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Teledentistry in the United States: a new horizon of dental care

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Abstract: Teledentistry has been developing since 1994 as a means to allow dental professionals to communicate with one another over long distances. It allows collaboration by multiple practitioners regarding a patient and the necessary treatment for this patient. Teledentistry can be greatly utilized with rural communities or those of underserved populations. It would increase the accessibility of specialists, besides decreasing time and cost associated with specialty consultations. Real-time videoconferencing and store and forward techniques are the mostly commonly used methodologies for teledentistry. Teledentistry will become more widely seen and utilized by the increase in digital media found in dental practices.

Key words: telemedicine; teledentistry; dentistry; dental hygiene; rural; underserved; collaboration; real-time videoconferencing; store and forward; oral health care

Introduction

Although telemedicine has been developing for more than 50 years, with a recent strong induction of electronic media into health care, telemedicine has become a familiar term. The State of California defines telemedicine as the practice of healthcare delivery, diagnosis, consultation, treatment and education using interactive audio, video or data communication. Similarly, the United States Federal Government views telemedicine as the use of electronic communication and information technologies to provide or support clinical care at a distance. While teledentistry is still very young in its use by dental professionals, by its inclusion into the field of medicine, teledentistry fits these definitions (1, 2).

History in the USA

Teledentistry began in 1994 as a military project to improve patient care, provide continuing dental education and establish dentist–laboratory communications (3). Teledentistry is a venue for oral healthcare that uses electronic media to allow dental professionals to consult with one another from distant locations. The military project concluded that teledentistry decreased overall cost, was expandable to remote and rural areas, and offered more complete information for data analysis (3). A teledentistry system can allow dental professionals to share patient information. Radiographs, both periodontal and hard tissue charting, treatment notes, photographs and any other needed drawings or information can be transferred between multiple providers. This sharing of information can be extremely beneficial to patients, especially those in need of a specialty consultation. This collaboration between practitioners can also provide support for a colleague's clinical treatment decisions. A general dentist may have treatment that needs to be completed in a specific order while working with another dental expert on one patient.

Need for teledentistry

People living in rural or underserved areas are among the most in need of oral healthcare in their communities (4, 5). In addition to the lack of oral healthcare providers in these areas, barriers to the accessibility of quality dental care appear to be geographical distance and limited local resources (4–7). Many rural communities lack the clinical settings and finances that are required to attract specialized dental providers. Patients living in rural areas who are referred to dental care providers in more urban settings must travel to these areas which is usually expensive and time consuming. It has been estimated that 38% of the nation's rural counties do not have dentists. Teledentistry can close this distance gap by allowing oral healthcare providers in the rural areas to seek advice from specialists in the urban settings (4, 5). This can be performed without the patient having to physically enter the specialty practice. An appropriate treatment plan can be devised prior to a direct patient–specialist visit. At least one preliminary appointment can be saved for the patient.

A situation perfectly suited for a teledentistry setting is for a dental hygienist working without a dentist. In this situation, the dental hygienist must work with a consulting dentist. Teledentistry would allow the dental hygienist to have consultation with their dentist, without being physically present. This would be of great importance when discussing dental treatment and necessary prescriptions.

When a dental hygienist has a patient who presents with a painful perioapical abscess, the dental hygienist could send a radiograph of the area, an intraoral photograph, all charting and health history information, and then consult with their dentist. If the dental diagnosis determines that the patient needs treatment in an endodontic practice, the dentist could write a prescription for an antibiotic and pain reliever. The dental hygienist can then share the information gathered with the endodontist. These simple teledentistry consultations save the patient many steps. The patient now only has to travel the distance for a visit to the specialist, and not to the general practitioner as well. The patient will be able to receive prescriptions for medication to prepare the area for treatment, as well as relieving his discomfort. Lastly, the patient knows what treatment will be rendered prior to his travel.

While working with a dental laboratory, a dentist may need to provide additional information to the laboratory on certain cases (3). Teledentistry would allow the dentist to present the laboratory technicians with colour images of the patient's teeth. Detailed instructions can be given as well showing exact measurement specifications for the patient. This would decrease the chance of an appliance being made incorrectly for the patient.

