Review Article

Teledentistry a new trend in oral health

Mittal Sanjeev, Professor, Garg Shushant K, Professor & Head
Department of Prosthodontics, Maharishi Markandeshwar College of dental sciences and research, Haryana, India. Email: ambaladental@yahoo.com


Abstract

“Teledentistry’ is a synergistic combination of telecommunications technology, Internet and dental practice. It is a relatively new and exciting field that has endless potential. The first entity to put teledentistry into practice was the US Army in 1994. Since then, various institutions and organizations have practiced teledentistry with varying degrees of success. Teledentistry increased patient access to dental care, improved quality of care and the cost effectiveness. Teledentistry is also useful in long-distance clinical training and continuing education, screening and dentist-laboratory communication.

Key words: telemedicine, telehealth, e-health, teleconsultation, education, caries.

Introduction

Technologic innovations in the field of dentistry have been extensive in recent years. Just as communication technology and uses of electronic information has developed over the years, terms to describe health care services at a distance, such as telehealth and telemedicine, have also evolved. Teledentistry is a combination of telecommunications and dentistry. "Tele" is a greek word meaning "distance" and "mederi" is a latin word meaning "to heal."

Teledentistry can be defined as the use of electronic information and telecommunications technologies to support long-distance clinical oral health care, patient and professional health-related education, public health, and health administration.

Many years ago how telephones affected people, in the same way within next 10 or 20 years teledentistry will be a routine of life. What was considered relatively distant future some twenty years ago today is the reality in dental clinics. Teledentistry is
not scary and complicated, if we know how to turn on a television or how to make a phone call or how to fax a document, we can learn teledentistry. A few years ago, teledentistry involved calling an expert on the telephone for advice. Now it involves consulting experts using the Internet.

**History of Teledentistry**
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. The initial concept of teledentistry developed as part of the blueprint for dental informatics, a new domain combining computer and information science, engineering and technology in all areas of oral health, which was drafted at a 1989 conference funded by the Westinghouse electronics system group in Baltimore.\[^1\] Its focus was a discussion of how to apply dental informatics in dental practice. 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.

**Form of teledentistry**
Teledentistry can occur in two form “real time consultation” and “store and forward.”\[^1,2\] 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 needed. In real time consultation dentist and patient at different location can see, hear and communicate with each other using advanced telecommunication technology. The store-and-forward method, involves collecting all the patient information and images and storing that data for review by a dentist specialist at a later time. Later, the dentist reviews the information make a diagnoses and a treatment plan.\[^7,8\]

**Typical Teledentistry Appointment**
For a typical teledentistry visit, special video conference equipment and a video/internet connection is set up at both the hub site and remote site. Patient checks in at the remote clinic and before consultation fills out a questionnaire. Dentist or assistant at the remote clinic records a hand-on-examination. Questionnaire, examination and any imaging or documents that are included in the dental record are transmitted to the hub via the online electronic patient record system. With this information in hand and reviewed, the specialist starts an online consultation with the patient through video conferencing.

The online video- consultation is similar to a live ‘in-person’ consultation. The dentist interviews the patient, asks questions, discusses the diagnosis, treatment plan and educates the patient. Dentist may ask the patient to open the mouth. In all cases, patient needs to feel connected to the dentist performing the consultation. A major challenge in teledentistry visits is the collaboration between the hub site and the remote site. Because the specialist cannot perform a hands-on-examination, he must rely on examination performed by the dental team at the remote site.
**Technological Requirements**

To practice teledentistry, there are certain **hardware, software** and **network connection** requirements.

A desktop or laptop computer with substantial hard drive memory, a significant amount of RAM, and a speedy processor is essential. A digital camera, video camera, and intraoral camera, and a panoramic digital X-ray unit, preferably portable, is required to provide consulting dentists with images of maximum clinical value.\[^1\] Microphone, headset or external speaker, and a webcam is highly desirable for PC-based video-conferencing.

