

Original Research

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Is Teledentistry a Feasible Alternative for People Who Need Special Care?

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Abstract

Objective: The aim of this study is to explore the feasibility and acceptability of teledentistry as a vehicle that provides enhanced delivery of oral care for the people who need special care (PNSC).

Methods: Between January 2018 and September 2020, PNSC who were admitted in the study were either waiting for a follow-up (F) appointment or on a waiting list. An examination via video call was carried out for initial examination (IE) and F purposes. The virtual examination was scored by the clinician who performed the examinations. The experience of the participants was evaluated with a satisfaction questionnaire.

Results: Forty PNSC (26 females, 14 males) between ages 7 and 48 years (21.17 ± 10.62) participated in the study. According to the clinician ratings, the accuracy of the examination was rated as the lowest. The F group had higher scores when compared to the IE group regarding clinician rating. No significant differences were found in terms of the scoring of the clinician and patient/parent satisfaction regarding cooperation status and type of examination ($P \geq 0.05$).

Conclusions: Through adequate adaptation of the technology into clinical practice and overcoming the barriers for wider implementation, the teledentistry approach could be a reliable and feasible alternative in triaging, treatment planning, and F purposes for PNSC.

Introduction

A person needing special care is an umbrella term that includes people with developmental disabilities, chronic illnesses, and/or psychosocial handicaps.¹ With advances in medicine, today this special population lives longer than before and their need for oral health care is increasing accordingly. People who need special care (PNSC) are more likely to have poor oral hygiene, periodontal disease, and are more vulnerable to having caries compared to the rest of the population; this is associated with the comorbidities and medications, neuro-motor incompetence, and behavioral obstacles.^{2,3} It is reported that 48% of people with disabilities have, at least, 1 oral health problem.⁴ While receiving oral care, PNSC also face barriers with transportation and cost, and have difficulties related to the lack of trained health care professionals in this area.^{2,5}

Traditional services require visiting multiple clinics or professionals, which need more time, effort, traveling great distances, costs, and long waiting times for treatment.⁶ Telemedicine is an innovative alternative to traditional health care services, which is defined as the utilization of information and telecommunication technology for transfer of medical information over long distances with an aim to facilitate access to health care.⁷ Teledentistry is the subspecialty of telemedicine and has been used in different branches of dentistry since the 1990s.^{8,9} The first teledentistry project known as Total Dental Access was conducted in the United States in 1994 for postoperative visits of soldiers after periodontal surgery. This project aimed to increase patient access to quality dental care and to establish a cost-effective telemedicine system.^{9,10} In the past, the regular telephone-based approach was mainly used to provide communication between patients and health care providers for telemedicine applications. However, developments in telecommunication technologies, the wide availability of broadband Internet connection, and smartphones with high technical audio and video settings have made it possible to communicate with patients and health care professionals more easily in different formats.^{11–13}

The teledental approach may be a viable option for the delivery of oral care to PNSC, especially during the current pandemic. However, limited studies in the literature evaluated the feasibility and acceptability of this approach in PNSC. The aim of the study is to explore the feasibility and acceptability of teledentistry as a vehicle that provides enhanced delivery of oral care for the PNSC.

Materials and Methods

This study was carried out with PNSC who applied to Ordu University Faculty of Dentistry, Department of Oral and Maxillofacial Surgery, between January 2018 and September 2020 and were under follow-up (F) or on a waiting list. The protocol of the present study was approved by the Ethics Committee of the Ordu University (No: 2020/196) and carried out in accordance with the ethical standards specified in the Helsinki Declaration of 1964. Informed consent was obtained from each patient or their parents for participation in this study. Patients with special needs (physical and/or mental disabilities) who have a smartphone with the WhatsApp application and an Internet connection were included in the study. Patients excluded from the study were those who did not want to participate, those who did not have a smartphone with the required properties, those who needed in-person visits, and those who were unable to use technology.

Patients were reached from the archival records and informed about the study. To explore the feasibility and acceptability of telerdentistry via a video call, the patients who declared to participate in the study had an appointment for a visual examination via WhatsApp (WhatsApp Inc., Mountain View, CA, USA). To perform visual examinations, a video call via the WhatsApp application was carried out. Initial examination (IE; patients were on a waiting list for treatment) and F group (patients whose treatments were completed) examinations were performed synchronously in the same manner as in-person examinations by the same specialist.

Virtual examinations were performed by the same clinician. The demographic data, disability status, cooperation status, and complaints were recorded during examinations. The quality of the interview, the ability of the patients to express themselves through the application, the ease of the interview, and the accuracy of the examination via a video call were scored by means of a 5-point scale, where 0 indicated "very bad" and 4 indicated "very good."

