

Teledentistry: The Lifeline for an Oral Diagnostician during Coronavirus Disease-19 Pandemic in Asia

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Abstract

Teledentistry is the remote facilitating of dental guidance, treatment, and education through the use of information technology instead of direct face-to-face contact with patients. Teleconsultation, telediagnosis, teletriaging, and telemonitoring are subunits of teledentistry that has important functions relevant to dental practice. There are many challenges for acceptance of this technology by the dentists as well as patients, which need to be addressed urgently. Teledentistry can offer an innovative solution to resume dental practice during this pandemic in our Asian population. This article reviews the origin, rationale, scope, basis, and requirements for teledentistry, along with the current evidence that exists in the literature and illustrates how the digital transformation will strongly aid oral medicine specialists and their patients

Key words: Oral Medicine, Teledentistry, Telediagnosis, Teleconsultation, Teletriaging

INTRODUCTION

Over the past decade, significant changes have occurred in information and telecommunication technology in health-care fields that have had a positive impact on practice style.^[1] Like other health professionals, dentists have seen a lot of change over the years from regular procedures to digital technology that is taking dentistry to greater heights.^[2,3] New terms like “telemedicine,” “teledentistry” and “telepharmacy” have caught the public’s attention. Although many disciplines exist within the health care field, they all share an important common denominator: The use of telecommunication technology as an important role in health-care practice. Teledentistry is an emerging field in our specialty that integrates electronic health records, telecommunications technology, digital imaging,

and the internet to link dental providers and their patients. The foundations of teledentistry lies in telehealth and telemedicine technologies that have been in practice since the 1950s.^[1,2] Our field has experienced extensive technologic innovations; recently and particularly, these advances have been made by the use of computers, digital diagnostic imaging services, and devices with respective software for analysis and follow-up.^[3]

With scientific advancements happening rapidly, the mankind was taken up to a surprise challenge. Coronavirus disease 2019, also called (COVID-19), is a recent infectious disease that is rapidly spreading worldwide and has taken up many lives till date. COVID-19 has as its etiologic agent the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2): The 2019 coronavirus is different from SARS-CoV, but it has the same host receptor: human angiotensin-converting enzyme 2 (ACE2). The epidemics of COVID19 started from Wuhan, China, last December and has become a major challenging public health problem for not only China but also countries around the world.^[4-6] On January 30, 2020, the World Health Organization announced that this outbreak had constituted a public health emergency of international concern.^[6-7]

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During such a pandemic, where every person is worried about their life and scared beyond any normal behavior, oral health has taken a back seat. Patients who suffer from dental issues are in a dilemma over available options to address their unbearable toothache, uncontrolled gum bleeding and other serious oral health issues. Furthermore, the ones who have just minor queries cannot contact the dental health specialist due to the prevailing lockdown situation. That's when the teledentistry comes into picture.

WHAT IS TELEDENTISTRY?

Teledentistry is a combination of telecommunications and dentistry, involving the casting of clinical information and images over remote distances for dental consultation and treatment planning.^[8-10] It is a synergistic combination of telecommunications, technology, and the internet, which ultimately has taken up dentistry to a relatively new and an exciting field that has endless potential. The term "Teledentistry" was first used in 1997, when Cook defined it as "the practice of using videoconferencing technologies to diagnose and provide advice about treatment over a distance."^[8,9]

The use of teledentistry as a means to improve access to oral health services in areas with inadequate availability of general and specialty dental care is emerging as a practical solution in emergency aid, initial consultation, and expert opinion.^[8,11] Like other health-care professionals, dentists too can use every option at their disposal to provide quality dental care to those who are in need. With simple tools such as smartphones and laptop webcams, dentists can provide their services to all patients safely from their homes, thereby eliminating their risk of infection.^[8,10-12] Teledentistry can occur in two forms, namely, "real time consultation" [Figure 1] and "store and forward" [Figure 2]. The real-time method transfers the information immediately, whereas the store-and-forward method allows data to be stored in a local database to be forwarded as and when needed.^[9]

