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Rapid implementation of teledentistry during the Covid-19 lockdown

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ABSTRACT

Introduction: The current corona virus disease 2019 (COVID-19) outbreak set new challenges to nearly all health plans and large health organizations worldwide, including movement restrictions, strict limitations in healthcare services, especially in the dental profession, and patient fears regarding potential infection. Telehealth can serve as an effective platform for remote connection between dental healthcare providers and patients, and can help reduce the risk of infection when social distancing is required.

Objective: The current study aimed to evaluate the quality of treatment provided via teledentistry, as perceived by patients using the service, as well as their willingness to use online distant medical consultation in the future.

Methods: Since March 2020, a new online service was implemented in the Oral Medicine Unit and Oral and Maxillofacial Surgery Department in the Galilee Medical Center, to expand the range of services beyond merely emergency treatments.

Results: The current study examined the quality of teledentistry services as perceived by 89 patients participating in at least one teleconsultation, and their acceptance of remote healthcare. Satisfaction rates were high in patients who received both full and partial solution to their chief complaint. Moreover, acceptance of the teledentistry platform was high, even in the older age groups.

Conclusions: We propose to implement teledentistry services in current and future pandemics, as well as during routine times, to strengthen our health care system with digital technologies.

1. Introduction

Recent technologies have been changing the world of dentistry. Trends and innovations include rapid prototyping, augmented and virtual reality, artificial intelligence and machine learning, personalized dentistry and telehealthcare [1]. Among these, telehealthcare was used in the past in emergencies, such as in hurricanes Harvey and Irma in 2017 and the severe acute respiratory syndrome (SARS) pandemic in 2003. Nevertheless, despite the availability of telehealth-related services during these humanitarian crises with no further cost to patients, their overall adoption was limited [2]. For example, one study demonstrated that less than 1% of people living in rural areas in the USA participated in telemedicine consultations [2]. The perception of such technology as being less effective and less safe than conventional, in-clinic consultations, may be a key barrier [2,3]. The ongoing corona virus disease 2019 (COVID-19) pandemic outbreak has brought to a resurgence of interest

in telehealthcare.

Teledentistry is a domain of telemedicine that is specifically devoted to oral healthcare, and emerged thanks to the availability of digital, distant communication technologies [4]. Smartphone applications are already in use today for information sharing and consultation amongst experts. For example, WhatsApp mobile application was shown to support communication between clinicians about oral conditions and to serve as an efficient platform for initial consultation [5]. Of note, among the pathological images shared through dedicated digital platforms, an 82% consistency was found between remote imaging and in-clinic physical evaluations [6].

The toolset provided by teledentistry is not limited to consultation among practitioners, and it has a wide variety of potential applications in oral healthcare. These include monitoring of high risk populations with limited mobility or accessibility, facilitation of patients' referrals to a dental consultant and treatment. Therefore, teledentistry can reduce

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waiting lists and unnecessary travel, especially in rural areas where public transportation is scarce, and improve overall productivity [7–9].

Remote consultation in addition to in-clinic visits is especially beneficial in the dental practice, which carries a higher risk for COVID-19 infectivity in comparison to other medical disciplines in the current ongoing global pandemic [10]. The dental setting can provide multiple routes of potential coronavirus transmission, including direct contact, aerosols, and indirect contact via contaminated surfaces. Recent research has shown that SARS-CoV-2 viral particle remains infective outside the host for several hours on copper surfaces and for up to three days on stainless steel and plastic [11]. All these materials are frequently in use in the dental clinic setup. Thus, in the context of the current ongoing global pandemic, remote consultation in addition to in-clinic visits is especially beneficial in the dental practice, which carries a higher risk for COVID-19 infection in comparison to other medical disciplines [10]. Indeed, in response to the current COVID-19 global health crisis, many health plans and large health organizations worldwide, began offering some form of coverage for telemedicine services, including in the field of oral health-care, and have been promoting their use [1].

Under the regulations of the Israeli Ministry of Health, only urgent dental care was permitted during the quarantine periods. We were highly motivated to expand our services for more than merely emergency treatments, and we therefore quickly established a free-of-charge, online medical service on March 19th, 2020. It is important to mention that the establishment of the novel teledentistry platform was completed without ignoring the potential risk of possible misdiagnosis or delayed diagnosis, and we accordingly adopted strict criteria to identify those patients who were suitable for distant medical consultation. The current study aimed to evaluate the quality of treatment provided via teledentistry, as perceived by patients using the service, as well as their willingness to use online distant medical consultation in the future.

