

Possibilities and limitations of teledentistry

Posibilidades y limitaciones de la tele-estomatología

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Cómo citar: Suetenkov DE, Popkova OV, Kiselev AR. Possibilities and limitations of teledentistry. Rev Cubana Estomatol. 2020;57(1):e2968

ABSTRACT

Dental care is considered to be an example of complex manual interventions in the medical sector. The vision presented describes the organization of dental care based on the application of modern telecommunication technologies. In developed countries, general dental practitioners have a positive attitude toward incorporating teledentistry into their practice. In PubMed there is a tendency to increase the states by telehealth key words and tags, including teledentistry. Those health care tendencies show a steady trend toward the broadening of teledentistry services.

Keywords: teledentistry; telemedicine; medical technology.

RESUMEN

El cuidado dental se considera un ejemplo de intervenciones manuales complejas en la industria médica. La visión presentada describe la organización de la atención dental basada en la aplicación de las modernas tecnologías de telecomunicación. En los países avanzados, los odontólogos generales tienen una actitud positiva ante la idea de introducir la teledentistería en su práctica. En PubMed hay una tendencia a aumentar los estados por las palabras clave y las etiquetas de la telesalud, incluida la teledentistería. Esas tendencias en materia de atención de la salud muestran una tendencia constante a la ampliación de los servicios de teledentistería.

Palabras clave: tele-estomatología; telemedicine; tecnología médica

Currently there are areas in the world in which the provision of dental care is difficult due to the lack of medical facilities. Low population density, remoteness from large cities and other factors affect the volume and quality of dental care provided, this is the most important medical-geographical factor in large countries or for remote regions. Presented vision described the organization of dental care based on the application of modern telecommunication technologies.

In those communities it is often difficult to organize specialized care, for example, in orthodontics, maxillofacial surgery, or pediatric dentistry. If the technologies of remote interaction with the patient are not sufficiently developed for the surgical profile, then in the diagnosis of risk factors for dental and maxillofacial anomalies, long-term therapeutic or retention periods of orthodontic correction, the existing methods can be discussed in the development of regional systems for the provision of medical and preventive care to the population. In public institutions, orthodontist dentists have a significant need for assistance, while in private hospitals this creates an opportunity to increase the cost of treatment, increasing the economic burden on households. These and other reasons require the optimization of dental care in sparsely populated areas, or the use of additional methodological approaches.⁽¹⁾

One solution to this problem is to use telemedicine technology. In the early 2000s this term was familiar to a small circle of people, recently we are increasingly using it, and technology is moving forward. A modern smartphone, being a multimedia device, can easily take a photo or record a video, and then send the information to a doctor or a diagnostic center. The development of specialized equipment will greatly increase the effectiveness of theranostics. Telemedicine technologies were first used at the beginning of the XX century to consult seafarers in case of emergency, they were carried out by radio.⁽²⁾ There are scientific works devoted to the use of telemedicine on the international space station.⁽³⁾ More than 20 methods and techniques of telemedicine technologies are described.

In November 2017, the National Agency for Financial Studies (NAFS) conducted a survey in Russia, posting 61% of respondents are ready to receive medical services remotely, 44% of respondents are ready to receive telemedical services to obtain medical documents and conclusions. Similarly, 39% of respondents would use the services of medical television for emergency medical consultation, 38% of respondents would use telemedicine to obtain a prescription for medication, 22% – for routine medical consultation. Another Russian study was conducted to answer the question: "what is preventing the use of telemedicine now?" More than half (74%) of the respondents primarily focused on the lack of technical facilitations. According to 58% of respondents the reasons was the lack of time to access the Internet for teleconsultation. Another reason is the lack of equipment and level of owning computerised technology.⁽⁴⁾ Almost half of the respondents said that their employees have low knowledge and skills in working with computers.⁽⁵⁾

Teledentistry is one of the specialized areas of telemedicine. Many researchers have repeatedly proven that teledentistry can be used as an alternative to consulting a doctor

in areas where there is a shortage of narrowly focused specialists. The application of mobile telemedicine systems for medical examination and broad examinations increases the availability of medical care in remote settlements.⁽⁶⁾ In advanced countries, general dental practitioners are positive about the idea of introducing teledentistry into their practice. Generally, the positive aspects of the introduction of teledentistry are noted by parents and children themselves who are on receiving the treatment.^(7,8)