IDEAL REQUIREMENTS FOR TELEDENTISTRY

Internet is the basis of modern systems of teledentistry, being up-to-date, fast, and able to transport large amounts of data. There are numerous reasons why internet-based teledentistry has taken precedence over other ways of communication: The reasons being speed, low cost, efficacy, documented consultation, minimized occupancy, simultaneous communication of multiple participants, and asynchronism.^[13] To enable live video conferencing, one might employ a widely available standalone Internet Protocol/Integrated Services Digital Network video

conferencing solution, or install a Peripheral Component Interconnect codec board into the system. If a live group session is desired, a multipoint control unit that bridges three or more parties is required. The codec must be able to accommodate audio and visual functions.^[1,13-15]

However, for most dental applications, store-and-forward technology provides excellent results without excessive costs for equipment or connectivity. A typical store-and-forward teledentistry system consists of a computer with substantial hard drive memory, adequate random access memory, and a speedy processor; an intraoral video camera and a digital camera for the capture of pictures; a modem and an internet connection.^[3,13,16] This data packet may include the patient's history, relevant clinical photographs, digital X-rays, and other higher investigative details.^[2]

UNDERSTANDING THE CONCEPTS AND CHALLENGES

In South East Asia, India is a developing country and most of the population belongs to a rural background where some of the basic amenities of daily routine life are missing, especially primary health education and services.^[2] Primary and community health centers can be equipped with modern telehealth and teledentistry to facilitate education and better services to the society. Students, teachers from educational institutions at various levels, and social workers from gram panchayat can be educated and trained toward the importance and functioning of telehealth. Instructors of teledentistry educational courses need to have both teaching experience and computer knowledge. The team must be guided by instructors who are experienced in leading online communication, able to promote discussion, and familiar with the use of updated computer technology.

GUIDELINES TO BE FOLLOWED

During this pandemic, our goal as dental care providers is to use telecommunication technology to triage patients, conduct problem-focused evaluations and to limit office visits to urgent or emergency care.

Protocols^[17]

- Take control of appointments in your own hands.
- Talk to all patients over the phone before their visit to the clinic. Depending on the symptoms, ask for some basic investigations before you see them in person for an early diagnosis.
- Preferably use over the counter drugs.
- Make all attempts to screen these patients for symptoms/signs of COVID infection and refer appropriately, if suspected.

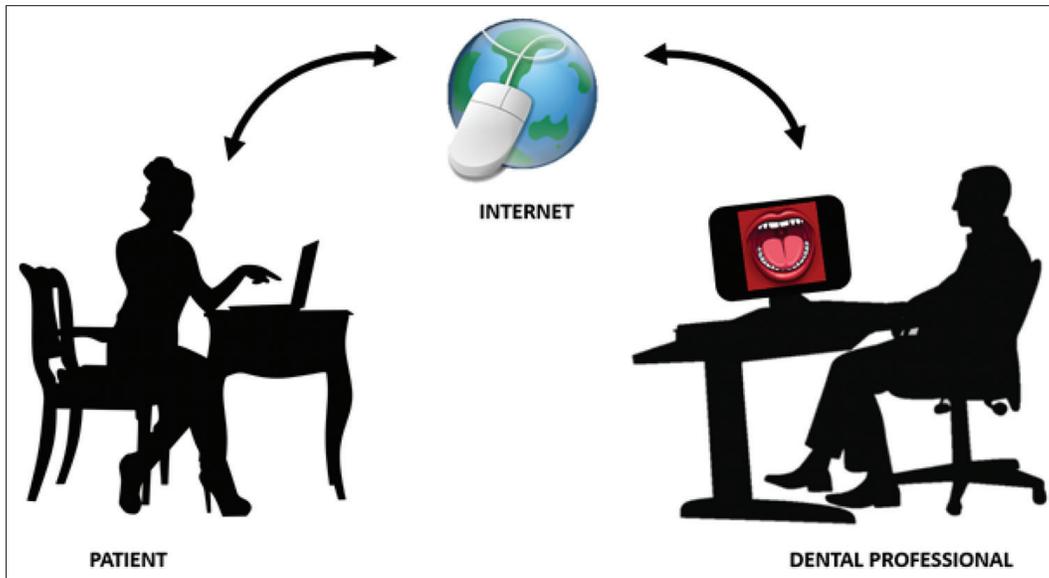


Figure 1: Real-time consultation involves a video conference between dental professionals and their patients, at different locations, through which they can see, hear and communicate with each other