2. Methods

2.1. Study design

This prospective, descriptive study was carried out by distributing questionnaires via either a text message or a WhatsApp® (WhatsApp Inc. California, USA) message to patients who received medical consultation using our teledentistry service. Patients received the online survey after attending a televisit between March 19th, 2020 until May 30th, 2020. Research protocol and questionnaires were approved by the Helsinki committee of the Galilee Medical Center, Naharyia, Israel.

2.2. Promotion of the new service

The teledentistry service was implemented on March 19th, 2020. A promotional video presenting the new, free-of-charge service was released on social media (published on the department's Facebook page) in order to suggest the new service to the community for no cost, in addition to the regular, in-person services that were still available (although for only emergency treatments at the time). In addition, patients who contacted the department were informed of the new service and were offered the online consultations.

2.3. Patient registration

All patients who were offered to use teledentistry were familiar to the department. Patients who had their appointments in advance for either: recall after a surgical procedure (extractions, implant placement), follow-up appointment (e.g. oral lesions that are under follow-up for years), or delivery of a biopsy result-were offered by our office to use distant consultation instead of arriving at the clinic. Those who agreed, were scheduled an appointment in advance, and received a brief explanation about the service.

2.4. Patient screening

An eligibility criterion was patient familiarity to clinicians. All patients were familiar to the attending clinicians (i.e. had been to the department at least once prior to the study). Patients who had an appointment in advance were contacted by the clinic or those patients who required medical consultation, were contacted by staff. A "safety algorithm" was established for management of patients (Fig. 1). First, a resident conducted a phone call for initial screening. If the patient was found suitable to continue to a video consultation (i.e. had no signs and symptoms that required a complete physical examination in-clinic), an appointment was scheduled and both the resident and the supervising senior attended. Counseling also depended on the patients' chief complaint. Patients reporting on symptoms that required a complete physical examination, were asked to arrive at the clinic.

2.5. Digital consultations

Patients were sent a link to their mobile phone and were scheduled for appointments in advance. Video calls were conducted using Zoom Video Communications® software. A room was allocated for this purpose; videoconferencing took place on one computer, while medical records were accessed on an separate computer.

2.6. Evaluation of teledentistry by patients

Anonymous satisfaction questionnaires (Appendix) were distributed via phone messaging, by either a text message or a WhatsApp®. Surveys were distributed using the Qualitrix web-platform, in concordance with the American Association for Public Opinion Research (AAPOR) reporting guideline. Questionnaires were distributed (via a link) to each patients who participated in an online distant consultation. Surveys were written in Hebrew and consisted of fourteen simple questions or statements constructed to evaluate satisfaction amongst patients (see supplementary information). Questionnaire results underwent statistical analysis.

2.7. Statistical analysis

Whenever multiple comparisons were performed, Dunn, Tukey or Bonferroni were used to adjust p values. The IBM SPSS Statistics (IBM Corporation, Armonk, New York, USA) and GraphPad Prism version 8 (GraphPad Software, La Jolla, CA, USA) softwares were used for all statistical analyses.

3. Results

Between March 19, 2020 and May 30, 2020, 200 patients participated in a video medical consultation session in concordance with the "safety algorithm" (Fig. 1). Among these, 145 patients completed the questionnaire, 55% of whom were women, and 93% were above the age of 25 years. Most patients (66%) learned of the new teledentistry service through the clinic, while the remaining patients (27%) were exposed to the service via social media, or were referred by their own dentist or general practitioner (8%). The majority (43%) of sessions were follow-up appointments or recall. Others were scheduled in response to pain attributed of dental origin (17%), presence of oral lesions, orofacial swellings or orofacial pain or to inquire about biopsy results (10% each) (Fig. 2).