All mistakes of telemedicine can be subdivided into technical, organizational and substantial. Many authors report that courses of telemedicine need to be introduced into educational programs of higher education institutions, and also to conduct courses for doctors.⁽⁹⁻¹¹⁾ Telemedicine technologies allow improving skills of medical employees in programs of continuous education of doctors without separation from their jobs.⁽¹²⁾ Modern information support can increase considerably overall performance of doctors, especially concerning diagnostics of rare pathology or in need of participation in various specialists in complex treatment.⁽¹³⁾ One more possibility of using telemedicine is use of so-called "house monitoring". Such devices perform the same functions as standard medical devices, however have an opportunity to save information and are connected by uniform network between several participants of process.⁽¹⁴⁾

Existing specialized journals on the use of telemedicine technologies are an important repository of information for health workers. Among them are: Journal of Telemedicine and Telecare, Healthcare Technology Magazine (UK), Telemedicine Journal and e-Health (USA), Telemedicine today (USA), European Research in Telemedicine (Netherlands), Journal of Telemedicine and e-Health (Russia), Polish Healthcare Journal OSOZ (Poland), Brazilian Journal of Telehealth (Brazil).

For example, in an article published in the Journal of Telemedicine and Telecare in 2008, the possibility of using telemedicine for diagnosing of the mucosa membrane diseases is described, however, attention is focused on the fact that for diagnosis it is not enough to analyze only graphical data.⁽¹⁵⁾ In Finland, video conferencing was successfully used by orthodontists for teleconsultations in research.⁽¹⁶⁾ A 2013 study conducted by Purna Raje Batham and co-authors showed that, thanks to the orthodontic body, a patient undergoing orthodontic treatment can be observed by a general practitioner.⁽¹⁷⁾

According to another study, general practitioners have positive attitude towards the idea of using telecommunication technologies counseling in orthodontics.⁽¹⁸⁾ However, some doctors are against teleconsultations.⁽¹⁹⁾

Gómez Bravo et al. propose to use social media not only for networking with the purpose of their involvement, but also to facilitate interaction with colleagues and patients.⁽²⁰⁾ There are already standards for the use of telemedicine by nurses.⁽²¹⁾

Teledentistry was as well used successfully in endodontic treatment for finding tooth root canals. According to the research, using teledentistry helps experienced doctors cooperate with young colleagues in everyday practice.⁽²²⁾ Also, teledentistry was as well used successfully for screening schoolers.⁽²³⁾

A simple photo, taken on a smartphone and sent to colleagues, should be enough for making a diagnosis by a general practice dentist.⁽²⁴⁾ Teledentistry technologies can be used for diagnosis in surgical pathologies.⁽²⁵⁾ Therefore, technologies of teledentistry can be used for optimizing dentistry service and making it more affordable.⁽²⁶⁾ Teledentistry is also commonly used in the examination of patients at the stage of anamnesis collection.⁽¹⁷⁾

Analyzing the data of PubMed, we find that there is a trend of increasing published articles by the keywords and tags of telehealth including teledentistry (Fig. 1). Figure 2 shown dynamics of publication numbers in PubMed by keywords: telemedicine, teledentistry, dental telehealth, oral telehealth, and dental telecommunication.

