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Teledentistry- Dentist A Call Away: A Review Article

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Review Article
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ABSTRACT

Abstract: Dentistry involves close face-to-face interaction with patients, hence during the COVID-19 pandemic, it has mostly been suspended. Teledentistry can offer an innovative solution to resume dental practice during this pandemic. In this review, we provide a brief overview of the applications of teledentistry. Methods: Articles on teledentistry, relevant to this review, were searched and consulted from PubMed, Google Scholar, and Cochrane databases.

Results: Teledentistry is the remote facilitating of dental treatment, guidance, and education via the use of information technology instead of direct face-to-face contact with patients. Teleconsultation, telediagnosis, tele-triage, and telemonitoring are subunits of teledentistry that have important functions relevant to dental practice. There are many challenges for the acceptance of teledentistry by dentists as well as patients, which need to be addressed urgently.

Conclusion: Teledentistry can offer a novel solution to resume dental practice during the current pandemic, hence, the need of the hour is to incorporate teledentistry into routine dental practice. If not fully replace, at least teledentistry can complement the existing compromised dental system during the current pandemic.

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, tele-triaging, and telemonitoring are subunits of teledentistry that have important functions relevant to dental practice. There are many challenges to 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.

Keywords: Teledentistry, Oral Medicine, Communication, Internet, Diagnosis.

Introduction

The information and communication technology used on the Internet has become a central part of life learning on university campuses. Through internet-based remote dental education, students can choose their

own study location, time, and mode. A modern internet system of continuous professional dental education offers online video conferencing, broadcast operations, treatments, and online courses.[1]
Teledentistry has limited access to treatments and solves people's oral care needs. Teledentistry is to use information technology and remote communications for dental care, counseling, education, public awareness, as well as telemedicine.[2]

The term "teledentistry" was used in 1997, when Cook defined it as "the practice of using videoconferencing technologies to diagnose and provide advice about treatment over a distance".[3]

It has been defined as "the practice of health care delivery, diagnosis, consultation, treatment and education using interactive audio, video or data communications".[4]

According to the American Dental Association (ADA)
"...examinations performed using teledentistry can be an effective way to extend the reach of dental professionals, increasing access to care by reducing the effect of distance barriers to care. Teledentistry has the capability to expand the reach of a dental home to provide needed dental care to a population within reasonable geographic distances and varied locations where the services are rendered."

— ADA Policy on Teledentistry
Improving access to health care and reducing health care costs are just two of the many benefits displayed by being integrated with remote dentistry and radically changing. At a reasonable cost, treatment can be expanded in a population of underserved patients such as rural areas.[4]

Principles
The following principles form the basis of the guidelines contained in this document:
1. All practice standards, legal requirements and professional obligations that apply to direct dental practice also apply to dental practice provided via teledentistry.
2. The use of teledentistry can help reduce the risk of COVID-19 radio waves displayed in face-to-face clinical encounters while ensuring the continuity and continued delivery of the required dental treatment.

Use of Teledentistry
- Private Practice
- Public Health
- Medical & Dental Integration

Private Practice
Teledentistry enables oral health care providers to quickly and easily create networks. Many private dentists and dentists employ the remote practice. Many provide patients with video chat consultations and follow-up appointments. Digitization of dental records and services allows patients to connect with the specialists they need more efficiently than traditional methods. It also provided a communication system.

Public Health
Teledentistry is slower, but it is being integrated into the public health system. Mobile hygiene programs have been added to some schools. It can be used for dental hygiene education, and can be used to connect people in

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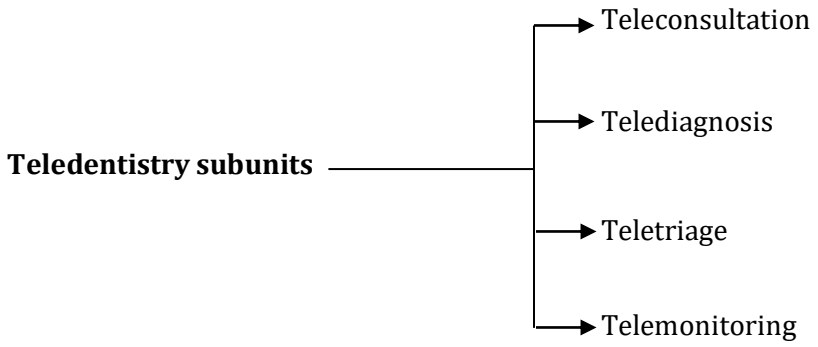
rural areas to dental care providers with limited access to care. Federally Qualified Health Centers (FQHCs) also have opportunities to integrate teledentistry into their practices.