The online medical counseling platform assisted patients in receiving a diagnosis and treatment plan (17%), referral to a general practitioner (13%), or scheduling a second video call (25%). In 46% of the sessions, patients were requested to arrive at the clinic for a complete physical examination. Overall satisfaction rates reached 100% amongst patients who either received a diagnosis and treatment plan or who were referred to their general practitioner. Satisfaction rates were lower (75%) among

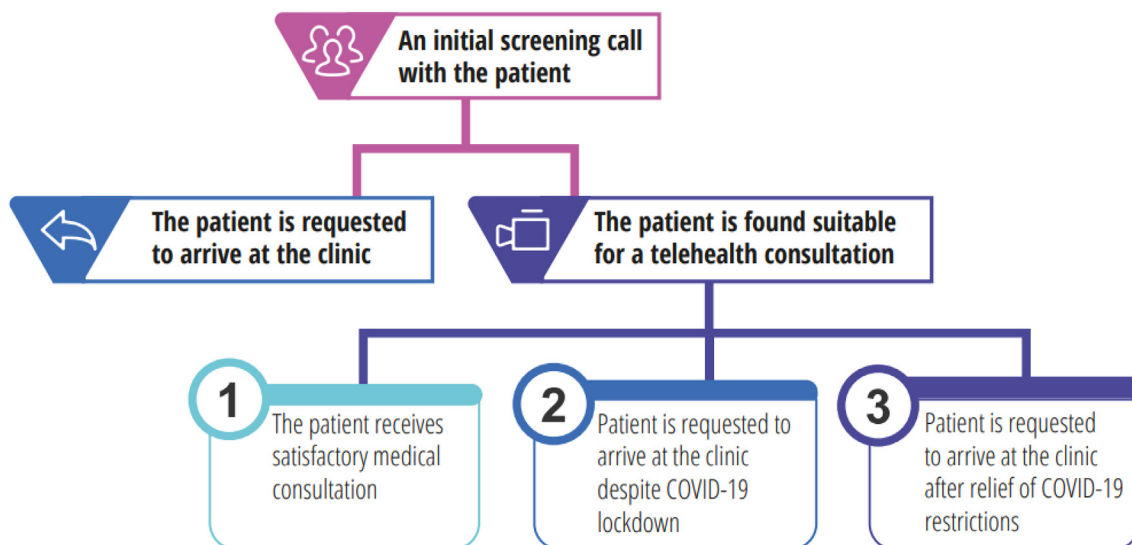


Fig. 1. "Safety algorithm" for the management of dental patients during the COVID-19 pandemic.

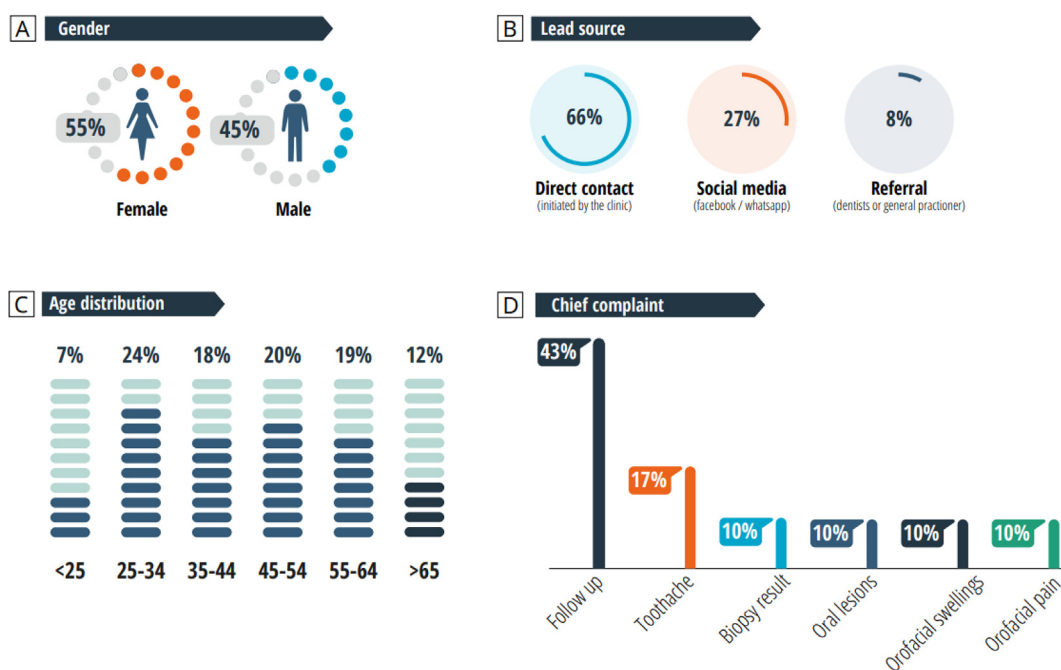


Fig. 2. Demographic characteristics and indications of patients participating in teledentistry program during COVID-19. A: Female to male ratio of participating patients. B: Lead teledentistry service dissemination source. C: Age distribution of participants. D: Chief complaint of patients at the time of the consultation televisit.

