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TELEDENTISTRY FILLING THE VOIDS IN DENTAL CARE

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ABSTRACT

Background: Teledentistry is an expeditiously emerging multi-faceted technology that is destined to become standard equipment in delivering the best possible dental care. It combines telecommunication technology and dental care. Teledentistry can improve access to oral healthcare, provide awareness among the patients and low cost treatment plans. It conjointly has the potential to eliminate the disparities in oral health care between rural and metropolitan communities. Teledentistry, a subset of the concept of Telemedicine, is an emerging field in dentistry that combines telecommunication, information technology, internet, digital imaging to support clinical oral health care to a wide population, patient awareness, skilled health care education, public health administration. The two main approaches used in teledentistry includes: Real time consultation and store and forward method. Addition of teledentistry to our national health care systems like national rural health mission enables to strengthen the availability of oral health care at the primary health centres, community health centres and district hospitals. **Aim:** In this article, we review the development of teledentistry, and its importance. **Clinical significance**: Patients who have dental concern can get answers that do not necessarily require in-person care and ample amount of time to ponder and discuss with family members about the treatment plan and charges. Patient is less burdened with travel, cost, time and quicker clarification of diagnosis is made. The number of unnecessary analgesic and antibiotic prescriptions often given to patients with oral health emergencies is reduced and there is increased continuity of care. **Conclusion:** This article gives an outlook on the use of teledentistry in dental education and treatment planning, explains its strengths, limitations, and its future role.

KEYWORDS: dentistry, health, internet, technology, telemedicine, treatment.

INTRODUCTION

Oral health is equally important as the general body health. Most of them ignore and underestimate the need for oral health and hygiene. Teledentistry, to a great extent can bring about a positive change in people through education and public awareness.

The impressive growth of the internet, telecommunication standards and information technology in the last decades has led to significant changes in how health care is delivered. The term "teledentistry" was coined by Cook in 1997. It refers to a method of diagnosing and providing treatment through implementation of video conferencing rather than through direct personal contact. Teledentistry's origin lies in telemedicine. Telemedicine with inclusion of teledentistry is outlined as "the observe of health provision, diagnosis, consultation, treatment and education with interactive audio, video or informative communications.[1]

The pace and technique in the development of information transfer taking place over the years have intended the dentists and information technology consultants to re-value teledentistry as an extremely valuable health care tool. In countryside due to the lack of experts, the dearth of comprehensive and complex health care could be a downside. Tele dentistry helps in extending care in countryside wherever there's lack of adequate transportation, shortage of dental specialists and economic stagnation. It provides general dental practitioner chance to refer patients.[2]

Technological advancements enable dental data to be managed in a single and consistent format. Storing and capturing of oral images can now be done in a single step by digital acquisition without any paper or film. Money transactions can be conducted electronically. Patient file information can be retrieved from different sources and displayed on a single monitor. This makes it easy to improve patient care and doctor patient relation. In a matter of minutes, patient's details together with pictures and x-rays can be communicated for review and treatment program with any peer dentist. It also helps a specialist to contact him for his expert opinion. Social networking sites helps to connect and discuss problems throughout the world. Two methods of consulting in teledentistry are: real time consulting and store-and-forward consulting. In real time consulting the doctor and patient can communicate to each other through videoconferencing. In store-and-forward consultation, the doctor can gather required patient data such as images, x-rays including lab results and transfer them to the consulting doctor through an electronic medium.[3,10] Telehealth engages technologies, like kiosks, web site observation applications, portable apps, wearable devices and video conferencing to supply care by allowing real-time, interactive communication between the patient and therefore the dentist situated at an overseas website. The efficiency of telehealth depends on hospitals, dental offices and medical offices changing from ancient paper patient charts to electronic health records (EHRs) that embodies each medical and dental information. Four sectors of telehealth utilize EHRs: synchronous (live video), asynchronous (store-and-forward transmission or SFT), remote patient monitoring (RPM), and mobile health (mHealth).[4] Teledentistry or dental health technologies have applications in the following key settings: private practice, group practice, public health programs, dental education, medical-dental integration, crisis response. Conveying teledentistry from schools to nursing homes, private dental practices and more is possible.

Thus, Tele dentistry's key application is tele-education and diagnosis in isolated areas of nations like India and Africa, wherever there's preponderance of rural population. There is a huge disparity in demand-supply of health care in rural areas due to lack of sound aid facilities which can be bridged by teledentistry.[2,11]

Teledentistry can be a complete game changer if it is implemented correctly. It will provide access to those who wouldn't otherwise have it. With its increasing benefits and advances for dentists and patients, teledentistry is on the rise and becoming popular in the dental field.