The experience and satisfaction of the patients were evaluated at the end of the interview with a 5-part questionnaire, modified from the Becevic et al.¹⁴ study, consisting of 9 questions about the patients' demographic information, the risks and benefits, effectiveness, future adoption, and efficiency of remote virtual examination. The questionnaire was carried out by a researcher who did not participate in the virtual examination after the video call via telephone. The questions were scored as "agree," "neutral," or "disagree" by patients.

Statistical analyses were performed using IBM SPSS Statistics for Windows software (version 23.0, IBM Corp, Chicago, IL, USA). The Shapiro-Wilk test was used to explore the normality of the continuous variables. Continuous data were present as mean \pm SD and median (min-max), categorical variables present as frequencies, and percentages. The Independent t-test was used to compare the age between IE and F groups. The Mann-Whitney U test was used to compare scorings of the clinician in terms of the quality of the interview, the ability of the patients to express themselves through the application, the ease of the interview, the accuracy of the examination of patients regarding cooperation status and type of the examination, and to compare distance between IE and F groups. To analyze satisfaction regarding cooperation status and type of the examination, and comparing gender and cooperation status between IE and F groups, the chi-square test was used. All tests were 2-tailed, and $P < 0.05$ was accepted as significant.

Table 1. Descriptive statistics

Variables	IE (n = 19)	F (n = 21)	P value
Age (year)			
Mean \pm SD	16.74 \pm 5.81	25.19 \pm 12.41	0.009 ^a
Median (min-max)	15 (8-31)	23 (7-48)	
Gender (n)			
Male	6	8	0.666 ^b
Female	13	13	
Cooperation status			
Cooperate	5	7	0.629 ^b
Non-cooperate	14	14	
Distance (min)			
Mean \pm SD	31.05 \pm 17.84	76.43 \pm 121.56	0.258 ^c
Median (min-max)	25 (20-70)	25 (20-460)	
Disability status (%) (IE + F)			
Physical	60		
Mental	22		
Physical/mental	18		

^at test.

^bchi-square test.

^cMann-Whitney U test.

Results

Forty patients (26 females, 14 males) between ages 7 and 48 years (21.17 \pm 10.62) participated in the study. A significant difference was observed between IE and F groups regarding age. No significant difference was found regarding gender and cooperation status between IE and F groups. The mean distance of the patients to the hospital was 54.87 \pm 90.84 min. Descriptive statistics were shown in Table 1. According to the clinician ratings, high scores were observed in terms of the quality of the interview, the ability of the patients to express themselves through the application, and the ease of the interview. The accuracy of the examination was rated as the lowest when compared to the other parameters rated by the clinician. F patients had higher scores when compared to the IE patients. No significant differences were found regarding the scoring of the clinician in terms of the quality of the interview, the ability of the patients to express themselves through the application, the ease of the interview, the accuracy of the examination of the patients regarding cooperation status, and type of the examination ($P \geq 0.05$; Figures 1 and 2). Patient/parent satisfaction regarding cooperation status and the type of the examination showed no significant differences ($P \geq 0.05$). Results of the patient satisfaction questionnaire performed after examinations were presented in Table 2.

Discussion

Oral health of the PNSC is a public issue of concern in many countries since people with special needs constitute about 15% of the world's population.¹⁵ According to the 2002 National Disability Survey, disabled persons constitute 12.29% of the population in Turkey.¹⁶ When compared to their healthy counterparts, PNSC are more vulnerable to poor oral health and face barriers accessing oral health care services. Thus, significant gaps occur between oral health status and accessing oral health care services for this special population.^{2,3} In the study of Dorin et al.,¹⁷ it was found that among 8401 children and teenagers with disabilities, only 3.4% have no

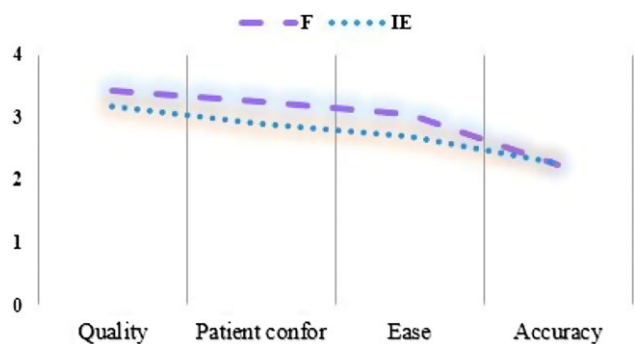


Figure 1. Clinicians' scoring in terms of examination type.

