

Original Article

Tele dentistry - Its Practical Applicability, Hurdles and Future Prospects

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Abstract:

Teledentistry is an amalgamation of dentistry and telecommunication where the clinical information is exchanged between the patient/ caregiver with the dentist from a remote distance. The role of teledentistry came into spotlight in the pandemic Covid 19 era. This proved to be the safest method to provide health care assistance in preventing the disease transmission was cost effective and also formed a bridge between the rural and urban communities. It also helps in telediagnosis and formulation of treatment in dental emergencies. Teledentistry has improved a lot in the recent times due to advent of smart phones, widespread internet connectivity and video conferencing applications. Teledentistry could provide hassle free consultations as well the patient history can be stored in the data base for a longer period of time. This review highlights the origin, its applications, drawbacks and its role in the covid 19 and lock down phase.

Keywords: Covid 19, lock down, telediagnosis, telehealth, telemedicine

*Bangladesh Journal of Medical Science Vol. 22: Special Issue 2023 Page : 52-57
DOI: <https://doi.org/10.3329/bjms.v22i20.66307>*

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Telemedicine or telehealth is the utilization of electronic devices and communicating technologies to provide health care provisions across geographically distanced participants. Telemedicine were mostly used in corporate hospitals but also are gradually being introduced in medical colleges and rural hospitals in developed countries for digital consultations and record maintainance.¹ The usage of teledentistry ages back to 1994 wherein US military first started teledentistry projects all around the world to serve US troops.² The term “Teledentistry” was first introduced by Cook in 1997 and defined it as “the practice of using video conferencing technologies to diagnose and provide advice about treatment over a distance”.³ It is a suitable method that operates by using digital technology, software analysis devices and internet to provide teleconsultation, maintain health database of the

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patient, exchange information on health related concerns across a long distance.

The concept of teledentistry was mostly widespread across developed countries but was rudimentary in India. In the pandemic covid 19 era the practice of teledentistry became popular as it was considered the

safest mode for consultation in the medical fraternity (Figure 1).⁴ Thus, owing to the difficult period of covid 19 a sound telemodel approach should be developed by synergistically applying dentistry and telecommunication to provide timely management of emergencies that can be treated at home safeguarding both the dentist and the patient.⁵

Methods of Teledentistry:

1. **Two way interactive or real time consultation/ Synchronous:** It involves videoconferencing between a patient and doctor in which live images, past medical history and the present symptoms are seen and the information is exchanged to reach a prompt diagnosis and treatment by prescribing medications to relieve the discomfort of the patient in the given time. This technique can be used in relevance to the social distance norms and accessibility is gained even in remote locations.⁶
2. **Store and Forward teledentistry/ Asynchronous:** In this method the information like images of presenting illness, radiographs, serological analysis, pathology reports are scanned properly and sent to the doctor and also to his/ her team for diagnosis and treatment planning. The data can therefore be stored in the application and can be yielded for future reference among the colleagues in the medical field.^{7,8}
3. **Remote monitoring of the patient:** Relevant information can be shared from one location to another via networking and digital informatics for supportive management and healthcare.⁸
4. **Mobile Health:** The use of computers, mobile phones, tablets and personal digital devices to avail community healthcare services.⁸

Applications of Teledentistry:

Use in Oral Medicine and Radiology:

Several authors have proved that teledentistry is an effective and alternative method for diagnosis of oral diseases from a distant and remote location using electronic devices via multimedia messages and email. They have also utilized the above method for treatment planning through a team of doctor.^{9,10,11}

Use in Oral and Maxillofacial Surgery:

Many authors have proposed that teledentistry is a cost effective method for pre-operative consultations in which the patient is unable to travel from distant location. Teledentistry can also be used in diagnosis of pericoronitis and impacted tooth via real time consultancy. Authors have also stated that images shared by smartphones provide an easy and effective way for the oral surgeon to get accessibility without any constrictions. Telemedicine can be a beneficial tool in advising antibiotic prophylaxis in patients undergoing surgical procedures, hence, reducing the travel cost and time.^{12,13}

Use in Periodontics:

Application of teledentistry was very useful in patients who underwent surgical procedures. In a study, 15 patients underwent surgical procedures and still images were recorded in the hospital and the patients were later discharged and travelled back to their own native. After 7 days the still images of the surgical site were taken and referred to periodontist. After tele-consultation suture removal were done. The patients were happy and satisfied that they their travelling burden and cost was reduced for the follow up due to teledentistry.¹⁴

Use in Endodontics:

The scope of teledentistry in the practice of conservative dentistry is still needs to be explored. Studies have shown that teledentistry can be used to locate root canal orifices in mandibular molars by photographic modality. Location of root canal in any tooth is utmost important in endodontics to prevent re infection and subsequent treatment failure.^{15,16}

Use in Orthodontics:

Mandall NA et al.¹⁷ suggested that identifying and streamlining of patients requiring orthodontic treatment can be effectively employed by teledentistry. The general dental practitioner can store the clinical and radiographic data and relevant information of the patient in a file in the computer and forward data to the orthodontist for opinion and guidance. The specialist can give recommendations either by real time videoconferencing with the dentist or by multimedia messaging. Minor malocclusions like rubber ligature displacement, discomfort due to appliance and irritation of cheeks can easily be managed at home by

telecommunication to a dentist that will reduce the amount of visit to the dental clinic/hospital.^{14,18}

Use in Oral Pathology and Microbiology:

Many pathologies are seen in the oral and paraoral surfaces which can be efficiently managed by telecommunication. The patients in the remote area can assess the dentist by sending clear images and also videoconferencing to get proper diagnosis and treatment. Oral ulcers, dental pain, abscess can be managed by use of topical analgesics, anti-inflammatory drugs and antibiotics. Previously, there was always a dilemma in delineating the biopsy site between an oral pathologist and oral surgeon.

Improper biopsy or inadequate biopsy can result in inappropriate diagnosis. Therefore, synergistic relation between oral surgeon and oral pathologist via teledentistry is useful in identifying the correct biopsy site that will aid in diagnosis and the outcome of the treatment.¹⁹

Use in Pediatric Dentistry:

Pediatric dentistry is a branch of dentistry that is a combination of endodontics, orthodontics and surgery. Common pediatric emergencies like teething problems can easily be solved at home by advising the patient to keep the gums clean using a moistened cotton or gauze and maintain oral hygiene. In case of exfoliation of tooth at home, clean gauze is applied with pressure to arrest the bleeding and post extraction instructions can be given through telecommunication by the dentist. Oral ulcers can easily be diagnosed by sharing still images via internet and a virtual diagnosis can be made. The dentist can instruct the parent to avoid hot and spicy food, application of lignocaine based topical gel to reduce the soreness either by telephonic conversation or multimedia messages which is less time consuming. Children with dental caries without any symptoms can be managed by advising the parent to take proper oral hygiene measures and later can visit the hospital at their own ease. Symptomatic cases like dental pain or abscess formation or swelling can also be managed by teledentistry, appropriate medications like analgesics and antibiotics can be prescribed along with warm saline oral rinses, avoiding hot and cold fomentation and schedule appointment for treatment and follow up. In severe cases involving cellulitis the parent is requested to immediately visit the hospital.

Management of orthodontic cases in pediatric patients involve removal of broken or debonded brackets, covering of impinging wires and brackets using orthodontic wax and avoid accidental swallowing of small components.^{4,20}

Limitations of Teledentistry:^{19, 20}

1. Difficulty in understanding the technology used in teledentistry as adaptability for new skill is the concern and many dentists may not be willing to comply with the advancement of technology.
2. Lack of infrastructure in the rural setting such as connectivity, new armantarium, x ray machines.
3. Two dimensional images are difficult to interpret and dentist might find clinical examination more convenient in reaching a proper diagnosis.
4. The dentist completely relies on the information shared by the attendant of the patient and can result misinterpretation of the details leading to faulty diagnosis.
5. Teledentistry raises legal issues like maintaining of patient confidentiality of the patient history stored as data in the computer.
6. Liability, jurisdiction and consents are a major hindrance in the practice of teledentistry.