Medical & Dental Integration

Dental care providers can also be associated with other healthcare professionals. Oral health and general health are essentially connected. Connecting dental and medical professionals creates the opportunity to receive medical services in all better ways. It is also a promising tool in the covid-19 era.

Teledentistry subunits

Remote facilitating of dental treatment, guidance, and education via the use of information technology is divided into 4 subunits.



Teleconsultation

The most common form of teledentistry is teleconsultation, in which the patient or local health care seeks consultation from dental specialists using telecommunication.

It has been valuable for the consultation of patients who are physically and intellectually challenged, and patients from aged care facilities and prisons.[5]

Telediagnosis

Telediagnosis technology is used to exchange images and data to diagnose oral lesions.[6,7]

Most oral lesions are often evident directly, allowing telediagnosis on dental photographs, reducing the need for in-depth clinical examination.[8] **Table 1** gives a review on telediagnosis in oral medicine.

AlShaya MS et al[9] in 2020	Detection of dental caries via smartphones
Vinayagamoorthy K et al[10] in 2019	screening of oral potentially malignant lesions .
Sunny S et al [11]in 2019 in 2019	early detection of oral potentially malignant or malignant lesions (telecytology)
Haron N et al.[12] in 2020	detection of oral cancer via Mobile Mouth Screening Anywhere (MeMoSA®)
Skandarajah et al[13] in 2017	screening of oral cancer via a tablet-based mobile microscope (CellScope device)
Machado RA et al [14] in 2020	differential diagnosis of oral lesions via whatsapp.
Torres-Pereira C et al.[15] in 2008	diagnosis of oral lesions using transmission of digital images by email

Table 1: Review of telediagnosis in oral medicine

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Teletriage

Teletriage involves the safe, appropriate and timely disposition of patient symptoms via smart phone by specialists. It has been used for remote assessment of school children and prioritizes those requiring dental care without unnecessary travel regardless of socio-economic and geographical difficulties in many places.[16,17]

Telemonitoring

To monitor a dental patient, the patient should be visited frequently to the dentist to monitor the progress of treatment. Telemonitoring can be seen as a promising tool for remote monitoring of surgical and non-surgical dental patients, especially reducing costs and latency.

It can replace the frequent physical visits with virtual visits for regular monitoring of treatment outcomes and disease progression.[18]

How Does Teledentistry Work?

Teledentistry is typically carried out in one of the following modalities:

- Synchronous (Real-Time Consultation)
- Asynchronous (Store-and-Forward Method)
- Remote Patient Monitoring (RPM)
- Mobile Health (mHealth)

Synchronous (Real-Time Consultation)

Synchronous means at the same time. This refers to live video or phone calls between a patient or caregiver and a provider. **(Figure1)**

This real-time interaction is imitating a normal visit to the dental office. Thus, patients can have certain tests and follow-up appointments at home. Your dentist may prescribe the medication, recommend a solution at home, or introduce patient-to-person care. Video conferencing is a versatile application.

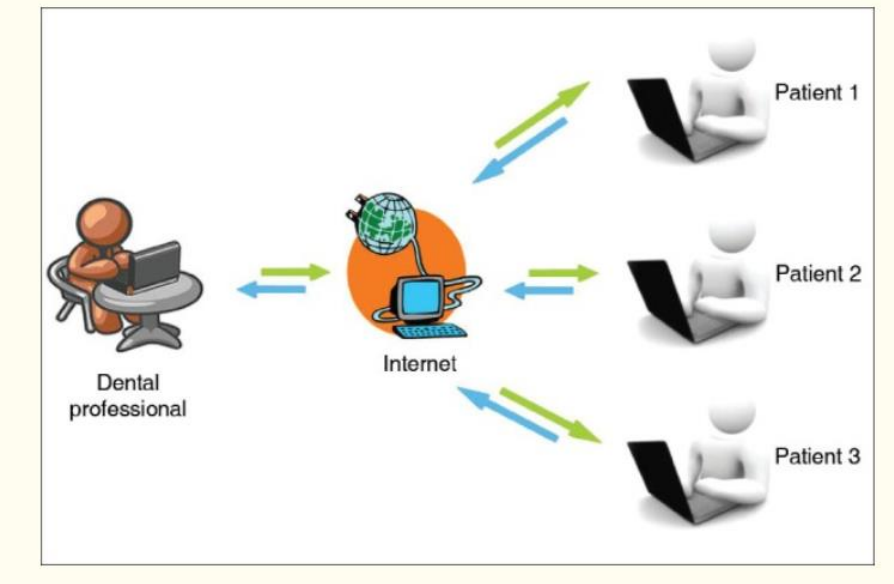

Figure 1: Real-Time Consultation

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Asynchronous (Store-and-Forward Method)

Asynchronous communication refers to sending and storing health information via secure communication systems.

