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INFORMATION TECHNOLOGIES AND

COMMUNICATION IN DENTISTRY: A REVIEW

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Resumen

Introducción Este artículo ha sido diseñado para revisar la aplicación de la tecnología de la información y la comunicación en Odontología. Con los desafíos a los que se enfrenta el acceso a la atención dental debido a la pandemia de Covid-19, se ha planteado una vez más la cuestión de la información y tecnología en Odontología como herramienta de diagnóstico adecuada.

Objetivos El objetivo clave de este artículo es revisar los métodos actuales de comunicación empleados en la profesión odontológica entre los profesionales y estudiantes de Odontología, que incluyen mensajería instantánea y comunicación por video. Además, se revisarán los datos demográficos disponible. Se evaluarán los futuros métodos aplicables en la profesión y su viabilidad.

Materiales y Métodos La investigación de artículos se realizó utilizando PubMed y MedLinePlus. Las palabras clave utilizadas fueron WhatsApp, Social Network, Zoom, Social Media y los términos MeSH empleados fueron Educación Dental, Educación en Odontología y Estudiante de Odontología. Entre los criterios de selección empleados, los artículos considerados en el

presente trabajo fueron escritos en español o inglés y publicados en los últimos diez años.

Resultado En general, los resultados demuestran cómo existe una correlación positiva con el uso de la información y la tecnología tanto con los estudiantes de odontología como con los profesionales. Esto lo vemos a través de las encuestas y recuentos realizados y los comentarios y resultados que se dan. Surgen preocupaciones con el sesgo y el pequeño tamaño de la muestra en algunos de los casos, pero el resultado generalmente es claro.

Conclusiones Nos ayuda en escenarios y situaciones difíciles para poder brindar a los pacientes la mejor atención. Existen preocupaciones con ciertos factores limitantes como el aislamiento, no poder realizar una biopsia y analizar adecuadamente las posibles lesiones cancerosas.

Abstract

Introduction This article has been designed to review the application of information technology and communication in Dentistry. With the challenges faced in accessing Dental care due to the Covid-19 pandemic, the question of Information technologies in dentistry as an appropriate diagnostic tool has once again been raised.

Objectives The key objective of this article is to review the current methods of communication employed in the Dental profession between Dental professionals and students. These include instant messaging and video communication. Furthermore, we will review the demographics who are engaging with such outreach. In addition, we will evaluate future methods of communication which may be utilised in the profession, and their viability.

Materials and Methods Article research was conducted using PubMed and MedLinePlus. Key words used were WhatsApp, Social Network, Zoom, Social Media and MeSH terms employed were Dental Education, Dentistry Education, and Dentistry Student. Amongst the selection criteria employed, articles considered in the present work were written either in Spanish or English and published within the past ten years.

Results The results generally demonstrate how there is a positive correlation with the use of information and technology with the dental students as well as the practitioners. We see this through the surveys and tallies carried out and the feedback and results given. Concerns arise with bias and small sample size in some of the cases but generally clear result.

Conclusions The impacts are clear with clear understanding that the information and technology has groundbreaking improvements and changes in the way we communicate and helped us break through difficult scenarios and situations to be able to provide patients with the best care. There are concerns with certain limiting factors like isolation, not being able to biopsy and properly analyse possible cancer lesions.

Table of Contents

Introduction

Many dental students as well as health professionals usually look at several online resources in search of learning and teaching material which they can utilise. The rapid advancement of technology makes it necessary to know the role of social networks in the development of the practice and teaching of dentistry.

Ventonella defines social media as the instrument that collects internet-based tools that provide populations of people and individual who are ready to discover new methods and ways of discovering information through a this new 'viral´method (1).

Social media provides e-learning tools that make possible to communicate over great distances in an engaging, individual and at the same time collaborative manner. It´s limitations include acknowledgement of authorship and copyright, privacy and the dissemination of false information. Its use has had an exponential increase since the early 2000's

to a stage now in 2020 where nearly every person you will see whether it's on the bus or walking along the road will have a phone or tablet to hand.

For instance, in the recent past dentistry professionals, dentists working on prosthodontic and orthodontic models would usually send e-mails and wait timelessly for letters through the post to communicate with their dental technician for their patient's crown preparations or dentures. Now with the touch of a button, they can instantaneously share photos of their designs through mobile applications like WhatsApp™, Viber™ and Messenger™to confirm designs, shape changes and even problems detected to save all parties time in the long run of things and the best possible results for the patients.

These platforms now allow doctors to communicate on a global scale from all around the world, we have had the privilege of listening to certain speakers like Dr. Rinesh Ganatra who shares online classes through Zoom (https://www.dentalpracticemastery.com/build-market-grow-v1) which is an online video conferencing which is readily downloadable to anyone with a phone or laptop with internet connection and a camera. These conferences are held with dental students and dentists showing them the brand-new innovative technology available as well as this he has guest

speakers who join the panel and share their experiences with us about their uses of such products through the form of PowerPoint and the regular dental seminars given by the COEM organization.

Many online video sharing sites like YouTube ®, Dailymotion®, Myspace ® are visited daily with huge amounts of viewers. The information received isn't all necessarily 'peer-reviewed'; so how much of it can we actually completely accept?

The UK General Dental Council first created guidelines for the use of social media in such a way that is both professional as well as safe for us in the year 2013 and which was recently updated and modified. A real problem within the dental community is maintaining the confidentiality of the patient and not sharing this data with anyone else. It is regretful that this exists and happens but due to the advance in technology, this has become an underlying problem within this community which is why such rules have had to come into place.

In relation to social networks, one of the facts that create the most alarm is data protection. On many occasions, professionals will share data

exclusively with students or staff, establishing a chain of trust that can unfortunately be broken due to the misuse of confidentiality and data protection codes. We hope that this work serves to reflect on this aspect of the use of social networks.

Through this review we will discuss the challenges and barriers that are faced with communication as well as the methods used to resolve this.

Objectives

The main objective of this review is to provide an update on what is known regarding the relationship between dental students and their professors as well as general practitioners and their respective patients through the social media platform.

The secondary objective is to identify how technology has played a crucial role in the COVID-19 pandemic in the dental sector with the ability to take snapshot images and send them instantaneously and ultimately evaluating the efficacy of this (2).

The other objective of this study is to evaluate future methods of communication that can be used in the dental profession and how viable they will be (3).

Materials and Methods

The sources that I used for this study were Medline and Pubmed to help me to discover which articles I will be needing to use in this review. I chose to evaluate from each of the sources available in the database and chose articles that had been written within the previous 10-year time frame and which were in connection to my topic.

Key words used were "WhatsApp", "Technology", "Social Network", "Zoom", "Social Media", "Dental Education", to search for articles that were there in complete text form and written in the English language. Using the two databases mentioned, the first search for articles related to the topic retrieved 122 articles. In the second selection, it was decided to choose articles written in the last 10 years. A double check was made to select the final articles on which the work has carried out to verify that the connection with the topic to be discussed.

I also used Google scholar as this helped me to broaden my search for the information of my topic.

The Origin

Dentistry needed to make its mark in the electronics world and it very well did so in the year of 1989 which was sponsored in Maryland USA by a company known as the Westinghouse Electronics Solution. The initial idea of information technologies in dentistry was created (4). The emphasis was discussed on the ways dental information can be used for dentistry to specifically impact oral health care delivery. The birth of telemedicine as a telemedicine subspecialist area may be related to 1994 and the US Army military (3), aimed at enhancing patient treatment, dental education, and collaboration between dentists and dental laboratories. This was a key link in being able to provide a fast and efficient way giving the patient best outcome. The communication between a dentist and his technician would later prove to be a golden game changer in the way they communicate. (4)

This military initiative has further proven that information technologies in dentistry lowered the average cost of medical care, expanded dental care to remote and rural regions, and offered full knowledge needed for deeper research. New possibilities for information technologies in dentistry have been developed as technology has progressed.

Technologies already available are starting to shift the complexities of the

provision of dental treatment. Information technologies in dentistry would

create fresh ways to boost patient service standards and reshape

traditional market models (4).

Methods of Teleconsultation

Teleconsultation will take place in "Real-Time Consultation" and "Store-and Forward Method" in one of the following forms.(5) Real-Time Consultation requires a videoconference in which dental practitioners and their patients can view, hear, and interact with each other at various places whether long or short distance (6). The Store-and-Forward Approach includes the exchanging of clinical details and static photographs captured and processed for consultation and care preparation by the dental practitioner (5)(7). During the "consultation" the patient is not present. Patient records, radiographs, digital images of periodontal and hard tissues, administered procedures, laboratory findings, studies, remarks, photos, and other transportable information may be exchanged by dentists by various suppliers (8).

Figure 1: Store and Forward Telehealth Solutions (where medical information as shared in real-time to patients in another location) and Real Time Telehealth (which is effectively a video conferencing) (9)

For patients, especially those in need of specialized consultation, this data exchange may be of extreme importance. A third technique, known as the Remote Monitoring System, has also been identified, in which patients are tracked at a distance and may either be hospital-based or home-based. In the literature, a "Near-Real-Time" consultation was also listed, which requires a low resolution, low frame rate product that looks like a jittery television.

Digital dentistry has the potential to expand access to oral health services, boost oral health care delivery, and reduce costs. It also has the ability to eliminate the gaps between rural and metropolitan populations in oral healthcare.

Digital dentistry can turn out to be the easiest way to cross the rural-urban health difference, as well as the quickest. Tele-dentistry will help introduce advanced healthcare to the most distant areas of the globe, taking into consideration the tremendous developments in the area of information and communication technologies.

Digital dentistry would be critical not just for rural areas, but also for our urban and suburban communities if the predictions about the scarcity of dentists in the next decade come to fruition (6). Inter-professional interactions would enhance the incorporation of dentistry with the broader distribution structure of healthcare. The usage of digital dentistry for expert consultations, evaluation, preparation and scheduling of treatment, and quality of care would include elements of decision support and promote sharing amongst dentists of the patient's contextual expertise. Through the usage of actual photographs of oral conditions rather than teeth maps and formal explanations, second opinions, pre-authorisation and other insurance provisions would be more immediately accessible online. Digital dentistry would also offer an avenue to complement conventional dental education training approaches to provide dental students and dentists with innovative experiences.

Current Evidence for ICT in Dentistry

The usage of information technologies in dentistry in oral dentistry in the community dental facility in Belfast, N. Ireland, utilizing a prototype information technology in dentistry device, was effectively shown for oral medicine and diagnosis by Bradley M, Torres-Pereira C et al, indicating that distant diagnosis is an important other option to the transfer of digital photographs via email in the diagnosis of oral lesions (10). There is also evidence of an information technology in dentistry-assisted, associated dental hygiene practice model established by the Northern Arizona University Dental Hygiene Department was documented by Summerfelt FF, which encouraged dental hygienists to provide underserved communities with oral healthcare by using the digital linking up method with the far away oral health team (11).

Duka M found for oral maxillofacial surgery that the diagnostic evaluation of the clinical diagnosis of impacted or semi-impacted third molars supported by the telemedicine technique was equivalent to the real-time clinical diagnosis evaluation (12). According to Rollert MK, telemedicine consultations are as accurate as those conducted through conventional

approaches in the appropriate assessment of patients undergoing

dentoalveolar surgery under general anaesthesia and nasotracheal

intubation, and that telecommunication is an efficient and cost-effective

mechanism to include pre-operative examination in circumstances where

patient travel is complicated or expensive (12). Brickley M said that there

is a need and appetite for reform in the oral surgeon professional

treatment referral method. One approach to expand access to expert oral

surgeon treatment might conceivably be telemedicine. Smartphones

provide easy and direct access to electronically mailed digital photographs

and enable free mobility of the oral/maxillofacial surgeon, not limited by

the limitations of a desktop personal computer, Aziz SR and Ziccardi VB

said (13). This, in essence, makes for increased specialty consultation

quality and better triage, eventually providing the maxillofacial patient

with enhanced treatment (13).