A comprehensive software capable of image acquisition and storage, and transmission of the gathered information and software capable of coding and decoding audio and video (codec) is desirable. Digital images for teledentistry transmission should be recorded in DICOM (digital imaging and communications in medicine) format. This is a standard developed by the American College of Radiology and the National Electrical Manufacturers Association to aid the distribution and viewing of medical images.\[^3\]

There is great variation in levels and speeds of connectivity to the Internet; and this is, of course, of major significance to the practice of any forms of telehealth. Dial-up connections, though economical, are not sufficient for teledentistry, due to limitations in quality and questionable reliability. Broadband technology, increasingly widespread and available, offers a selection of cutting-edge alternatives well suited to the needs of the teledentist and his staff. DSL (digitally subscribed line), cable and satellite modems, ISDN (integrated service digital networks) and ultrahigh-capacity T1 services, are all available for utilization as the basis of any teledentistry system.

To enable live videoconferencing, one might employ a widely available standalone IP/ISDN videoconferencing solution, or install a PCI codec board into the system. This is a digital signal processing unit that converts analog input into digital on the sending end, while another codec board reverses the mechanism at the receiving end. 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 and be compliant within recommended guidelines.\[^1\]

**Online Dental education**

Teledentistry provide a unique way to deliver long-distance clinical training and continuing education and hands-on training to the dentist/dental hygienist at remote clinics.\[^9\] It can even facilitate patient education about self-care. Online education is of two types, web based self instruction and interactive videoconferencing. The advantage of Web based self-instruction is that the user can control the pace of learning and can review the material as many times as he or she wishes. A disadvantage of Web-based self-instruction was dissatisfaction which may be, due to the lack of face to face communication with peers and instructors. Whereas advantage of interactive videoconferencing is that, there was two-way
communication between instructors and trainees, and user can receive immediate feedback, which enhances students' enthusiasm for learning.\textsuperscript{[10,11]}

Orthodontics and periodontics are especially well-suited to teledentistry because much of the hands-on care can be rendered by general dentist. Dental radiology and imaging is another specialty area that is well-suited to teledentistry in education.\textsuperscript{[9]} Other advantages of teledentistry is it Reduce isolation of practitioners by proving peer contact. Sending color image to teeth to laboratory help prevent them making improper prosthesis, saving time and money. So, improve dentist- laboratory communications. Patients, whose chronic conditions require on-going treatment, have to drive long way to see a doctor, teledentistry in these cases save time and money.\textsuperscript{[12]} However bad news about teledentistry is that it is likely that some doctors will use the Internet to set up and seek direct patient contact, thus become cyberdentists. Cyber dentist would not be in best interest of public.\textsuperscript{2} However, teledentistry should not only be a practice builder for the local dentist, but also has the potential for helping dentists better serve their patients.

**Legal issues**
Largely still untested by law, and with significant variation among countries, issues such as accountability, jurisdiction, liability, privacy, consent and malpractice is crucial to consider, when attempting establishing sound foundations for telehealth practice.

Licensure of teledentistry practice is largely depends upon the country definition of teledentistry. The most significant barrier to a nationwide teledentistry practice is the traditional system of state-by-state licensing.

Confidentiality Patients should be made aware that their information is to be transmitted electronically and the possibility exists that the information will be intercepted, despite maximum efforts to maintain security. The form should contain the name of both the referring and consulting practitioners to ensure adequate coverage for malpractice, and the consulting doctor should acquire a copy of the informed consent before any form of patient contact is established.\textsuperscript{[13]}

Liability Teledentistry raise concerns about liability. There is no law to clarify the role of the teledoctor and their liability.

**Challenges**
The teledentistry examination is not a face-to-face. You have to rely on judgment of the other practitioner’s examination. Productivity can be another issue as new practitioners become accustomed to the technology. Teledentistry initially takes a longer time compared to their regular office visits. When they get used to the system, they get more efficient. In India uneducated population, below the poverty line and lack of infrastructure is major challenge.
Conclusion
Currently, teledentistry has not yet become an integral part of mainstream oral health care. In the near future teledentistry will be just another way to access an oral health care, especially encouraging for isolated populations who may have difficulty accessing the oral health care system due to distance, inability to travel, or lack of oral health care providers in their area. Future advances in technology will enable teledentistry to be used in many more ways, such as clinical decision support, quality and safety assessment, consumer home use, medication e-prescribing, and simulation training.

References