

Teledentistry- Upcoming Advancement in Dentistry: Review Article

Dr. Ritu Jain¹, Dr. Kavita Bagri², Dr. Anju Malik³, Dr. Neha⁴

¹MDS (Oral and Maxillofacial Surgery), Consultant Oral and Maxillofacial Surgeon at Guru Dental Clinic, Gurgaon

²MDS (Orthodontics and Dentofacial Orthopedic Surgeon), Consultant Ortodontist at Saral Solution Dental Clinic, Faridabad

³MDS (Orthodontics and Dentofacial Orthopedic Surgeon), Consultant Ortodontist at Daya Ram Hospital at, Sonipat

⁴MDS (Orthodontics and Dentofacial Orthopedic Surgeon), Consultant Ortodontist at Life line Medical and Dental Care Center, Delhi

ABSTRACT

Teledentistry” is a synergistic combination of tele-communications technology, internet and dental practice. Teledentistry increased patient access to dental care, improved quality of care and the cost effectiveness. Telemedicine is transferring medical data between geographically separated areas. Teledentistry is also useful in longdistance clinical training and continuing education, screening and dentist-laboratory communication. Teledentistry may provide a possible solution to many prevailing problems related to dental care provision, like people living in rural areas and those who are not able to retrieve regular dental care. There also remains a large reservoir of untapped potential with teledentistry in the field of clinical practice.

Key Words: Teledentistry, Tele-communication, Telemedicine

INTRODUCTION

Health care has changed dramatically with the era of computers and tele-communication. There are many implementations of tele-communications in hospitals and with time a new term arrived i.e. Telemedicine. Association of American Medical Colleges states that “Telemedicine is the use of tele-communications 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”¹. Teledentistry is one of the recent advances in the use ofTele-communication technology, digital Diagnostic imaging services, computers devices and Softwarefor analysis and follow-up². 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 teledentistry³. It is also defined as “The segment of the science of telemedicine concerned with dentistry which deals with the entire process of networking, sharing digital information, distant consultations, workup and analysis”⁴. We are “Gadgeteers” and we usually respond with great enthusiasm to new developments (Clark, 2000). We are seeing a decline in the dental disease among young patients, we are also facing an aging population people are living longer and wanting to maintain their dentitions throughout their lives new technologies challenge the current paradigms of dental practice and will lead significant shiftin future treatment modes (Bhambal, 2010)⁵.

HISTORY OF TELEDENTISTRY

Radiology was one of the earliest medical specialties to utilize tele-communication as early as 1959 when Albert Jutra used communication cable to transmit videotaped tele-fluoroscopyexaminationsbetween two hospitals in Montreal, five miles apart.⁶

The initial concept of teledentistry developed as part of the blueprint for dental informatics, which combines computer and information science, engineering and technology in every areas of oral health, and which was drafted at a 1989 conference

funded by the Westinghouse electronics system group in Baltimore⁷. The US Army's total dental access (TDA) project is seen as being at the frontier of teledentistry. Begun in 1994, this project initially used a traditional plain old telephone system (POTS) with two different communication methods: real-time and store-and-forward⁸. In 1995, Rocca et al conducted a pilot study in Haiti to connect a general dentist to a dental specialist in Washington DC, via a satellite system.

TYPES OF TELEDENTISTRY

There exists, at present, two different forms of teledentistry⁹

- 1.) Two Way Interactive/ Real-Time.
- 2.) Store and Forward.

1.) Two Way Interactive/ Real-Time: This type of teledentistry is a derivative of synchronous type of telemedicine¹⁰ and can be as simple as a telephone call of a general practitioner to a specialist/peer for confirmation of a diagnosis or something as complex as a robot assisted remote surgery. Basically in this type there is no storage of the data and it is streamed in real time between the two parties involved. The requirements of this type on real time connections are more compared to the store and forward type as the basic requirement in many cases is a fast internet/intranet connection which demands for adequate infrastructural support. Video conferencing equipment is one of the most common forms of technology used in this type of communication¹⁰. Long distance specialist consultation can be made possible via this method helping in healthcare delivery in resource constrained settings.

2.) Store and Forward: It is derived from the asynchronous type of telemedicine¹⁰ and involves the gathering and forwarding of data in stored form to different locations. These data packets can be patient files, X-Rays, digital photographs, CT Scans, MRIs, EEG data etc.¹¹⁻¹³

Tools in Transfer of Information POTS-Plain old telephone system- it is frequently used in teledentistry because of its low maintenance and technical support. It works through Telephone Company with low speed and unreliable connection.

ISDN-Integrated Service Digital Network- it provides high speed which increases accessibility and reliability.

The World Wide Web is a tool for easy access of information. Web based dentistry is more cost effective but poses security and privacy concerns due to hackers.¹⁴

BENEFITS OF TELEDENTISTRY

- Reduces the cost of service and improves the Quality of care.
- 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.²

Legal issues related to teledentistry:

- There is 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.
- Teledentistry allows professionals to practice across broad geographic areas, some difficult ethical, legal and regulatory concerns arise which point out that "patients will need to be advised of the inherent risks of improper diagnosis and/or treatment due to failure of the technology involved".
- 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.¹⁵⁻¹⁹

APPLICATION OF TELEDENTISTRY IN VARIOUS FIELDS OF DENTISTRY

Oral and Maxillofacial Surgery

Use of new technologies in dental surgery provides better diagnosis, situational analysis and planning of appropriate treatment solutions. Technologic development is at a highest level in computerized support in dental implants placement, where it is possible to observe the patient in one part of the world and in the other part make a digital project of complete implant and prosthetic construction and route the direction for navigational Technique of dental implantation. Some very good medical results have been achieved in one of the principal areas of oral surgery i.e. impacted wisdom teeth.