Following Brullmann D et al., in Endodontics, remote dentists have

confirmed that root canal orifices can be defined based on photographs of

endodontically accessed teeth (14). Zivkovic D et al. have shown that

Internet-based telemedia can be successfully used as a

telecommunications medium in the evaluation of periapical front teeth

lesions, minimizing the costs associated with remote visits and rendering immediate assistance accessible. Baker WP found that there was no statistical disparity between the assessors' abilities to distinguish periapical bone lesions using traditional view of radiographs and their ability to recognize the same images transmitted by a visual teleconferencing device on a computer screen (14).

According to Berndt in Orthodontics, interceptive orthodontic therapies offered by adequately qualified general dentists and remotely monitored by orthodontic professionals by information technologies in dentistry are a promising solution to minimizing the incidence of malocclusions in vulnerable children where it is not feasible to appeal to an orthodontist (15).

In Prosthodontics, Ignatius explored the usage of videoconferencing for diagnostic and care preparation of patients needing prosthodontic or oral recovery counselling and observed that dental video-consultation has the ability to expand the overall amount of specialist dental facilities in heavily populated areas (16).

In Periodontics, we observed that referrals to oral surgery, prosthodontics and periodontics had the largest number of appointments in the Web-based information technologies in dentistry consultation framework established for the US Department of Defence dental clinics. Fifteen patients performed periodontal surgery at Fort Gordon, Georgia, and under the Periodontist's tele-supervision, their sutures were removed a week later at a site 150 miles south. On a follow-up treatment, just 1 patient made the return-trip (17).

Kopycka-Kedzierawski DT and Billings RJ found that information technologies in dentistry is as effective as visual/tactile screening for dental caries in young children in the paediatric and preventive dentistry field. Kopycka-Kedzierawski indicated that information technologies in dentistry is a theoretically effective way of screening for early childhood caries for high-risk preschool children (18). An information technology in dentistry initiative set up in inner-city child-care centres in Rochester, NY was effectively illustrated. Amavel suggested that a valid resource is remote detection of children's dental conditions focused on non-invasive images. Kopycka-Kedzierawski have shown that the intraoral camera in

preschool children attending childcare centres is a viable and possibly

cost-effective alternative to visual oral screening for caries, especially

early childhood caries (18).

Analysis of Several Evaluation Instruments on The Perception of The Usage of Information Technologies

According to Turkyilmaz I, Hariri NH, Jahangiri an assessment of the survey tool was used and developed to assess student views of the impact of web apps and animations on their perceived academic performance. In the 14-question survey, 7 multiple choice questions, two fill-in and two open-ended and 3 sub-level Likert scale questions were included. The survey was reported to have taken less than 5 minutes to conclude. The survey faced by the number of 1.130 dental students, of which 255 (23 %) responded. Students uncovered 43 separate technological resources/Apps, with the main five listed being: YouTube (37.5 %), Bone Box (13.1 %), Google (10.5 %), Dental Anatomy Master (5.4 %), and Lecture Podcasts (5.2 %). The sum of time respondents invests per day utilizing electronic resources/Apps for academic purposes. For instructional purposes, 40.5 % of learners utilize electronic resources for less than 1 hour a day, but 11.2 % use them for more than 4 hours. One hundred and thirty-four students indicated that the usage of e-learning in classes was more widespread among schools expected so being of the below the age of fifty. (19)
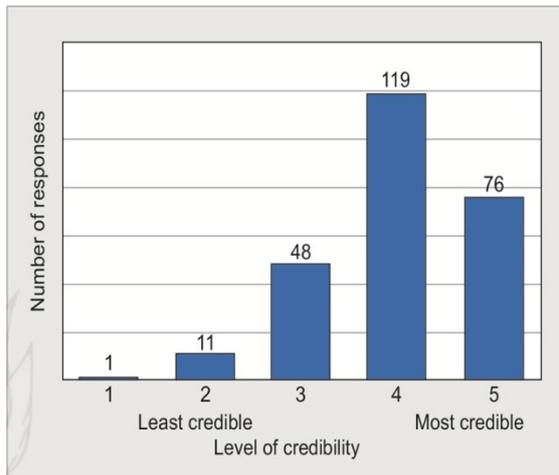
Figure 2: The analysis of question 7 regarding the "level of credibility" given by students when the resource is recommended by the faculty (19)
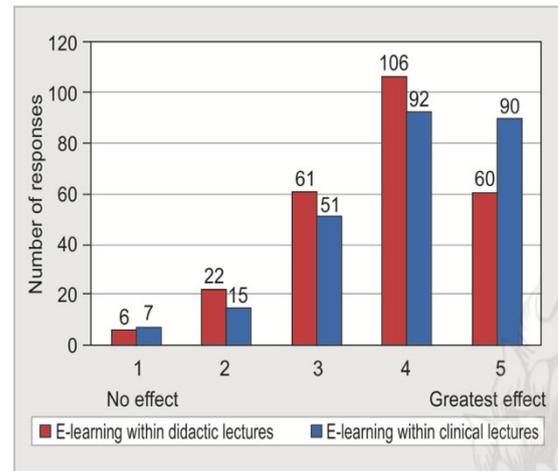
Figure 3: The analysis of the perceived effect of e-learning on students' understanding of a topic (19)

A another study, a group of adults or parents / guardians of children visiting the dental clinic are invited to participate in dental screening. Both of the photographs captured were confidential and the subject's dentition was only shown. To enable the database collection, recovery, and maintenance of the mobile telemedicine device architecture, a store-and-forward telemedicine server, "Remote", was constructed. The screening (visual and photographic) procedures were carried out by a qualified dentist using the screening technique employed in our previous research, with 4,16 unassisted face-to-face oral screenings (without radiography) of all participants. A skilled dental assistant (dental student or dental assistant) took photos of each participant's mouth using a smartphone camera (7). The outcome assessment of the mapping of the images was

independently conducted by two dentists (charters) using a different

picture display app based on the Remote-i process. External testers

(screeners/charter) have had access to other personal details regarding

the participants, such as date of birth, gender, and postcode. Table 1

indicates in the results the demographic characteristics of the survey. The

participants obtained approximately 500 dental photographs (5

photographs per subject) using a smartphone camera. Sensitivity and

accuracy values for the photographic method ranged from 60% according

to the benchmark face-to-face assessment of caries. (7)

Table 1. Demographic Characteristics of the Sample	
	NUMBER
Total	100
Female	36
Male	64
Aboriginal and Torres Strait Islander	20
Non-Indigenous	80
0–14 years	20
15–24 years	23
25–44 years	22
45–64 years	22
65+ years	13

Table 2. Accuracy and Reliability Measures			
	BENCHMARK SCREENING VERSUS CHARTER 1	BENCHMARK SCREENING VERSUS CHARTER 2	CHARTER 1 VERSUS CHARTER 2
Sensitivity (%)	63	60	85
Specificity (%)	99	96	97
Accuracy (%)	97	94	96
PPV (%)	79	52	58
NPV (%)	98	97	99
Kappa statistic (95% CI)	0.66 (0.59–0.75)	0.54 (0.41–0.63)	0.68 (0.56–0.77)

Benchmark screening: face-to-face oral screening; Charter: photographic caries assessment.
CI, confidence interval; NPV, negative-predictive value; PPV, positive-predictive value.

Figure 4: The demographic characteristics of the sample are presented in Table 1 (7)

Figure 5: The accuracy and agreement measures are presented in table 2 (7)

Another cross-sectional research was conducted in Saudi Arabia in

November 2019 to assess the existing levels of knowledge, behaviours,

procedures and obstacles to tele-dentistry among Saudi Arabia's dental students (20) (21). The students were working during their breaks on workdays to finish the research questionnaire. Data was collected through a hard-copy self-administered questionnaire in English, which took around 10 minutes to complete. Anonymously, all details were used and all recognizable data was deleted. The results indicated how a total of 314 dental students and interns with a mean age of 23.06 (SD = 1.63) performed the study questionnaire. Where only 54 (17.2 %) participants had previously learned about tele-dentistry, 444 percent described the true sense of tele-dentistry (14 %) (20).

Discussion

We are used to being just centimetres away from our patients for long periods of time as a dental student and dentist—this is the essence of our close contact career. We changed the way we worked within a few months after the COVID-19 pandemic, but the effects and improvements that resulted are sure to last a lifetime. Dental teams had to adjust rapidly to find ways to interact easily with their patients and address, identify and, when possible, handle the dental issues they were having, with dental practices pushed into escalating costs of running the business due to massively increased need for personal protection equipment and reduced patient footfall that could result in eminent closure. Dental intervention normally involves the use of our treatment instruments, from forceps to high velocities, how effective will dentistry really be over the phone and how impactful these changes will be to dental training programmes and the effectiveness of tele-dentistry.

Universal Stimulation UK is just one example of a company that have taken the initiative to allow virtual dentistry whereby allowing students to conduct treatment on virtual patients by allowing a medical 'flight

stimulator'. The sensations make treatments sound as they would with a real patient with the use of haptics and can differentiate between soft and hard tissue without having to put any real patients at risk. (22)

What persists is the issue of "who will pay for the tele-dental consultations"? Grant money funded much of the experiments carried out on telemedia technologies, and while the nature of these projects is unclear since the funding ended, the studies are likely to have been terminated due to lack of financial help (23) (3) . None of the telemedical consulting payment services have incorporated telemedical reimbursement throughout their strategies to date. A answer to this dilemma needs to be sought instantly (24). A definite alternative is payment for telemedicine in the same manner as telemedicine is reimbursed. Other options should be explored, and it must be assured that their simulated visits are adequately paid for by all teledental consultants.

Balancing the educational needs of learners and the time constraints of the current didactic timetable is one of the areas of concern in dental

education. Notes, electronic presentations, and handouts are the subject of the conventional teaching approach, while the e-learning strategy focuses predominantly on procedural images, modules, flashcards, and software applications. A previous study stated that, due to technical difficulties, it was difficult to introduce this novel teaching process.

Our research has shown that the videos of the pre-class lecture were well received by the students. Many students felt the video lectures were better for interpreting the content than face-to-face lectures. The majority of students said they would watch the videos again, indicating that in the near future, this modality could be a beneficial means of continuing education.

This is the first research to compare the effectiveness of WhatsApp with other data and knowledge transfer methods. The results of this pilot study indicate that WhatsApp is more efficient with respect to reception time and response time of users than electronic mail.

For all participants using one or more of the sites, the use of SMS messaging within this community of students is universal (25). The

majority of people who use Instagram and YouTube use Facebook and WhatsApp. A lot of the times we have found that users will agree to contracts and legal guidelines without even reading what is written especially those of the younger generation. The implications s of this is that very sensitive information can go out into the public domain which could put the dental profession at risk.

Half of those who took part found that the security settings were protected on the pages they were using. Some had a fundamental level of awareness of third-party access to SMS information (for example, Facebook) (25) (26) (27). This may be due to the fact that in other research, this category is in the slightly older students and has more life experience and personal examples of other people having seen and witnessed improper use. The participants did not discuss any of the latest. This is important because dental students may still be at risk of harming their reputation by engaging in unprofessional conduct online, even in their first year (1) (25). When one person observes something online that they found unprofessional and uses this as a weapon in what they thought would remain a professional relationship, this raises the issue of power. The information gathered shed some light on their views and it challenged

some of the initial presumption that when it comes to social media use, these students could be more aware of guidance, laws and regulations.

