

## Teledentistry: A Review

Dr. Inayaat Virk<sup>1\*</sup>, Dr. Shilpa Sunil Khanna M.D.S<sup>2</sup>, Dr. Rahul Vinay Chandra Tiwari, FOGS, MDS<sup>3</sup>, Dr. Munshi M.A.I MDS<sup>4</sup>, Dr. Deepesh Mathur, BDS (MBA)<sup>5</sup>, Dr. Rishabh Bhanot<sup>6</sup>

<sup>1</sup>Consultant Dental Surgeon, Indus Hygiea, SCF 21, Phase 6, Mohali, Punjab, India

<sup>2</sup>Department of Oral and Maxillofacial Surgery, Senior Lecturer, Sri Ramakrishna Dental College and Hospital, Coimbatore 641006, Tamil Nadu, India

<sup>3</sup>Consultant Oral & Maxillofacial Surgeon, CLOVE Dental & OMNI Hospitals, Visakhapatnam, Andhra Pradesh, India

<sup>4</sup>Oral and Maxillofacial Surgery, Reader, Sri Ramakrishna Dental College and Hospital, Coimbatore, Tamil Nadu, India

<sup>5</sup>Admin, FMS Dental Hospitals, Hyderabad, Telangana, India

<sup>6</sup>Consultant Oral and Maxillofacial Surgeon, Jyoti Kendra General Hospital, Ludhiana

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\*Corresponding author: Dr. Inayaat Virk

### Abstract

Health care has changed dramatically by the union of computers and telecommunications. Implications for physicians and hospitals have already gained an extensive media attention, although relatively lesser information gained in terms of the impact of information technology on dentistry. Teledentistry is the use of telecommunications and information technology for dental care, education, consultation and public awareness. The present article reviews the basis, origin, scope, rationale and requirements for teledentistry, along with the illustration with the help of current evidence that exists in the literature of how the digital transformation will likely affect the dentists and their patients.

**Keywords:** Applications, dentistry, teledentistry, telemedicine.

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## INTRODUCTION

With the advent of era of computers and telecommunication, the health care has been changed dramatically. Many implementations of telecommunications are there for hospitals such as telemedicine. By making use of communications systems and information-based technologies in order to deliver the health care across the world is defined as telemedicine [1]. The telemedicine has been increasingly possible because of the immense technical progress over the last few years. Teledentistry is a rapidly emerging subset of telehealth, which is a field that already has significant impact on the health care industry. In 1997, Cook defined "Teledentistry" as "the practice of using video-conferencing technologies to diagnose and provide advice about treatment over a distance" [2]. Internet forms the basis of modern systems of teledentistry, being fast and upto date, as well as it is able to transport a large amount of data. This entire channel and process of sharing digital information, networking, distant consultations and analysis is dealt by a segment of science of the telemedicine concerned with dentistry known as "teledentistry [3]."

## HISTORICAL ASPECT OF TELEDEDENTISTRY

In 1989, at a conference funded by the Westinghouse electronics system group in Baltimore Teledentistry was developed as a part of the representation for dental informatics, a new domain combining information science, computer, engineering and technology in all areas of oral health [4]. More specifically, teledentistry emerged as a subspecialist field of telemedicine which could be linked to year 1994 and a military project of the United States Army (U.S. Army's Total Dental Access Project), which was aimed to improve the patient care, dental education, and to bring about the communication between dentists and the dental laboratories. Teledentistry revealed that even at larger distances, the dental professionals can consult each other. Hence, this military project had demonstrated that the teledentistry was capable to reduce the total patient care costs, expanding the dental care to rural and distant areas as well as offering a complete information required for detailed analyses [5].

## REQUIREMENT OF TELEDEDENTISTRY

Teledentistry can improve the accessibility to oral health care, upgrade the delivery of oral health care as well as lower its cost. It also has the prospective to terminate the disparities in the oral health care between

rural and urban communities. Teledentistry may also turn out to be the fastest as well as cheapest method to bridge the rural and urban health divide and also can help in bringing specialized health care to the remotest corners of the world [6].

### INTERNET AS PREMISE OF TELEDENTISTRY

Internet is the fundamental of the modern systems of teledentistry and it makes it possible to be up- to- date, fast and able to transport large amounts of data. Numerous numerous reasons can be listed for the precedence of internet- based teledentistry over other ways of communication, such as speed, efficacy, low cost, minimized occupancy, documented consultation and simultaneous communication of multiple participants, while probable shortcomings are the necessity of appropriate training, pressure for an instant response, message misunderstanding, possibility to overlook/neglect the message and privacy concerns.<sup>7</sup>

### TELEDENTISTRY CATEGORIES

There are two ways for teleconsultation through teledentistry that is “real-time consultation and store-and-forward method.” The real- time consultation implicate a videoconference in which the dental professionals and their patients may see, hear and communicate with one another at different locations whereas store- and- forward method includes the exchange of clinical information and static images collected and stored by the dental practitioner, who forwards them for further consultation and treatment planning. There is also a third method has been described, as “remote monitoring method,” which includes the monitoring of patients at a distance and can either be a home- based or hospital- based. In literature, these is also mentioning of a “near real- time” consultation, which involves low resolution, low frame rate product that looks like jittery television.

