

Teledentistry: potentials unexplored!

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Abstract:

Teledentistry is a rapidly forming subset of dentistry. It has implications not only in an urban set up when a patient under severe dental distress or in a state of dental emergency wants to seek a dentist but also in rural areas where money is a great concern to people residing there as it can pose a big hurdle to seek medical or dental treatment as the distance separating a village from hospital in a city could be hundreds in kilometer. Teledentistry has the potential to meet these needs by just logging into the site on internet and getting relief immediately. Teledentistry approaches may hold the potential to address many of the problems related to access, cost, efficiency, and the quality of dental care. The purpose of this article is to highlight these emerging areas of teledentistry.

Keywords: Telemedicine, Dentistry, Dental Caries

Introduction:

Health care is being changed dramatically with the era of computers and telecommunication. There are many implementations of telecommunications for hospitals and with time a new term arrived for it i.e. Telemedicine. Association of American Medical Colleges states that "Telemedicine is the use of telecommunications technology to send data, graphics, audio, and video images between participants who are physically separated (i.e., at a distance from one another) for the purpose of clinical care".¹

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Teledentistry is a rapidly forming subset of telehealth,¹ a field that already has considerable impact on the health care industry. Cook in 1997 defined "Teledentistry" as "The practice of using video-conferencing technologies to diagnose and provide advice about treatment over a distance".²

Forms of Teledentistry:

Teledentistry can take two forms: (1) Real-time consultation and (2) Store and forward.

Real-time consultation involves a videoconference in which dental professionals and their patients, at different locations, may see, hear, and communicate with one another actually using advanced telecommunication technology and ultra-high-bandwidth network connections.

Store and forward, on the other hand, 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 required clinical information and digital intraoral and extra oral images and radiographs (or scanned, originally no digital images) and forwards them for consultation and treatment planning via established networks and/or the Internet and treatment is provided in a far timelier, targeted, and cost-effective manner.³⁻⁶

How does a Teledentistry visit look like?

It begins much like a standard first dental visit. The local dentist with his dental hygienist records patient's medical and dental histories. This information with photographs taken through intraoral cameras is then forwarded by fax or through electronic record to the specialist. With the information in hand an appointment is fixed for the patient through video-conferencing. Right away the specialist works to put the patient at ease.⁷

Uses of Teledentistry:

1. Online education:

Formal online education can be divided into two main categories: Web based self instructions and Interactive videoconferencing.

The Web-based self-instruction educational system contains information that has been developed and stored before the user accesses the program. 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.

Interactive videoconferencing (conducted via plane old telephone system (POTS), satellite, Integrated Services Digital Network (ISDN), Internet or Intranet includes both a live interactive videoconference (with at least one camera set up where the patient's information is transmitted; however, cameras at both locations are ideal) and supportive information (such as patient's medical history, radiographs) that can be sent before or at the same time (for example, via fax) as the videoconference (with or without the patient present). The advantage of this educational style is that the user (typically the patient's health care provider) can receive immediate feedback.⁸

2. Teledentistry in Periodontics:

It was by the US Army when teledentistry was first tested at Fort Gordon, Georgia in July 1994.⁹ In this study in conjunction with an Intra-oral camera a dental image management system was used to capture color images of a patient's mouth. Using a 9600 band modem these images were then transmitted from the dental clinic over to Fort Gordon, Georgia, a distance of 120 miles. Fifteen periodontal patients were referred to Fort Gordon for surgery. One week after their surgery, each patient reported to Fort McPherson for suture removal and intra-oral imaging. At the time of suture removal, color still images were obtained of the surgical sites and these images were transmitted to Fort Gordon for examination by the Periodontist who

performed the surgery. The results of this study showed that 14 of the 15 patients saved the return trip to Fort Gordon. The patients uniformly felt that they had received better care than they normally received and were especially pleased at the elimination of the long trip to Fort Gordon. The dentists were also comfortable in their ability to make proper decisions and diagnoses using the equipment.

3. Teledentistry in Oral Pathology:

The University of Florida, College of Dentistry (UFCD) developed and evaluated a web-based CDE (Continuing Dental Education) format (“Case of the Month”) that specifically focused on clinical oral pathology. The primary purpose of this study was to evaluate the expectations and attitudes of these CDE participants. A case was presented and a differential diagnosis in the form of a question was developed, followed by a detailed description and rationale describing why the option was correct or incorrect. At the conclusion of the case of the month, respondents completed an online survey that ascertained their needs, expectations, attitudes, level of clinical knowledge gained, and experience with the online environment. Results suggested that the participants’ needs and expectations were generally met. The biggest disadvantage reported was the inability to communicate with others, including the instructor, while viewing the case and more respondents would like to have seen some more general/common oral pathology information.¹⁰

4. Tele Oral Medicine:

A first pilot study was undertaken at the Oral Medicine Department, University of California at Los Angeles on the diagnosis and management of oral mucosal diseases. The ultimate goal of a teleoral medicine consultation would be to enable the consulting provider (general dental practitioner, dental specialist, or medical provider) to make a sound patient management decision that may in some instances involve referral to an appropriate

specialist. The results of pilot study suggest that face-to-face patient examination is more accurate in establishing a correct diagnosis for oral mucosal pathologies than transmitted descriptive patient data alone. Until the time when adequate data transfer (including text and visual information) by the consulting practitioner is possible, the e-mail may be best used for exchanging ideas, disseminating the latest scientific information, and discussing the potential diagnoses only.¹¹