If a medically compromised patient were seen in a teledentistry dental practice, the technology would allow for easy consultation between multiple medical disciplines. This interdisciplinary approach to holistic healthcare is becoming the standard. If your patient is on a blood thinner, you can inform their clinic that you will need a blood clot time reading prior to their dental treatment. This assures that provider information you are getting is accurate, and not just your patient's best guess.

Teledentistry can also be very helpful for hospital consultations. In situations in which patients are hospitalized for extended care, such as a transplant, the patient's oral health status is imperative to the success of medical treatment. After a dental examination, doctors could access the electronically their patient's oral condition. This would also provide them with an understanding of what type of dental care is necessary and the time period required to complete it.

Teledentistry methodologies

There are currently two basic techniques that are used for teledentistry (8–13). One is real-time videoconferencing, and the other, more common, is the basic store and forward technique. Both techniques involve a dental care professional digitizing and electronically transmitting videos, drawings, diagrams, photographs and X-rays. The information is then

prepared for transmission and the data are transmitted to the distant site.

Real-time videoconferencing allows people at two or more sites to communicate with each other by using a digital screen to display a video image of the person or people at either or both sites. These systems use a video camera and speaker phones so that the users at either site can see and hear them. For this type of consultation, both parties agree upon a meeting time and information that is exchanged in real time is transmitted simultaneously between sites. Users can verbally clarify points, add comments, physically point to certain data and amend details already entered during the consultation as it happens. This type of consultation allows for more in-depth discussion and personal contact than store and forward. However, the equipment and high speed network connection required to run the operations can be more expensive.

The store and forward technique uses less complicated equipment and can operate via the internet. The dental professional seeking advice collects all the necessary information and stores it in a file. The file is forwarded via e-mail as an encoded file to ensure a secure transfer of information, which can only be accessed by the appropriate parties. The consultant retrieves the file and examines its contents. Recommendations are then provided to the dental professional in the same manner in return. This technique is the least expensive, yet provides ample benefit for a wide range of applications, and is just as effective at presenting cases in a real-time setting.

Both real time, and store and forward require the same basic type of hardware, software, peripheral devices and telecommunications links with appropriate bandwidth. Real-time conferences do require slightly more sophisticated equipment and faster connections (10).

To begin the implementation of teledentistry into practice, one should begin consultation with a dental software company. These companies can provide what dental software is available for individual needs. For example, if your practice does not have digital radiography, they can explain your options for digitizing your radiographs. Also begin speaking with an individual or company who specializes in the necessary technical hardware. The hardware utilized will be imperative to functionality of the teledentistry practice. The company or individual should be able to determine your technical needs, teach you how to use the hardware and provide technical support for any difficulties that may follow. Meanwhile, discuss with your fellow dental practitioners as to the types of technologies they are employing. This is very important, because if the technologies in the collaborating practices are not compatible, the patient information cannot be transferred appropriately.

Teledentistry opportunities

Teledentistry has the potential to expand the oral healthcare being provided. It can be utilized by any dental care professional who wishes to gain advice, improve diagnostic care or determine referrals. The prospects of teledentistry are enormous. It has the ability to alleviate many barriers that currently exist in access to oral healthcare.

Teledentistry is likely to be most beneficial in rural and underserved areas. It is a method of delivery that has the ability to extend care to patient populations with limited access or no access to dental care.

Teledentistry's ability to provide more professional connectedness for dental professionals working in rural areas could decrease the phenomenon of professional isolation. Teledentistry can bridge this gap by creating greater professional connectivity, thus enabling all dental care providers to work in conjunction to create complete, individualized treatment plans.

Conclusions

Teledentistry is on the verge of an exciting new growth and opportunity. Once the current barriers are resolved, the practice of teledentistry will probably meet the standards established by its predecessor, telemedicine. As the digital revolution moves forward, it is only a matter of time before most dental professionals will gain familiarity with, and have the necessary technology to make teledentistry a reality. Teledentistry will bridge the gaps between dental care professionals and specialists, tap into previously isolated manpower, and above all else, it will provide patients with affordable, accessible, quality dental care.

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