Revolution in modern teaching in dentistry since the appearance of the COVID-19 pandemic: A review

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Abstract

Dentistry schools have attempted to overcome the challenges imposed by the coronavirus disease 2019 (COVID-19) pandemic through teaching via the Internet with the use of virtual platforms, designed to simulate face-to-face interaction and counteract the social isolation affecting the integral development of students. This review searched the main health databases, including MEDLINE via PubMed, Scopus and LILACS, and selected 31 articles to proceed with the research. During the pandemic, platforms such as Facebook, Instagram, YouTube, Zoom, Google Meet, and other similar tools allowed teachers to develop dynamic slides and dental models to simulate procedures, which played an important role in the course of mainly theoretical classes. In addition, applications such as WhatsApp allowed the rapid acquisition and sharing of useful information on a specific topic. While virtual resources facilitate the learning process through generating interest as well as providing accurate, necessary, valuable, and easily accessible information, which is constantly updated, the disadvantages of remote learning include the lack of instruments, infrastructure and materials, apart from supervision, to promote personal development and progressive evolution to directly treat patients. Another issue with regard to virtual learning is whether within a short period of time students can achieve a comparable level of practical skills as in the case of the conventional learning. In conclusion, the current pandemic has changed not only the use of technology in education, but also educational strategies for the future.

Keywords: virtual learning, COVID-19, dentistry

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Introduction

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by a viral agent identified as a novel betacoronavirus, named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[1] The pandemic caused by COVID-19 has had an unprecedented effect on global health and has led to important alterations in many activities, including education.[2] Schools of dentistry have attempted to overcome the current situation through teaching via the Internet with the use of virtual platforms, designed to simulate face-to-face interaction and counteract the social isolation affecting the integral development of students.[3,4]

The global strategy aimed at reducing the spread of COVID-19 included the promotion of social distancing as well as the suspension of instruction in the classroom in order to avoid the crowding of too many people in enclosed spaces. Up to November 24, 2020, more than 61.2 million cases and 1.44 million deaths had been reported worldwide. Moreover, more than 900 million students at all levels of education, including higher education, had been affected.[5–7]

The face-to-face educational activities of undergraduate and postgraduate schools of dentistry have been interrupted, leaving teachers and students to adapt to social distancing. The teaching of dentistry involves face-to-face settings with specialists and students to enable the evaluation of the signs and symptoms of oral diseases, to achieve a correct diagnosis, and to develop an adequate and individualized treatment plan.[8,9]

In these times, quarantines and social isolation could happen again. Thus, some virtual solutions are being implemented to continue the teaching activities. The electronic tools used in dental education centers include Moodle, Zoom, Jitsi, and Webex, which are interesting alternatives to classrooms. There are also other tools, such as Microsoft Teams, Google Meet, Google Classroom, and Google Hangout, which facilitate live activities, involving hundreds of participants simultaneously. The presenter's screen can be shared, allowing various didactic actions. In addition, classes can be recorded and stored on Google Drive, providing students with the possibility to learn later on.[10]

All of these applications help provide the theoretical content, but do not enable participation in laboratory, preclinical and clinical activities.[11–13] Teaching with the use of the currently most popular social networks, such as Facebook, Instagram, WhatsApp, and YouTube, offers more options and is more dynamic as compared to other student platforms.[14–18] Rapid and ongoing communication between cities and countries by means of social networks provides the current context, facilitating a search for answers to the unsolved questions based on alternative virtual resources. While virtual platforms may be considered a lifesaver during the time of a pandemic by connecting teachers with students, there are also some disadvantages that should be taken into account. Students may find it difficult to concentrate on virtual education. Besides, some platforms lack filters that control students' attendance to theoretical sessions; therefore, students may only partially attend classes.[19–21]

This study aimed to determine, analyze and compare modern virtual learning/teaching based on technology vs. traditional learning/teaching. The secondary objectives were to analyze the different modern teaching tools in dentistry established during the COVID-19 pandemic, to describe resources that are most in demand at universities, to compare the information available on research platforms and social networks, and to assess the speed of the dynamic, creative sharing of knowledge that attracts the full attention of students.