those who were told to arrive at the clinic for further evaluation. Level of satisfaction was even lower (62.5%) among patients who had to schedule a second video call. The teledentistry platform fully addressed patient needs in 42% of cases, while 37% reported that the service provided them with a partial solution, and 21% found the service unhelpful. Among those reporting on complete resolution of their medical issue, satisfaction rate was 100%, while 84% and 31% satisfaction were reported among cases where teledentistry partially addressed the purpose of the consultation or was entirely unhelpful (Fig. 3).

Most patients (89%; $p < 0.01$) were satisfied with their overall virtual appointment regardless the proposed solution, while only 11% were dissatisfied with their teledentistry experience. Satisfaction rates were high amongst all age groups.

The vast majority of patients (87%) are willing to recommend the use of digital, remote counseling instead of in-person appointments to their

family and friends, while only 13% were not willing to recommend it. More than half of the patients (58%) still preferred in-person medical consultation over telehealth, yet many preferred online counseling (42%). Overall, 89% of participants perceived telehealth as a good option during emergencies, such as the recent COVID-19 (Fig. 4).

4. Discussion

Since the worldwide outbreak of COVID-19, oral healthcare has been facing great challenges. Telehealth can be particularly advantageous during the current COVID-19 pandemic. Telehealth services can be used for triage and to provide solutions for common medical issues encountered by patients, such as follow up appointments. Since the oral cavity is easily accessible for clinical examination, intraoral photographing can be relatively simply carried out by patients [6].

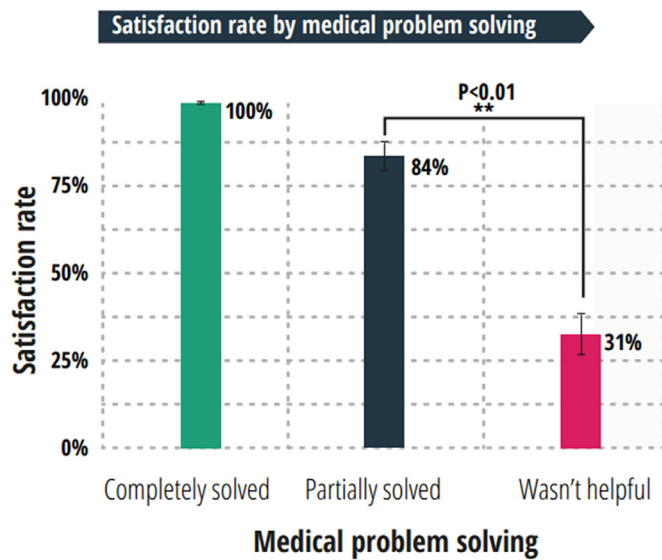


Fig. 3. Satisfaction rates in relation to suggested solution by video call effectiveness.

In light of dynamic changes and new risks and in response to the lockdown regulations of March 2020, our department rapidly initiated its very first telehealth platform and limited the new service to patients who were familiar with the department clinicians. A main application of telehealth in times when only emergency dental treatments were permitted was identification of patients' issues and possible solutions that could be provided for them. For example, we were able to recognize those patients who needed further examination in the department, as opposed to patients whom their in-person appointment could be delayed to ordinary days.

Services in our department, which practices both maxillofacial and oral surgery as well as oral medicine, include dental care for medically compromised patients and patients with special needs. Consequently, many of the patients are at high risk for developing complications from COVID-19 due to their age and/or medical background. Online appointments are consequently safer for these high risk patients. Another advantage for oral medicine is that telehealth platform can serve as an initial screening modality to assess any changes of intraoral lesions or appearance of new ones. Similarly, a recent study demonstrated mobile technology could be used to obtain intraoral images of children in school settings and send them digitally to an off-site dentist for remote

examination [12,13].