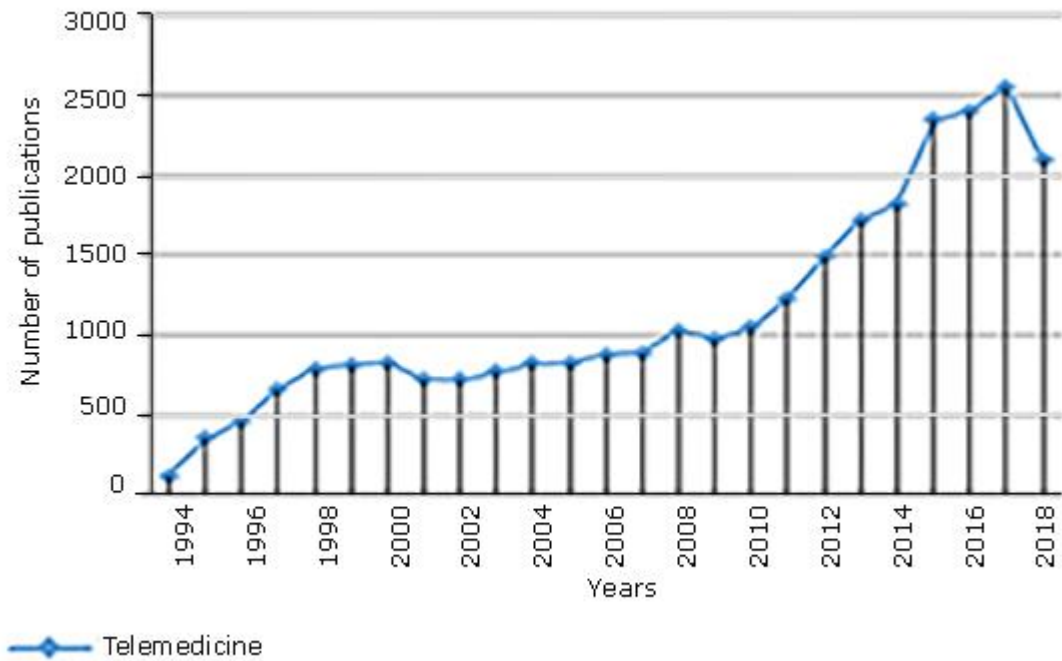


Fig. 1 - Articles in PubMed including keywords and tags: telehealth including teledentistry.

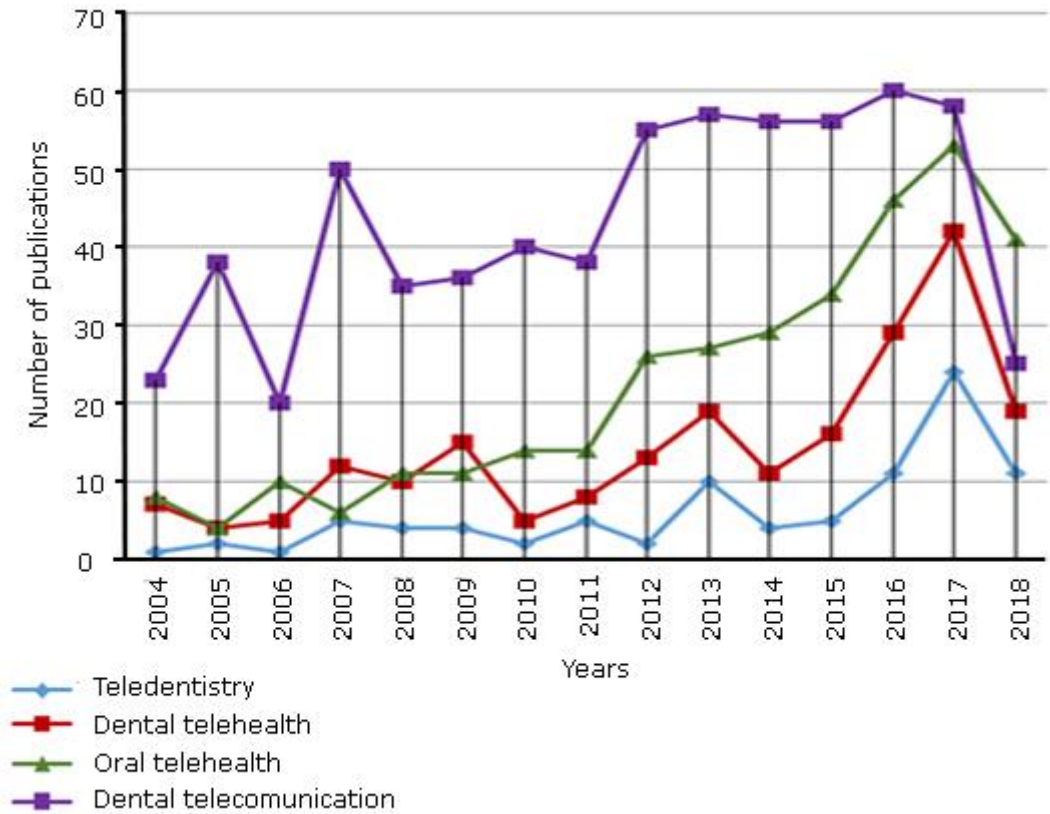


Fig. 2 - Dynamics of publication numbers in PubMed by keywords: telemedicine, teledentistry, dental telehealth, oral telehealth, and dental telecommunication.