Tele Oral Medicine

Orofacial disorders include oral cancer, temporomandibular disorders, oral mucosal disease, salivary gland disorders, orofacial pain disorders, oral neurosensory disturbances, orofacial dystonias and dyskinesias, bruxism, burning mouth, dental sleep disorders, malodour, and dental phobias. If the recognition and treatment of the orofacial disorders are inadequate or inappropriate, the personal impact can be tragic, and the costs are great. Most general dentists and dental specialists feel inadequately trained to recognize and manage these problems, for several reasons, including inadequate clinical and didactic training in dental school, lack of knowledge about appropriate medical billing procedures and codes, and the different office protocols that require more time. The complexity and difficulty of managing orofacial disorders usually results in a consultation with or referral to a specialist. Teledentistry can bring the specialist in orofacial pain or oral medicine to the rural dentist or dental hygienist through remote teleconsultations.²⁰

Teledentistry in Orthodontics

Orthodontic specialists, after taking dental impressions of the jaws, instead of casting jaw models in plaster, send the impressions by special postal service to specialized companies for 3D digitization of working models; then they create digital 3D models using patent-protected systems for 3D scanning and digitization, form a computer file, and return it via Internet to the therapist. The therapists share this digital model of the jaws with others via network, effectuating necessary consultations with his colleagues. Peer teleconsultants, if required, may also participate from a distance in the creation of a plan and program of orthodontic management, using digital patient model.²¹

Teledentistry in Endodontics

Periapical lesions constitute a large portion of dental pathology and their treatment is commonly performed by dentists who are not specialists in endodontics. Modern telemedical systems are an ideal solution for seeking and obtaining timely expert help in that regard. Distant consultants, specialist in endodontics, are informed via their mobile phones about the received request, after which they download the digital images and accompanying anamnesic data. They establish the diagnosis and suggest a treatment, then post this information on an online server, which informs the consultation-requester dentist about the received response.²²

Teledentistry in Pediatric and Preventive Dentistry

Prevention and early detection of caries are the key factors in the suppression of this mass disease of etiologically insufficiently known nature. Telemedicine is here to a method of choice in many situations where direct clinical inspections are not possible. It has been demonstrated in real conditions that distant diagnosis of pediatric dental problems, based on non-invasive imaging, is a valid grounding for an appropriate insight into dental problems. The success with these teledentistry systems largely depends on the quality of intraoral cameras.²³

Teledentistry in Dental Prosthetics

There are dentists and dental technicians who are not very skillful doing this somewhat complicated process of designing shapes and interjaw relationships using CAD software, the usual practice is to request teledentistry help of computerized dentistry specialists. The resulting project file is encrypted and sent by e-mail to a teleconsultant for model analysis, projection of the shape of restoration, of its height and interjaw relationships using a virtual articulator, the completed project is then encrypted and returned to the clinic, usually by e-mail.²⁴

Teledentistry and its Use in Rural Areas

In rural areas, where there is a shortage of specialists, the lack of comprehensive and sophisticated health care is a problem. Teledentistry can increase the accessibility of the specialists to the rural and underserved communities for their dental needs, besides decreasing the time and the cost which are associated with the specialty consultations.²⁵

Scope of Teledentistry in India

India has opened up to telemedicine to address various issues which are being faced by the healthcare delivery system, like inadequate health infrastructure and clinical services, paucity of qualified doctors, the almost non-availability of specialist care, the late discovery of the ailment, the delay in the delivery of the treatment due to the greater time which is required for the transport of the patients to urban healthcare facilities and the provision of healthcare by inexperienced primary healthcare service providers.²⁶

To identify the appropriate technological tools and services which are required to implement telemedicine technology at the three premier hospitals in the northern parts of India, namely, All India Institute of Medical Sciences (AIIMS), New Delhi, the Post Graduate Institute of Medical Education and Research (PGIMER) at Chandigarh and the Sanjay Gandhi Post Graduate Institute of Medical Sciences (SGPGIMS) at Lucknow (Uttar Pradesh).²⁷

Future Prospects

The advances in tele-communication have rightly enabled the dental care to promise many exciting changes during the next few years. However, like any revolution, it will not be easy or painless. There are certain issues which require resolution for the success of Teledentistry. These issues include inter-state licensure, jurisdiction and malpractice, as well as technological, security and ethical aspects. Various measures that can be employed for the effective implementation of Teledentistry are: The instructors of the Teledentistry education courses need to be well versed with computer knowledge and they should have adequate teaching experience. The practitioners who are engaged in Teledentistry must have a license in each state in which they practice. Dentists who are engaged in Teledentistry must make every effort to ensure the security of their systems, as well as of any data that they may transmit. For example, data encryption, password protection and user access logs can help in deterring most of the people and in protecting patient confidentiality.²⁸

CONCLUSION

Despite the fact that telemedicine has been used in medicine for many years, there has been little use in dentistry. Currently, Teledentistry has not yet become an integral part of mainstream oral health care. The reasons are many including: reimbursement; regulatory and legal sanction; privacy and security; compatibility and interoperability of technology across systems; sustainability; and acceptance of Teledentistry by patients and providers alike. 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.

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