

GRADUATION PROJECT

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TELEODONTOLOGY

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ABSTRACT

Introduction: Teleodontology or Teledentistry is the use of telecommunication and information technology to provide both care and education in the dental field at a distance. It involves the use of remote monitoring, video conferencing and other digital communication tools to enable dentists and other health professionals to consult and treat patients who are not physically present in the clinic.

Objectives: To establish the most frequent indications for the use of Teleodontology, as well its accuracy and perception from both health professionals and patients' point of view.

Methodology: We analyzed 58 articles related to Teledentistry, its applications and exponential rise during and after Covid-19 pandemic.

Conclusion: In recent years, Teledentistry has grown in popularity, especially in places with limited access to dental care. It has shown to be a successful strategy for increasing access to dental care for underserved populations, enhancing patient outcomes, and lowering the price of conventional dental care. However, nowadays, Teledentistry is not unanimously accepted, especially by some patients who question the confidentiality of their personal information and who also do not feel comfortable or overwhelmed by the new technologies. Nevertheless, technologies and their security systems are also evolving rapidly and are becoming more and more efficient, with the primary aim of patient comfort and confidence. It is therefore recommended in some cases to combine the Teledentistry with a more conventional consultation.

Key Words: Dentistry; Teledentistry; Teleodontology; Information technology

RESUMEN

Introducción: La Teleodontología es el uso de las telecomunicaciones y la tecnología de la información para proporcionar tanto asistencia como formación en el campo de la odontología a distancia. Implica el uso de la monitorización a distancia, la videoconferencia y otras herramientas de comunicación digital para que los dentistas y otros profesionales sanitarios puedan consultar y tratar a pacientes que no están físicamente presentes en la clínica.

Objetivos: Establecer las indicaciones más frecuentes para el uso de la Teleodontología, así como su precisión y percepción tanto desde el punto de vista de los profesionales sanitarios como de los pacientes.

Metodología: Se analizaron 58 artículos relacionados con la Teleodontología, sus aplicaciones y aumento exponencial durante y después de la pandemia de Covid-19.

Conclusiones: En los últimos años, la Teleodontología ha crecido en popularidad, especialmente en lugares con acceso limitado a la atención dental. Ha demostrado ser una estrategia eficaz para aumentar el acceso a la atención odontológica de las poblaciones desatendidas, mejorar los resultados de los pacientes y reducir el precio de la atención odontológica convencional. Sin embargo, hoy en día la Teleodontología no es unánimemente aceptada, sobre todo por algunos pacientes que cuestionan la confidencialidad de su información personal y que tampoco se sienten cómodos o abrumados por las nuevas tecnologías. No obstante, las tecnologías y sus sistemas de seguridad también evolucionan rápidamente y son cada vez más eficaces, con el objetivo primordial de la comodidad y la confianza del paciente. Por ello, en algunos casos se recomienda combinar la Teleodontología con una consulta más convencional.

Palabras clave: Odontología; Teleodontología; Tecnología de la información

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1 INTRODUCTION

Teleodontology, also called Teledentistry, is an exchange of clinical information and images. It combines telecommunication and dentistry for dental consultations and treatment planning over vast distances. In 1989, it's the first time this concept appears during the conference in Baltimore, for dental informatics and their efficacy in the delivery of oral health care in dental practice. In 1994, Teledentistry was utilized for a military project which led to advancements in patient healthcare, dental education, and improved communication between dentists and dental laboratories. The U.S. army, tried to manage a dental image system by using an intraoral camera in a way to obtain color images of the patient's mouth and transmit them to a dental clinic situated over a distance of 120 miles. In 1997, Cook defined Teledentistry as "the practice of using video-conferencing technologies to diagnose and to provide advice about the treatment over a distance". For many authors, this new way of telecommunication will fundamentally change the future of oral health and dental practices ⁽¹⁻³⁾.

Nowadays, according to WHO, the World Health Organization, Teledentistry can be defined as "The delivery of health-care services, where distance is a critical factor, by all health-care professionals using information and communications technologies for the exchange of valid information for treatment and prevention of disease and injuries, research and evaluation, and the continuing education of health-care workers, with the aim of advancing the health of individuals and communities" ⁽⁴⁾.

In 2019, Teledentistry is experiencing a major boom with the arrival of a global pandemic. Covid-19 has radically changed the daily lives of people and the medical world, especially dentists and oral specialists. Effectively, because of its high power of contagiousness and morbidity, this virus became the greatest concern during December 2019. This virus can be lethal when it evolves in interstitial pneumonia, thus procedures involving droplets like any restorative procedures or a simple dental prophylaxis put the dental and team workers at a high risk of infection and contamination. Thereby new personal protective equipment (PPE) made their apparition in order to decrease the risk of contamination and propagation of the virus. Dental treatments become a risk for the dental practitioners and assistants but also for the patient. Despite an adaptation of sanitary and hygienic methods such as social distancing, quarantine, only urgent treatment and

producing systemic symptoms are treated as a priority. Any other treatment is delayed and suspended until the global health situation has evolved and stabilized. Thereby Teleodontology is growing rapidly, allowing for long-distance dental care and advice, this helps to mitigate the risk of COVID-19 transmission ⁽⁵⁾.

After the pandemic, even if the risk of the Mondial contamination has considerably decreased, the preventive and protective measures are kept in place for the sanitary protection of both the patient and the dentist. Improving patients' access to professional advice and minimizing healthcare disparities are ones of the most important considerations of Teledentistry. It allows patients to have an easier access to diagnosis and management of their oral health concerns. The treatment duration is shortened without affecting the quality of it and thereby the waiting times are also reduced. Effectively, a reduction of dental cost was observed, and more complete information were offered for deeper dental analysis, even in distant rural areas ⁽¹⁻³⁾.

Teledentistry can be applied in many specialties in dentistry such as in Oral and Maxillofacial Surgery in which oral surgeons can make a faster and easier diagnosis during orofacial emergencies such as Ludwig's angina, necrotizing fasciitis or pathologies related to impacted third molars. It's also facilitating the revision of the surgery and answer to any concerns that could have the patient related to his treatment. Oral malignant lesions for example can also be detected and diagnosed earlier, allowing a faster access to the treatment, increasing its safety and effectiveness ⁽⁶⁾.

In Endodontics, it can be used to help dental colleagues who live and work in rural areas, to recognize root canal orifices or periapical lesions without the need of travelling or send the patient far from where they live. Many doubts about pulp or periapical pathologies are resolved immediately and thus the patient could be treated in a shorter period of time ⁽⁶⁾.

Children also seem comfortable with this kind of new technology. It's a really an advantage for them and their parents. Through telecommunication, an easier access and a better control of oral hygiene have been observed in children. The virtual consultation doesn't force the parents to leave their job earlier and prevent children to miss class. In fact, children with high risk of caries can be advised online, with the presence of their parents, and thus allow dental professionals to improve their oral hygiene and their brushing techniques before another evaluation the following months. Thereby the oral health of

pediatric patients can be controlled and monitored regularly and enable professionals to distinguish between emergency and urgency patient ^(2, 6-8).

Teledentistry has been also really useful for patients following an orthodontic treatment. It is not a treatment that could be solved in only one appointment, it's a process in which we need time for the teeth to move correctly and regular checkups. By doing the orthodontic appointment online, it allows many professionals and patients, to gain time and money. During the virtual consultation, the patient should take pictures of his mouth and of his appliances to control if the teeth are displacing correctly. Teledentistry is a great tool especially when there is rubber ligature displacement, discomfort and irritations or to solve minor orthodontic emergencies ^(6, 8).

