

**Teledentistry: A Brief Review**

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**Abstract**

Teledentistry is an emerging mode of practice which promises immense potential in fields of clinical practice as well as public health delivery. Teledentistry presents a possible solution to many longstanding problems in dentistry, but it also faces significant challenges. Teledentistry provides new opportunities for dental education by providing an easy access to primary care professionals for efficient consultation, thus helping in conducting effective postgraduate education and

continuing dental education programmes. Hence this review of literature aims discusses teledentistry and its applications in dental practice in brief.

**Keywords:** Teledentistry, Telemedicine, Teleconsultation, Dentistry

**Introduction**

Teledentistry is a fairly new branch of dentistry. Teledentistry, like telemedicine, uses information technology and modern communication systems to deliver healthcare across geographical locations.<sup>1</sup>

Health care has changed dramatically with the era of computers and telecommunication. There are many implementations of telecommunications in hospitals and with time a new term arrived i.e. Telemedicine. Association of American Medical Colleges states that “Telemedicine is the use of telecommunications technology to send data, graphics, audio, video and images between participants who are physically separated (i.e., at a distance from one another) for the purpose of Clinical care”.<sup>2</sup> Teledentistry is one of the recent advances in the use of Telecommunication technology, digital Diagnostic imaging services, computers devices and Software for analysis and follow-up.<sup>3</sup> Term “teledentistry” was used in 1997 by Cook, who defined it as “the practice of using video-conferencing technologies to diagnose and provide advice about treatment over a distance” Most dental professionals are unaware that teledentistry can be used not only for increased access to dental care but also for advanced dental education. There is a significant potential of teledentistry.<sup>4,5</sup>

The COVID-19 pandemic has challenged the existing healthcare systems across the globe. As it spreads by droplet, fomite and contact transmission, face-to-face interaction of healthcare professional with the patient carries a risk of its transmission. As dental treatment invariably involves close inspection, examination, diagnostic and therapeutic interventions of the naso-oro-pharyngeal region, dental professionals are most susceptible to get infected with corona virus ongoing COVID-19 pandemic, with increasing likelihood of it becoming endemic, the main aim is to avoid person-to-person contact. The word ‘tele’ means ‘distant’, and therefore teledentistry satisfies the need for social distancing as has been advocated by the health

authorities all across the globe to contain the spread of SARS-COV-2 virus. Teledentistry can be incorporated into routine dental practice as it offers a wide range of applications such as remote triaging of the suspected COVID-19 patients for dental treatment and decreasing the unnecessary exposure of healthy or uninfected patients by decreasing their visits to already burdened dental offices and hospitals.<sup>6,7</sup> This review of literature discusses teledentistry and its applications in dental practice in brief.

**History:** Telemedicine began in 1924, with the concept of a physician seeing his patient over the radio using a television screen. Telemedicine programs first started in 1950.<sup>8</sup> The initial concept of teledentistry developed as a part of the blueprint for dental informatics. Teledentistry was put into practice in US army in 1994 by doing dental consultations on person located more than 100 miles apart. Since then, various institute and organization have practiced teledentistry with varying degree of success.<sup>3,9</sup>

**Equipment:** Earlier, teledentistry involved calling an expert on the telephone for advice. Nowadays it involves consulting experts using the internet. It involves the local dentist digitizing and electronically transmitting drawings, diagrams, photographs, and X-rays to a specialist.<sup>10</sup>

To develop the teledentistry-assisted, affiliated practice dental hygiene workforce model and add teledentistry skills to its curriculum two each of the following equipment is required: Open Dental office management software; Tiger View Professional digital imaging management software; Acclaim Intraoral Digital Cameras; Scan-X Duo digital x-ray film scanners; Nomad Portable Handheld X-ray radiographic systems; Dell laptop computers; and Dell projectors. All of the

equipment chosen integrates seamlessly and has proven to be successful in both local and remote applications of teledentistry-assisted, affiliated practice dental hygiene. "Teledentistry In Practice – An Update" Interactive video-conferencing may be conducted via POTS (plain old telephone service), satellite, ISDN, Internet or Intranet. Nowadays social media like facebook and whats-app are being used for teledentistry. It allows dentist to seek opinion of experts and peers for difficult procedures. Also pictures are posted of treatment already done by the dentist.<sup>11</sup>

**Methods of Teleconsultation:** Teleconsultation through teledentistry can take place in either of the following ways:

Real-time consultation includes video-conference in which dentists and their patients are at different locations and they may see, hear, and communicate with one another using advanced telecommunication technology and ultra-high bandwidth network connections.<sup>3</sup>

Store and forward, involves the exchange of clinical information and static images collected and stored in the telecommunication equipment. In store and forward, the dental practitioner collects all the important clinical information and digital intraoral and extra oral images and radiographs and forwards them for consultation and treatment planning via established networks and the internet and treatment is provided in a far timelier, targeted, and cost-effective manner.<sup>2</sup>

The third method may be home based or hospital based where patients are monitored at a distance i.e. "Remote Monitoring Method". A "Near-Real- Time" consultation has also been mentioned in the literature, where use of low resolution, low frame rate product like jittery television.<sup>5</sup>

## Application of Teledentistry

**Patient education:** Teledentistry can serve as a good tool for postgraduate students and for providing continuing updates for the dentists. In interactive video-conferencing, the patient information is checked first, which allows for the interaction and feedback between the educator and the students. The patient cases can be reviewed comprehensively and at the students' own pace. This boosts the students' enthusiasm and provides new learning opportunities for the dentists.<sup>12</sup>

**Application of teledentistry in Oral medicine:** Dental professional can confidently and independently analyze the obtained clinical information and images. The 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.