HISTORY AND DEVELOPMENT OF TELEDENTISTRY

In transparent form telehealth has been around for decades. The use of radios to link emergency medical personnel to medical center has become a common place in health care. The familiar use of telephone for consultations between patients and clinicians continued in most of the last century. However in the last three decades, experts have been probing into advanced telecommunication and computer robotics to boost health care.[4] In 1959 Albert Jutra used data cables to transfer videocassetted examinations between hospitals which were more than thousand meters apart (Weinstein et al 1987), in which radiology became the earliest medical specialties to utilize telecommunication. The original thought of teledentistry advanced as part of the model for dental informatics that was written at a 1989 conference funded by the Westinghouse[9] One of the primary major steps in teledentistry came Electronic Systems Group in Baltimore from the U.S. Army's Department of Defence in 1994 with the advancement of the Total Dental Access Program (TDA). This project initially used a traditional plain old telephone system (POTS) with two completely different communication methods: real-time and store-and-forward. In 1995, a pilot study was conducted by Rocca et al in 1995 conducted a pilot study to connect a general dentist in Haiti to a specialist in Washington DC via a satellite system. Years later ISDN Integrated services digital network based teledentistry was also tested in countries like Germany, Italy, Scotland, England and Taiwan. Since then, teledentistry is advancing globally and is progressing in developing countries.[1, 12]

REQUIREMENTS FOR TELEDENTISTRY

The field of dentistry has shown drastic technological changes in the recent years. Innovations in the use of computers, telecommunication technology, digital diagnostic imaging services, software for analysis and follow up found their way in dentistry. These available facilities has crossed distance than it will ever be. A classic teledentistry system consists of High speed broad band services (1meg for downloading & 384 K for uploading); a Computer with speakers; an Encrypted software services; a digital x-ray system; an extra oral and intraoral camera. Most important telecommunication modalities include face time, zoom, Skype, hangout, teledent etc. with a clean background space for the video calls and a source of light for camera. Prior to appointments patient consent form through portal system is required. Documentation is of most importance which includes electronic patient records, patient location, methodology of screening the patients that may be synchronous (live interactive if video conferencing system is used) or asynchronous (store and forward if a messaging system is used like Facebook messenger, email etc) including Covid 19 screening questions. Case history is recorded as per usual. Plan the treatment according to immediate patient care and refer to concerned specialist.

METHODS FOR EXCHANGE OF INFORMATION

Most frequently used tool in teledentistry is POTS (plain old telephone system) and two distinct method of connections used are real time and store and forward due

to its prolonged sustainment and low technical expertise. A Personal computer, a 28.8 Kbps modem, software and hardware (Share vision PCS3000), Intra-oral camera and a document camera is the basis for POTS. Transferring of data in real time method is prompt where as in store and forward method information can be stored in a local database to be forwarded when needed.

The receptiveness and the authenticity in teledentistry has risen due to the use of integrated services digital network (ISDN) which helps in rapid transfer of data. International ISDN system is too overpriced and impractical. The World Wide Web is a popular network because of its instant reach and availability. Web-based teledentistry is fruitful than ISDN, as it does not need uncommon organization. The guidelines on the web are minimum with no licensure and confirmation and there is very little liability. The web-based network is well protected and secure against cyber bullies.

On the contrary ISDN network is associated from one reason to an alternative with no network sharing. Live interactive videoconferencing can likewise be led by means of satellite.[1]

TELECONSULTATION (E-CONSULTATIONS

With increase in the development of technology and knowledge patients are requesting admittance to a full scope of excellent treatment choices.

A new way of accessing speciality care is provided through electronic consultations (e-consults). E-consults offer a fast, controlled, and recorded correspondence way for conference between essential consideration and authority. It is a new method for reasonable allowance of health care facilities providing appropriate care for patients with better admittance and teamwork of speciality care across the framework and it is budget - friendly.[5] Any online references to be done only after receiving consent from the patient and their identity should be concealed, including covering of eyes and other identifiable marks.[1]

Dental specialists uses a consultation framework named DENTAL CONSULTS which is a network based teledentistry allowing the dentist to access into patient details including chief complaints, provisional diagnosis and dental radiographs which helps in reviewing and advising the diagnosis and treatment plan. In case the referring dentist requires the help of a specialist, he is alerted immediately and then signs into a safe web server and reviews the consult and suggest his diagnosis and treatment plan within next five days. A valuable teledentistry consultant is one who makes sure that acceptable information is provided by the consulter (e.g. good images, correct patient history, general health and review of systems data, and accurate physical examination findings). This data is received by email to the referring specialist, any queries, if needed, is possible and the feedbacks are inquired after the consultation. Secure Sockets Layer system codes the information that transfers between the internet browser and the internet server receiving the referral. The information is secured to transfer only when the lock or solid key is visible. Thus dental consults utilizes this technology to provide safe connection.[1]

TELE-EDUCATION[1,8]

Two approaches are used to provide online education: web- based self-instruction and interactive video conferencing.