Store-and-Forward Method involves the exchange of clinical information and static images collected and stored by the dental practitioner, who forwards them for consultation and treatment planning. **[Figure 2]**

Common documents include:

- Radiographs (X-rays)
- Photographs and Videos
- Digital impressions
- Photomicrographs

This dental information is used by a practitioner to evaluate a patient's condition. It can be sent anytime and doesn't need to be communicated during a live interaction.

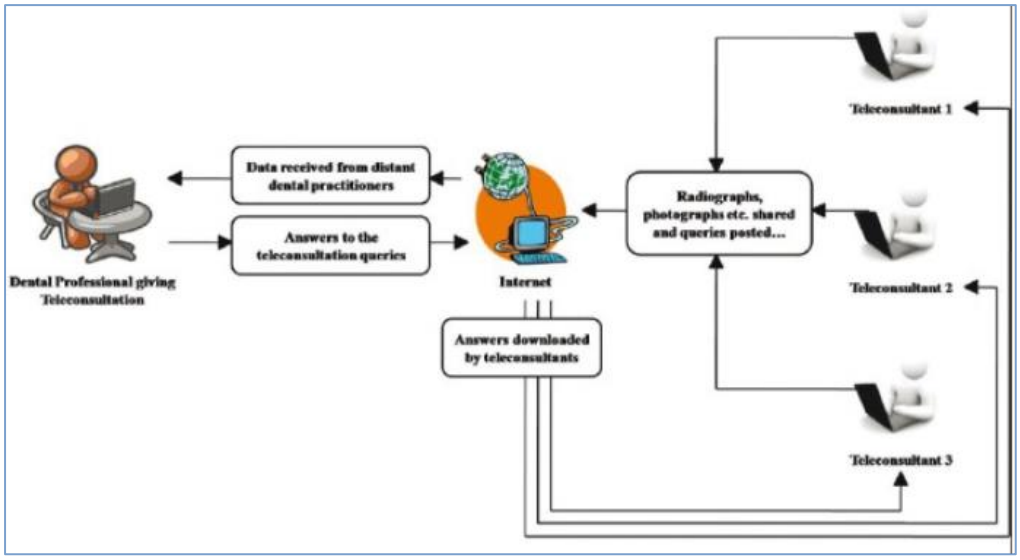

Figure 2[19]- Store-and-Forward Method

Remote Patient Monitoring (RPM)

Remote patient monitoring is used to provide interest and support in different locations. Personal information and medical data are digitally transmitted to the collection provider. The patient is likely to be at home or in another medical facility (hospital, etc.). This allows dental care providers to remotely monitor a patient's progress. Video chat may be included as part of the care delivery system. They can change treatment plans remotely.

Mobile Health (mHealth)

This is the main focus of health care providers and educators as mobile phones are rapidly globally integrated into our daily lives. Mobile health refers to the practice of health or public health supported by a mobile phone or tablet.

Pros and Cons of Telehealth Dental Care

Teledentistry is a subject that is being discussed by dentists, public health authorities, and state regulators. Despite its limitations, the dental industry clearly needs to integrate remote dental services. It remains in the ever-evolving field of dentistry.

Pros of Telehealth Dental Care

Teledentistry is proven to:

- **Improve the dental hygiene of patients.**
  Using telehealth systems to connect providers with patients has become an important tool for improving the oral health of patients conveniently.
- **More affordable than in-office dentistry.**
  It has been shown to reduce the cost of care and increase efficiency through reduced travel times, shared professional staffing, and fewer in-person appointments.
- **More innovative solution for the mainstream healthcare industry.**
- **Align with today's patients' needs for modern forms of communication.**
  Recent studies on the use of telehealth services have shown that patients are comfortable communicating with their healthcare providers via text, email, or video in lieu of seeing them in person to check for medical or diagnostic information.
- **Reduce the number of time employees spends away from the office.**
  Teledentistry options reduce the time taken by employees to see dental providers in person. In fact, though appointments can take hours out of an employee's workday, only 17 percent (20 minutes) of that time is spent actually seeing the doctor.
- **Make in-office appointment times more accessible to patients who need them.**
  Teledentistry options reduce the time taken by employees to see dental providers in person. Though appointments can take hours out of an employee's workday, only 17 percent (20 minutes) of that time is spent seeing the doctor.
- **Provide the same level of care to patients as in-office visits.**
  Research indicates that the quality of care and success rates of patients were the same whether patients used telemedicine or not.
- **Increasing access to patient care**
  It is especially important for patients in rural or out of service areas, people with disabilities and severe health complications, and travellers who experience dental problems when they are far away from home. Teledentistry eliminates the need to travel long distances and can help health care providers supplement clinician staffing in areas where they are understaffed. It also allows providers to expand their reach to patients beyond their own offices. It has a unique capacity to increase providers' services to millions of new patients.
- **Patient Education Opportunities**
  Often patients simply need to know whether what they are experiencing is an emergency. Virtual counseling can educate patients so they can make the best decisions based on the situation.
- **Prescribing antibiotics for dangerous infections**
  Infections at risk of escalation can be seen and diagnosed during a virtual consultation. This will increase the patient's chances of recovery if they can quickly provide virtual counselling. It also eases the burden on the emergency room or emergency care facilities.
- **Cons of Telehealth Dental Care**
  - Not available in all states. Dentists must comply with protocols set by the regulatory body of the licensed country.

- Certain treatments require a visit to the office. Bent, crooked or dirty teeth can be treated remotely, but there is no remote treatment for other problems such as tooth decay and periodontal disease. In-person, physical dental treatment is necessary to fix some dental problems.
- X-rays or face-to-face evaluations do not limit the accuracy of the diagnosis**.** Certain tooth problems require high resolution dental x-rays and tactile examination of the teeth. With the limited information provided in a teledental consultation, patients could receive a false diagnosis.

Limitations

There is a considerable variation between countries in terms of accountability, licensure, jurisdiction, liability, privacy, consent, and malpractice. The latter appears to be a major impediment to the use of teledentistry across borders.[20] The problems with the internet in general and teledentistry, in particular, are due to a lack of well-defined standards. If a technical problem occurs during data transmission that may cause a misdiagnosis or medical error, if patient data are lost or stolen during the process of transmission, the entire project may need to be discontinued.[21] A clear, nationwide teledentistry protocol is needed regarding the forms, equipment, efficiency, privacy, and security, which would enable organizers to control the problems caused by different standards and result in a more objective program evaluation. A standardized recording system would make the data-collecting process much easier and decrease the learning curve.

Training

Instructors of teledentistry education courses need to have both teaching experience and computer knowledge. The educational team must continuously update the course. Educational courses should be guided by instructors who are experienced in leading online communication, able to promote discussion, and familiar with the use of computer technology.[20] Finally, most of the teledentistry-based education programs are in English. Since the internet is a worldwide tool, future goals should include consideration of more multilingual programs.

Teledentistry & The COVID-19 Pandemic

The word "tele" means "distant" so teledentistry meets the needs of social distancing. As has been proposed by health authorities around the world to contain the spread of the SARS-COV-2 virus. Teledentistry is a routine dental practice to provides a variety of applications, including remote screening of suspected COVID-19 patients about dental treatment and reducing unnecessary exposure to healthy or uninfected patients by reducing already burdensome dental and hospital visits.

Looking at the current increasing trend of COVID-19 cases, it does not appear that this pandemic will end anytime soon.

Indeed, even WHO fears recently that this virus may not turn out to be a mere other outbreak viruses in society. If this speculation is true, and if COVID-19 actually occurs, dental care needs to be revamped and innovated to continue dental treatment to minimize the risk of cross-infection. Teledentistry can provide innovative solutions for continuing dental care not only in between and beyond the current pandemic. Telemedicine plays an even more important role as the world begins to move to more distant products and services. There has been a rapid change in healthcare services due to the need to reduce share and protect vulnerable populations under social distancing protocols and travel restrictions. As the world begins to shift towards more remote work, products, and services, telehealth will take on a much more prominent role.

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In today's circumstances of ongoing COVID-19 pandemic, with increasing likelihood of it becoming endemic, the main aim is to avoid person-to-person contact.[22]

Management of dental problems during COVID-19 pandemic is illustrated in **figure 3**.

