Teledentistry: Now And Then


Abstract
A few years ago, teledentistry involved calling an expert on the telephone for advice. Now it involves consulting experts using the Internet. This article explains the basic ideas underlying teledentistry. It involves the local dentist digitizing and electronically transmitting drawings, diagrams, photographs, and X-rays to a specialist. Along with these data, the dentist will most likely need to fill out a standard consult form from the specialist’s Web site. In return, the specialist will develop and return a confidential consultation report to the dentist or physician requesting help. For this service, a time-based fee will be paid to the expert. Unfortunately, it is likely that some doctors will use the Internet to set up and seek direct patient contact, thus becoming “cyberdentists.” In most cases, cyberdentistry will not be in the best interests of the public. 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 while increasing their own knowledge.


Key words: Teledentistry, Telemedicine, Telehealth, e-health

Introduction
Just as communication technology and uses of electronic information have developed over the years, the terms to describe health care services at a distance, such as “telehealth”, “e-health”, and “telemedicine”, have also evolved. Currently, “telehealth” and “e-health” are generally used as umbrella terms. They describe all the possible variations of health care services using telecommunications. These services include the support of long-distance clinical health care, patient and professional health-related education, public health and health administration. “Telemedicine” has come to describe the direct provision or support of clinical care at a distance through the use of electronic communication and information technologies. Terms such as “telepathology”, “teleradiology” and “teledentistry” have evolved to describe the application of telehealth to those particular medical specialties. Thus, “teledentistry” has come to mean 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.

**History**

In its simplest form, telehealth has been around for decades. The familiar use of the telephone for consultations between patients and clinicians and the use of radios to link emergency medical personnel to medical centers have been commonplace in health care for this and most of the last century.\(^4,8\) However, in the last 30 years, clinicians, health services researchers, and others have been investigating the use of advanced telecommunications and computer technologies to improve health care.\(^4\)

One of the first teledentistry projects, the Department of Defense through the United States Armed Forces’ Total Dental Access (TDA) project, focused on three applications: continuing dental education, dentist-laboratory communications, and referral and consultation patient care services.\(^7\) In general, clinical applications involving direct patient care have not been compatible with telemedicine services. However, certain fields such as mental health services (telemental health) and the advent of new robotic technology (telesurgery) offer the opportunity for clinical applications.\(^4,6-8,11\)

Today, telehealth systems can be found in hospitals, clinics, private offices, nursing homes, rehabilitation facilities, homes, assisted living facilities, schools, prisons and health departments.\(^8\) As technology continues to evolve, telemedicine applications will continue to expand.

**Services**

Teledentistry encompasses a broad array of oral health services. Teledentistry has a variety of applications in patient care, education, research, administration, and public health.

*Dental education* provides distance learning primary or continuing education services to health professionals located in remote locations.\(^14\)

*Consumer dental and health information* includes the use of the internet or other electronic media for consumers to obtain specialized oral health information, on-line discussion groups, or peer-to-peer support.\(^14\)

*Health care research* permits health care researchers to become linked to other health care researchers despite geographical separation.\(^11\)

*Management and administration services* allow key oral health centers to oversee satellite or remote sites.\(^11\)

*Specialist referral/consultation services* typically involve a specialist assisting a general practitioner in rendering a diagnosis. These services can involve a specialist interacting with a patient “live” or in “real time” or involve a specialist reviewing a patient’s records without the patient being present.\(^14\)

*Supervision of direct care services* allows a doctor (or dentist) to provide statutory supervision of a health care auxiliary (e.g. nurse, physician assistant, dental hygienist) who then can provide direct patient care at a site remote from that of the supervising doctor.\(^11\)

These services utilize a wide range of technology including telephone lines, cable, fiber optics, wireless technology, and even satellites to transmit data over a variety of networks.\(^4,6,8\)

**Practice and Knowledge**

Teledentistry is a relatively new adjunct in the modern trend of telemedicine. Teledentistry is a combination of telecommunications and dentistry which involves the exchange of clinical information and images over remote distances.\(^17\) Most teledentistry programs to date have focused upon distance management and administration of remote facilities, learning and continuing education, and consultation and referral services rather than supervision of auxiliaries or direct patient care. Most teledentistry programs are associated with a dental or medical school. Some of these are worthy of examining briefly.\(^7\)

Marquette University School of Dentistry initiated the Marquette University Dental Telehealth and Education Link in 2003. The project aimed to create a network linking Marquette and other health systems with dental sites in remote areas where access to care is problematic. The project utilized both store and forward and interactive technology for the purposes of primary care, consultation, education, and public awareness programs. The Wisconsin
Advanced Telecommunications Foundation (WATF) was the major funding agency on this project, but the Milwaukee Area Health Education Center and Wisconsin Geriatric Education Center also were sponsors.20

Since 2003, the Apple Tree/Head Start Teledentistry Model29, 30 has provided expanded access to oral health by providing mobile, teledental oral health care services in the Minneapolis, Minnesota area.29

The U.S. Department of Health and Human Services Indian Health Service also utilizes teledentistry to provide oral health care to American Indians and Alaskan Natives in various states around the country. However, there is little documented information regarding these programs.31

Teledental Equipment

Teledentistry sites require some or all of the following basic equipment. The exact equipment required will depend on the nature of the site being outfitted. Hub sites will be different from remote sites – hub sites will only require videoconferencing equipment, whereas remote sites will require digital dental diagnostic equipment along with videoconferencing equipment. Moreover, mobile sites may require different transmission equipment than fixed sites (e.g. satellite dishes and modems). The equipment listed does not include telecommunications service equipment (e.g. routers, switches, T-1 lines, etc.). The nature of the telecommunication equipment will depend on the type of telecommunication service utilized by each site. Further, the teledental equipment does not include the equipment or supplies needed to outfit a traditional dental unit with traditional dental (which will be necessary in the remote sites). One other note, there are a variety of manufacturers and models. Thus, there are a variety of choices for each individual piece of equipment.

- Videoconferencing System$^8$
- Intraoral Wand Digital Camera$^{31,32}$
- Digital Radiographic Equipment$^{31}$
- Laser Caries Detection Device (KaVo DIAGNoSent)$^{33,34}$
- Computer$^{31}$

Conclusion

Teledentistry is not a separate dental specialty. Teledentistry does not create new oral health care services. It simply provides an alternative method to deliver existing services. Currently, teledental technologies have 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. Yet despite these barriers, the technology currently exists to provide teledental specialty consultation and referral services, distance learning educational services, and limited teledental clinical preventative services. It is not far fetched to imagine that in the near future teledentistry will be just another way to access an oral health care provider. This is especially encouraging for isolated populations who may have difficulty accessing the oral health care system due to distance, ability to travel, or lack of oral health care providers in their area.

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