Healthcare treatment paradigm is undergoing substantial modifications. Those healthcare tendencies show a conservative yet steady trend of healthcare service scaling. That is proved by such a high technology medical industry as dentistry.

BIBLIOGRAPHIC REFERENCES

1. Vagner VD, Arharova OA. The assessment of the health conditions of the patients seeking for orthodontic help. Stomatologiya. 2015 [acceso 26/12/2019];94(6-2):55. Russian. Disponible en: <https://instom.spb.ru/catalog/magazine/4969/>
2. Mahdi SS, Amenta F. Eighty years of CIRM. A journey of commitment and dedication in providing maritime medical assistance. Int Marit Health. 2016 [acceso 26/12/2019];67(4): 187-95. Disponible en: https://www.researchgate.net/publication/312276053_Eighty_years_of_CIRM_A_journey_of_commitment_and_dedication_in_providing_maritime_medical_assistance
3. Doarn CR, Lavrentyev VA, Orlov OI, Nicogossian AE, Grigoriev AI, Ferguson EW, et al. Evolution of telemedicine in Russia: the influence of the space program on modern telemedicine programs. Telemed J E Health. 2003 [acceso 26/12/2019];9(1):103-9. Disponible en: <https://www.ncbi.nlm.nih.gov/pubmed/12703503>

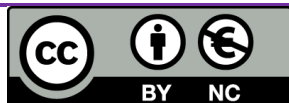
4. Russians with good health are interested in telemedicine [Internet]. [cited 2019 Dec 26]. Disponible en: <https://nafi.ru/analytics/rossiyane-s-krepkim-zdorovem-zainteresovany-v-telemeditsine/>
5. Pavlenko YeV. The cyberspace of medicine: Internet as enemy and ally of physician and patient. *Sotsiologiya Meditsiny*. 2013 [acceso 26/12/2019];22(1):42-6. Russian Disponible en: <https://elibrary.ru/item.asp?id=19397964>
6. Kopycka-Kedzierawski DT, McLaren SW, Billings RJ. Advancement of teledentistry at the University of Rochester's Eastman Institute for Oral Health. *Health Aff (Millwood)*. 2018 [acceso 26/12/2019];37(12):1960-6. Disponible en: <https://www.ncbi.nlm.nih.gov/pubmed/30633668>
7. Jampani ND, Nutalapati R, Dontula BS, Boyapati R. Applications of teledentistry: a literature review and update. *J Int Soc Prev Commun Dent*. 2011 [acceso 26/12/2019];1(2): 37-44. Disponible en: <https://www.ncbi.nlm.nih.gov/pubmed/24478952>
8. Li X, Xu ZR, Tang N, Ye C, Zhu XL, Zhou T, et al. Effect of intervention using a messaging app on compliance and duration of treatment in orthodontic patients. *Clin Oral Investig*. 2016 [acceso 26/12/2019];20(8):1849-59. Disponible en: <https://www.ncbi.nlm.nih.gov/pubmed/26631059>
9. Ainslie M, Bragdon C. Telemedicine simulation in online family nurse practitioner education: Clinical competency and technology integration. *J Am Assoc Nurse Pract*. 2018 [acceso 26/12/2019];30(8):430-4. Disponible en: <https://www.ncbi.nlm.nih.gov/pubmed/30085986#>
10. Pathipati AS, Azad TD, Jethwani K. Telemedical education: training digital natives in telemedicine. *J Med Internet Res*. 2016 [acceso 26/12/2019];18(7):e193. Disponible en: <https://www.jmir.org/2016/7/e193/>
11. Zhou L, Parmanto B, Joshi J. Development and evaluation of a new security and privacy track in a health informatics graduate program: multidisciplinary collaboration in education. *JMIR Med Educ*. 2018;4(2):e19.
12. Marttos AC, Kuchkarian FM, Abreu-Reis P, Pereira BM, Collet-Silva FS, Fraga GP. Enhancing trauma education Worldwide through telemedicine. *World J Emerg Surg*. 2012 [acceso 26/12/2019];7(suppl 1):S4. Disponible en: <https://wjes.biomedcentral.com/articles/10.1186/1749-7922-7-S1-S4>
13. Petruzzi M, De Benedittis M. WhatsApp: a telemedicine platform for facilitating remote oral medicine consultation and improving clinical examinations. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2016 [acceso 26/12/2019]; 121(3): 248-254. Disponible en: <https://www.sciencedirect.com/science/article/abs/pii/S2212440315013036>
14. Bui AL, Fonarow GC. Home monitoring for heart failure management. *J Am Coll Cardiol*. 2012 [acceso 26/12/2019];59(2):97-104. Disponible en: <http://www.onlinejacc.org/content/59/2/97>
15. Torres-Pereira C, Possebon R, Simoes A. Email for distance diagnosis of oral diseases: a preliminary study of teledentistry. *J Telemed Telecare*. 2008;14(8):435-8. Disponible en: <https://www.ncbi.nlm.nih.gov/pubmed/19047454>
16. Tommola T, Rauhala A, Rainio A, Keski-Nisula K. Video consultation orthodontic treatment. *Finnish Dental Journal*. 2005;12:988-94.
17. Batham P, Pereira Kalia U, Dilliwal SJ. Teledentistry and its role in orthodontic patient management. *Stomat Occ Med*. 2014 [acceso 26/12/2019];7(1):6-12. Disponible en: <https://link.springer.com/journal/12548>
18. Cook J, Edwards J, Mullings C, Stephens C. Dentists' opinions of an online orthodontic advice service. *J Telemed Telecare*. 2001 [acceso 26/12/2019];7(6):334-7. Disponible en: <https://www.ncbi.nlm.nih.gov/pubmed/11747634>
19. Stephens D, Cook J. Attitudes of UK consultants to teledentistry as a means of providing orthodontic advice to dental practitioners and their patients. *J Orthod*. 2002 [acceso 26/12/2019];29(2):137-42. Disponible en: <https://www.tandfonline.com/doi/abs/10.1093/ortho/29.2.137?journalCode=yjor20>