The web-based self-instruction educational system encompasses data which is already created and saved before the program is accessed. This system favor's ease of learning and the program can be viewed infinite times. The drawback of this system is seen in areas of satisfaction (absence of eye to eye conversation with friends and educators) and accuracy (absence of up close and personnel patient examination).

Interactive videoconferencing system contains a base one camera set up at any place the patient's data is transferred and placement of cameras at every area is required. Validator data including patient's case history and dental x-rays sent previously or at that time and the video calls in the presence or absence of patient is also accommodated. Feedbacks can be given to the user quickly.

Individual professionals belonging to various dental associations and study clubs can share their knowledge through dental chat rooms.

ADVANTAGES OF TELEDENTISTRY[1,6,7]

- The expense of administration is diminished and the nature of care is enhanced especially in rural areas and improves in diagnostic services.
- Helps in providing cumulative data (longitudinal data) record of the patient from different dental clinics, which will assist in diagnosis management of patient. As the patient's data record is converted into digital form (EPR system–electronic patient record system), storage space required is less, data can be fetched with speed and examined any time.
- Remarkable tool for educating students and dentists and elevates health care knowledge and computer skills.
- A preferred position of the virtual CDE is that it disposes travelling to and from ongoing training lessons. Often dental specialists need additional time to get to CDE courses due to family and employment liabilities. Truth be told, once examining the entirety of the costs that an expert needs to consider for a CE course (travel, housing, food, and time away from work), online CDE has numerous points of interest when contrasted with conventional CDE

- Increases the awareness among the population regarding oral hygiene, dental and oral diseases and can also be used to educate and motivate them.
- Improved assimilation of Dentistry into bigger medical care conveyance framework.
- Improvement in correspondence with the Insurance business concerning necessities.
- Correspondence with dental research centers is improved.

DISADVANTAGES OF TELEDENTISTRY[1,6,7]

- Stable internet connection is required for teleconferencing.
- A substitute connection framework and specialized technical group is essential.
- Proficiency of the doctor and his insight too fundamental.
- Legal issues including licensure, malpractice, protection, internet safety and morals prevail.
- Any issues occurring during information transfer may prompt wrong diagnosis or clinical error, leading to problems of duty and negligence.
- In cyberspace privacy and security becomes a major issue. If patient's information is missing or stolen during transmission, the entire project gets discarded, especially when
  Health Insurance Portability and Accountability Act becomes law.
- Absence of universal dental diagnostic coding system leads to disuniformity among users.
- As the upcoming dentists become conversant in the applied sciences ,productivity may get affected
- The capability of suppliers to bill and gather expenses for dental facilities obtained through teledentistry is a major problem for continuing a teledentistry program. This limits remuneration.
- The teaching faculty should ceaselessly refresh the course. Educational courses ought to be monitored by teachers who are proficient in networking.

TELEDENTISTRY: SAVIOUR IN THE FACE OF COVID-19

Teledentistry has gained momentum after covid 19 has barged into the world. In this new normal, the dental experts are obligated to restrain patient contact while still providing continuity of care for patients in need during this pandemic. Gadgets like smart phones, laptops; webcams has helped patients to consult their dentists safely by being at their home thereby eliminating the risk of infection. Pregnant women, children, elderly and medically compromised patients are apprehensive to visit hospitals and clinics due to the increasing fear of contacting the virus in such cases teledentistry act as a saviour whenever they encounter tooth related issues. During the covid period, the cost of dental care has gone up considerably due to the special protocols and equipments necessary for practice. Teledentistry has contributed to reduce the unnecessary expense on PPE KIT, mask and sanitizers both for the dentists and the patients thereby reducing the cost. Teledentistry has mitigated the overall cost of dental services. Teledentistry has minimized the waiting period and consultation can be done according to the need. Even before the virus came into the action people used to prolong their dental treatment till it gets severe, so before the prognosis turns poor, people can get their right advice from the dental experts through this method. People had been sticking to teledentistry even before covid era due to time constraints. Teledentistry thus holds tremendous potential for the future and the solution is just a click away.

CONCLUSION

Teledentistry incorporates innovative technologies to extend remote dental expertise no matter where the patient is. Services can be provided at lower expenses to undeserved and vulnerable communities at ease. It is not beyond the realm of possibility for teledentistry to become an integral part of routine oral health care. Teledentistry will assist dental specialists in helping patients without including the danger of cross contamination. Inspite of some challenges present in teledentistry like legal, insurance and education which can be overcomed by thorough planning and utilization of technology, teledentistry is a proof that dental industry is embracing innovation, too. In the coming future teledentistry may be the key to keeping practice afloat during unprecedented economic challenges. Dental professionals should adapt to the mindset of adopting teledentistry, into their practices as the new normal. A few obstructions still prevail for teledentistry application, along with legal, instructive and protection problems. Generally, an accomplished teacher is required for planning conventions, educating students and offering specialized support. A well-designed teledentistry practice has to think about all of these problems. With profound coordination and planning, teledentistry has a promising future ahead.

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