5. Tele-Orthodontics:

Most low-income families in rural areas live paycheck to paycheck, and parents must scrimp and budget carefully to pay for each visit to the orthodontist. Making matters worse, many families must embark on long drives out of town to find an orthodontist and usually miss a day at work and school to keep the appointment. Given the barriers of cost and access to care, too many rural, low-income children go without and enter adulthood with “bad teeth” that can impair their quality of life.¹²

In the study, using teledentistry services Interceptiv orthodontic care was provided at a rural and an inner-city clinic in the state of Washington. The treatment expands the jaw and reshapes the mouth to reduce or eliminate the malocclusion. Using the Peer Assessment Rating (PAR) index to score the outcomes of the procedure, the authors found that the general dentist fared nearly as well with the aid of teledentistry as the residents did under direct supervision. Teledentistry offers General Dental Practitioner (GDP) a usable means for obtaining quick access to orthodontic advice. Teledentistry helps to reduce the number of inappropriate referrals and enable dentists to treat more patients themselves.¹³

Mandall et al. suggested that teledentistry is a good way of positively identifying patients who should be referred to a consultant orthodontist.¹⁴ Stephens et al supported the dentists’ opinions that teledentistry enabled them to offer a better

service for their patients and use specialist services more appropriately.¹ Cook et al established a prototype teledentistry service that incorporated a PC-based expert system designed to assist in orthodontic cases. It guided the general dental practitioner (GDP) through the assessment of a patient's malocclusion and helped ensure that all relevant clinical observations were made and details recorded. The resulting data file, containing radiographic images and clinical data, was then transferred via the Internet to a dental specialist. The specialist's recommendations were returned by the same route or, where appropriate, a real-time videoconference was conducted.¹⁵

According to Stephens et al the majority of UK orthodontic consultants were in favour of developing teledentistry techniques to provide orthodontic advice to general practitioners. These methods should be used by orthodontists in other countries to obtain second opinions from their specialist colleagues and to provide immediate advice to referring general practitioners. Telemedicine techniques may also have a role in facilitating continuing professional education and clinical audit in orthodontics.¹⁶

6. Teledentistry in detection of Dental Caries:

A teledentistry project was implemented in Rochester, New York in six inner city elementary schools and seven child care centers using intraoral cameras, telehealth assistants recorded images of children's teeth and sent images to a pediatric dentist to review to provide treatment and referral recommendations. In the first nine months of 2005, 123 children were screened, revealing that almost 40% of the children had active dental caries. For the first time many children attending those inner city schools and child care centers had their teeth examined at an early age and were given prompt feedback on the need for dental care.¹⁷

7. Teledentistry in Allied Health Sciences:

Dental hygienists and staff are being trained to take the case histories with the local dentist when the patient is treated through teledentistry service.⁷ In an effort to raise the dental hygiene student's awareness concerning the public health and community health issues currently associated with access to care, a course in Teledentistry was added to their curriculum at the Minnesota state University, Mankato. Specific objective was to assess student's knowledge levels, attitudes and confidence levels following completions of a teledentistry course.¹⁷

Benefits of Teledentistry:

- Reduced costs of the service, improved quality of care.
- Reduced isolation of practitioners by providing peer contact, specialist support and postgraduate education.^{18,19}
- General dentists will send multimedia patient records (that is, including images, text and sounds) to dental specialists, often enabling the specialist to make a diagnosis and develop a treatment plan without having to see the patient in person. Inter-professional communications will improve dentistry's integration into the larger health care delivery system.
- Second opinions, preauthorization and other insurance requirements will be met almost instantaneously online, with the use of real images of dental problems rather than tooth charts and written descriptions.¹⁸
- Occasionally, cases submitted to the dental laboratories have subtle Complications or esthetic nuances that require direct Contact between the dentist and the laboratory technician. In these instances, the ability to send color images of the patient's teeth and then to

talk about the images can help to prevent making improperly constructed appliances, thereby saving time and money⁹

According to Clark there is good news and bad news with teledentistry. The bad news is that it is highly likely that some doctors will set up and seek direct patient contact via the Internet, thus becoming "cyber dentists." In most cases, cyber dentistry will not be in the best interests of the public, and state dental boards should monitor cyber dentistry and punish abuses. The good news is that for many, teledentistry will produce wonderful advantages for the patients of a primary care doctor who partakes of the vast expertise available through tele-consultation.³

Legal issues:

Telemedicine and teledentistry also raise concerns about the confidentiality of medical and dental information. Concerns arise from the transfer of medical histories and records as well as from general security issues of electronic information stored in computers. Concerns also may arise about the proper method of informing patients of the potential transmission of their data.²⁰

Legal and compliance considerations are significant for all areas and types of telemedicine, including teledentistry. Largely still untested in law, and with significant variation among countries, issues such as accountability, licensure, jurisdiction, liability, privacy, consents, and, of course, malpractice is crucial to consider when attempting establishing sound foundations for Telehealth practice. Licensure of teledentistry practice largely depends upon the country's definition of teledentistry and upon its interpretation and perception of the nature of the doctor-patient relationship therein. The malpractice issue is a major legal obstacle to overcome. In the event of malpractice, teledentistry practitioners can be sued in the jurisdiction of the country patients reside. The malpractice issue is a major legal

obstacle to overcome. Informed consent is an integral part of the doctor-patient relationship in any area of health care. In teledentistry, it should cover everything that would exist in a standard, traditional consent form; in addition, it should advise the patient of the inherent risk of improper diagnosis and/or treatment due to failure of the technology involved. 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.^{20, 21}

Conclusion:

Telecommunications with its implications in dental fields in the form of Teledentistry has benefited people's life to a great extent by local dentist by contacting specialist through teledentistry visit or email, also students can be educated and staff can be trained via a videoconference proving teledentistry as a potential source of health care.

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