Not only Teledentistry is really effective in the prevention and treatments for our young generation, but also with the geriatric patients. Indeed, becoming older is often accompanied by losing teeth and bone structure, and a relaxation of the muscles. Teledentistry has showed an important impact on the older generation for who, traveling far distances is not as easy as before. Geriatric patient who opted and adapted to new technologies, have seen in most of the cases, their oral health controlled and enhanced thanks to these virtual consultations, especially in patients wearing fixed or removable prosthesis. Indeed, in prosthodontics, Teledentistry has also its effectiveness for the evaluation of supporting tissues structures, edentulous ridges, advices for the preparation of abutment teeth by the use of pictures, radiographs and diagnostic casts or answer to any concerns related to retainers' fracture. Patient with periodontal problems also found Teledentistry useful, especially after a periodontal surgery. They have appreciated the fact to be well followed up and to have the possibility to ask for any advice at any times ^(3-4, 6).

Finally, Oral and Maxillofacial surgery, Restorative and Endodontic treatments Orthodontics, Pediatrics and Geriatrics patients are domains in which Teledentistry can be an effective and accurate tool for diagnosis or treatment planning. It also plays a key role in Dental Education, enabling students to learn and see many cases. Classified in two categories: self-instruction and interactive videoconferencing which allow health teachers to supplement their traditional teaching methods ⁽⁶⁾.

However, Teledentistry can have some limitations, some pathologies will still need a dental act and the respect of confidentiality is still discussed from an ethical point of view⁽⁹⁾.

In a future, Teledentistry may play an important gap in oral health care system.

Despite the previous applications, the innovation of technologies will allow us a better communication inter specialist, an overall reduction of the cost and finally an easiest access to dental consultations, decreasing the inequity between urban and rural zone ⁽¹⁰⁻¹¹⁾.

1.1 How does Teledentistry work?

Teledentistry works by using various communication technologies to connect dentists and patients remotely. Here's how it typically works:

- Initial consultation: The patient contacts a dental provider to request a teledentistry appointment. The provider may ask the patient to fill out a questionnaire or provide some basic information about their oral health and medical history ⁽¹²⁾.
- Video conferencing: The healthcare provider arranges a virtual video conference with the patient via a secure platform that meets the HIPAA regulations. Compliance with HIPAA regulations means following the deadlines set forth in the Health Insurance Portability and Accountability Act (HIPAA) of 1996, which establish national standards for safeguarding individuals' medical information, also referred to as protected health information (PHI) ⁽¹²⁾.
During the conference, the dentist may ask the patient to show them their mouth or teeth using a handheld camera or a special dental camera ⁽¹²⁻¹³⁾.
- Diagnosis and treatment planning: Based on the information gathered during the video conference, the dentist can diagnose the patient's condition and recommend an appropriate treatment plan. The dentist may also prescribe medication or refer the patient to a specialist if needed ⁽¹²⁻¹³⁾.
- Follow-up and monitoring: The dentist might arrange subsequent visits to keep track of the patient's development and modify the treatment strategy if needed. The patient can also use teledentistry to ask questions, receive education on oral health, or get advice on maintaining good oral hygiene ⁽¹²⁻¹³⁾.

Indeed, teledentistry provides a convenient and effective way for patients to receive dental care from the comfort of their homes, especially in areas where dental services may be limited or inaccessible. It also allows dentists to reach a wider patient population and provide care more efficiently ^(1, 12).

- Teledentistry can be categorized in two approaches: Real-time consultation and Store-and-Forward method. Real-time consultation refers to a live, interactive video conference between the dental provider and the patient. This method enables the dental provider to inquire about the patient's condition, examine their teeth and mouth, and provide instant feedback and

guidance. Real-time consultation is beneficial for addressing urgent dental problems and conducting routine check-ups and consultations ^(1, 6). Figure 1.

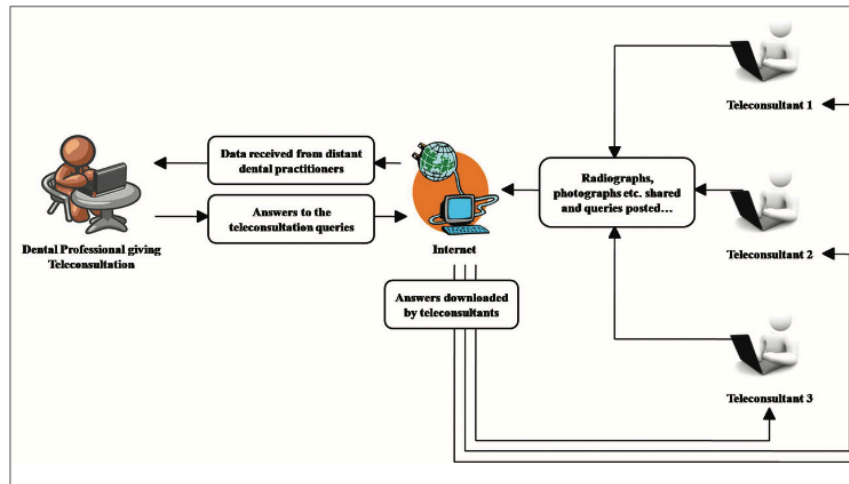


Fig.1 Real-time consultation ⁽¹⁾

- Store-and-forward method: Store-and-forward method involves capturing and transmitting digital images or other data to the dental provider for later review and diagnosis. This approach is sometimes referred to as "asynchronous" telemedicine because the dental provider and patient do not interact in real-time. Instead, the patient takes pictures or videos of their teeth or mouth and submits them electronically to the dental provider, who reviews them at a later time. The dental provider may then provide a diagnosis and treatment plan remotely ^(1, 6). Figure 2.

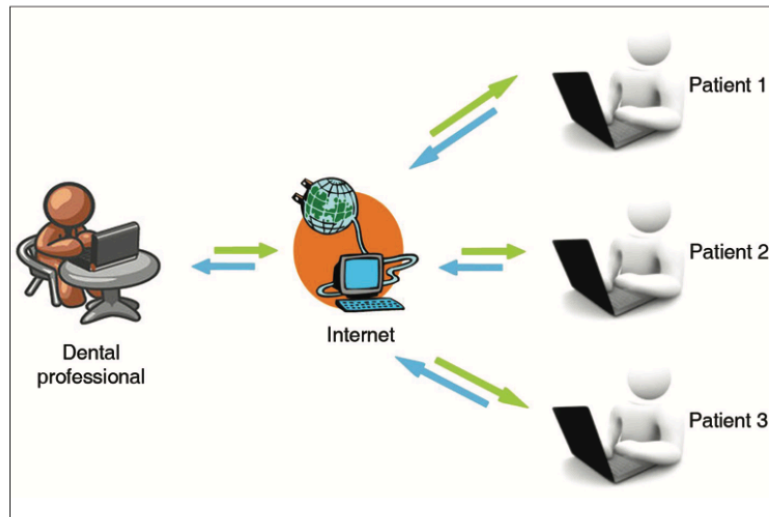


Fig.2 Store-and-Forward ⁽¹⁾

In fact, the key difference between real-time consultation and store-and-forward methods is the timing of the interaction between the dental provider and the patient. Real-time consultation provides immediate feedback and allows for a more interactive and personalized experience, while the store-and-forward method is more flexible and allows for greater convenience and access to care. Both real-time consultation and store-and-forward methods have their advantages and disadvantages, and the choice of which approach to use will depend on the specific needs of the patient and the dental provider ^(1, 6).

Teledentistry relies on various technologies to enable remote communication and collaboration between dentists and patients ⁽¹⁴⁾.