Castro et al. (2014) evaluated the efficacy of teledentistry 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.<sup>13</sup>

**Application of Teledentistry in Pediatric dentistry:** Telehealth broadens healthcare delivery for patients in remote and underserved communities. Teledentistry involves the use of Telehealth modalities to deliver dental care. Teledentistry has many benefits in improving access to oral healthcare for infants, children, adolescents, and individuals with special healthcare needs in a cost-effective manner. Additionally, teledentistry are useful in time-sensitive injuries such as

trauma or when unexpected circumstances result in difficulties accessing care.<sup>14</sup>

Teledentistry can serve as a tool to symphonized and expand the capacity of school and paediatric care centres to meet the children's oral care needs by using technology to connect to the health providers at another location.<sup>15</sup>

- Screening for dental problems before they become emergencies.
- Helping children in managing their chronic illnesses.
- Connecting children and their families health and social services and
- Providing urgent consulting for oral healthcare.

**Application of teledentistry in Orthodontics:** In orthodontics, owing to advancement in technology, demand for convenience, and the need for social distancing due to COVID-19, teledentistry is being adopted as a means of consulting and monitoring a patient without an in-office visit. Although the implementation of teledentistry has not eliminated the need for in person clinical care, telecommunication can be particularly used for preliminary orthodontic consultations; reviewing forms; explaining diagnosis and treatment plans; monitoring leveling and aligning; evaluating maxillary expanders, functional appliances, clear aligners, and removable appliances; explaining and checking patient cooperation with the elastic use; and guiding parents with minor emergencies that can be handled at home. In addition, some have reported that online checkups are more time-saving and economically more appealing to both clinicians and patients.<sup>16,17</sup>

**Application of teledentistry in Prosthodontics:** In prosthodontics, proper evaluation of edentulous ridges, supporting tissue structures and abutment teeth can be done via diagnostic casts, clinical photographs and

radiographs obtained via teledentistry and the appropriate prosthesis can be fabricated by the on-site general dentist and dental technologist.<sup>18</sup>

Ignatius E et al. (2010) investigated the use of videoconferencing for diagnosis and treatment planning for patients requiring prosthetic or oral rehabilitation treatment and stated that video-consultation in dentistry has the potential to increase the total number of dental specialist services in sparsely populated areas.<sup>19</sup>

**Application of teledentistry in Oral surgery:** In oral and maxillofacial surgery, the most common complaints arising are of pain in the third molars. In such condition patients can send clinical and radiographic images to dental professionals which can be forwarded to a specialist for a consultation. Due to the COVID-19 pandemic, the incidence of dental trauma and non urgent treatments has decreased.

Assessment of orofacial emergencies such as Ludwig's angina and necrotising fasciitis can be done and appropriate medical and surgical intervention as it affects the maxillofacial region can be discussed with the general surgeon on-site via facilities provided by teledentistry. A study by Rollet MK et al. (1999) on efficiency of telemedicine consultation for preoperative assessment of patients for dentoalveolar surgery with general anaesthesia and nasotracheal intubation showed that telemedicine consultations were as reliable as those conducted by traditional methods.

Similarly Duka M et al. (2009) showed that the clinical diagnosis of impacted or semi-impacted third molars assisted by the telemedicine approach was equal to the real-time assessment of clinical diagnosis.

**Application of teledentistry in Endodontics:** Endodontics is a specialised part of dental practice provided by endodontist that is rarely found in remote

areas in developing countries. Teledentistry can be used to provide endodontic services in this underserved communities.<sup>22</sup>

The most common complaint of the patients in lockdown is dental pain and swelling. In such cases, they can have a telephonic conversation with the dentists informing them about the symptoms experienced by them. For certain specific cases like symptomatic reversible pulpitis, analgesics can be prescribed. If proven ineffective, a pulp therapy procedure can be performed as a secondary protocol. The dentist can then prescribe them a suitable course of antibiotics or take a clinical judgment if the case requires immediate clinical intervention depending upon its severity.<sup>23</sup>

#### **Advantage of Teledentistry<sup>3,5</sup>**

- Analysis of the various studies on teledentistry concluded about cost-effectiveness compared with other mode.
- It also improves the access and quality of care by facilitating better and timely information to the dentists, which improves decision making and producing better communication between the dentists and their patients.
- Decrease in peer isolation and increased specialist support and education.
- General dentists will mail multimedia patient records to dental specialists, enabling the specialist to make a diagnosis and develop a treatment plan without seeing the patient.
- Improvement in diagnostic services
- Improved integration of dentistry into the better health care delivery system.
- It helps in communication with the insurance industry with respect to requirements.
- Better communication with dental laboratories

#### **Limitation of Teledentistry<sup>12</sup>**

- Legal issues exist, including licensure, malpractice, privacy, Security and ethics.
- One of the advantages of teledentistry is its ability to increase access to dental care, but users must be careful when providing consultations a cross country lines.
- If technical problems occur during data transmission that cause a misdiagnosis or medical error, issues of responsibility and malpractice need to be considered.
- In addition, privacy and security are important issues in cyberspace. If patient's data are lost or stolen during the process of transmission, the entire project may need to be discontinued, especially once the Health Insurance Portability and Accountability Act becomes law.

#### **Conclusion**

Currently, teledentistry has not yet become an integral part of mainstream oral health care. Teledentistry is still nested under the wings of telemedicine and is yet to be recognized in its own right. Dentistry combined with information technology has the potential to revolutionize the way in which clinical and primary health care is delivered in our country. However, with few drawbacks and constant efforts to combat them, teledentistry has a very promising future and a long way to go.

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