A multidimensional approach to the battle against online disinformation has been established by the European Commission, focusing on five pillars: enhanced accountability, promotion of media and knowledge literacy, consumer empowerment, defence of the news media environment, and research on the impacts of disinformation. Non-academic publishers generate most online content. Teachers need to be mindful that online material is being used by students to study clinical procedures (28)(29). A way of addressing this is to increase the quantity of high-quality content available online, which, considering the low number of users, would boost the viewing experience. The question is how to enable students to advise about what makes online a successful learning experience that will turn the amount of online viewing numbers into a better-quality experience for learning about dental procedures for students.

From the study that was carried out for both the examiners, there was a significant agreement between the diagnosis based on clinical evaluation and the picture messaging image. Compared to clinical oral review, the sensitivity and accuracy of photo-messaging-based image evaluation suggested a small overestimation of the lesions. In countries such as India with a high prevalence of oral PMDs (potentially malignant disorders) and lack of skilled labour and existing cancer screening programs, the Information technologies in dentistry model is very suitable. By encouraging informed decision-making through professional consultation, the use of free messaging services for oral lesion screening will help improve the quality of treatment in remote areas. In countries with a lower prevalence, however, these diagnostic aids may be used to assist the referral process from primary to secondary treatment in a "progressive multifocal leukoencephalopathy¨ present or absent" mode (30). Due to information governance issues, it must be accepted that the use of a free messaging service in certain countries will be precluded.

Figure 6: Mouth Examination with What´s App photo (31)

Figure 7: What´s App image of smokers keratosis (31)

Figure 8: ORAL LEUKOPLAKIA What´s App image (31)

This research shows that a combination of store-and-forward telemedicine and inexpensive use of a mobile camera provides a legitimate and effective remote screening tool for dental caries. It is recognized that without radiography inspection, neither the photographic method nor a standard face-to-face screening approach can detect interproximal or precavitated carious lesions and failure to use radiography could lead to the incidence of caries being underestimated (31). Despite the lack of research evidence on the use of a smartphone camera in dental screening, the current results validated our previous reports that the approach to mobile tele dentistry has the ability to detect caries from a smartphone picture. The findings show that the evaluation of photographic caries retained a relatively moderate degree of sensitivity

and very high precision, similar to that of the evaluation of face-to-face

caries. The photographic method's sensitivity reached the reference level

of the WHO of 0.85-0.90 (7). The lower sensitivity value is likely to be

because there was no inclusion of filled and missing teeth in the study.

Figure 9: Mouth photography with smartphone (7)

The problems of many Android telephone users could be overcome by

more productive training and hands-on experience (7)(32). The median

time spent on record formation, uploading and grading was 20 minutes.

While this time is longer than an oral in-person examination (10-15

minutes), a period of 20 minutes is still considered appropriate as the

other choice is to spend hours commuting to the closest practice or sending a practitioner to a remote area. They may not have to rely on the system because the supervisory dental team at the hub does not rely on a telemedicine system to do a supervisory test.

The philosophy of information technologies in dentistry involves a mixture of the use of computers, telecommunications technologies, digital imaging diagnostic services, oral health research and monitoring equipment and software. Because of convenient access to remote areas and decreased time and expense for patients, the use of these aids has been used in fields such as nursing, education, and public health. In the diagnosis of pathological disorders, a more regular use of this modality is recommended. However, as most studies have not shown prior assessments, there are only a few studies that help define good quality levels. This could be due to limited access to networking in rural areas or the pilot phase of the studies; further studies with a significant sample and follow-up studies in Latin American countries need to be performed.

From the participants in the study sample who had a lower degree of knowledge of tele-dentistry than related studies conducted in Pakistan, India and Rwanda. Some countries, including Saudi Arabia, have been shown to face several difficulties with the overall use of telehealth. The level of knowledge was not related to gender, college form, or age, indicating that this lack of knowledge is widespread. Over half of the study's dental students used a smartphone for dental consultations, with one-fifth receiving hands-on dental instruction using a tele-dental device. This may mean that, as part of the nation's digital transformation, dental students are engaging in tele-dentistry along with increased use of smartphone devices and social media in their personal and professional lives. A recent report suggested that 52.76% of Saudi Arabia's dental students and dentists use social media to engage with their patient (33). However, in relation to patient safety, many dental practitioners lack proper instructions for using such devices. More research focused on enhancing privacy and protection, taking into account the desires of providers to keep data secure, should be introduced. Turkish dental professionals have shared this view. It should be researched, but the tests were not of high quality, but it was found that the quality of dental caries was appropriate. One-third of respondents also believe that tele-dentistry

may breach patient privacy, and participants rated it as one of the most

critical barriers to tele-dentistry use.

Conclusion

In my opinion video animation, mixed media and augmented and virtual reality are new tools of medical and dental education and clinical training that are gaining an important position. In addition to their advantages as teaching aids, they can be used before the execution of a particular procedure as a tool for quality control. Using augmented or virtual reality, these stimuli can be enriched. It is very important to discuss the possibilities of using this method for medical purposes at a time when virtual reality penetrates many areas of life such as video games, the automotive industry, architectural stimuli and many more. In short, in twenty-first century education, computer-aided augmented reality stimulations of biological principles that have major clinical effects have an important role to play. In order to turn the factual information conveyed by the video into knowledge of processes and their effects, medical guidance may be incorporated into such stimuli. This represents a format and forum to be understood and connected to by the new generation of learners and will increase conventional models for medical education.

Digital technology in dentistry is nothing new, but its far-reaching potential has become even more evident after the pandemic, helping to reshape clinical practices. However online security so we should have more dental forces that are exclusively there, so they can stop hackers or the so called online ´trollers´ or ´keyboard warriors´ (people who hide behind a keyboard and make rude or inappropriate comments to an individual to seek out a negative reaction from them).

The digital technology can be a huge distraction and it can be easy to waste ample amount of time, this in effect can take away time from family life and disrupt that work life balance we all want.

I assert the wellbeing of patients and personnel a top priority, avoiding infection is paramount in the minds of clinicians. Around the same time, in the current environment, many patients are worried about returning to dental care and understandably want to spend as little time on surgery as possible.

Being unable to connect with one's peers can lead to social isolation and this can lead to more serious issues like possible depression. This can result in healthcare professionals getting into the cycle of depression.

A complete chair-side approach that incorporates both scanning, design and development within the practice is a timely response to patient requirements and guarantees complete clinical protection. CAD/CAM methods allow minimally invasive care as well. The accuracy of the final restoration implies conservative preparations, with limited aerosol development and without the need for temporary preparations.

On reflection an integrated workflow is provided by a digitally activated practice in which multi-disciplinary dentistry can work efficiently to improve patient trust, save care time and reduce the need for repeated appointments.

The ramifications for this pandemic will have far reaching consequences for example such as an increased resistance to antibiotics. As patients are not able to be correctly assessed on prescription of drugs. We need to

engage with our less computer savvy older colleagues on this journey so

that they can say abreast with digital technology. The digital technology

should not be used as a opportunity to engage patients to have unrealistic

cosmetic dentistry where underlying issues of caries and periodontal

disease are not being addressed. On the positive side we can engage

asynchronously with colleagues over the world using webinars where we

can gather knowledge and guidance from our professors without having to

be present at world conferences to allow for holistic care of our patients.

Responsibility

With respects to the sustainability it will be the main saving factor in all this as we are saving on printing costs, billions of pounds and huge masses of our natural ecosystem are lost to the vile cutting down of our natural flora and fauna. To the expense of our future generations such activates are carried out which is why it is so necessary for us to take forward the technological route of communication and for the purposes of education.

For the economic factor some may argue that these technological devices and gadgets can be of great expense and not available to the average person but if used correctly it can be of great service and economical in the long run as the amount of printing over that long period of time will be the same if not higher than just discussed.

Socially the technology will be of a great disadvantage as it will stop the communication among the people and break verbal communication and make it harder for people to do things like public presenting and weaken the communication skills among the common person. This can cause long term consequences like isolation which can lead to factors like depression which is a serious issue among the younger generation of our time.

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Annexes

Paper and Year of Publication	Social Media Tools Used	Aim of the Study	Relevant Conclusions
Awareness of, Beliefs about, Practices of, and Barriers to Information technologies in dentistry among Dental Students and the implications for Saudi Arabia Vision 2030 and Coronavirus Pandemic 2020	E-mail	To conduct an investigation which would increase our knowledge as to the attitudes of dental students and dentists towards the information technologies in dentistry field	Although only a small percentage of 17.2% really were aware of the information technologies in dentistry many of the students were open to learning more about it and how to venture into this path so if any future global disasters were to take place they are fully aware and ready for them.
'Does time matter? WhatApp vs electronic mail for dental	WhatsApp- e-mail	A comparison study in the efficiency in time between dental professional's response	Through this study we concluded that WhatsApp provides a faster

education. A pilot studies

2020 | | in both the WhatsApp and traditional e-mail | response time and is more efficient than e-mails. |
| Teledentistry from a patient perspective during the coronavirus pandemic

2020 | | Assessment of patient experience during the coronavirus (COVID-19) pandemic by using telemedicine. | The research has shown positive patient interactions in all five areas through the use of teledentistry. In view of the COVID-19 pandemic, healthcare professionals should consider the adaptation of patient routes and the use of telehealth as a form of consultation in service recovery planning, as well as the reduction in the spread of this highly transmissible disease. |
| Can Information technologies in dentistry Improve the Monitoring of Patients during the Covid-19 Dissemination? A descriptive pilot study | WhatsApp, Mountain View | To be able to see the positives of telemedicine in the dental clinic when there is a national emergency. | This application has helped to increase the patients gratification and help maintain that healthy doctor patient relationship |

2020			49
Protocol for information technologies in dentistry during COVID-19 in Armed Forces dental establishment 2020	WhatsApp, Skype, Google Duo, Zoom	The patients conveyed their problems through the email, whatsapp groups and so force through the conventional armed forced channels and of course ensure there was no sensitive information shared and the results were collected and seen whether and clinical visual assessment would be useful.	The deficit of personal on site hand to mouth contact and radiographs was a key lacking factor but there was a favour of having a clinician patient communication possible to help in urgent cases.
Student's Perception of the Impact of E-learning on Dental Education 2019	YouTube, Bone Box and Google	In this study they assessed how dental students' lives were affected by e-learning.	Across the done research it was found that these predoctoral students found e-learning had a positive impact in their learning and, helped them in their understanding of certain concepts and in their applications into some specific cases.