Some of the information and communication technologies (ICT) used in teledentistry, include:

- **Video conferencing**: This technology allows dentists and patients to communicate in real-time using video and audio, much like an in-person consultation. Video conferencing platforms like Zoom, Skype, and WebEx are commonly used for teledentistry appointments ⁽¹⁾. Mouthwatch is one of them and a special teledentistry platform that offers a range of tools for dental providers, including intraoral cameras, digital imaging software, and teleconsultation capabilities. Mouthwatch is HIPAA-compliant and can be integrated with a variety of dental practice management software programs ^(13, 15).
- **Digital imaging**: Specialized cameras and scanners can capture high-quality images of a patient's teeth and mouth, which can then be shared electronically with dentists and other dental professionals for diagnosis and treatment planning. There are different types of

cameras that are used in teledentistry to capture images of a patient's teeth and mouth. Some of the most commonly used cameras are the following:


- **Intraoral cameras:** These are small cameras that can be inserted into a patient's mouth to capture high-quality images of their teeth and gums. Intraoral cameras are designed to be lightweight and easy to maneuver, allowing dentists to capture detailed images of a patient's oral cavity from multiple angles ^(1, 6, 16).
- **Digital cameras:** Digital cameras are also used in teledentistry to capture images of a patient's teeth and mouth. These cameras can be either handheld or attached to a tripod, and they can capture high-resolution images that can be shared electronically with dental providers ^(13, 16-17). Figure 3.

Periapical Image Report

Patient: XXXX XXXX QQ YYYYYY Identification: 96080610278 Date of Birth : Gender :	Dentist: Institution: Date of Image : November 9 th , 2011 Report Number : 999109
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HEADER

IMAGE



BODY

DESCRIPTION
 Periapical Rx where it is possible to see an apical root fracture with a displacement and a big bone destruction in the periapical level.

CIE10
DIAGNOSTIC : xxxxxxxxxxxx

Fig.3 Periapical X-ray transferred to a specialist in Endodontic ⁽¹⁷⁾

- **Panoramic X-ray machines:** Panoramic X-ray machines are specialized cameras that capture a panoramic view of a patient's teeth and jaw. These machines are commonly used to diagnose complex oral health issues and plan dental treatments ⁽¹⁷⁾. Figure 4.

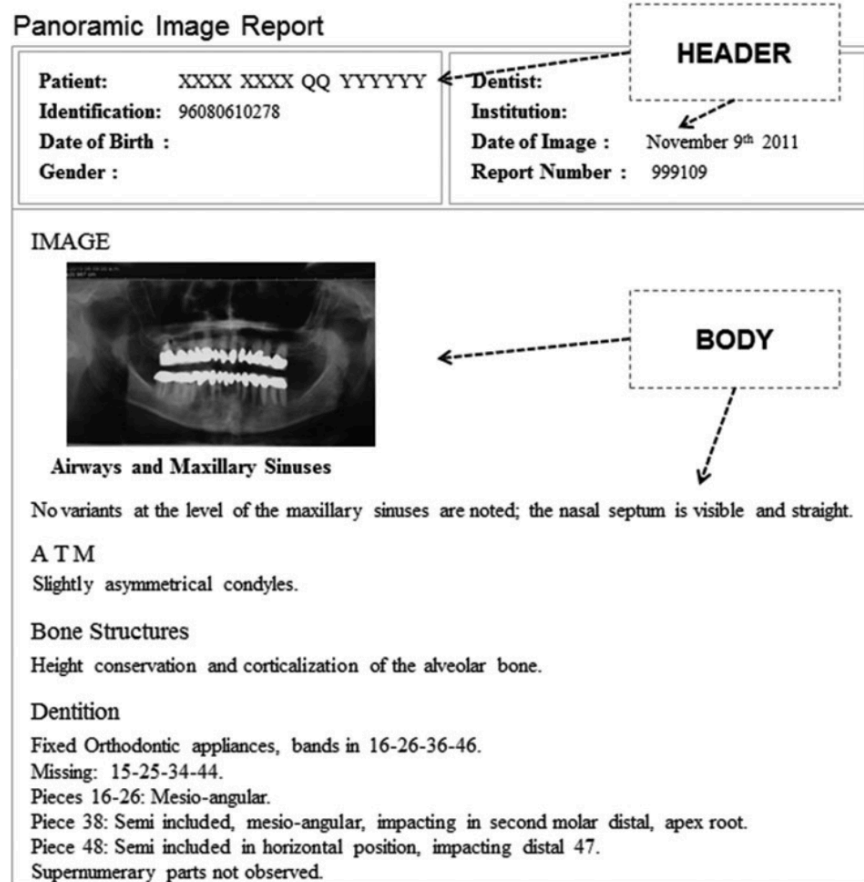


Fig.4 Panoramic X-ray⁽¹⁷⁾

- **CBCT scanners:** Cone beam computed tomography (CBCT) scanners employ a cone-shaped X-Ray beam to acquire three-dimensional images of a patient's teeth, jaw, and adjacent structures, making them highly sophisticated imaging equipment. CBCT scanners are commonly used in implant dentistry and other complex dental procedures⁽¹⁷⁾.

The type of camera used in teledentistry will depend on the specific needs of the patient and the dental provider. Intraoral cameras and digital cameras are often used for routine check-ups and consultations, while panoramic X-ray machines and CBCT scanners are typically used for more complex diagnostic procedures^(1, 6, 13, 16-17).

- **Electronic health records:** Electronic health records (EHRs) allow dentists to access a patient's medical history, treatment records, and other important information remotely. This enables them to make informed decisions about patient care even when they are not physically present in the same location as the patient⁽¹²⁾.

- ***Remote monitoring:*** Teledentistry can also involve remote monitoring of a patient's oral health using sensors and other monitoring devices. For example, a patient might wear a smart device that tracks their brushing habits and sends that data to their dentist for analysis ⁽¹²⁻¹³⁾.
- ***Mobile apps:*** There are a variety of mobile apps available that can help patients manage their oral health remotely. Some apps provide educational resources on oral hygiene, while others allow patients to track their symptoms or connect with a dental provider for a virtual consultation ⁽¹²⁾.

In conclusion, teledentistry relies on a range of technologies that enable dentists and patients to communicate, share information, and collaborate on oral health care remotely.

1.2 Applications of Teledentistry

1.2.1 Oral and Maxillofacial Surgery

Teledentistry may be recommended initially for patients who require dental surgery, particularly in cases where a specialist's evaluation is necessary for the diagnosis of impacted or semi-impacted third molars. Unfortunately, not all dental offices have a specialist in oral and maxillofacial surgery. Teledentistry can then appear as a good solution. The dentist can, via the Internet, applications and certain platforms, send photographs and X-rays to specialists who are used to encountering this type of pathology. In addition, the diagnosis is done in a very similar way. Patients who were diagnosed via telemedicine and subsequently underwent dentoalveolar surgery with general anesthesia and nasotracheal intubation, were all as effective as if the diagnosis had been made in a traditional way, while avoiding unnecessary visits and reducing waiting time ^(1, 6, 18-19).

The detection and diagnosis of oral lesions can also be facilitated by this tool, making it an intriguing option. Especially in the case of cancerous lesions, which could be detected during routine visits to the dentist. Oral cancers currently have a high mortality rate, mainly due to their late detection. Teledentistry appears as an innovative way for the early detection of precancerous lesions. In a way to observe any dysplacety, autofluorescence will help us for detecting oral potentially malignant lesions (OPMLs), such as Oral Leukoplakia, the one that mostly occurs, but also Erythroplakia and Erythroleukoplakia. The use of autofluorescence equipment and or combination with conventional oral examination has allowed to obtain direct optical images. The quality of the image is very important in order to avoid misdiagnosis. The camera captures high-resolution images up to 2k using an image sensor. Nevertheless, the image resolution may vary depending on the device and the quality of its display . To be able to transfer all the information and images obtained, it is essential to have a secure data transfer software, as the Teledentistry does not yet allow to send information directly from the camera used during the diagnosis ⁽²⁰⁻²⁴⁾. Figure 5.