Role of teledentistry in Covid 19 era:

In the pandemic period, along with the rule of lock down the normal routine visit to dental clinic and hospital were hampered. This compelled the hospitals and healthcare facilities to develop new and alternative methods for patient care. To check the spread of covid 19 infection in the community effective methods had to be developed for remote screening, monitoring, diagnosis and treatment of the patient. Many authors in their studies have suggested that teledentistry is an innovative method for diagnosing and screening of patients for oral medicine and pediatric dentistry. With the advent of smart phones with high resolution cameras, user friendly and readily available in the market it is most commonly used for store and forward data method of telecommunication.^{21,22,23,24} But in another study it was reported that real time mode of teledentistry was more satisfying for the patient to provide the treatment systematically.²⁵ Thus, in the pandemic and lock down time teledentistry rapidly gained popularity as it was the safest mode for exchange of information between the patient and the

doctor without involving the risk of infection. The information also could be shared with the fellow colleagues which aided in the diagnosis and treatment outcome of the oral disease.⁸ It also helped in saving resources by reducing Personal Protective Equipments (PPE) kit usage, reducing patient crowd and having more time in hand.

Future prospects:

1. *Easy and Immediate Consultation:* Consultation from a dentist about minor problems and emergency issues can be done from any place and any time.^{4,10}
2. *More Time in hand and Less Crowd:* Teledentistry can help in reducing crowd in dental clinics. Minor problems can be addressed through virtual consultation which will allow the dentist to focus on other patients with major issues.⁶
3. *Improving Oral Health:* In developing countries, educating mass population about oral health and spreading awareness about common problems can be easily executed in both rural and urban population.¹⁹
4. *Second opinion:* Teledentistry saves time of travelling from dentist to dentist. A second opinion can be easily availed without spending much time.

Conclusion

Teledentistry improves the overall oral health of the patient using teleconferencing. Telecommunication has proved to be a boon in the covid 19 period. This technique was useful in solving many dental emergencies like tooth pain, abscess / swelling and other minor dental injuries. It also aids in palliative care during lockdown. Advancement in technology can further increase the scope of teledentistry. Hence, further studies are required to improve and validate the different applications of teledentistry.

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Figure 1: Evolution of Teledentistry

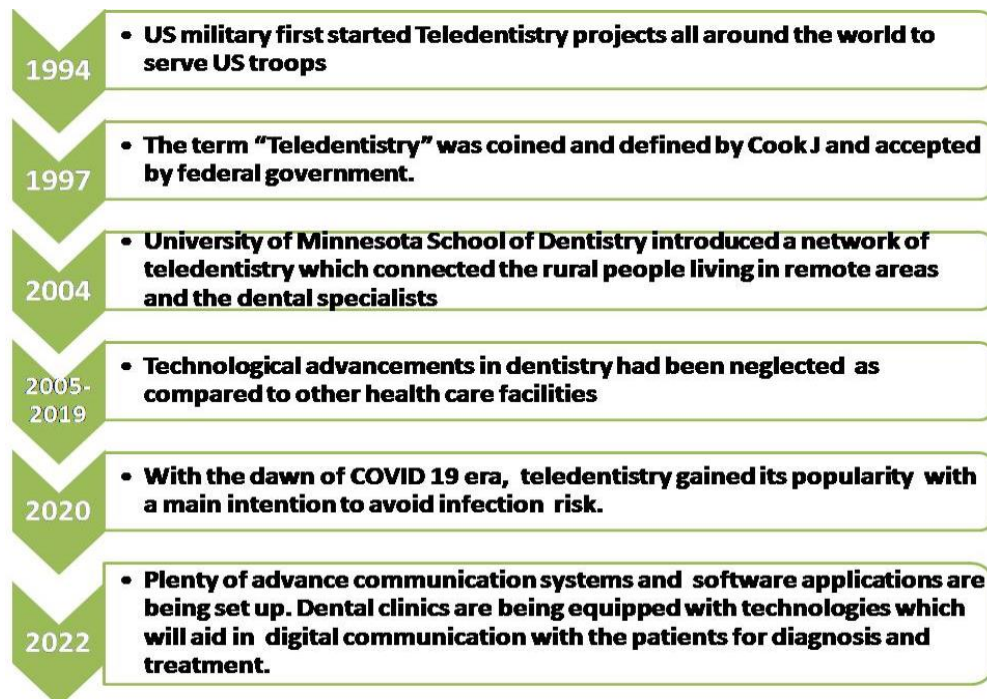


Figure 2: Management of common dental emergencies through teledentistry