The Use of Social Media by Dental Students for Communication and Learning 2019	Facebook, Myspace, YouTube	This article analyses two views from two totally different perspectives one which is how it is beneficial to dental students learning and the other more about the problems. Later we have Professionals in the field who give their view on the matter and final acknowledgments.	A lot of the viewpoints there yes have depth as to how great social media is and has become over the years but what we are missing is hard concrete evidence. Smith a researcher has reported that there are gaps in the understanding of how social media is influencing the classroom environment.
Who is providing dental education content via YouTube? 2019	YouTube	For this study, the main aim was to find out how reliable dental students feel the content of YouTube has been for them.	A lot of the content found was unfortunately found to have no matched its credible reliability of the universities.
Applications of information technologies in dentistry in dental practice: a systemic review 2019	WhatsApp	Through the application's which are emerging in ICTs the information technologies in dentistry allows us to promote the prevention, diagnosis and treatment and this study tries to be able to determine the	There is not enough evidence to be able to be using this as the technology in dentistry and with this concept being so novel it seems as though a lot more further research will be required before we can bring in any concrete statements forward.

		applications have based in the literature.	51
Potential of information technologies in dentistry in the delivery of oral health services in developing countries

2019 | Email, WhatsApp | This study investigates the history and practical beneficiaries of information technologies in dentistry and how it has overcome barriers in the. Urban rural sector of health care problems. | It is shown through this article how the information technologies in dentistry can have such a good impact on the in delivery of the oral healthcare at the low cutting price but attention must be focused on some of the recurring problems that can still not be dealt with like the lack of physical contact. |
| Efficacy of a remote screening model for oral potentially malignant disorders using a free messaging application: A diagnostic test for accuracy study

2019 | WhatsApp | To check how feasible, it would be to using these free application tools in the screening of the oral malignant potential disorders in rural areas of India | In between the diagnosis which was based on clinical examination and WhatsApp images in the examiners. Screening for oral potentially malignant disorders whilst using photo messaging can serve as an effective adjunct and is a useful cost saving tool in the setting we are placed. |

Older and wiser? First year BDS graduate entry students and their views on using social media and professional practice. 2018	WhatsApp, Facebook, Snapchat, YouTube, Instagram, LinkedIn, Twitter, Pinterest, GDPUK	We wanted to explore the views from first year graduates in the university of Lancashire and their use of SMS together with their opinion on what they consider to be a professional behavior on an online platform.	From the results of this study we see how much of a challenge there is for the educating incorporations not only about the professionalism and ethical and legal aspect within undergraduate curriculum but to actually use social media as a forefront part of the undergraduate BDS course.
Reliability of mobile phone information technologies in dentistry in dental diagnosis and treatment planning in mixed dentition 2018	WhatsApp, Messenger, Facebook, Mountain View	We wanted to be able to test how the mobile phone could be used as a tool for the diagnosis and treatment planning of children with a mixed dentition	From this study we were able to gather that even though without radiographs it is of course not as accurate we are still able to achieve a relatively acceptable initial diagnosis of the caries present in the child.
Efficacy of a remote screening model for oral potentially	WhatsApp	To be able to assess the feasibility of being able to use this message application in the screening of the oral	There was a very strong agreement between the intial diagnosis made and what the examiners said when the lesions were made and the

malignant disorder using a free messaging application: A diagnostic test for accuracy study 2018		potentially malignant disorders	actual match. The screening using this app proved to be a positive low cost effective tool.
Dental students' learning attitudes and perceptions of YouTube as a lecture video hosting platform in a flipped classroom in Korea. 2017	YouTube	The aim for this study was how applicable YouTube was a delivery platform in providing online videos for the Dental Students and then to assess they're learning attitudes to the flipped classroom model.	Results found a positive correlation as YouTube being a suitable platform in delivering the video lectures and exposing students to a great variety of knowledge and information
Informal Peer-Assisted Learning Groups Did Not Lead to Better Performance of	Google teams	This study was made see if the peer assisted learning groups made by dental undergraduate students in a biomedical course and to investigate the association of	Students in the high grade's groups were found to have benefited to a much greater extent when working with the PAL groups. When we analyzed the similarities in the PAL

		individual and group characteristics with academic performance	groups, we found no difference in the scores.
Saudi Dental Students. 2017			
Comparison of a Smartphone-Based Photographic Method with Face-to Face Caries Assessment: A mobile Information technologies in dentistry Model 2017	Special Lens camera from Android Store	To evaluate and analyze the efficacy of a mobile phone app to screen the mouth for possible oral caries. Images of the teeth were taken and then from the app sent to the server and independently assessed by dentists.	The app has demonstrated a good assessment analysis for occlusal dental caries from the photos. The results have shown that it is in fact possible to be able to combine this phone technological service as a tool for screening oral caries if necessary.
End-user acceptance of a cloud-based information technologies in dentistry system and Android	Modified camera apps on smart phone from the Android or Apple AppStore	To be able to evaluate different user s and how they are using their smartphone cameras to detect and screen for the dental caries and areas where we can improve on.	A very strong percentage of people showed very high optimism and great encouragement towards the use of information technologies in dentistry in their work and we were able to see how from this we were able read the images faster from

phone app for remote screening for oral diseases 2015			the phone as opposed not he normal traditional way which was surprising to the common person. The concerns arise with the coordination, training between the sites and upgrading the current system at present.
Tele-periodontics - Oral health care at a grass root level 2015	Laptop, computer, mobile phones, video conferencing equipment, digital camera, X-ray digitalizer, X-ray unit Software	The dental practitioner gathers all the necessary clinical information and digital intraoral and extra oral images and radiographs (or scanned, not originally digital images) and transmits them to a specialist through existing networks and/or the Internet for consultation and treatment planning, and treatment is given in a much more timely, targeted, and cost-effective manner. The dental practitioner will then call or e-mail the periodontist.	Although this new technology-based approach which face a few initial teething issues, it is bound to see new frontiers in the provision of health care, which is crucial in an Indian scenario. The definition will not only put a smile on the lips of rural millions, but also shed light on many issues that cross regional borders, such as distance education, international partnerships and live experiences that extend the boundaries of periodontal health care. With the intention of providing periodontal treatment, excluding all geographical borders and distances,

			the limitless potential of this area needs to be explored.
Flipped – learning course design and evaluation through student self-assessment in a predental science class 2013	Facebook, Twitter	This very interesting study explored how we are able to design a flipped classroom for a predental science course and then later evaluate the course through the students in a self-assessment so we can provide the full implications on a practical level, so they are prepared once they are to enter into their respective undergraduate programme and hopefully evaluate whether such methods will actually work or not.	We found how the vast majority of the students felt more prepared than at a medium level behind the class and had low preference to the social media. From this we found that desire to learn was more associated to the satisfaction they pertained from class satisfaction and discussions within their class. The analysis had very rightly set in stone that actually being ready for had a major influence on how the learning outcomes are latter projected. Even though in this study we found that to be successful in this flipped classroom we are dependent on how the student feels and how prepared they are we still require more from social media before we are able to start enjoying the fruits of labour that it may apply in the future.

Social Media Use in Medical Education: A systematic Review 2013	Facebook, Twitter	In this study the idea was to review literature about social media. It's main goal was to try and answer two questions which was how effective it is as a tool for harnessing knowledge and the other was the problems and gratifications professionals and students have had from the use of these platforms.	As of now we can say that social media is a rapidly advancing method of education, but more studies and investigation are required to be sure that the information is online is 100% reliable for students and their respective curriculums as a whole.
Teledentistry and its role in orthodontic patient management 2013	High resolution image applications for capture	In addition to the existing evidence in the literature, this article discusses the sources, justification, scope, foundation and criteria for teledentistry. This article also reviews the use in the field of orthodontics of this alternative and creative form of providing dental treatment.	Teledentistry is the tool that can help integrate the efforts of a general dentist and an orthodontist to provide patients that are in desperate need of treatment but have no access to an orthodontist with the best possible orthodontic care.
Prevalence of dental caries and dental care	Dr. Camscope intra-oral camera	To determine the prevalence of dental caries and the use of dental treatment in pre-school	The data showed that 28 percent of children had caries and 61 percent of these were never treated for

utilisation in preschool urban children enrolled in a comparative-effectiveness study

2011 | | children enrolled in urban childcare centers that participated in a review of comparative efficacy. | caries, suggesting that continued efforts are needed to increase the use of oral health care by preschool children in the inner city. |
| Recognition of root canal orifices at a distance – a preliminary study of teledentistry

2011 | Laptop computer | 50 pictures of endodontically accessed teeth obtained with an intra-oral camera have been checked for remote detection of root canal orifices. The photos were stored on a laptop computer and presented to 20 observers who used software to identify the visible channel orifices that stored the canal positions in standard files. | Fast access to advice would therefore allow the supported colleagues to approach themselves in a wider range of cases and reduce the re-inflammation of teeth with untreated root canals. |
| Teledentistry-assisted, affiliated practice for dental | Computer Application | A prototype teledentistry scheme was developed in 2005 to test this theory. | This study shows that using teledentistry can function effectively in the management of |

hygienists: an innovative oral health workforce model 2011		The Voluntary Dental Service of the Homefirst Legacy Trust (now Northern Trust) in association with the Department of Oral Medicine at the School of Dentistry, Royal Group of Hospitals Legacy Trust, as part of a service enhancement scheme (now Belfast Trust). The feasibility study is listed in this text.	patients with oral mucosal disease, leaving aside the governance issues associated with using a teledentistry system and despite the limitations identified. It is particularly useful for referral management of older dependent adults with oral mucosal disease.
Telemedicine Using Smartphones for Oral and Maxillofacial Surgery Consultation, Communication, and Treatment Planning	Smart phone with application	The required senior resident and attending physician may then be e-mailed with these photos. This allows the e-mailed photos to be conveniently accessed regardless of location, since many department residents and faculty have smartphones.	Smartphones provide easy and direct access to digital e-mail images and allow free mobility for oral and maxillofacial surgeons, not limited by the limitations of a desktop PC. This, in turn, allows for increased specialty consultation quality and improved triage, eventually providing the maxillofacial patient with improved treatment.

2010			
Use of videoconferencing for consultation in dental prosthetics and oral rehabilitation

2010 | Videoconferencing | A 13-month research was conducted to examine whether video conferencing may be used to diagnose and make recovery plans for patients needing treatment with prosthetic or oral rehabilitation. The consultations were conducted in seven regional health centres between a specialist dental care unit in a central hospital and general dental practitioners. | Video conferencing thus appears acceptable for long-distance consultation in dentistry under the limitations of the present report. In sparsely populated areas in Finland, it has the ability to increase the total number of dental specialist services. |
| Evaluation of telemedicine systems for impacted third molars diagnosis

2010 | Web server | The purpose of the study was to explore the functional usability of the approach to telemedicine in the daily management of patients undergoing oral surgery. | The telemedicine-assisted diagnostic assessment of the clinical diagnosis of impacted or semi-impacted molars was equivalent to the real-time assessment of the clinical diagnosis. |

Application of teledentistry in oral medicine in a Community. Dental Service, N. Ireland 2010	Computer Application	A prototype teledentistry scheme was developed in 2005 to test this theory. The Voluntary Dental Service of the Homefirst Legacy Trust (now Northern Trust) in association with the Department of Oral Medicine at the School of Dentistry, Royal Group of Hospitals Legacy Trust, as part of a service enhancement scheme (now Belfast Trust). The feasibility study is listed in this text.	This study shows that using teledentistry can function effectively in the management of patients with oral mucosal disease, leaving aside the governance issues associated with using a teledentistry system and despite the limitations identified. It is particularly useful for referral management of older dependent adults with oral mucosal disease.

The Use of Social Media by Dental Students for Communication and Learning: Two Viewpoints: Viewpoint 1: Social Media Use Can Benefit Dental Students' Communication and Learning and Viewpoint 2: Potential Problems with Social Media Outweigh Their Benefits for Dental Education

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Affiliations + expand

Abstract

Social media have become a major part of an interconnected society, impacting personal and professional lives. This Point/Counterpoint presents two opposing viewpoints on the question of whether social media should be used in dental education as a learning and communication tool for dental students. Viewpoint 1 argues that social media benefit student learning and should be used as a tool in dental education. This argument is based on evidence concerning use of social media and improved learning across health professions, improved peer-peer communication in clinical education, improved engagement in interprofessional education (IPE), and provision of a mechanism for safe and improved communication between practitioners and patients, as well as faculty and students. Viewpoint 2 argues that potential problems and risks in using social media outweigh any benefits found in learning and therefore social media should not be used as a tool in dental education. This viewpoint is supported by evidence of negative effects on learning, the establishment of a negative digital footprint in the public's view, risk of privacy violations when using social media, and the new phenomenon of Internet addiction with its negative physiological effects on social media users.