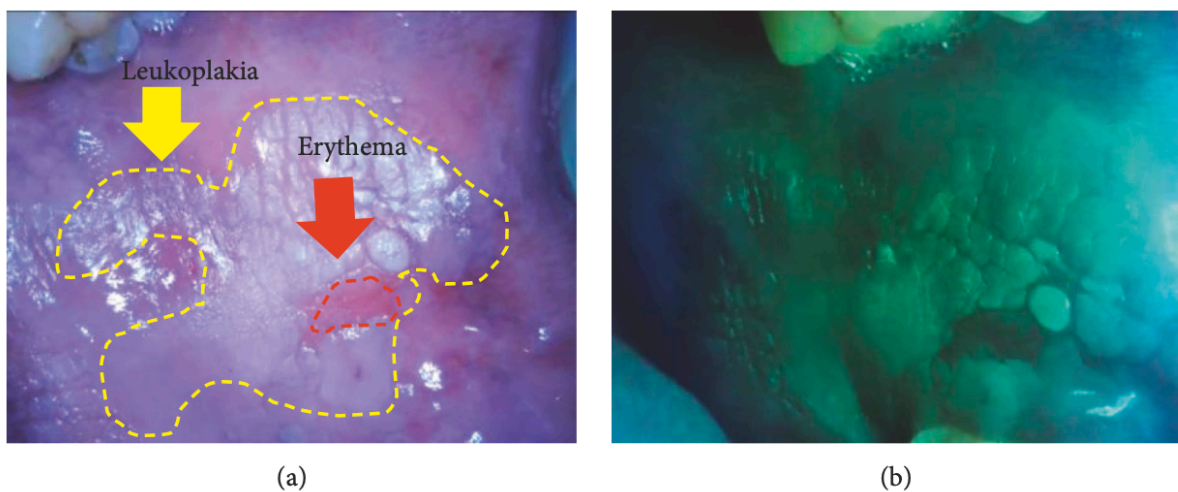


Fig.5 Images from the devices in (a) LED white light mode and (b) autofluorescent mode showing loss of fluorescence in erythema area ⁽²¹⁾.

In order to avoid all kind of diagnostic errors, there is a systematic approach to capture pictures of oral lesions in intraoral specific sites. Depending on the location of the lesion and its extension, there are different technics to positionate the head of the patient, but also how to place the mirror to prevent any distortion of the lesion in the picture. There are some recommendations either the pictures are taken by a professional in the clinic or if it's done at home by the patient himself, when a following and regular checkups are needed, without obligating the patient to come physically at the clinic to see the specialist ^(18, 22-23). Figures 6 and 7.










A. Clinical Setting			
Site of Oral Lesion	Chair/Client Positioning	Mirrors	Method
<p>Hard/soft palate</p> 	Upright, with client facing clinician	Occlusal mirror 	<ul style="list-style-type: none"> Place cheek retractors Patient's tongue should be relaxed on the floor of the mouth Place mirror behind the last molar of the top arch and slant to rest equally on the lower teeth Capture two photos: (1) centring the arch and (2) centred on the lesion The palate should be on 1 vertical plane
<p>Floor of mouth</p> 	Reclined, with client facing clinician	Occlusal mirror 	<ul style="list-style-type: none"> Place cheek retractors Place mirror against patient's raised tongue, at the retromolar area of the lower arch and slant to rest equally against the top teeth The occlusal arch should be centred, with the floor of the mouth on 1 vertical plane
<p>Lingual gingiva</p> 	Upright	Lingual mirror 	<ul style="list-style-type: none"> Place cheek retractors Insert mirror obliquely above the premolars of the opposite arch For the lower lingual gingiva, use the mirror to push the tongue to 1 side and angle it to ensure the lesion is visible Zoom in to capture only the mirror image in the frame The occlusal edge of the teeth should be parallel to the floor Place camera flash further out of the mouth; you may need to hold the device upside down
<p>Buccal gingiva</p> 	Upright	Buccal mirror 	<ul style="list-style-type: none"> Place cheek retractors Patient closes halfway Insert narrow end of buccal mirror and push outwards against the buccal mucosa Zoom in to capture only the mirror image in the frame Occlusal edge of teeth should be parallel to floor Place camera flash further out of the mouth; you may need to hold the device upside down
<p>Anterior gingiva</p> 	Upright, with occlusal plane parallel to the floor	NA	<ul style="list-style-type: none"> Place cheek retractors Patient bites together loosely Occlusal plane should be parallel to floor

Fig.6 A straightforward methodical procedure for obtaining consistent intraoral photographs at a dental clinic, tailored to each site on the patient teeth ⁽²²⁾.




B. Home setting			
Site of Oral Lesion	Patient Positioning	Mirrors	Guidelines
Gums, inside of cheek, inside/outside of lip 	Upright	NA	Patient, using clean fingers, pulls lips or cheeks to the side until the lesion is clearly visible.
Roof of mouth 	Reclined with the head and chin tilted back	NA	Patient, using clean fingers, pulls the cheeks to the side until they are not blocking the lesion.
Floor of mouth 	Chin tilted down	NA	Patient should lift the tongue to the roof of the mouth, or push back the tongue gently with a spoon.

Fig.7 A straightforward methodical approach for obtaining consistent intraoral photographs at home, tailored to the specific location being captured ⁽²²⁾.

Sometimes it is necessary to follow patients and see the evolution of their oral lesions over several days or weeks. To do this, it is often necessary to take pictures, measure the diameter, observe if there has been a change in color, extension or consistency, so the Teledentistry allows patients to avoid moving each time, by taking pictures themselves of the evolution of their lesion. To do this, patients are given a few recommendations beforehand, such as first of all, taking the pictures in a well-lit room, if possible using external light sources such as LEDs or camping headlamps in a way to provide additional luminosity. Separate the mucous membranes, with previously washed hands, to avoid any involuntary movement of the tongue. The image will then be taken without activating the zoom and sent to an internet cloud in order to share the information with the specialist, who will then be able to view and evaluate it on another device with a good image resolution. Unfortunately, it sometimes happens that the images are not totally clear, too bright or too dark, some shadows or insufficient vision, can sometimes make the diagnosis more complicated than in direct consultation on the seat of the specialist ⁽²²⁾. Figure 8.

