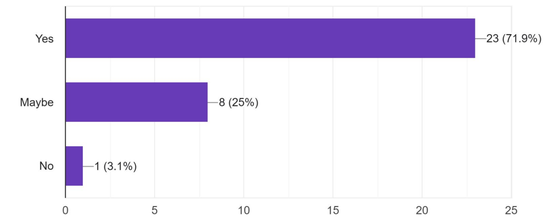


Figure 4
Would you like the doctor to check your mouth with the camera again in the future?



Discussion

Data reveals that about 47% of participants considered the intraoral camera to be "very comfortable," while 28% reported it to be "somewhat comfortable" and 19% thought it was "okay." Only about 5% of participants felt that it was slightly uncomfortable, with no participants reporting it to be very uncomfortable (Fig. 1). When asked whether the intraoral camera made the dental visit more pleasant (Fig 2), if they think the camera will help them have healthier teeth (Fig. 3), and if they would like the doctor to check their teeth with the camera again in the future (Fig. 4), 71%, 84% and 72% answered yes, respectively. This result indicates that more than two thirds of the participants gave a positive response to using the intraoral camera. When asked how they felt about the mouth camera visit today, participants with a positive response reported that they enjoyed being able to see photos of their own teeth and was helpful. The intraoral photos capture detailed hard and soft tissues, which can improve patient's sense of their oral health and improve OHI. A few of the other participants reported that they did not enjoy the feeling of the camera in the mouth.

In terms of the age of participants, the age did not seem to be associated with positive or negative responses. It is worth noting that those who gave an unsure or less positive response included patients with diagnoses like ADHD or autism, and those with a bad gag reflex. Also, patients who were nervous and had poor behavior in the chair reported a negative response to the camera. This indicates that teledentistry can be a challenge for those with a behavioral diagnosis or are nervous about or fearful of dental visits. Furthermore, using the intraoral camera may be contraindicated for these patients to avoid a bad dental experience.

Although no statistical analysis was completed to test for significance, data suggests that an intraoral camera is overall well accepted by pediatric patients. If further studies are to be done on patients' acceptance of intraoral imaging, it would be beneficial to study the acceptance of patients based on age and behavior.

Conclusions

Intraoral imaging could be an effective modality in asynchronous teledentistry. Patients predominantly reported a positive response regarding its comfortability and helpfulness. It would be beneficial to continue research in this area over a longer period of time with more subjects.

Study Limitations

- Small sample size and short duration of research
- Age of patient may be affect how patients feel about intraoral camera.
- Confounding factors: The patient's mood that day, time of day the appointment takes place (morning vs. afternoon); provider's skills with using the intraoral camera

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