Methodology

This research was based on the review of the scientific articles found on the Internet in the main heath databases. The search was carried out from July to November 2020, without limitations as to the year of publication. The articles were similar in terms of content and in the approach to the problem. Virtual tools were used, starting with the Google Scholar search engine, followed by a search for articles in the United States National Library of Medicine (MEDLINE via PubMed), Scopus and LILACS as the main sources of information. The following search terms were used: 'dentistry' ('orthodontics', 'endodontics', 'periodontics', 'pediatric dentistry', 'oral rehabilitation', and 'maxillofacial surgery'), 'virtual education', 'virtual learning', 'COVID-19', and 'SARS-CoV-2'. Observational studies, analytical and descriptive research as well as clinical trials were included. Case reports, editorials, opinion articles, literature review articles, and systematic reviews were excluded. For the inclusion of studies, the analysis was carried out in 2 phases. In the 1st phase, observational studies were analyzed. In the 2nd phase, analytical and descriptive research, and clinical trials were evaluated. The selected articles were reviewed by 2 investigators (KJAS and LEAG). Finally, following rigorous systematic selection, 31 articles were identified and included in this review (Fig. 1). All studies had a moderate risk of bias according to the Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) tool.

Future vision of virtual platforms in dentistry

By 2022, face-to-face classes are planned for both theoretical and practical classes. However, guided practice

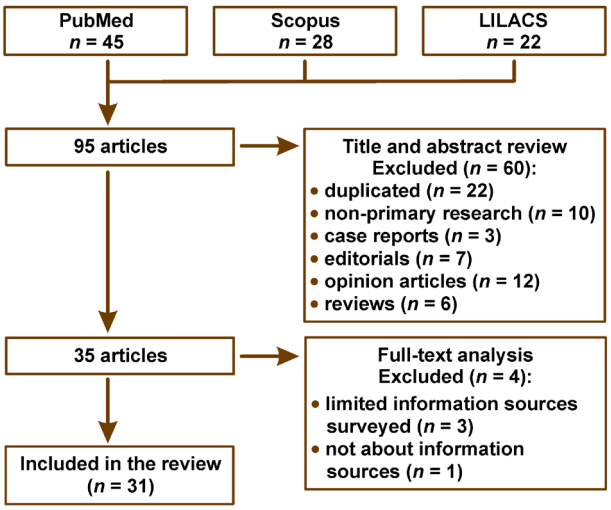

Fig. 1. Flow chart for the selection of studies

is needed to develop the operator's skills also by virtual means in order to avoid imbalance between the simulated and clinical interventions. To prepare students to adequately manage and perform treatment without complications, teaching with the use of objective videos, slides for the recognition of instruments and models that resemble work with real patients have been proposed.

Students must take advantage of the digital era and the Internet by using the immediately available virtual resources to facilitate and promote dentistry learning based on scientific evidence. Scientific websites as well as multimedia resources, like videos on YouTube, Facebook and Instagram, can clarify a concept, provide in-depth information on a specific topic or reinforce an idea. These resources are able to capture the attention of young people while providing new knowledge in a different way than the conventional university teaching. Therefore, students' schedules should include the use of virtual tools, such as online platforms and social networks, to thereby motivate students to do research, and consequently expand their knowledge beyond the lessons learned.[21–23]

Since online learning should be combined with the conventional learning, virtual tools must not replace the use of physical resources, including books, encyclopedias and atlases. From the student's perspective, a suitable environment must be created to avoid distractions and connection problems, and to optimize results. The space equipped with technological tools must be considered and the time granted by the university to complete various academic tasks must be maximized.

For all of the above, in the near future, universities should complement face-to-face classes with virtual hours to improve the level of education and to ensure the coexistence of both learning/teaching methods. One method should not replace the other, but rather a new approach should enrich the study routine, awakening new interests by handling large amounts of information.

In this era of globalization, today's students have a great advantage over those of previous decades. The Internet facilitates learning, as it generates interest as well as provides accurate, necessary, valuable, and readily available information, which is constantly updated. Due to the accessibility of technology and the speed of its diffusion, students can learn, understand, and put into practice new techniques, and gain knowledge for their long-term development as future professionals.

Use of virtual tools in dental education

In the schedules prepared by universities to carry out virtual classes, various platforms, repositories and scientific websites are needed to develop the competencies imposed in the curriculum with respect to the requirements of the national quarantine. Students can make the most of the Internet, exploring its resources. Different platforms can be analyzed for different purposes, with the main objective being virtual learning. For example, the WhatsApp application allows the sharing of information on a specific topic, whether it be data, new knowledge or news, between two or more people.[24]

During the pandemic, platforms such as Zoom, Google Meet, and other similar tools allowed interaction among the collective of students, thus playing an important role in the development of mainly theoretical classes, generating meetings, sharing ideas and knowledge, and effectively explaining the concepts of the topic to be further investigated by students. However, the question is: How can such platforms be efficiently used to conduct practical classes? The first obstacle in running practical classes from home is the lack of instruments, infrastructure and materials, apart from supervision, to promote personal development and progressive evolution to directly treat patients. Another issue with regard to virtual learning is whether within a short period of time students are able to achieve a comparable level of practical skills as in the case of the conventional learning.[24,25]