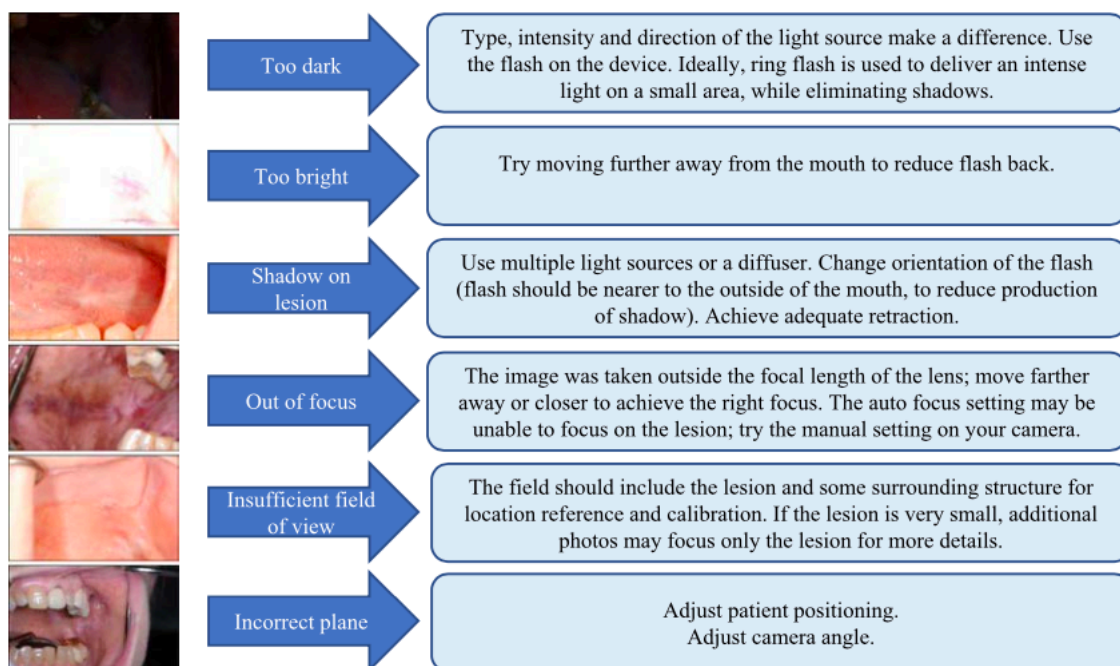


Fig.8 Common issues encountered ⁽²²⁾.

Indeed, there are still some oral pathologies where it is necessary to make a traditional consultation, with physical examination, such as for temporomandibular disorders, orthognathic surgery, salivary gland disorders and special cases of head and neck cancers. This is why Teledentistry is less implemented in oral pathology, oral medicine and oral radiology than in prosthodontics and endodontics ^(2, 25-26).

1.2.2 Endodontic and Restorative Treatments

Teledentistry, also known as virtual dental care, has become increasingly important in endodontics, particularly during the COVID-19 pandemic. Endodontics is a dental specialty that focuses on diagnosing and treating conditions of the inner part of the tooth, including the pulp and root canal system.

Indeed, not all clinics have an endodontic specialist on site. Teledentistry allows, via a virtual session, to obtain the opinion of a colleague specialized in this field, especially when searching for the entrance of a canal or when diagnosing a periapical lesion ⁽⁶⁾.

This is facilitated by the use of software and an intraoral camera (IOC), allowing the detection in real time of the entrance of a root canal. The camera allows the professional who uses it, a better vision and improves the course of the treatment with great sensitivity. However, in order to obtain all the advantages of this procedure, it is necessary to have a good training and practice with the camera and its software ⁽²⁷⁾.

There are several reasons why Teledentistry is important in endodontics:

- Convenient access to care: Teledentistry enables patients to receive dental treatment from the convenience of their own homes, which can be particularly advantageous for individuals who face mobility challenges or reside in remote regions with restricted dental care accessibility ⁽⁶⁾.
- Increased safety: During the COVID-19 pandemic, virtual dental consultations have reduced the risk of exposure to the virus for both patients and dental professionals.
- Improved patient education: Teledentistry enables dental professionals to provide visual aids and other educational materials to help patients better understand their conditions and treatment options ⁽⁶⁾.
- Increased efficiency: Virtual dental consultations can be more time-efficient than traditional in-person appointments, allowing dental professionals to see more patients in a shorter amount of time ^(6, 27).
- Improved continuity of care: Teledentistry allows dental professionals to easily share information and collaborate with other members of a patient's healthcare team, improving continuity of care and reducing the risk of miscommunication ⁽⁶⁾.

Overall, endodontics has benefited greatly from the use of teledentistry as an effective tool, providing patients with convenient, safe, and efficient access to care, as well as improving the quality of care they receive.

Teledentistry refers to the remote provision of dental care through digital technology and telecommunication. In restorative dentistry, it can have a significant impact on the diagnosis and treatment of dental issues, patient care management, and ultimately, enhancing patient outcomes. Some common applications of Teledentistry in restorative dentistry include virtual consultations, remote monitoring of treatment progress, and remote diagnoses. For example, a patient can have a virtual consultation with a dentist to discuss their symptoms and receive

recommendations for further procedure. The dentist can also use remote monitoring tools to track the patient's progress and make adjustments to their treatment plan as needed ⁽²⁷⁾.

The efficacy of Teledentistry in restorative dentistry has been the subject of much research and discussion in recent years. While the use of Teledentistry in restorative dentistry is still in its early stages, it has been indicated by evidence that it may serve as proficient means of identifying and addressing dental issues. One study found that virtual consultations were just as effective as in-person consultations in diagnosing dental problems and determining the appropriate course of treatment. Indeed, Teledentistry has been shown to be effective in remote monitoring of patients undergoing restorative dental treatments, such as dental implants, fillings, and crowns ⁽²⁾.

Additionally, Teledentistry can be used to diagnose dental problems through the use of high-resolution images and videos, allowing the dentist to make a diagnosis without the need for an in-person exam. Teledentistry holds significant promise in enhancing the availability of restorative dental care, particularly for patients residing in remote locations or experiencing mobility constraints. Moreover, it can mitigate the necessity for physical consultations, thereby lowering the risk of contracting contagious illnesses and advancing patient well-being ⁽²⁷⁾.

However, there are also some challenges associated with Teledentistry in restorative dentistry, such as the need for high-quality imaging equipment and reliable internet connectivity. It is important to note that Teledentistry is not a replacement for in-person dental care, and some treatments may still require an in-person visit. Additionally, the use of Teledentistry in restorative dentistry is still subject to regulations and licensing requirements, which vary by jurisdiction ⁽⁶⁾.

In conclusion, the efficacy of Teledentistry in restorative dentistry is still a topic of ongoing research and discussion. Teledentistry has the capacity to significantly enhance the availability of restorative dental treatment, particularly for individuals residing in distant regions or experiencing difficulties with mobility. In these cases, virtual consultations and remote monitoring can be a lifesaver, providing patients with access to dental care that would otherwise be unavailable to them, but it should always be approached with caution and in accordance with established regulations and guidelines.

1.2.3 Pediatric Dentistry

Teledentistry is the provision of dental services using telecommunication technology to communicate with patients remotely, such as video conferencing, phone calls or instant messaging. This can be especially useful for children, as it allows them to receive dental care without having to leave their homes or schools, reducing the stress and anxiety associated with visiting a dental office.

Teledentistry can also be an effective way for dental providers to assess and diagnose dental problems in children, as well as to provide preventive and educational services, such as oral hygiene instructions and nutrition counseling. In some cases, Teledentistry can also be used to provide treatment, such as prescription of antibiotics for certain dental conditions ^(2, 28-29).

By allowing dental providers to assess and diagnose dental problems remotely, Teledentistry can help identify and address dental issues early, before they become more serious and require more extensive treatment, especially in children with a high risk of caries ⁽³⁰⁾.

In terms of efficacy, according to research teledentistry has been demonstrated to be a viable approach for diagnosing and treating typical dental issues in children, such as cavities and gum disease. For example, research has found that dental professionals can accurately diagnose cavities using Teledentistry, and that Teledentistry can be used to monitor the progress of treatment for children with gum disease ^(13, 30-31).

