

Tele-Dentistry And Public Health Dentistry: A Literature Review

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Abstract

Tele-dentistry has a history going back to 1994. The main concept of tele-dentistry proposes the application of information and communication technologies (ICT) to facilitate oral healthcare for geographically distant patients and/or practitioners. It also allows dental professionals to communicate with one another over long distances. It not only has the potential to increase accessibility of specialists, but also decreases time and cost associated with speciality consultations. The aim of this article is to present an overview of the uses of information and communication technologies in oral health.

Keywords: Public health dentistry, real-time video conferencing, telecommunications, tele-dentistry, telemedicine.

Introduction

There is a long history of the use of various tele-communication technologies in improving availability of a good quality of healthcare and in reducing inequalities in health. A link between health and tools of communication has always been there. A few examples, including the use of various sounds (drums, instruments), use of *quipu* (or speaking knot, a complex recording system fashioned from strings and historically used by various cultures in the region of Andean South America), and the use of smoke signals (one of the oldest forms of long-distance communication) have all been used to exchange health informations, stories related to major calamities and noteworthy events such as spread of bubonic plague (black death) in European nations.^[1,2] Though all these cannot be considered to be typical examples of telemedicine.

The word *tele* has been derived from a Greek word which means "far away". Thus, telemedicine simply means "practice of medicine from a distance", and this term "telemedicine" was first mentioned in a newspaper article in 1927.^[3] Telemedicine has now become a common term in healthcare due to a recent rapid introduction of electronic and communication technology into the healthcare^[4] and a growing familiarity of patients with such technologies has now created an urgent need for access to information related to healthcare at one's convenience.^[5] However, there is still no universally accepted, comprehensive definition of telemedicine. Out of all the definitions given in literature, the most fitting definition of telemedicine is the one developed by AAMC (Association of American Medical Colleges), which defines telemedicine as, "the use of telecommunication technology to send data, graphics, audio, and video images between participants who are physically separated (i.e.,

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at a distance from one another) for the purpose of clinical care^[6,7]. Although tele-dentistry is still in a very early stage in its use by the dentists, but its inclusion as a branch of medicine allows it to fit very well into this definition of telemedicine.

What is Tele-dentistry?

Many explanations and elucidations of tele-dentistry can be found on reviewing the literature, and each of these highlights its specific aspect. In the year 1997, Cook described tele dentistry as “the practice of using telecommunication technology to make a diagnosis and subsequently provide an advice on treatment from a remote distance.”^[8] Tele-dentistry is useful in providing consultation with dental specialists, supervising dental healthcare providers in remote areas and for their education through the use of various telecommunication tools like electronic health records, digital imaging, internet etc. Tele-dentistry is a combination of tools of telecommunication technology and the dentists and it involves exchanging clinical data (including images) from far-away areas for providing consultations and treatment planning.

The Need for Tele-dentistry

Tele-dentistry possibly has the potential to enhance availability of oral healthcare, improving the oral healthcare delivery, and to reduce costs related to dentistry by facilitating prompt diagnosis, well timed management of diseases and to reduce seclusion of healthcare providers by allowing regular peer-to-peer communications. Tele-dentistry can also reduce inequalities in availability of oral healthcare between urban and rural areas.^[9] There are many barriers in providing access to a good quality of oral healthcare in the rural communities which includes the shortage of oral healthcare providers in these rural areas, a long travelling distance to reach the limited healthcare providers available and the scanty local resources.^[10] Most of the rural communities do not have the financial and clinical resources needed to attract oral healthcare specialists. The patients who live in rural areas when referred to dental healthcare specialists (mostly in urban settings), have to travel long distances to reach them, which more often than not is expensive as well as time-consuming. Tele-dentistry has the potential to bridge this gap as it allows the oral healthcare providers of rural

areas to take advice from urban dental specialists.^[10] Currently, most of the tele-dentistry programs have their primary focus on distance management in administering oral healthcare in rural institutions, continuing dental education and learning programs and providing referral services after thorough tele-consultations. Tele-dentistry is still not used as a direct program for providing oral healthcare.^[11] In order to allow such a widespread implementation of these tele-dentistry initiatives political support, in addition to implementation of appropriate health policies and strategies is a must.