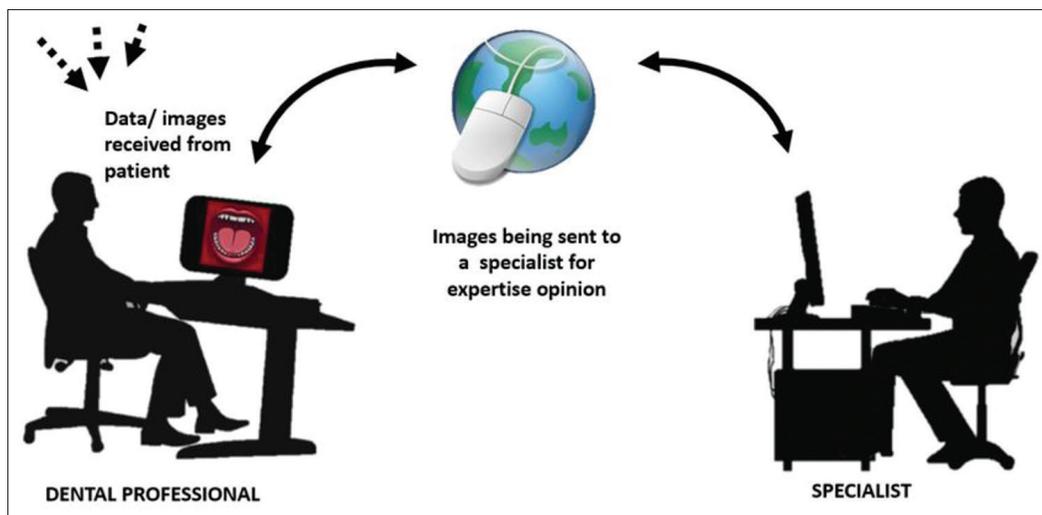


Figure 2: Store-and-forward method involves the exchange of clinical information and static images collected and stored by the dental practitioner, which is sent for an expertise opinion for a more appropriate treatment planning in the patient's absence^[8]

- Audio record the conversation with prior consent of the patient.
- Record all personal details of the patients as spoken by the patient
- If audio not recorded, make an entry in your diary, stating time of conversation, personal information and clinical details. The concluding part will contain your diagnosis and expertise as you would do if patient was seen by you physically.
- Technology utilizing closed method of communication is acceptable (e.g.: video conference through mobile device, telephone conversation, computer-based software, smartphone communication through text message, email, and photos).
- Patients must be made aware of privacy implications when using these communication methods and encryption must be used whenever possible.
- Encounters through telecommunication must be properly documented in a patient's record. Proper documentation of services provided must include details of encounter such as date of service, time, and duration, along with supportive documentation describing encounter.^[18]

American Dental Association Guidelines for a Virtual Appointment through Telecommunication

- Technology utilizing method of communication platforms open to the public is prohibited (e.g.: Social media encounters).

MERITS AND DEMERITS

Merits	Demerits
1. Distance diagnosis of oral diseases is possible.	1. Treatment will require a visit to the clinic.
2. Can provide preventive services.	2. Additional diagnostic aids such as percussion and palpation cannot be performed.
3. Less patient exposure due to digitalization of techniques and equipment.	3. The accuracy of intraoral photographs may vary.
4. Better discussion of patient's problems with other peer dentists of concerned specialty within minutes, therefore, better treatment planning.	4. Initial investment is high.
5. Provide oral health-care services to patients who are medically compromised, children and geriatric populations.	5. Time consuming during signal issues and technique sensitive.
6. Decreased time and labor required to store the data.	6. Technical problems occurring during data transmission may cause a misdiagnosis or medical error
7. No wastage of papers and files for patient records.	7. Legal issues regarding the confidentiality of the patient information may raise concern ^[19]
8. Effective chairside time management ^[1,3,13,19]	