Theoretical knowledge must be balanced with practical skills, regardless of the kind of learning employed – face-to-face or through virtual platforms, social networks and applications. Face-to-face learning should be prioritized, in compliance with safety protocols, and all courses and laboratory schedules should be reinforced to complement the knowledge acquired in the virtual classroom. Virtual platforms have been a valuable tool in continuing university studies, and despite the return of face-to-face classes, the use of mobile devices and online platforms should be encouraged with the aim of expanding students' knowledge.[25]

Advantages of using virtual platforms

Learning evolves with the provision of alternative choices, with its purposes, procedures, means, and structure being defined by both students and teachers. Currently, students and teachers are developing immediate communication. In this way, virtual education is implemented, in which students learn online through various platforms, such as Zoom, Google Meet, Google Drive, and Google Classroom, among others. Taking this into account, it is necessary to discuss the advantages of virtual teaching and learning.[26]

Through the use of different platforms, virtual education saves time for students as well as teachers by not having to travel to the work or study location. Virtual education also allows the learning schedules to be flexible. In addition, the use of mobile devices has been again highlighted in the virtual setting, further breaking down the space and time barriers.[27]

These platforms allow the application of different individual and collaborative e-learning strategies, and have a huge capacity. Zoom in its free version allows up to 100 students to participate in the lectures online and 1,000 in the paid version. It facilitates the sharing of knowledge and helps build relationships, thus promoting social communication in the environment of the automatically and collaboratively programmed activities. Moreover, with the use of a laptop and a reliable Internet connection, learning can be comfortably accomplished anywhere.[25]

Another advantage of the use of virtual platforms is the speed with which students can connect, communicate, submit work, and download or view material, although this is related to the speed of the Internet, and the device and platform used. Videoconferencing with the Zoom or Google Meet platforms has been assessed positively for allowing synchronous responses to teachers' queries without delays.[26]

Google Drive and Google Classroom are some of the tools most commonly used by students and teachers due to the ease of uploading and downloading files and information to/from the platform. In addition, through the Classroom platform, teachers can quickly send university students extra materials, such as reading excerpts, presentations, texts, and reviews, before starting classes. These virtual platforms aim to improve communication and workflow between teachers and students.[27]

Disadvantages of virtual classes due to the pandemic

The use of virtual platforms requires that students have permanent access to computer media, and at least a desktop or laptop connected to the Internet. Students and teachers need to know how to use office tools, and since students have to sit in front of a computer for hours, they also must make a greater effort to avoid being distracted or carrying out other activities that could compete with their classes.[28]

Other important disadvantages of online learning include technical problems, such as the unexpected closure of the platforms in the middle of the class, while filling in a questionnaire or during exams. In such situations, students often do not know how to act, since disturbances may be related to the platforms, the Internet, or problems with the compatibility of browsers or the operating systems. These drawbacks can cause frustration on the part of students and result in the interruption of learning.[29]

The location chosen to participate in virtual classes must be adequate and orderly to enhance concentration, since bedrooms may distract students or even induce sleepiness.[30]

Virtual classes reduce the social relationships established in the classroom. Students cannot socialize with their peers beyond the mere education. The lack of interpersonal relations leads to frustration. Studying online is a very lonely activity, and students may need direct contact with the teacher to solve doubts or practice using physical tools, e.g., in laboratories, as the practical skills required for performing dentistry have been greatly affected by the pandemic.[31]

Limitations

Although the results of this study produce valuable information for dentistry, they should be evaluated with caution, because the quality assessment revealed a moderate risk of bias of the included studies. Likewise, their external validity did not allow the results to be generalized. More studies comparing traditional methods with the methods adapted due to the pandemic should be carried out.

Conclusions

Throughout the COVID-19 pandemic, modern teaching in dentistry has continued to evolve efficiently with the use of virtual tools, and although clinical practice requires contact face-to-face, virtual learning will still be employed when everyday life returns to normal. With the aim of continuing educational activities, students have been taught dentistry techniques via virtual platforms, and this has been widely accepted by both students and teachers for their ease of handling, among other advantages. Thus, despite the challenges presented by the pandemic, dentistry students have adapted to new reality, combining learning in the classroom and at a distance. The current pandemic has not only changed the use of technology in education, but also educational strategies for the future.

Ethics approval and consent to participate

Not applicable.

Data availability

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Consent for publication

Not applicable.

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