However, it is important to note that Teledentistry is not a substitute for in-person dental exams and treatments, especially for children who may require hands-on procedures and need to establish a relationship with their dental provider. For example, hands-on procedures, such as fillings, extractions, or orthodontic adjustments, cannot be performed through Teledentistry. Children with complex dental problems may also require in-person care, as it may not provide enough information for an accurate diagnosis or treatment plan. Teledentistry can complement in-person care, but it should not replace it ⁽³¹⁾.

In conclusion, Teledentistry can be a valuable tool for improving access to dental care for children, particularly in areas where there are shortages of pediatric dental providers or difficulties in accessing care. Nevertheless, it should be used in conjunction with traditional in-person care to ensure that children receive the best possible dental care.

1.2.4 Orthodontic Treatments

Teledentistry is the use of technology, such as video conferencing and digital images, to provide dental care and consultation remotely. In the field of orthodontics, Teledentistry can be used to diagnose and monitor the progress of orthodontic treatment, as well as to provide remote consultations and advice to patients ^(4, 32).

The Orthoscan camera is an example of the application of Teledentistry. The device consists of an intraoral camera that is equipped with a light source and is placed on the biting surfaces of the patient's teeth, while a mouthpiece is used for support. This method has shown to be accurate in monitoring patient orthodontic treatment evolution ⁽²⁷⁾.

Additionally, orthodontic treatment often requires regular visits to the orthodontist for adjustments and monitoring of the progress of treatment. With Teledentistry, some of these visits can be done remotely, reducing the need for in-person visits and making orthodontic care more convenient and accessible for patients. Orthodontic treatments that can be done via virtual consultation include the following:

- Consultation and diagnosis: Orthodontists can use virtual consultation to diagnose a patient's dental problems, such as misaligned teeth or bite problems, and recommend an appropriate treatment plan ^(2, 32).
- Monitoring treatment progress: Virtual consultations can be utilized by orthodontists to oversee the advancement of current treatment and implement any required modifications ⁽²⁾.
- Invisalign treatment: Invisalign is a popular orthodontic treatment that uses clear aligners to straighten teeth. Orthodontists can use virtual consultation to prescribe and monitor Invisalign treatment ⁽³³⁾.
- Retention check-ups: After orthodontic treatment is completed, patients typically need to wear a retainer to maintain their newly straightened teeth. Orthodontists can use virtual consultation to check the fit and comfort of retainers and make any necessary adjustments ^(6, 8).
- Orthodontic appliances: Some orthodontic appliances, such as clear plastic aligners or removable retainers, can be prescribed and monitored via virtual consultation ⁽⁸⁾.
- Minor orthodontic emergencies: coming from discomfort or irritations and rubber ligature displacement ^(6, 8).

However, it is important to note that Teledentistry is not a substitute for in-person visits and hands-on examination by an orthodontist. Virtual consultations in orthodontic treatments have some limitations, including:

- Limited treatment options: Some orthodontic treatments, such as fitting braces or making adjustments, require in-person visits and cannot be done via virtual consultation ⁽²⁾.
- Technical difficulties: Virtual consultations can be subject to technical difficulties, such as poor internet connection or camera quality, that can hinder the ability of the orthodontist to effectively diagnose and monitor treatment ⁽²⁾.
- Limitations in accuracy: Virtual consultations rely on digital images and video conferencing, which can have limitations in accurately diagnosing and monitoring orthodontic treatment. An in-person examination by an orthodontist is still necessary for a comprehensive evaluation of a patient's dental problems and for hands-on adjustments ⁽²⁾.
- Patient comfort and trust: Some patients may feel uncomfortable with virtual consultations and prefer in-person visits with their orthodontist. Building trust and rapport with a patient is important in orthodontic treatment, and virtual consultations may not be as effective in achieving this as in-person visits.

In conclusion, Teledentistry can play a role in orthodontic treatment by providing remote consultations and monitoring, but it should not replace in-person visits and hands-on examination by an orthodontist. It's important to consider the specific needs and preferences of each patient when determining the best approach for their orthodontic care.

1.2.5 Geriatric Patients

Teledentistry, or the use of technology to provide dental care remotely, has the potential to greatly benefit geriatric patients, who often face challenges in accessing traditional dental care. Some of the benefits of Teledentistry for older adults include:

- Increased Access to Care: Teledentistry provides dental care for seniors in the convenient of their home, offering particular advantages to those residing in rural regions or experiencing mobility limitations ^(2,10).

- **Reduced Stress and Anxiety:** Many older adults experience anxiety or fear when visiting the dentist. Teledentistry provides a more relaxed, low-stress environment that can help reduce these feelings ⁽²⁾.
- **Improved Communication:** Teledentistry can improve communication between patients and their dentists, as they can easily ask questions and receive answers in real-time ⁽²⁾.
- **Cost-effective:** Teledentistry can be a more cost-effective option for older adults, as it eliminates the need for travel and may also reduce the need for in-person follow-up visits ⁽²⁾.

While Teledentistry has many potential benefits for older adults, there are also several limitations to consider:

- **Limited Examination Capabilities:** Teledentistry is primarily focused on virtual communication between patients and dentists, and therefore may not allow for a comprehensive physical examination of the mouth and teeth ⁽²⁾.
- **Limited Treatment Options:** Due to the limited examination capabilities of Teledentistry, some dental procedures may not be able to be performed through virtual means and may require in-person visits. ⁽⁶⁾
- **Technical Challenges:** Older adults may not have access to or be familiar with the technology required for Teledentistry, such as a computer, tablet, or smartphone with a camera and internet connection ^(6, 27).
- **Quality of Care:** Although Teledentistry can offer dental care accessibility, the level of care it delivers may not be equivalent to in-person consultations. This is because virtual communication can be less personal and may not allow for the same level of examination and diagnosis as in-person visits ⁽²⁾.
- **Privacy Concerns:** Older adults may have concerns about the privacy and security of their personal information when using Teledentistry ^(2, 6).

In conclusion, Teledentistry is not a replacement for in-person dental care and may not be suitable for all dental procedures. Geriatric patients may require hands-on examination, which cannot be done through telecommunication technology. It is important for older adults to discuss their specific dental needs with their dentist to determine if Teledentistry is a good option for them and to weigh the potential benefits and limitations. In some cases, to ensure that older adults maintain good oral health, it may be optimal to provide a blend of face-to-face and virtual dental appointments ⁽⁴⁾.

1.2.6 Prosthodontics

Teledentistry is a practice that employs telecommunication and digital technology to offer dental care and guidance to patients from afar. This approach enables dental experts to assess, diagnose, and treat patients without the necessity for face-to-face appointments, effectively minimizing in-person visits.

Prosthodontics is a dental specialty that deals with the replacement of missing or damaged teeth and tissues with artificial replacements, such as dentures, bridges, crowns, and implants. In the field of prosthodontics, Teledentistry can be used to consult with patients, assess their needs, and provide guidance on treatment options.

The efficacy of Teledentistry in prosthodontic treatments is dependent on various factors, including the type of prosthodontic treatment being considered and the available technology. In general, Teledentistry can be effective in the following ways for prosthodontic treatments:

- Consultations: Teledentistry can be used for initial consultations with patients to discuss their prosthodontic needs, answer questions, and provide information on treatment options. This can prove especially advantageous for patients residing in far-flung regions or facing limitations in mobility ⁽²⁾.
- Diagnosis: Through the use of digital technology, such as high-definition cameras and digital X-rays, dental professionals can diagnose prosthodontic conditions remotely and provide a preliminary treatment plan ⁽¹⁾.
- Treatments: Here are a few examples of prosthodontic treatments that can be managed through virtual consultations:
 - Denture consultations: Virtual consultations can be used to discuss denture options, take impressions, and provide information on the process of getting dentures ⁽⁶⁾.
 - Crown and bridge consultations: Patients can use virtual consultations to discuss crown and bridge options, review treatment plans, and receive information on the process of getting these restorations ⁽⁶⁾.
 - Implant consultations: Virtual consultations can be used to discuss implant options, review treatment plans, and provide information on the process of getting dental implants ⁽⁴⁾.