### WHY TO PRACTICE TELEDENTISTRY?

Most of the dental applications, such as store- and- forward technology have provided excellent results without any excessive costs for the connectivity or equipment. There are various features in a typical store and forward teledentistry system like computer with substantial hard drive memory, a speedy processor;, adequate random access memory, an intraoral video camera, a digital camera to capture the pictures, a modem and internet connection. In some cases, a fax machine, printer and scanner may also be required. In order to enable the live video conferencing, one might have to employ a widely available standalone IP/ISDN videoconferencing solution or install a PCI codec board into the system. In case where live group session is desired, there will be requirement of a multipoint control unit that bridges three or more parties.

## DISCUSSION

Teledentistry is “not” a new specialty, rather an alternative method for delivering the existing dental services. The utility of teledentistry in distant, remote areas is extensive. The rural and urban areas, where there is unavailability of the specialit consultation, this application stands to be of utmost importance. India, with its huge rural population, diverse landmass and existing health care delivery mechanism collaborated with the advancement in telecommunications technology could be an ideal setting for teledentistry.<sup>6, 7</sup> There can be a delivery of a cost- effective dental care through teledentistry by appointing the general dental surgeon and dental hygienists can be appointed at the subcenters. Likewise, graduate dentists with knowledge in teledentistry can be appointed at the community health centers and primary health centers for discussing the diagnosis and treatment plan of the cases with the specialists. The ideal places to serve as a common site for teledentistry consultation are dental colleges as they encompass all the specialists serving under a roof. At remote clinics, a team of specialists could communicate for a few hours on a daily basis with the dentists/hygienists/ patients. The outcomes achieved so far are very motivating setting the milestones for future investigations. Nevertheless, a few things have yet to be addressed before the teledentistry can rise to its peak. However, in order to validate the teledentistry applications, studies involving greater number of participants will be required in future [8].

### STRENGTHS

Teledentistry can extend the care to remote areas where there is shortage of specialists; the lack of comprehensive and sophisticated health care at a reasonable cost as well as can overcome the problem of shortage of specialized and professional dental. It also teaches the general dentists to refer a patient when required and also to treat more complicated cases, which can thereby open several options in treating such difficult cases [9]. With the help of teledentistry, global communication with other colleagues is instantly available. It is possible to get as well as make the cumulative or longitudinal data record of the patient from different dental clinics, which in turn will aid in the diagnosis and proper management of the patient along with the study of series of cases. The patient’s data record can be converted into digital form (EPR system–electronic patient record system) and thereby its storage will require less space and hence data can be retrieved with speed and can be reviewed at any time. Teledentistry can prove to be a very good method for providing continuing education for dentists as well as to teach postgraduate students. It also significantly elevates the computer skill and health care knowledge [10]. The efficacy of interactive videoconferencing is more than that of web-based self-instruction. The online CDE is more advantageous as it preclude the traveling to and from continuing education lectures. The dentists often do not have an extra time to

access CDE courses because of family and job responsibilities. In fact, by considering all the costs that a professional has to contemplate for a CE course including the travel, food, lodging and time away from work), online CDE is definitely superior as compared to the traditional CDE [2, 7, 10]. Teledentistry can also be used in order to increase the awareness regarding dental oral diseases, oral hygiene in general population and thereby, it can be used for educating and motivating them. A universal dental diagnostic coding system (SNODent—The Standard Nomenclature for Dentistry) is developed which is comprised of diagnostic terms, terms describing clinical signs and symptoms, radiographic observations and related test findings. This can provide a fundamental platform for designing the digital record forms of artificial intelligence in order to further assist in providing the dental care and also in making more accurate diagnostic decisions. In addition to these strengths, the advances in the technological aspect also help in the improvement of quality of education along with the treatment. By understanding dental applications, limitations, strengths and the future of teledentistry, it will be easy to identify the contribution of teledentistry as future potential source of help as a common diagnostic and education tool [10].

## CONSTRAINTS

There is no face to face examination in teledentistry. The judgement of the other practitioner has to be trusted. Accustoming to the technology can also affect the productivity of new practitioners. Initially, the time taken for the teledentistry takes a longer time compared to their regular office visits. In India, there is major challenge of lack of infrastructure, uneducated and below the poverty line population. The practitioners involved in the teledentistry must have a license in each state where they practice. There should be insurance given by the dentists engaged in teledentistry in terms of the security of their systems as well as any data that they transmit. Various methods can be employed for protecting the confidentiality of the patients such as data encryption, user access logs and password protection. Practitioner may link upto the virtual dental health care clinics with all the technological developments occurring in the field of teledentistry and thereby, an entirely new era of dentistry can be constituted. There might also be distant telemedical control of robotized instruments in the future for the situations with long-term unavailability of dental care.

## CONCLUSION

Telecommunications with the implications in dental fields in the form of teledentistry has been beneficial for people to such a great extent by providing the facility for the local dentist to contact the specialist through teledentistry, email etc and also students can be educated and staff can be trained by videoconference and thereby proving the teledentistry as a potential source of health care. However, before teledentistry can rise to its peak, a number of things have yet to be addressed. For the validation of various aspects of applications of the teledentistry, further studies involving greater number of participants will be required.

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