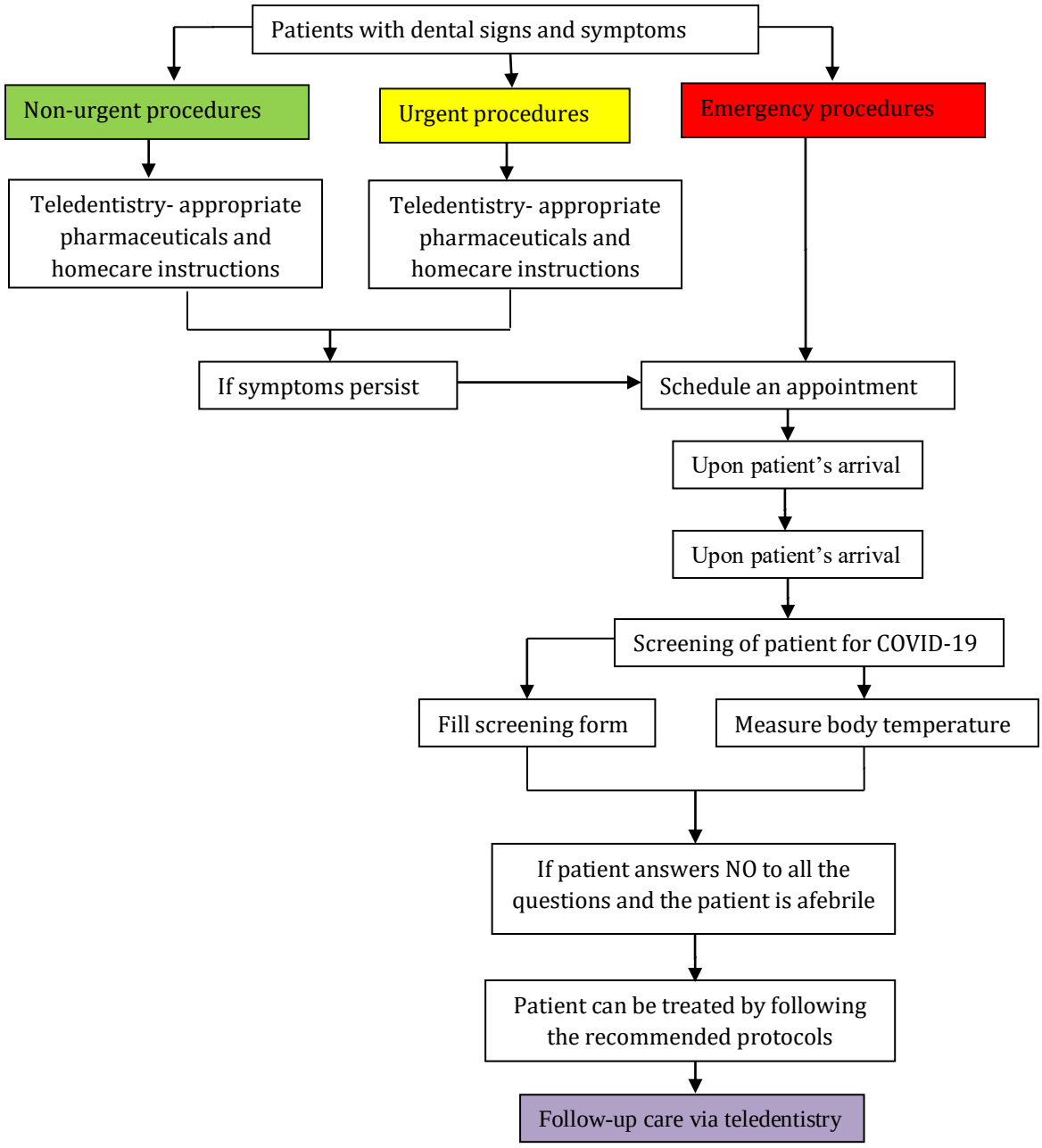

Figure 3: Management of dental problems during COVID-19 pandemic.[23]

Conclusion: Dentistry forms an important part of our health care system and is currently suffering severe damage during the COVID-19 pandemic. The need for time, remote dentistry can be integrated into your daily dental practice. If not completely replaced, at least remote dentistry can complement the existing risk dental system in between the current pandemic. Despite these "teething problems", telemedicine and teledentistry possibilities are enormous.

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