- Partial denture consultations: Patients can use virtual consultations to discuss partial denture options, take impressions, and receive information on the process of getting partial dentures ⁽⁶⁾.
- Follow-up care for dentures and implants: Virtual consultations can be used for follow-up appointments to monitor the fit of dentures and implants, address any concerns or complications, and make any necessary adjustments.
- Monitoring and adjusting dentures: For patients with dentures, Teledentistry can be used to monitor the fit and adjust them remotely, reducing the need for in-person visits ⁽²⁾.

While virtual consultations can be useful in many aspects of prosthodontics, there are also limitations to their use. Here are a few of the limitations of virtual consultations in prosthodontics:

- Limited physical examination: Virtual consultations rely on digital technology and remote communication, which can limit the dental professional's ability to physically examine the patient's mouth and teeth. This can make it difficult to accurately diagnose certain conditions or determine the best course of treatment ^(2, 6).
- Limited ability to take impressions and measurements: The process of taking impressions and measurements for dentures, crowns, bridges, and other prosthodontic treatments typically requires hands-on examination and manipulation. This can be difficult or impossible to achieve through virtual consultations ⁽⁶⁾.
- Difficulty in evaluating the fit of dentures and implants: Virtual consultations can be limited in their ability to accurately evaluate the fit of dentures and implants. Hands-on examination and manipulation may be necessary to properly assess the fit and make any necessary adjustments.
- Some patients may not be able to participate in virtual consultations due to their limited access to the necessary technology, such as high-definition cameras, internet access, and compatible devices. This can limit the availability of virtual consultations for certain patients ^(6, 27).
- Virtual consultations have limited capacity to offer hands-on treatment, such as adjusting dentures or placing dental implants. In-person visits may still be necessary for certain prosthodontic treatments ⁽⁶⁾.

In conclusion, while virtual consultations can be useful in many aspects of prosthodontics, it is important to consider the limitations and determine whether they are appropriate for a

given patient's needs. In some cases, in-person visits may still be necessary for a full examination and hands-on treatment such as dental implants or full-mouth rehabilitation. Nevertheless, Teledentistry remains a significant factor in enhancing patient experience and promoting accessibility to care within the field of prosthodontics. The specific prosthodontic treatment and the individual patient's needs will determine whether virtual consultations are appropriate.

1.2.7 Periodontal Treatments

Teledentistry refers to the use of telecommunication technology, such as video conferencing, to provide dental care remotely. Teledentistry can be useful in many situations, including for periodontal patients.

Periodontal patients are those who have gum disease, a condition that can lead to tooth loss if left untreated. The early stages of periodontal disease can often be managed through regular cleanings and other non-surgical treatments. In more advanced cases, however, surgery may be necessary.

Teledentistry can be a valuable tool for periodontal patients, as it allows them to receive regular check-ups and monitoring from their dental care provider without having to physically visit the office. This can be especially beneficial for patients who have mobility issues or live far from their dental office ⁽⁶⁾.

During a Teledentistry appointment, the dental provider can examine the patient's gums and teeth, and make recommendations for treatment. They can also provide patient education on proper oral hygiene and discuss any concerns the patient may have.

Periodontal treatments that can be done via virtual consultation, also known as Teledentistry, include:

- Patient Education: Providing patients with information about periodontal disease, proper oral hygiene, and risk factors can be done through virtual consultations ⁽⁶⁾.
- Monitoring and Assessment: The dentist or periodontist can use video conferencing to examine the patient's gums, teeth, and oral hygiene. This allows them to monitor the progress of the disease and determine if any treatments need to be adjusted ⁽⁶⁾.

- Medication Management: The dental care provider can review the patient's medication history and make recommendations for changes or adjustments if necessary. They can also provide instructions for using topical medications to manage the disease ⁽⁶⁾.
- Dental Cleanings: Regular cleanings are an important component of periodontal disease management, and these can be done remotely through virtual consultations.
- Referrals to a Specialist: If necessary, the dental care provider can refer the patient to a specialist for further treatment ^(2, 6).

While Teledentistry has many benefits for periodontal patients, it also has some limitations in terms of the procedures that can be performed remotely. Some of the limitations of Teledentistry for periodontal procedures include:

- Lack of Hands-On Examination: An in-person appointment allows for a great level of hands-on examination compare to virtual consultations. This can limit the dentist's ability to accurately assess the patient's condition and make recommendations for treatment ⁽⁶⁾.
- Limited Treatment Options: Some periodontal procedures, such as surgery, cannot be performed remotely. Teledentistry may not be suitable for patients who require more extensive treatment, and they may need to visit the office for in-person appointments ⁽⁶⁾.
- Technical Challenges: Technical challenges, such as poor internet connectivity or difficulty using the video conferencing software, can disrupt virtual consultations and affect the quality of care received.
- Reduced Interpersonal Connection: Virtual consultations may lack the same degree of personal connection as face-to-face appointments. This can limit the dentist's ability to form a relationship with the patient and provide personalized care.
- Legal and Regulatory Concerns: Teledentistry is subject to various legal and regulatory requirements, and some states may have restrictions on the types of services that can be provided remotely ⁽²⁾.

In conclusion, virtual consultations can be a valuable tool for managing periodontal disease, as they allow patients to receive care and treatment remotely. However, it's important to note that while Teledentistry can be a useful tool for periodontal patients, it is not a substitute for in-person dental appointments. Some procedures, such as surgery, cannot be performed remotely, and patients may still need to visit their dental office for these treatments and technical challenges, reduced interpersonal connection, and legal and

regulatory concerns may also impact the quality of care received. The dentist or periodontist will determine the best course of action based on the individual needs of each patient ⁽¹⁾.

1.2.8 Dental Education

Teledentistry is a term used to describe the provision for dental services using various forms of remote communication technology such as video conferencing, electronic documentation, and remote monitoring. This method enables dental practitioners to diagnose and treat patients from a distance, thereby increasing accessibility and convenience of dental care for patients.

In terms of dental education, telemedicine can play a significant role in providing students with access to real-time demonstrations and hands-on experience. For example, students can observe procedures remotely, participate in virtual case discussions, and receive feedback from dental professionals in real-time. This can help to enhance their learning experience and prepare them for the challenges of modern dental practice ⁽²⁷⁾.

There are several advantages for dental students when it comes to telemedicine and dental education:

- Convenience: Telemedicine allows dental students to receive education and training from anywhere, at any time, making it more convenient for them to access information and resources ⁽³⁴⁻³⁵⁾.
- Real-time demonstrations: With telemedicine, dental students can observe procedures remotely in real-time, providing them with a front-row seat to the latest techniques and technologies ^(27, 34).
- Collaboration: Telemedicine makes it easier for dental students to collaborate with dental professionals and other students, allowing them to participate in virtual case discussions and receive feedback on their work ⁽³⁴⁾.
- Enhanced learning experience: Telemedicine provides dental students with a more immersive and interactive learning experience, making it easier for them to understand complex concepts and retain information ^(6, 34-35).

- Increased access to specialists: Telemedicine allows dental students to connect with specialists from all over the world, providing them with access to a wider range of knowledge and expertise ^(27, 34).
- Improved patient care: By learning about telemedicine and incorporating it into their education, dental students are better prepared to provide patients with the best possible care, regardless of their location or accessibility to in-person care ⁽³⁴⁾.