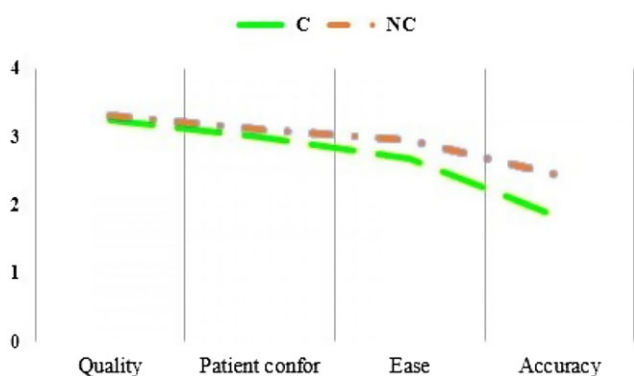


Figure 2. Clinicians' scoring in terms of cooperation status.

oral disease. The teledentistry approach poses a reliable option nowadays to bridge this gap and increase ease of access of quality oral care, reducing and/or eliminating the costs of transportation. Furthermore, teledentistry could possibly be more appropriate for PNSC than in-person visits because patients can have the examination in their home with their caregivers.^{3,9,12,18}

In medicine, the use of telemedical applications has had promising outcomes for the PNSC where most of the participants with special needs had a positive opinion regarding health care delivered via telemedicine.^{6,11,12,19} In the era of dentistry, however, limited evidence was present regarding the efficacy of teledentistry applications in the PNSC. In this study, we aimed to explore the feasibility and acceptability of teledentistry from patient/parent and clinician perspective in PNSC admitted to our department. A recent national survey in 2020 indicated that 79% of Turkish citizens between ages 16 and 74 years used the Internet, and 89.9% of them used a broadband connection; 86.9% of them had access to the Internet via a mobile broadband connection. Also, the rate of cell phone/smartphone usage was reported to have reached 98.7% in 2019.²⁰ Therefore, we performed virtual examinations via video calls by means of smartphones. We prefer the mobile teledental approach via the WhatsApp application because the application is simple, has large-scale usage, is suitable nearly for all smartphones, requires no costs, and has obvious benefits in terms of privacy in the health care setting.^{21,22}

In this study, none of the participants had used the telemedical approach before in the medical or dental specialties. Most of the participants, both F and IE groups, reported being satisfied with the teledentistry approach performed via video calls and reported having used this tool to take the examination again. However,

Table 2. Patient/parent responses to teledentistry satisfaction questionnaire (%)

Questions				P
<i>Usage</i>	1. Have you seen a doctor through telehealth?	NC ^a		
		0	1	2-5 > 5
	IE	100	-	-
	F	100	-	-
<i>Risks and benefits</i>	2. Which telehealth specialties have you used?	NC ^a		
		IE	None	
	F	None		
	3. I was fine with being on camera.	0.335 ^a		
Agree		Neutral	Disagree	
IE		100	-	
F		95.2	- 4.8	
<i>Effectiveness</i>	4. I felt that things I shared were kept private.	0.756 ^a		
		Agree	Neutral	Disagree
	IE	78.9	15.8	5.3
	F	81	9.5	9.5
<i>Future adoption</i>	5. My telehealth visit was as good as one that is in person.	0.297 ^a		
		Agree	Neutral	Disagree
	IE	57.9	5.3	36.8
	F	38.1	19	42.9
<i>Efficiency</i>	6. The use of telehealth saved me travel time and money.	0.628 ^a		
		Agree	Neutral	Disagree
	IE	89.5	-	10.5
	F	85.7	4.8	9.5
<i>Efficiency</i>	7. I would use telehealth to have my doctor see me again.	0.344 ^a		
		Agree	Neutral	Disagree
	IE	89.5	-	10.5
	F	76.2	9.5	14.3
<i>Efficiency</i>	8. I will tell the people I know about telehealth.	NC ^a		
		Agree	Neutral	Disagree
	IE	100	-	-
	F	100	-	-
<i>Efficiency</i>	9. Was the examination via telehealth helpful for you and your relative need of special care?	0.637 ^a		
		Agree	Neutral	Disagree
	IE	84.2	10.5	5.3
	F	76.2	9.5	14.3

^aChi-square test; NC, not calculated.

nearly half of the participants have concerns regarding the efficacy of remote examination when compared to face-to-face visits. The clinician who performed the examinations reported “accuracy of examination” as least satisfactory and found this approach more effective in F patients when compared to the IE patients. These results may have originated from the lack of standardization in terms of technical infrastructures that the participants used and also the lack of knowledge of the patients regarding remote care. Despite these concerns, our findings also suggest that this approach could be useful to facilitate oral care delivery if it is improved.