Keywords: communication and interpersonal skills; dental education; educational technologies; professional behavior; social media.

CLINICS

Teledentistry support in COVID-19 oral care

Gabriel de Toledo Telles-Araujo, Raquel D'Aquino Garcia Caminha, Monira Samaan Kallás, and Paulo Sergio da Silva Santos[*]

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See commentary "Computing systems, telehealth, and personal data: what is up?" in volume 75, e2240.

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Given the latest updates in scientific publications about the impact of COVID-19 on oral health, such as the role of salivary glands as potential reservoirs for SARS-CoV-2 (1), the appearance of possible oral vesiculobullous lesions (2), and the presence maculopapular manifestations in suspected and confirmed cases (3), we aimed to emphasize the inexorable need for close monitoring by a dentist specialized in oral medicine in such COVID-19 patients. Their skill and accuracy in diagnosing mouth diseases could contribute to a better understanding of the pathogenesis of SARS-CoV-2 in oral health.

Based on the recent data, topical and systemic corticosteroid therapy is not recommended for COVID-19 infection. Hence, positive patients with immune-mediated oral conditions (pemphigus, pemphigoid, lichen planus) may present exacerbations of these manifestations during the period of viral infection. Correspondingly, multidrug therapies in patients positive for SARS-CoV2 and hospitalization conditions could also result in oral implications such as opportunistic infections, xerostomia, traumatic ulcerations due to orotracheal intubation, and periodontal disease (4).

Due to the pandemic scenario of COVID-19 in Brazil and following the recommendations of the Federal Council of Dentistry (5) and the National Health Surveillance Agency (6), dental care has been limited to emergencies and urgencies. Due to the aerosols produced during many oral procedures, this measure is justified because of the higher risk of exposure of theses professionals to the virus and prevention of cross-infection between patients. Unfortunately, this endorsement has created a distance between patients and dentists. Moreover, the incipient inclusion of a dentist in a hospital setting corroborates this detachment. Thus, there is still limited scientific evidence on the relationship between

Applications of teledentistry: A literature review and update

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Affiliations ➕ expand

Abstract

Teledentistry is a combination of telecommunications and dentistry involving the exchange of clinical information and images over remote distances for dental consultation and treatment planning. Teledentistry has the ability to improve access to oral healthcare, improve the delivery of oral healthcare, and lower its costs. It also has the potential to eliminate the disparities in oral health care between rural and urban communities. This article reviews the origin, rationale, scope, basis, and requirements for teledentistry, along with the current evidence that exists in the literature. This article also reviews the ethical and legal issues related to the practice of teledentistry and the future of this alternative and innovative method of delivering dental care.

Keywords: Information technology; internet; teleconsultation; teledentistry; telediagnosis; telemedicine.

Conflict of interest statement

Conflict of Interest: None declared.

Figures

Telemedicine

What have we learned?

P. Whitten, B. Holtz, and C. LaPlante

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Abstract

Go to: ⊡

As the health care industry is facing many challenges and is undergoing extensive change, telemedicine is in the position to address these challenges and be an important part of health care's development. Telemedicine has been used for approximately a half century, in which researchers have explored the different technologies utilized, clinical outcomes, cost benefits, perceptions, and adoption challenges of its use. This paper reviews and summarizes these findings and presents possible future research endeavors. Examining what is known about telemedicine can aid in the development of innovative, sustainable and beneficial health technologies that could positively impact health care delivery and outcomes.

Keywords: Telemedicine, telehealth, e-health

1. Introduction

Go to: ⊡

Telemedicine – the use of telecommunications technology to provide health care over a distance – was first documented in the late 1950's when a Nebraska psychiatrist connected to a prison over 150 miles away using closed circuit television to provide mental health services to the inmates [1]. Now the utilization of telecommunications technologies is practiced worldwide in virtually every specialty and is becoming more ubiquitous through use of consumer personal electronics [2-4]. Over the years, there have been different terms utilized to describe this practice. The term *telehealth* was developed to include healthcare and specialties such as nursing, mental health and nutrition that do not always provide clinical services. *Cybermedicine* and *e-health* are also commonly used terms, but typically describe health care delivered through the Internet [5]. This paper, consistent with Maheu, Whitten, and Allen's [6] definition, uses the term telemedicine to encompass the provision of health care services, clinical information, and education in all specialties over a variety of technologies including the Internet, mobile phones and electronic medical records. Telemedicine is continuing to grow due to the expansion of broadband infrastructures and the reduction of technology costs. The use of technology in a health care setting is also gaining increasing recognition and use in managing the changing state of health care and its many challenges.

Applications of teledentistry: A literature review and update

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Abstract

Teledentistry is a combination of telecommunications and dentistry involving the exchange of clinical information and images over remote distances for dental consultation and treatment planning. Teledentistry has the ability to improve access to oral healthcare, improve the delivery of oral healthcare, and lower its costs. It also has the potential to eliminate the disparities in oral health care between rural and urban communities. This article reviews the origin, rationale, scope, basis, and requirements for teledentistry, along with the current evidence that exists in the literature. This article also reviews the ethical and legal issues related to the practice of teledentistry and the future of this alternative and innovative method of delivering dental care.

Key words: *Information technology, internet, teleconsultation, teledentistry, telediagnosis, telemedicine*

INTRODUCTION

"Telemedicine" is the use of information-based technologies and communications systems to deliver healthcare across geographic distances.[1] It uses electronic information to communicate technologies to provide and support healthcare when distances separate the participants.[2] Telemedicine is part of a wider process or chain of care. It can improve this chain and thus enhance the quality and efficiency of health care.[3] Telemedicine is being used today in academic medical centers, community hospitals, managed-care companies, rural hospitals, and is also being used internationally to link providers in developing countries to hospitals in developed countries. Advances in digital communication, telecommunication, and the Internet introduce an unprecedented opportunity to remote access to medical care.[4]

The field of dentistry has seen extensive technologic innovations in recent years. Advances have been made in the use of computers, telecommunication technology, digital diagnostic imaging services, devices and software for analysis and follow-up.[5] Using advanced information technology, the science of dentistry, today, has crossed much longer distances than it was ever able to.[6] New information technology has not only improved the quality of management of dental patients, but also has made possible their partial or complete management at distances of thousands of kilometers away from healthcare centers or qualified dentists. The entire process of networking, sharing digital information, distant consultations, workup, and analysis is dealt with by a segment of the science of telemedicine concerned with dentistry known as "Teledentistry".[7]

DEFINITIONS

To some, teledentistry means searching the Web for

Feasibility Assessment for using Telehealth Technology among Dentists and General Population in Satara District, Maharashtra

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Abstract

Background: In this era of modern medicine, teledentistry has been constantly changing with the advent of information and technology. Teledentistry is a part of telemedicine. Teledentistry has many branches such as telestomatology, teleradiology, telepathology, tele oral surgery, and teleorthodontics. Teledentistry uses information technologies and communication system to deliver health-care services to people. **Materials and Methods:** A cross-sectional analytical study was conducted among the all dental specialist and people related to dental health service of Satara district. Respondents were given a brief introduction to the purpose of survey in an electronic format (dentist) and physical format (general population). Bulk of questions were focused on two domains (1) need for telehealth technology (2) interest in using telehealth technology for dental care delivery. The Collected information is subjected to descriptive statistical analysis. The Chi-square test was used to test the association of variables for dentists and general population. **Results:** Results showed great need of telehealth technology to overcome the obstacle in providing sufficient oral health services to the rural and underserved population as well as positive response from the dentist toward teledentistry. Out of 196 general population and 60 dentists, it is not easy for 67% general population to visit dentist due to difficulty of basic transportation services. Moreover, 56% people have no access to dentist only. 80% of dentist is willing to participate in teledentistry program if it ever comes and 83.33% dentists think it can improve overall efficiency of dental health-care services. **Conclusion:** Unwillingness and attitude among local dental practitioners can be changed through increasing scope of education regarding teledentistry at the central government level through preparing legislation.

Keywords: Dentists, rural population, teledentistry, telemedicine

INTRODUCTION

Around 30,570 dental graduates and post graduates practice in various sectors of country according to the article published by NCBI in 2016. The current status of dental graduates in India by S Yadav in 2016, despite the number of professionals the rural population and the vulnerable sections still suffer from lack of availability of basic oral health care facilities.[1] Reasons for available dentist population ratio in the rural areas are mainly migration of qualified professionals to urban areas. The world health statistics 2012 released by the WHO stated that India has <1 dentist per 10,000 people in the urban area and this ratio falls to one dentist per 150,000 people in the rural area.[1] This leaves the rural and vulnerable groups like the elderly with limited access to oral care. It has been observed that the number of visits to the dentists of such groups is minimal and is need based. The available oral health services at primary health care level are inadequate to cater to the needs of the population.[1]

Recently, dental care is transformed into technology and telehealth care. The initial concept of teledentistry developed as a part of blueprint for dental informatics in 1989 conference funded by Westinghouse electronic system group in Baltimore.[2] Teledentistry is a combination of telecommunication and dentistry, which involves the exchange

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Comparison of a Smartphone-Based Photographic Method with Face-to-Face Caries Assessment: A Mobile Teledentistry Model

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Affiliations ✚ expand

Abstract

Objectives: This study sought to evaluate the efficacy of a mobile teledentistry approach using a smartphone camera for remote screening of dental caries.

Materials and methods: An image acquisition Android App was created to facilitate the acquisition and transmission of dental images to a store-and-forward based telemedicine server. One hundred participants who were attending routine checkups at dental clinics were enrolled in 2014. Following a face-to-face oral screening by a screener (dentist), images of patients' teeth were obtained using a smartphone camera. These images, along with patient information, were then transmitted from the Android App to the server through the Internet for later independent assessment by two charters (off-site dentists). The assessments of these charters were then compared to the benchmark face-to-face caries assessment.

Results: Sensitivity values for the photographic method when compared to the benchmark face-to-face caries assessment were moderate, and ranged from 60% to 63%. Weighted kappa (K) as a measure of intragrader agreement for the photographic assessment was estimated as almost perfect (K = 0.84). The intergrader agreement for the photographic method compared to the face-to-face caries assessment ranged from moderate to substantial (K = 0.54-0.66).

Conclusions: Despite some limitations, the mobile teledentistry approach has shown the potential to detect occlusal caries from photographs taken by a smartphone camera with an acceptable diagnostic performance compared to traditional face-to-face screening. This study suggests that telemedicine and cellular phone technology can be combined to create an inexpensive and reliable screening tool.

Keywords: caries; dental photography; dental screening; smartphone; teledentistry.

POTENTIAL OF TELEDENTISTRY IN THE DELIVERY OF ORAL HEALTH SERVICES IN DEVELOPING COUNTRIES

A.J. Tella,[1] O.M. Olanloye,[1] and O. Ibiyemi[2]

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Abstract

In developing countries, access to qualified medical personnel especially oral health care specialists by inhabitants of rural and remote areas remain a challenge due to the fact that these personnel are mostly located in urban communities. Teledentistry is an approach that will eliminate the problem of distance between qualified oral health care personnel and potential patients in rural and remote communities. The objective of this review is to investigate the history of teledentistry and its practical application in overcoming the rural-urban oral health care problems.

A scoping search of literature using keywords associated with telemedicine and teledentistry and its application was undertaken via PubMed and Scientific Electronic Library Online (SciELO). Literature published in English in the last 10 years (2008 - 2018) were selected. The review summarises the available literature related to origin and method of delivering teledentistry and its use in dental practice and education. It shows that teledentistry has the ability to improve access to and delivery of oral health care at a relatively lower cost as well as supplementing traditional teaching methods in dental education. However, despite the promising nature of teledentistry in improving oral health care provision, it is associated with some attending problems and challenges.