Tele-dentistry Methodologies

There are two forms of tele-consultation.^[12] First one is “real-time consultation”, which uses direct online video communication between a dentist, a hygienist, and/or a patient from a remote area and a dental specialist from a larger community who will provide the necessary support or supervision. Also, a very common form is “store and forwarding method”, which uses electronic health records and videos available in the form of stored data which can then be retrieved and can then be scrutinised by an expert, who will then give his/her opinion. Real-time consultation allows a more in-depth discussion and a better personal communication when compared to the store and forwarding method. Store and forwarding method also has the potential to provide sufficient benefit for a wide range of applications, and is considered to be almost as effective as real-time consultation in presentation of cases.

In a classic real-time videoconferencing technique, special videoconferencing tools and internet connections are set up at both the hub site and the remote site. A major challenge in real-time videoconferencing visit is the timely cooperation between the representatives of the hub and the remote site. Fig.1 shows the process of communication between the remote site and the specialist clinical setup.^[13] Teams of dentists at both sites must always work together to enable smooth processing of the tele-dentistry visit. The challenge begins with making the simultaneous appointments on both sites, progressing with patient information collection and transferring this information to the specialists, which then facilitates the “long-distance” real-time assessment of the patient, and ending with

facilitating future treatment and care. As the specialist cannot examine the patient himself or herself, he or she has to rely on the examination performed by the dental team at the remote site and so confidence and a good working relation must be established between the numbers of dental teams at both the sites. Proper

training, practice, and patience are all essential for a satisfying outcome, just like any other learning process. A reliable network for tele-dentistry can be established with an effective hands-on training and repeated practice of dental team members at both the sites.

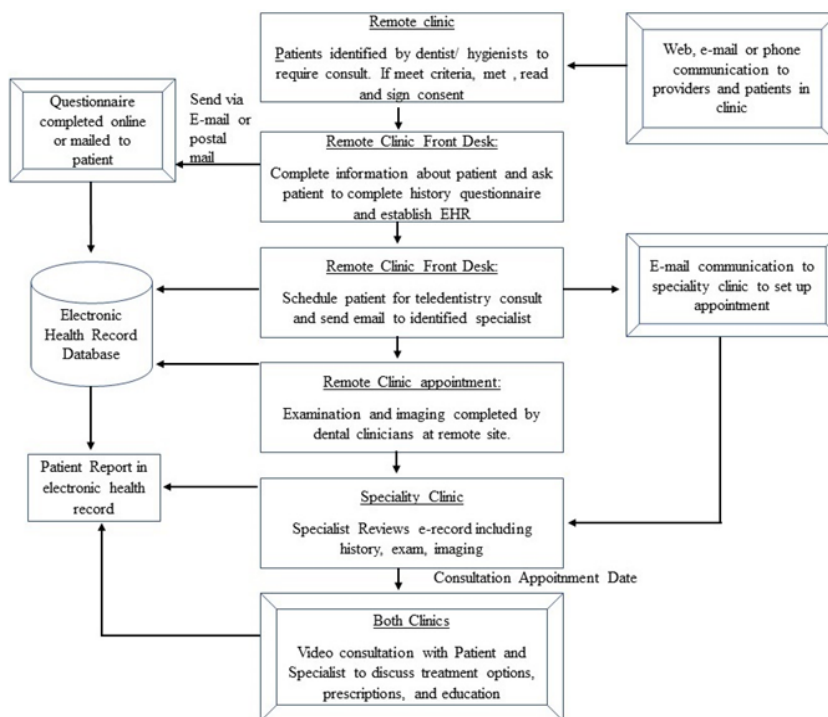


Fig. 1. Illustrating the process for communication between the remote site and the specialist clinical setup.