A remote oral diagnosis for the PNSC has been researched in a teledentistry project named *e-DENT*, which was conducted in France. In the *e-DENT* project, a caregiver or a nurse used an intraoral camera with fluorescence to record information for teledentists who performed the diagnosis. For a similar group of patients, another project named *TEL-E-DENT*, also conducted in France, used an endoscope to record information of the virtual examination. In these 2 projects, more than 4000 patients have been diagnosed. The participants found this approach less stressful and cost-effective. Nurses/caregivers who participated in the projects found the approach useful. Also, dentists reported that teledentistry is a useful tool to connect directly with patients/caregivers, and it is very useful making a first evaluation.^{3,4,9}

In Australia, the teledentistry approach for diagnosis and consultations of the underserved, high-risk population with major oral health needs was explored by comparing face-to-face examinations and remote examinations using an intraoral camera. A total of 50 individuals participated and it is suggested that teledentistry is a feasible and reliable alternative to traditional methods, in particular, for oral health screening. Participants reported high satisfaction with the teledentistry approach.²³ Also, another project known as *Virtual Dental Home (VDH)* in California uses telehealth technology so that dental personnel in the community could communicate with dentists in dental offices/clinics as well as the interdisciplinary teams for education, triage, preventive care, and early intervention for underserved groups of children and adults. The project has shown that, with this approach, more patients can receive care, and without additional costly infrastructure this model can better adapt oral care into health care.² It is difficult to compare the results of the present study with the previous researches conducted in the PNSC because of the difference regarding the designs and the populations. Regardless of the teledentistry service formats, a high satisfaction rate in the present study echoes the results of the previous research.^{4,9,23}

Telemedicine can be applied in a synchronous (real time) or asynchronous (store-and-forward mode) manner.^{8,24} In a systematic review about the telemedicine applications among rural individuals with disabilities, it was reported that generally video-conferencing was used for synchronized intervention, in which local care providers, patients, caregivers, and the remote care team could interact in real time. High satisfaction was observed among caregivers with the usage of this method. However, in some instances when a disabled patient does not cooperate in real time, asynchronous telehealth may be preferred since patients are more likely to cooperate when having a medical exam done alone by a person they know.^{12,18} Regarding telehealth service modes, such as m-Health or mobile health care, Jones et al.²⁵ reported in their systematic review that disabled users indicated a 40% adoption rate of m-Health apps. In this study, a video call via WhatsApp was successfully used for the examination of the patients in real time for most of the patients. Only 12% of the patients had difficulty using the application during examinations.

Impairment of people's access to dental health care is an important consequence of the disasters and emergencies such as the COVID-19 pandemic. In this way, teledentistry can bridge access to health care services by avoiding disruptions while allowing the vulnerable populations to remain safely at home during utilization of the remote care. Therefore, teledentistry would be a valuable care option for vulnerable populations during disasters/public health emergencies.

This study has some limitations that should be considered when interpreting the results. Although the small sample size is

a limitation, this is a pilot feasibility study. Another limitation of this study was the lack of standardization regarding the quality of video-calling, which was affected by smartphones. In the present study, only a physician performed and evaluated video consultations. The WhatsApp application used in this study is not a specific application designed for a telemedical approach.

Teledentistry is considered a highly effective approach, comparable with face-to-face visits, which enhances an early diagnosis and referrals, and transcends social and geographic barriers. This practice reduces the costs for patients without increasing costs to the oral health provider as well as avoiding inappropriate referrals and preventing backlogs to waiting lists.^{12,26,27} However, barriers such as issues related to reimbursement, lack of knowledge about this option among patients, the costs and maintenance of telehealth equipment, and ensuring patient privacy prevent the wider implementation of this approach.^{6,26,27}

Conclusions

PNSC are more vulnerable to poor oral health and are faced with a variety of barriers in accessing the traditional oral health care system. Through successful adaptation of the technology into clinical practice, and overcoming the barriers for wider implementation, the teledentistry approach could be a reliable and feasible alternative that would extend the provision of oral health care for PNSC.

Author contributions. MMO and DT designed the study. DT and EBY recruited the participants. All authors were involved in writing the paper for this study.

Conflict(s) of interest. None of the authors report a conflict of interest.

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