Keywords: Telemedicine, Teledentistry, Rural, Remote, Developing countries

INTRODUCTION

In both developed and developing countries, the importance of adequate and everyday routine and emergency medical and dental services for everyone cannot be overemphasized. However, over the years, the need has arisen for a wider reach of these services where medical experts may not be readily available. This is particularly so for developing countries where access to qualified medical personnel especially specialists by residents of rural and remote areas still remains a challenge. Several barriers to oral health care in rural area have been found, these barriers include lower health care provider to population ratio, cost of dental care, poor infrastructure and inadequate dental facilities. Other barriers include longer travel distances to dental facilities, lack of transportation to obtain dental care, lack of awareness about oral health, geographic barriers to care, poverty and cultural barriers. As a result of this discrepancy in oral health care delivery and availability between rural and urban areas, different modalities have been explored one of which is teledentistry.

The term "Teledentistry" was first used in 1997, when Cook defined it as "… the practice of using videoconferencing technologies to diagnose and provide advice about treatment over a distance"[8]. It uses electronic medical records, ICT and the internet to provide consultation at a distance[8]. Teledentistry can be applied in four ways namely teleconsultation, teleeducation, telemonitoring and telesurgery.

In teleconsultation, the local general dentist in a remote area can seek consultation from a specialist by transmitting data as the patients are being attended to or stored data of patients to the specialist. Practitioners in rural remote areas can receive continue medical education through interactive video-conferencing and web-based self-instruction which have been developed and stored.

Meanwhile in telemonitoring, patients' condition can be monitored by the patient recording and transmitting data to physician by telephone, facsimile or the internet. Patients' condition can also be monitored by continuous data collection and automatic transmission to another physician involved in the management of the patients. Using telesurgery, specialists in urban

On-Demand Solutions, All, Product Development

Scope and Impact of Telemedicine Solutions | Healthcare Industry

Author
Karan Sood

Published
December 9, 2020

In this era of advanced technology, almost every industry rely on technological devices. Whenever a person feels uncomfortable, they head to the clinic for a primary health checkup. But the problem comes in when situations become like Covid-19, then personal meetings for the minor health challenges are not possible with the doctors. In such situations, there are numerous on-demand telemedicine solutions are available in the healthcare industry like telemedicine, patient app, etc.

What is Telemedicine?

Telemedicine is also known by the name of the "online doctor visits" or "doctor visits". Through telemedicine texas, the patients can discuss issues, symptoms, or even more than that with the doctors remotely. At the same time, the doctors can assess the health through telemedicine software, prescribe medicines or medical tests, provide suggestions related to the patient's health issues. Telemedicine provides a robust platform for doctors, nurses, and patients as well.

> *"HEALTH ON-DEMAND ATTRACTS $1B IN INVESTMENTS"*

✦ **What are the common examples of Telemedicine?**

Application of teledentistry in oral medicine in a Community Dental Service, N. Ireland

M. Bradley ✉, P. Black, S. Noble, R. Thompson & P. J. Lamey

Key Points

- Presents a pilot series of patients with oral mucosal problems who had high quality clinical photography of their lesions taken in primary care and then viewed online by an oral medicine specialist.

- Distance diagnosis of disease has the potential to significantly alter patient referrals.

- Most participants could be managed in primary care without attending a hospital specialist.

Abstract

Currently, patients with oral medicine conditions from all areas of Northern Ireland are referred by dentists and doctors to a small number of specialist services: predominantly, the Regional Oral Medicine Consultant at the School of Dentistry, Belfast. On receipt of the referral the consultant makes an assessment of the urgency of the case and the patient is placed on a waiting list. Until the recent implementation of waiting list initiatives (Elective Access Protocol, Department of Health, N. Ireland, 2006), patients remained on the waiting list for long periods of time. Analysis of these patient profiles highlights that many need both multiple treatment and review appointments of their chronic conditions, and consequently remain in the hospital system for significant periods of time. This increases the waiting time for these services. The idea of using teledentistry to triage referrals, and its potential as a tool to support locally based treatment, poses an alternative

Teledentistry during COVID-19 pandemic

Suhani Ghai

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Abstract

Go to: ⊙

Background and aims

Dentistry involves close face-to-face interaction with patients, hence during the COVID-19 pandemic, it has mostly been suspended. Teledentistry can offer an innovative solution to resume dental practice during this pandemic. In this review, we provide a brief overview of applications of teledentistry.

Methods

Articles on teledentistry, relevant to this review, were searched and consulted from PubMed, Google Scholar, and Cochrane database.

Results

Teledentistry is the remote facilitating of dental treatment, guidance, and education via the use of information technology instead of direct face-to-face contact with patients. Teleconsultation, telediagnosis, teletriage, and telemonitoring are subunits of teledentistry that have important functions relevant to dental practice. There are many challenges for acceptance of teledentistry by the dentists as well as patients, which need to be addressed urgently.

Conclusion

Teledentistry can offer a novel solution to resume dental practice during the current pandemic, hence, the need of the hour is to incorporate teledentistry into routine dental practice. If not fully replace, at least teledentistry can complement the existing compromised dental system during the current pandemic.

Keywords: Teledentistry, Telehealth, Telemedicine, COVID-19, Coronavirus

1. Introduction

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The COVID-19 pandemic has challenged the existing healthcare systems across the globe. As it spreads by droplet, fomite and contact transmission, face-to-face interaction of healthcare professional with the patient carries a risk of its transmission. As dental treatment invariably involves close inspection, examination, diagnostic and therapeutic interventions of the naso-oro-pharyngeal region, dental professionals are most susceptible to get infected with coronavirus [1]. As a result, during the current pandemic, most routine dental procedures all around the world, have been suspended, and only emergency dental procedures and surgeries are being performed.

However, looking at the current increasing trend of COVID-19 cases, it does not appear that this pandemic will end anytime soon. In fact, even the WHO has recently feared that this virus may become just another endemic virus in our communities and may never go away [2]. If these speculations are true and COVID-19 indeed becomes endemic, dental practice will need to reorganize and innovate to continue dental care with minimal risk of cross-

[Evaluation of telemedicine systems for impacted third molars diagnosis]

Milos Duka [1], Branko Mihailović, Milan Miladinović, Aleksandar Janković, Biljana Vujicić

Affiliations ＋ expand

Abstract

BACKGROUND/AIM. In the last twenty years significant advances have been made in the fields of information and telecommunication technology in health care applications, with a positive impact on the health care practice. The need for remote diagnosis and planning of interventions is of special importance in military health care, and health management of immobile persons, and those with special needs. In cases such as these, availability of specialist health care is mainly limited by geographic and financial factors. The aim of this study was to investigate practical usability of telemedicine approaches in everyday management of oral surgery patients in terms of reliability of established diagnosis and indications for oral surgery treatment of the third molars.

Methods: Our experimental randomized study enrolled 432 randomly selected patients of both genders, aged 20 to 87 years, undergoing panoramic radiography for some reason in the Centre for Dental Radiography in Belgrade. In addition to radiography, photographs of the face and mouth cavity were taken. These images were uploaded to the web server specially dedicated to the study purposes, and then transmitted to teledentists, i.e. oral surgeons, who made remote diagnoses. Diagnostic agreement was determined by way of the Cohen's kappa coefficient, and diagnostic sensitivity (SE), specificity (SP), and effectiveness (EFF) were also established. Statistical significance was determined and comparisons performed by using the z-test, and testing of non-parametric characteristics by using the McNemar's chi2 test for $p = 0.05$ significance cut-off.

Results: The results obtained by analyzed images and diagnostic assessment of the clinical diagnosis (kappa = 0.99, SE = 99%, SP = 99%, EFF = 99%, for 95% CI) indicate an almost complete diagnostic agreement. The differences

Recognition of root canal orifices at a distance – a preliminary study of teledentistry

Dan Brüllmann, Irene Schmidtmann, Katharina Warzecha, more...   Show all authors ⌄

Article information ⌄   🔒

Abstract

The remote recognition of root canal orifices was tested on 50 images of endodontically accessed teeth acquired with an intra-oral camera. The images were stored on a laptop computer and were presented to 20 observers who marked the visible canal orifices using software which stored the canal locations in standard files. The marked positions were verified on histological slices. In 87% of the cases, the canal locations were marked correctly. Inter-observer reliability depended on the location of the reviewed root canal (kappa = 0.44–0.77). The detection rate was related to the professional experience of the observers. The maximum proportion of accurate detections was found for the observers with more than 10 years of professional experience. The minimum proportion of accurate detections, 79%, was by the observer with one year of experience. The results of the study suggest that remote recognition of root canals by experienced dentists can help younger colleagues in the detection of root canal orifices.

Telemedicine using smartphones for oral and maxillofacial surgery consultation, communication, and treatment planning

Shahid R Aziz [1], Vincent B Ziccardi

Affiliations   ➕ expand

Abstract

Telemedicine is the specialty of medicine that uses the evolving telecommunications industry combined with medical information technology to provide remote medical services. The use of smartphone telemedicine is an efficient and effective way for remote specialist consultation and should be considered by the oral and maxillofacial surgeon. Smartphones provide fast and clear access to electronically mailed digital images and allows the oral/maxillofacial surgeon free mobility, not restricted by the constraints of a desktop personal computer. This in turn allows for improved efficiency of the specialty consultation and improved triaging, ultimately providing improved care to the maxillofacial patient.

Teledentistry and its role in orthodontic patient management

Prerna Raje Batham MDS ✉, Ulrika Diana Pereira Kalia BDS, MDS & Suryansh Dilliwal BDS, MDS

Abstract

Teledentistry is a combination of telecommunications and dentistry involving the exchange of clinical information and images over long distances for dental consultation and treatment planning. Teledentistry has the ability to improve access to oral healthcare, improve the delivery of oral healthcare and lower its costs. It also has the potential to eliminate the disparities in oral healthcare between rural and urban communities. This article reviews the origin, rationale, scope, basis and requirements for teledentistry along with the current evidence that exists in the literature. This article also reviews the use of this alternative and innovative method of delivering dental care in the field of orthodontics.

Use of videoconferencing for consultation in dental prosthetics and oral rehabilitation

Eino Ignatius [1], Sami Perälä, Kari Mäkelä

Affiliations   + expand

PMID: 21030487   DOI: 10.1258/jtt.2010.100303

Abstract

We conducted a 13-month study to investigate whether videoconferencing could be used for diagnosis and for making treatment plans for patients requiring prosthetic or oral rehabilitation treatment. The consultations took place between a specialist dental treatment unit in a central hospital and general dental practitioners in seven regional health centres. Videoconferencing was conducted using standard commercial units via an IP network, at bandwiths of 762 kbit/s - 2 Mbit/s. In total, 24 patients and 25 professionals (18 dentists, 2 dental hygienists and 5 nurses) took part. There were no technical problems. In 24 out of 27 teleconsultations, a diagnosis or treatment plan could be made. All participating dentists were satisfied with the consultation process and indicated that the technology used was of sufficient quality for clinical purposes. A patient satisfaction questionnaire indicated that patients were also satisfied. Videoconsultation in dentistry has the potential to increase the total number of dental specialist services in sparsely populated areas, such as those in Finland.

Tele-periodontics – Oral health care at a grass root level

Haritha Avula [1]

Affiliations ➕ expand

Abstract

A new concept of tele-periodontics, which merges the innovative technology of telecommunications and the field of periodontics, is proposed. This new field of tele-periodontics will have an infinite potential where access to a specialist will be provided at a grass root level, enhancing effective delivery of therapy and information to the rural and under privileged areas. It would allow the specialist and the patient to interact either by video conferencing (real time) or through supportive information (store and forward) over geographic distances. Different probabilities of tele-periodontics such as tele consultation, tele training, tele education and tele support are also discussed in this paper.