Tele-dentistry in Public Dental Health Services

Tele-dentistry allows for the dynamic dissemination of knowledge in the public health field of dentistry by using its applications such as tele-education and tele-assistance to achieve all these objectives and hence, acts as an instrument of standardisation, development, and equity.^[14,16] The main advantages of tele-dentistry include reducing the waiting time and treatment costs.^[20,21] Tele-assistance is a very helpful method which helps in delivery of health services and has the potential to enable the prompt distribution of information to the practitioners who are locally based and hence, improves their decision making capabilities. It also

helps to provide consultation services in case a second opinion is necessary, to effectively prioritise the patients who require referrals, and to reinforce these locally based treatment centres.^[19] Most of the dental practitioners and the patients have reported to experience more optimism and satisfaction regarding tele-dentistry and its inclusion into the present dental practices as there is a resulting possibility of saving time and a possibility of having faster access to dental care and treatment planning.^[15,23] Tele-dentistry systems may prove to be very helpful in managing the patients with conditions such as, oral mucosal disease (stomatology and oral medicine)^[24], periodontitis^[20], malocclusions,

orthodontic disorders^[25,26], temporomandibular joint disorders, and oral pain.^[24] Tele-dentistry is a system that has not only reduced the costs related to dental care but has also enabled remote dental examinations in case an oral medicine ward is not available^[18,23] and is especially useful to assist primary dental care providers.^[15,17] It also has the potential to allow an easy access to efficient dental consultations. Additionally, it also enables the underprivileged public to receive treatment earlier, which also results in reduction of the burdens faced by such patients who would have to otherwise travel long distances to receive a dental consultation.^[27,28] It was demonstrated that when these techniques of tele-dentistry were employed in experiments carried out in certain countries, there was a reduction of approximately 30% in the treatment costs when compared to those of traditional treatment techniques. These estimated savings may be the result of reduced salary bill of the dental therapists and also due the costs avoided by both the patients and the professionals towards travel and accommodation.^[19,20] These financial resources and the time thus saved by tele-dentistry can be used to help the patients who are at a higher risks of suffering from oral diseases. In the present scenario when there are limited resources for dental services, tele-dentistry can prove to be a crucial contributing factor to reduce the existing oral health inequalities by reorienting public health services.^[17]

Conclusion

In conclusion, tele-dentistry may prove to be a very practical and useful tool for dental public health providers as well as for the patients. Although, tele-dentistry does not have a very long history of use but surely it has a great potential for further development. Tele-dentistry can also prove to be useful for the training and continuing dental education of the professionals, for facilitating remote patient care, to enable exchange of information amongst health professionals, and also provides them orientation. It results in benefits such as reducing the waiting time for both general as well as specialised dental care, avoiding the expenses related to movements in seeking dental care, and hence saving the involved financial resources. In this way, it enables an improved access to quality dental care especially for patients who live in far-away areas or those who

do not have access to specialists in their localities. It enhances peer-to-peer interactions amongst oral health care professionals and thus, improves the quality of the care being provided and also boosts satisfaction amongst patients. Tele-dentistry is a relatively new technique but it has an immense potential for continued growth and expansion in the current setting of public health care systems. In order to achieve this goal, an outstanding and serious governmental support is necessary, and strategic focused action plans are a must to not only improve the technological resources available, but also to increase the acceptance of these information & communication tools (ICT) among the general patient population and health professionals. In addition to this, the use of ICT requires increased training and continuing professional development for the general dentists, dental specialists, dental auxiliaries, nurses, and other oral health care professionals who deal with oral health issues. Furthermore, to enhance the adoption of tele-dentistry in public dental health services, these strategic action plans must form an inherent portion of the various public health policies, which must advocate tele-dentistry as an evidence-based and cost-efficient way of improving oral health.

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