APPLICATIONS OF TELEDENTISTRY IN ORAL MEDICINE

An experienced oral physician can confidently and independently analyze the obtained clinical information and images. His scope will not only include common teeth and gum problems, but a wide range of orofacial disorders such as oral cancer, temporomandibular joint disorders, oral mucosal diseases, salivary gland disorders, orofacial pain disorders, and infective orofacial lesions. Success was tasted in studies conducted by Torres-Pereira *et al.* (2013) and Castro *et al.* (2014) in a population of 60 and 102 patients, respectively, to understand the efficacy of teledentistry in the field of oral medicine and radiology which concluded that it is a reliable alternative to the traditional oral examination for dental caries assessment and increased accuracy of consultations was seen when two observers participated.^[13] Belfast in N. Ireland has successfully proved that distant diagnosis is an effective alternative in the diagnosis of oral lesions using transmission of digital images by E-mail in a community dental service.^[19] Summerfelt reported a teledentistry-assisted, affiliated practice dental hygiene model developed by the Northern Arizona University Dental Hygiene Department that allowed dental hygienists to provide oral health care to underserved populations by digitally linking up with a distant oral health team.^[3] A study by Jacobs *et al.* (2002) reported accurate results during comparison

of radiographs viewed through the telemedicine versus while viewing in person.^[20,21] Birur *et al.* (2015) conducted a cohort study in 2000 individuals and concluded that, in the targeted cohort, out of 61% interpretable images, 45% of the lesions confirmed by him were in 100% concordance with the specialists.^[22] The role of oral diagnostician in offering specialist services to the deprived population in remote areas can be clearly demonstrated with these studies.

NEED OF THE HOUR

Dentistry today needs a complete structural and cultural change to prevent doctors as well as patients from getting infected. Dental specialists should adopt telementoring and establish a digital hybrid learning platform to create awareness and regulate important information through social media or by conducting webinars to influence more people positively. Furthermore, there is a need for telementoring in dentistry to curb panic and fear and communicate facts. The coming together of dentistry, pharma, and IT in the country will make a huge positive impact in providing essential, acute emergency dental services to the general public. Practitioners should start practicing teledentistry globally which can be incredibly useful for triaging and will also reduce direct contact with patients. However, this needs to be regulated and also remunerated. This model, if adopted in India, can help save time, effort, and money significantly, thereby providing emergency dental access to the masses.

FUTURE PROSPECTS

The advances in telecommunication have rightly enabled the dental care to promise many exciting changes in the coming years. There are certain issues which if resolved might benefit the success of teledentistry.^[20, 23,24] These issues include the following:

1. Today's dental students are facing many new challenges on graduation. Introduction of teledentistry technology and education into their curriculum, can serve as an eye-opener toward exciting opportunities and advanced approaches in their growing career.
2. Since most of the teledentistry-based education programs are in English, the Information Technology professionals should come up with an advanced software incorporating regional languages so that teledentistry will reach a larger section of the society in our country's diverse population.
3. Light-field-based 3D telemedicine could be the next generation cutting edge technology in teledentistry. This enables recording light rays in a single shot and provides 3D glass-free display with a wide zone of viewing as well as an immersive 3D display and highly

detailed convertible algorithm with patient details incorporated in it.^[19]

CONCLUSION

COVID-19 is having a devastating impact in the field of dentistry, and with the pandemic still on the growth curve, it is difficult to ascertain the extent and severity of its long-term impact at this point of time. The professional future of dental practitioners and the sustenance of their practices is a serious concern. Utilizing current teledentistry technologies, oral health-care providers can digitally acquire and transmit diagnostic data to a distant dentist for triage, diagnosis and patient referral. Day-by-day, the use of this new field is attracting dentists across the globe and bringing the fraternity closer as well as improving the quality of the services rendered. Studies involving greater number of participants will be required in future to validate the various aspects of teledentistry applications.

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