Keywords: Real-time conferencing; tele-periodontics; teledentistry.

Prevalence of dental caries and dental care utilisation in preschool urban children enrolled in a comparative-effectiveness study

D T Kopycka-Kedzierawski [1], R J Billings

Affiliations + expand

Abstract

Aim: To assess dental caries prevalence and dental care utilisation in pre-school children enrolled in urban childcare centres that participated in a comparative effectiveness study.

Study design: Cross-sectional study.

Methods: Caries prevalence was determined in a cohort of children 12–60 months of age. Eligible children were randomised into two groups: group one received a traditional visual/tactile oral examination and group two received a teledentistry examination. Questionnaires were administered to the children's parents/guardians to gather demographics and information about using dental and medical services.

Results: Of 234 children examined, approximately 28% had caries experience. The mean dfs score was 1.56 with a range of 0–34 carious surfaces. The mean dfs score for the children examined by means of teledentistry was 1.75 and for the children examined by means of the traditional visual/tactile method mean dfs was 1.40; the means between the two groups were not significantly different. Twenty-six children showed evidence of being treated for dental caries. According to the parents, 31.5% of the children had never had a dental check-up before, only 3% of the children were lacking dental insurance and majority of the parents (92%) did not perceive accessing dental care for the children as a problem.

Statistics: The Wilcoxon Mann-Whitney test and the Kruskal-Wallis test were used to assess statistical differences among groups of children.

Student's Perception of the Impact of E-learning on Dental Education

Ilser Turkyilmaz [1], Niki H Hariri [2], Leila Jahangiri [3]

Affiliations ➕ expand

PMID: 31316028

Abstract

Aim: The aim of this study is to assess the influence of e-learning on dental education as perceived by predoctoral dental students.

Materials and methods: In an institutional review board (IRB) approved protocol, a 14-question survey was created and electronically distributed to second-, third-, and fourth-year dental students. The participation was considered voluntary and all responses were anonymous.

Results: The survey targeted 1,130 predoctoral students, of which 255 (22.6%) responded. Of the respondents, 124 students (48.6%) preferred traditional lecture mixed with online learning, while 46 students (18%) preferred only the traditional lecture style. The top three electronic resources/applications, which students perceived as having the greatest impact on their learning, were: YouTube, Bone Box, and Google. The responses also indicated that 76.5% of the students gave high credibility (scores of 4 and 5) to electronic resources recommended by faculties. Sixty percent of students spent 1 to more than 4 hours per day on electronic resources for academic performance. The most important factor for online applications influencing academic performance was "organization and logic of content" (54%). E-learning had a significant perceived effect (scores of 4/5) on didactic understanding (65.1%) and on clinical understanding (71.4%). Students observed that faculties estimated to be under 50 years of age were more likely to incorporate e-learning into courses (52.6%) and more likely to use social media for communication (41.6%).

Conclusion: The results indicate that e-learning may successfully be used in a dental school's curriculum to enhance students' perceptions of fundamental concepts and to enable students to apply this knowledge to clinical cases.

Clinical significance: E-learning has recently been proposed as a basic

Awareness of, Beliefs about, Practices of, and Barriers to Teledentistry among Dental Students and the Implications for Saudi Arabia Vision 2030 and Coronavirus Pandemic

Khalid T Aboalshamat [1]

Affiliations + expand

Abstract

Objectives: Saudi Arabia launched multiple initiatives to overcome the problem of health-care access. The recent coronavirus pandemic created urgent demand to deal with the problem using nonconventional venues such as telehealth and teledentistry. This study aimed to investigate teledentistry knowledge, attitudes, and practices, and barriers to its use among dental students and teaching staff in Makkah province, Saudi Arabia.

Materials and methods: A total of 314 dental students participated in this cross-sectional study. Data were collected using a validated self-reported questionnaire to measure teledentistry awareness, attitude, practices, and barriers to teledentistry. The study was approved by Umm Al-Qura University, Saudi Arabia.

Results: Only 17.2% were aware of the term "teledentistry." However, after it was explained, participants were able to correctly answer 25.16%-62.42% of items about teledentistry. A total of 67.83% would practice teledentistry, and 70.7% support using teledentistry on a national scale for Vision 2030. Only 25.16% used teledentistry before, but 56.05% did dental consultations via smartphone. The most common barriers were patient satisfaction requiring a dentist's physical presence, violation of patient privacy, and low levels of population education.

Conclusion: Dental students seem to know little about teledentistry. However, they are open to learning and using it. It is encouraged to include the topic in continuing dental education, including how to use it during health disasters such as the coronavirus pandemic.

Keywords: COVID-19; Saudi Arabia; Teledentistry; Vision 2030; attitude; barriers; dental students; knowledge; telehealth.

The application of teledentistry for Saudi patients' care: A national survey study

Soulafa A. Almazrooa,[a,*] Ghada A. Mansour,[a] Sana A. Alhamed,[a] Sarah A. Ali,[a] Sara K. Akeel,[a] Nada A. Alhindi,[a] Osama M. Felemban,[b] Hani H. Mawardi,[a] and Nada O. Binmadi[a]

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Abstract

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Background/purpose

Teledentistry has emerged as a new communication tool in various dental disciplines around the world. The aim of this study was to investigate the applicability and reliability of teledentistry in the field of diagnostic dentistry and explore the perception of Saudi dentists of its benefits and concerns.

Materials and methods

An electronic survey with 40 questions was developed, validated and distributed electronically by email and social media channels to dentists from different specialty in Saudi Arabia. Collected data were analyzed for statistical significance.

Results

A total of 148 dentists completed the survey. The current data demonstrated that 50% of study participants have had applied teledentistry in their clinical practice. Out of all, 90% have computers in their dental offices and 72% have been using electronic medical records in which radiographs and clinical images are uploaded. Most participants had smart phones (91%), in which they were used more commonly (74.3%) than conventional cameras (54.1%) to capture and share patients' clinical images over communication applications (74.3%) and less likely through emails (62.2%). Overall, 83% were confident that teledentistry can improve daily dental practice, specifically in the fields of oral radiology followed by endodontics and oral medicine.

Conclusion

Teledentistry is an emerging tool with potential to improve the delivery of diagnostic dental care for communities with limited or no access to dental specialists. As of today, teledentistry has not been truly implemented by the Saudi dental community. Development

Cost-analysis of teledentistry in residential aged care facilities

Rodrigo Mariño [1], Utsana Tonmukayakul [2], David Manton [3], Andrew Stranieri [4], Ken Clarke [5]

Affiliations + expand

Abstract

Introduction: The purpose of this research was to conduct a cost-analysis, from a public healthcare perspective, comparing the cost and benefits of face-to-face patient examination assessments conducted by a dentist at a residential aged care facility (RACF) situated in rural areas of the Australian state of Victoria, with two teledentistry approaches utilizing virtual oral examination.

Methods: The costs associated with implementing and operating the teledentistry approach were identified and measured using 2014 prices in Australian dollars. Costs were measured as direct intervention costs and programme costs. A population of 100 RACF residents was used as a basis to estimate the cost of oral examination and treatment plan development for the traditional face-to-face model vs. two teledentistry models: an asynchronous review and treatment plan preparation; and real-time communication with a remotely located oral health professional.

Results: It was estimated that if 100 residents received an asynchronous oral health assessment and treatment plan, the net cost from a healthcare perspective would be AU$32.35 (AU$27.19–AU$38.49) per resident. The total cost of the conventional face-to-face examinations by a dentist would be AU$36.59 ($30.67–AU$42.98) per resident using realistic assumptions. Meanwhile, the total cost of real-time remote oral examination would be AU$41.28 (AU$34.30–AU$48.87) per resident.

Discussion: Teledental asynchronous patient assessments were the lowest cost service model. Access to oral health professionals is generally low in RACFs; however, the real-time consultation could potentially achieve better outcomes due to two-way communication between the nurse and a remote oral health professional via health promotion/disease prevention delivered in conjunction with the oral examination.

Keywords: Economic evaluation; cost-analysis; older adults; oral health; teledentistry

The impact of COVID-19 on dental education in North America—Where do we go next?

David T. Wu, [1] Kevin Y. Wu, [2,3] Thomas T. Nguyen, [1] and Simon D. Tran [2]

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Associated Data

▶ Data Availability Statement

Abstract

Go to: ⊙

During the COVID-19 pandemic, the dental education community faced unprecedented challenges. In this commentary, we share the perspectives of faculty clinicians, residents and students in academic dental institutions in the United States and Canada. We discuss COVID-19's impact on various aspects of academic dentistry including patient care, education, research and raise key concerns regarding the future of dental education post-pandemic.

Keywords: COVID-19, infection control, online learning, prevention, teledentistry

1. INTRODUCTION

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During the COVID-19 pandemic, the academic dental community faced a myriad of challenges. [1,2,3] Dental education institutions in North America followed governmental recommendations and implemented measures to actively respond to the ongoing public health crisis in all areas including patient care, education, research and dental team wellbeing. Dental institutions worked closely with universities, health centres and governments to make informed decisions to ensure the safety and wellbeing of patients, students and all members of the education and dental team. [4] The COVID-19 public health crisis affected several areas of academic dentistry including patient care, education and research. In this commentary, we share our perspectives, discuss the impact of COVID-19 on dental education in North America and raise key concerns regarding the future of dental education post-pandemic.

2. IMPACT ON PATIENT CARE

Go to: ⊙

Due to the risk of infection transmission in the dental setting, academic dental institutions have, since March 2020, closed teaching clinics and sent students home to continue didactic learning in accordance with governmental stay-at-home measures. In terms of dental emergencies, it was crucial for oral health professionals to maintain non-hospital based urgent dental care services operational in order to help reduce the burden on our hospital centres already under pressure. [5] Most institutions have limited patient care to only urgent or emergency needs with faculty clinicians and advanced dental education residents providing care. Dental students are also participating in teledentistry consultation to continue their learning. However, they do not provide care in the clinic. Teledentistry consultations are used to triage patients to reduce the need for in-person appointments and mitigate the risks of disease transmission if the issue can be resolved by consultation. Institutions follow

Attitudes toward Social Media among Practicing Dentists and Dental Students in Clinical Years in Saudi Arabia

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Abstract

Background:

Recently, social media use has been rising among dental students and practitioners.

Objective:

The aim of this study was to investigate the usage, attitudes, and professionalism on social media among dental students and dentists in Saudi Arabia.

Methods:

This cross-sectional study investigated 779 dental students, interns, and dentists recruited from university hospitals and private clinics in three major cities (Jeddah, Riyadh, and Dammam), representing the eastern, central, and western regions of Saudi Arabia. Validated questionnaires were distributed to the participants asking about the use of social media for general purposes and professional purposes, attitudes on the social media, professionalism on social media, and the use of social media for marketing purposes. This study was ethically reviewed and approved by the Faculty of Dentistry Institutional Review Board, Umm Al-Qura University with application number (102-18).

Results:

Among the participants, the social media platforms most frequently used on a weekly basis are WhatsApp (m = 6.13 days/week, SD = 2.10), Snapchat (m = 5.33, SD = 2.65), and Instagram (m = 4.63, SD = 2.84). LinkedIn was the least frequently used platform. The most common professional uses were to watch clinical procedures (80.49%), find new information (79.59%), learn from peers (61.1%), and communicate with patients (5.76%). Only 47.75% followed their university or workplace professionalism guidelines, and 31.74% do not have any professionalism guidelines for using social media. There were 28.75% of participants who had considered posting information/photos about a patient without the patient's permission, those who had criticized a dental colleague numbered 49.04%, and 59.69% had criticized a dental organization. However, only a few items had statistically significant differences between dental students and dentists.