20. Gómez Bravo R, Lygidakis C, Gómez Bravo M, Sattler M, Zoitanu R, Rigon S. Social media in healthcare: the power of networking. J Telemed Health. 2016 [acceso 26/12/2019]; 2(1): 3-5. Disponible en: http://jtelemed.ru/sites/default/files/jtm_6-8.pdf
21. Bartz C. Telehealth standards of practice: a nursing exemplar. J Telemed Health. 2017 [acceso 26/12/2019];3(1):26-9. Disponible en: http://jtelemed.ru/sites/default/files/jtm_26-32.pdf
22. Brullmann D, Schmidtmann I, Warzecha K, d'Hoedt B. Recognition of root canal orifices at a distance. A preliminary study of Teledentistry. J Telemed Telecare. 2011 [cited 2019 Dec 26];17(3):154-7. Disponible en: <https://journals.sagepub.com/doi/full/10.1258/jtt.2010.100507>
23. Kopycka-Kedzierawski DT, Billings RJ. Teledentistry in Inner-City Child-Care Centres. J Telemed Telecare. 2006 [acceso 26/12/2019];12(4):176-81. Disponible en: <https://journals.sagepub.com/doi/pdf/10.1258/13576330677488744>
24. Amavel R, Cruz-Correira R, Frias-Bulhosa J. Remote diagnosis of children dental problems based on non-invasive photographs – a valid proceeding. J Stud Health Technol Inform. 2009 [acceso 26/12/2019];150:458-62. Disponible en: <https://www.ncbi.nlm.nih.gov/pubmed/19745354>
25. Khan SA, Omar H. Teledentistry in practice: literature review. Telemed J E Health. 2013;19(7):565-7. Disponible en: <https://www.ncbi.nlm.nih.gov/pubmed/23672799>
26. Estai M, Kruger E, Tennant M. Optimizing patient referrals to dental consultants: Implication of teledentistry in rural settings. Australas Med J. 2016 [acceso 26/12/2019];9(7):249-52. Disponible en: <https://amj.net.au/index.php/AMJ/article/viewFile/2696/1409>

Recibido: 17/07/2019

Aceptado: 2/02/2020

Publicado: 21/03/2020



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