In the current survey, most patients found teledentistry to be helpful for their oral health issues, perceived telehealth as a good option in times of emergency and were likely to recommend it to others. Surprisingly, older patients were pleased with virtual appointments and found the pilot to be convenient for use. This is of particular interest since a common misperception is that older individuals struggle with technology.

The "safety algorithm" delineating strict eligibility criteria, effectively screened out patients who were not suitable for online consultation. Moreover, any patient who presented with signs or symptoms rising even slight suspicious for an emergency or a life-threatening condition or a lesion, were requested to arrive immediately at the clinic. These precautions were practiced to avoid any potential misdiagnosis or delayed diagnosis. We perceive telehealth as an additional tool available for healthcare providers rather than an alternative to traditional healthcare, and as such, it is not always applicable.

While telehealthcare is a critical tool in times of emergency, and in streamlining patient management, it comes with inherent limitations, which must be carefully weighed in the context of COVID-19 pandemic. One of the main drawbacks of telehealth is that it only allows a limited physical examination. As such, it often cannot substitute for the traditional in-clinic, in-person appointment. Moreover, the emotional component of virtual consultation should not be overlooked. Firstly, strict case selection when delivering biopsy results should take place (e.g. irritation fibroma vs. oral squamous cell carcinoma). Secondly, the staff providing medical consultations was different every day, since all departments in Israel were obligated to work in "capsules", i.e., fixed, segregated shifts. This may partially explain the dissatisfaction expressed by some patients who attended online appointments more than once. Future research should further investigate the psychological aspects of medical telecommunication in the COVID-19 era and their impact on health management.

5. Conclusions

Teledentistry trends are still developing; further research, funding, implementation strategies and regulatory structures are required. Based on our initial experience during COVID-19 pandemic we strongly advocate the use of teledentistry for routine follow-ups and recall appointments. We intend to continue the integration of teledentistry in our department as part of our services, as it can effectively substitute for many in-person consultations. While telehealth implementation is highly valuable during the normal time, the current COVID-19 underscores the potential benefit of telehealth integration in global preparedness for health emergencies.

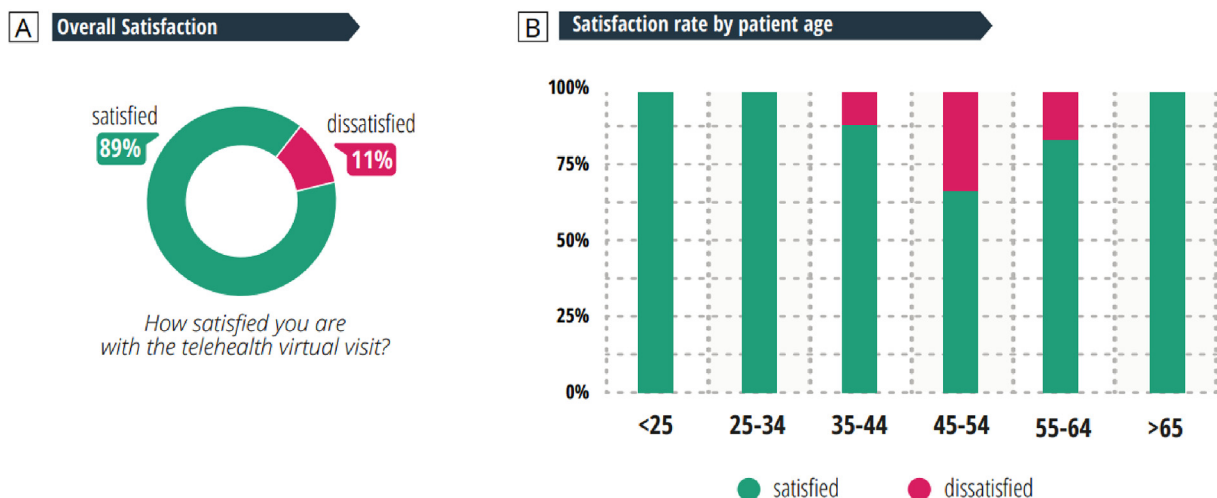


Fig. 4. A. Overall satisfaction by patient age. B. Patient satisfaction by age group.

- The authors declare no conflict of interest.
- Ethics approval and patient consent were obtained.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.adoms.2021.100031>.

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