Conclusion:

More stringent guidelines regarding proper conduct online should be implemented and included in the dental continuous education material.

Keywords: Social media, Attitude, Professionalism, Dental students, Dentists, Saudi

Social media use in medical education: a systematic review

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Affiliations + expand

Abstract

Purpose: The authors conducted a systematic review of the published literature on social media use in medical education to answer two questions: (1) How have interventions using social media tools affected outcomes of satisfaction, knowledge, attitudes, and skills for physicians and physicians-in-training? and (2) What challenges and opportunities specific to social media have educators encountered in implementing these interventions?

Method: The authors searched the MEDLINE, CINAHL, ERIC, Embase, PsycINFO, ProQuest, Cochrane Library, Web of Science, and Scopus databases (from the start of each through September 12, 2011) using keywords related to social media and medical education. Two authors independently reviewed the search results to select peer-reviewed, English-language articles discussing social media use in educational interventions at any level of physician training. They assessed study quality using the Medical Education Research Study Quality Instrument.

Results: Fourteen studies met inclusion criteria. Interventions using social media tools were associated with improved knowledge (e.g., exam scores), attitudes (e.g., empathy), and skills (e.g., reflective writing). The most commonly reported opportunities related to incorporating social media tools were promoting learner engagement (71% of studies), feedback (57%), and collaboration and professional development (both 36%). The most commonly cited challenges were technical issues (43%), variable learner participation (43%), and privacy/security concerns (29%). Studies were generally of low to moderate quality; there was only one randomized controlled trial.

Conclusions: Social media use in medical education is an emerging field of scholarship that merits further investigation. Educators face challenges in adapting new technologies, but they also have opportunities for innovation.

Dentists' Self-perception on Teledentistry: The Changing Landscape Driven by Technological Booming in the 21st Century.

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Abstract

Aim:

Teledentistry has gained popularity worldwide because it is cost-effective and increase accessibility to dental healthcare. This study assessed the self-perceptions of teledentistry among dental practitioners in Saudi Arabia and examinedany gender-related differences.

Methods:

This cross-sectional study was conducted between January and December 2017 and recruited a convenience sample of dental practitioners, whose self-perceptions of the practice-related use of teledentistry were assessed viaateledentistry survey (TDS). The TDS consisted off our sections:efficiency in patient care, cost reduction,capabilities forimproving practice, and security and confidentiality.Data analyseswere conducted throughdescriptive statistics,internalreliability tests(Cronbach's alpha), andchi-squaredtests of the TDS.

Results:

The response rate was 620/800(78%). Most respondents were female (62%), and 58% of themworked in the public sector. The internal reliability of the TDS was 0.85 for the whole sampleand 0.85 and 0.90 for males and females, respectively. Among the entire sample, 51% agreed that teledentistry reduced potential cost, and 65% reported shortened waitlists. More females (42%, $p<0.001$) than males (22%) agreed that teledentistry could help monitor a patient's condition.More females (35%) than males (13%, $p<0.001$) considered that teledentistry would require additional appointments for imaging. More females(29%, $p=0.0001$) than males (22%) expressed great concern aboutpotential violations of confidentiality.

Conclusion:

These findings suggest thatteledentistry in dental practiceis well perceived by practitioners in Saudi Arabia. Gender differences in perceptions are linked to certain aspects of teledentistry.

Keywords: Dentists, Self-perception, Technology, Teledentistry, Teledentistry survey, Sociodemographic characteristics.

Teledentistry as a novel pathway to improve dental health in school children: a research protocol for a randomised controlled trial

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Abstract

Background

Despite great improvement in child oral health, some children subgroups still suffer from higher levels of dental caries. Geographic and socioeconomic barriers and the lack of access to dental care services are among common reasons for poor oral health in children. Historically in Australia, oral health therapists or dental therapists have been responsible for providing dental care for school children through the School Dental Services (SDS). The current SDS has been unable to provide sustainable dental care to all school children due to a reduction in workforce participation and limited resources. We propose a paradigm shift in the current service through the introduction of user-friendly technology to provide a foundation for sustainable dental care for school children.

Methods/design

We describe an ongoing parallel, two-armed, non-inferiority randomised controlled trial that compares routine and teledental pathway of dental care in children aged 4–15 years ($n = 250$). Participating schools in Western Australia will be randomly assigned to the control or teledental group, approximately three schools in each group with a maximum of 45 children in each school. All participants will first receive a standard dental examination to identify those who require urgent referrals and then their teeth will be photographed using a smartphone camera. At the baseline, children in the control group will receive screening results and advice on the pathway of dental care based on the visual dental screening while children in the teledental group will receive screening results based on the assessment of dental images. At 9 months follow-up, all participants will undergo a final visual dental screening. The primary outcomes include decay experience and proportion of children become caries active. The secondary outcomes include the diagnostic performance of photographic dental assessment and costs comparison of two pathways of dental care.

Discussion

The current project seeks to take advantage of mobile technology to acquire dental images from a child's mouth at school settings and forwarding images electronically to an offsite dental practitioner to assess and prepare dental recommendations remotely. Such an approach will help to prioritise high-risk children and provide them with a quick treatment

POTENTIAL OF TELEDENTISTRY IN THE DELIVERY OF ORAL HEALTH SERVICES IN DEVELOPING COUNTRIES

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Affiliations + expand

PMID: 32669987   PMCID: PMC7358811

Abstract

In developing countries, access to qualified medical personnel especially oral health care specialists by inhabitants of rural and remote areas remain a challenge due to the fact that these personnel are mostly located in urban communities. Teledentistry is an approach that will eliminate the problem of distance between qualified oral health care personnel and potential patients in rural and remote communities. The objective of this review is to investigate the history of teledentistry and its practical application in overcoming the rural-urban oral health care problems. A scoping search of literature using keywords associated with telemedicine and teledentistry and its application was undertaken via PubMed and Scientific Electronic Library Online (SciELO). Literature published in English in the last 10 years (2008 - 2018) were selected. The review summarises the available literature related to origin and method of delivering teledentistry and its use in dental practice and education. It shows that teledentistry has the ability to improve access to and delivery of oral health care at a relatively lower cost as well as supplementing traditional teaching methods in dental education. However, despite the promising nature of teledentistry in improving oral health care provision, it is associated with some attending problems and challenges.

Keywords: Developing countries; Remote; Rural; Teledentistry; Telemedicine.

Efficacy of a remote screening model for oral potentially malignant disorders using a free messaging application: A diagnostic test for accuracy study

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Research output: Contribution to journal › Article › peer-review

📖 **Overview**　　◎ Fingerprint

Abstract

Objective: To assess the feasibility of using a remote sensing model as a free messaging application tool in the preventive screening of oral potentially malignant disorders in a rural area of India. Design: An observational cross-sectional study. Setting: Primary care setting in Udupi District, Karnataka, South India. Participants: One-hundred and thirty-one individuals with a mean (SD) age of 37.34 (11.31) years, of whom 64.1% and 35.9% were men and women, respectively. Interventions: Clinical oral examination followed by photo capture of five areas of the patients' mouth. Main outcome measures: Reliability measures for the use of a photo messaging service in diagnosing oral potentially malignant disorders, as compared to the clinical examination. Results: When lesions were categorised as normal and abnormal, the reliability (kappa) between the diagnoses, based on photo messaging and clinical oral examination, was 0.68 and 0.67 for Examiners 1 and 2, respectively. The sensitivity values for Examiners 1 and 2 were 98.5% and 99.04%, respectively, whereas the specificity was 72% and 64%, respectively. When the agreement between photo messaging and clinical oral examination for an exact diagnostic match was assessed, the reliability (kappa) was 0.59 and 0.55 for Examiners 1 and 2, respectively. The sensitivity values for Examiners 1 and 2 were 98.1% and 98.7%, respectively, whereas the specificity was 64% and 52% respectively. Conclusion: There was a substantial agreement between the diagnosis based on clinical examination and WhatsApp image for both the examiners, when the lesions were dichotomised as normal and abnormal, but slightly reduced when assessed for the exact diagnostic match. Screening for oral potentially malignant disorders using photo messaging can serve as an effective adjunct and a potential cost-effective tool in a low-resource setting.

Accuracy of remote diagnoses using intraoral scans captured in approximate true color: a pilot and validation study in teledentistry

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Abstract

Background

Intraoral scans (IOS) provide three-dimensional images with approximate true colors representing a possible tool in teledentistry for remote examination. The aim of the present cross-sectional validation study was, therefore, to evaluate the levels of agreement between remote diagnoses derived from IOS and diagnoses based on clinical examinations for assessing dental and periodontal conditions.

Methods

The test sample comprised 10 patients representing different clinical conditions. Following the acquisition of IOS (Trios, 3Shape), a full-mouth dental and periodontal examination was done and periapical radiographs were taken. Ten dentists were asked to perform dental and periodontal scorings for each of the ten patients on a tablet computer presenting the IOS. Scores included diagnosis of gingivitis/periodontitis, and evaluated presence as well as amount of plaque and calculus, and presence of teeth exhibiting gingival recession, furcation involvement, erosion, tooth wear, stain, and non-carious cervical lesion, as well as presence of decayed, filled, and crowned teeth and implants. In a second round of assessments, the periapical radiographs were provided and the dentists were able to change the scores. The time for the remote assessment was recorded. The agreement between remote and clinical scorings (reference) was then analyzed descriptively.

Results

The mean time for the tele assessment was 3.17 min and the additional consultation of the radiographs accounted for another 1.48 min. The sensitivity and specificity values were 0.61 and 0.39 for gingivitis and 0.67 and 0.33 for periodontitis, with no relevant changes when radiographs were provided for the diagnosis of periodontitis (0.72 and 0.28). The agreement for dichotomized dental and periodontal indices ranged between 78 and 95%. With the provision of radiographs, the remote examiners were able to detect existing filled teeth, crowned teeth, and implants, whereas the detection of decayed teeth (70%) was not improved.

End-user acceptance of a cloud-based teledentistry system and Android phone app for remote screening for oral diseases

Mohamed Estai [1], Yogesan Kanagasingam [2], Di Xiao [2], Janardhan Vignarajan [2], Stuart Bunt [1], Estie Kruger [1], Marc Tennant [1]

Affiliations + expand

Abstract

Objective This study aimed to evaluate users' acceptance of a teledentistry model utilizing a smartphone camera used for dental caries screening and to identify a number of areas for improvement of the system. Methods A store-and-forward telemedicine platform "Remote-I" was developed to assist in the screening of oral diseases using an image acquisition Android app operated by 17 teledental assistants. A total of 485 images (five images per case) were directly transmitted from the Android app to the server. A panel of five dental practitioners (graders) assessed the images and reported their diagnosis. A user acceptance survey was sent to the graders and smartphone users following completion of the screening program. Results Of the 22 surveys sent out, 20 (91%) were completed. Generally, users showed optimism towards the use of the teledentistry system, and strongly positively assessed items on content and service quality. The majority of graders took less than 15 min to read the images while phone users took 5-10 min to complete the dental photography using the Android app. This study identified a number of factors that are essential for improving the current system, such as optimization of smartphone camera features, the format of the server, and the orientation of images and using oral retractors during photography. Conclusions Users appear to be generally satisfied with the proposed teledentistry model. However, they have specific concerns to address, many of which could be resolved through more effective training, coordination between sites and upgrading the current system.

Keywords: Attitude; dental screening; dentist; smartphone; store-and-forward; telemedicine.