Overall, telemedicine offers numerous benefits for dental students, allowing them to enhance their education and prepare for the challenges of modern dental practice ⁽³⁴⁻³⁵⁾.

While telemedicine offers many advantages for dental students, it is not without its limitations. Some of the limitations include:

- Technical limitations: Technical issues such as poor internet connectivity, equipment malfunctions, or software glitches can disrupt telemedicine sessions and impact the quality of the learning experience ⁽²⁷⁾.
- Lack of hands-on experience: Telemedicine cannot replace the hands-on experience that dental students need in order to develop their manual skills and gain a deep understanding of patient management ⁽²⁷⁾.
- Limitations of remote diagnosis: Telemedicine can be limited in its ability to diagnose complex dental problems, especially when compared to in-person exams and consultations.
- Limitations of remote treatment: Some dental procedures cannot be performed remotely, meaning that students may miss out on the opportunity to observe or participate in these procedures ⁽²⁷⁾.
- Limitations of remote observation: Observing procedures remotely can be less immersive than being in the room in person, meaning that students may miss out on important details and nuances ⁽³⁴⁾.
- Limited access to patients: Telemedicine may limit the number of patients that dental students have access to, reducing the diversity of cases and patient populations that they are exposed to ⁽⁶⁾.

In conclusion, telemedicine is a valuable addition to dental education and has the potential to greatly enhance the learning experience for students, while also improving access to care for patients. Nevertheless, it is important to acknowledge its limitations. Training is a key component of dental education. Students still need hands-on experience with patients, as

well as the opportunity to develop their manual skills and gain a deep understanding of patient management ⁽³⁵⁾.

1.3 The Rise of Teledentistry during and after COVID-19 Pandemic

The year 2019 was remembered for the arrival of Covid-19. This global pandemic has drastically changed the course of everyone's life and our habits. COVID-19 is a highly contagious illness that originates from the SARS-CoV-2 virus, which was initially detected in Wuhan, China, in December 2019. The virus has rapidly spread worldwide, resulting in a worldwide outbreak that has affected various aspects of daily life. Many people's lifestyles have been significantly altered due to the pandemic, and these modifications include:

- Remote work: With the implementation of social distancing measures, many companies have shifted to remote work to help reduce the spread of the virus. This has resulted in a major change in work-life balance for many people ⁽³⁶⁾.
- Virtual education: Schools and universities have also shifted to virtual learning, with students attending classes remotely. This has created new challenges for educators and students alike, and has also highlighted the need for access to technology and internet connectivity ⁽⁶⁾.
- Increased hygiene measures: There has been an increase in people's awareness of hygiene and its significance, leading them to adopt new practices aimed at minimizing the transmission of the virus. Examples of these practices include wearing masks, frequently washing hands, and refraining from touching one's face ⁽³⁶⁾.
- Reduced travel: Travel restrictions have led to a significant reduction in travel, both domestically and internationally. This has had a major impact on the tourism industry and the global economy ⁽³⁶⁾.
- Changes in socializing: Social distancing measures have led to changes in how people socialize, with many people choosing to connect virtually rather than in person.
- In general, the COVID-19 outbreak has had a profound effect on various facets of daily existence and has resulted in substantial alterations to the way many individuals live. While some of these changes may be temporary, others may have more lasting effects on how we live and work in the future ⁽⁴⁾.

- The healthcare sector has also had to adapt and evolve to minimize the risk of infection. This virus is spread through the air and in the form of droplets, especially during dental treatment. Thus, a simple cleaning or scaling of the teeth, can increase the risk of contamination and propagation on a national or global scale. Patients but also health professionals, such as dentists, who are in the front line of the risk of contamination^(4, 37-38). The field of dentistry has been greatly affected globally as a result of the COVID-19 pandemic. Here are some ways that dentistry has been affected by COVID-19:
- Office closures: During the initial stages of the pandemic, many dental offices were closed or saw limited patients in order to comply with government and health authority guidelines to curb the transmission of COVID-19⁽⁷⁾.
- Changes in patient appointments: Many dental offices have had to reschedule routine appointments or limit the number of patients seen in a day to reduce the risk of COVID-19 transmission⁽⁷⁾.
- PPE requirements: Dental offices have had to adhere to strict personal protective equipment (PPE) guidelines to protect both staff and patients from COVID-19. This has led to increased costs for PPE and changes in how dentists perform certain procedures.
- Increased emphasis on infection control: The COVID-19 pandemic has highlighted the importance of infection control in dentistry. Many dental offices have implemented additional cleaning and disinfection protocols to reduce the risk of COVID-19 transmission⁽⁷⁾.
- Changes in dental procedures: Some dental procedures have been modified or postponed due to COVID-19. For example, some procedures that generate aerosols, such as dental cleanings, may be postponed or performed using additional PPE and infection control measures⁽³⁹⁾.
- In general, dentistry has been greatly affected by the COVID-19 pandemic, leading to changes in how dental offices operate and how dental procedures are performed. After a national and international government decision, treatments not considered as urgent or life threatening are thereby suspended^(4, 7, 37-38).

Some dental offices have implemented Teledentistry services to provide consultations and advice to patients remotely. Teledentistry appears as a good alternative during the Covid-19 period and during the imposed national quarantines. Through a virtual consultation, the risk of contamination decreases and it also allows to respect the laws and sanitary rules put in place by the government⁽⁴⁰⁾.

People of a certain age and immunocompromised, considered more at risk than others, can continue to be followed, more or less normally, thanks to these virtual

consultations. Although not all treatments are available online at the beginning of the pandemic, however the patient is still followed and avoids the risk of being contaminated by the virus to which he is more sensitive ⁽⁹⁾.

The anxiety of the patients, thanks to these virtual consultations, has remarkably decreased because they can be examined in an environment they know and where they are comfortable. This reduces their stress and allows them to be followed over time, until the health situation has improved, without taking any risk of being contaminated by Covid-19 ⁽⁴¹⁾.

Teledentistry also allows to reduce the number of cancellations, knowing that the consultations are done online, so it is a saving of time and money for the health professional. But Teledentistry is especially recognized to reduce inequalities between patients, indeed living in the city or in rural areas, then has no impact on dental treatment and monitoring of patients seen that they can be made during a virtual consultation. It is also possible, with trained staff and good quality equipment, to follow certain prisoners and advise them in order to achieve good oral hygiene in the long term ^(4, 10, 42).

During the pandemic, the number of self-medication has particularly increased, with the help of fraudulent online websites, selling certain drugs, normally requiring a prescription to obtain them. But also, the use of old medication, that patients have kept at home, from previous prescriptions and that are mostly expired, according to their expiration date, sometimes one or two years, in most cases. Antibiotics are no exception to the rule and this causes resistance to antibiotics in many patients who think they are treating themselves correctly ⁽³⁸⁾.

Finally, Teledentistry has made its appearance in the field of Education. Indeed, the Covid-19, has prevented many students to follow courses physically in classrooms. This is how online education developed in many universities or school complexes. Students were then able to take their courses online, in much the same way as if they had been in class. The beginning was a bit difficult, in order to find the right software and understand how it works, but it allowed many students to continue to have access to education. Dental Education is one of them, it has been possible to study at a distance, even in different countries of residence, in Europe, the United States and Asia ⁽⁴⁾.

Thus, in conclusion Teledentistry has been a rather effective response to this pandemic, avoiding the risk of contamination during oral treatments. It has shown during Covid-19, its effectiveness by:

- Remote consultations: Teledentistry allows dentists to provide remote consultations to patients who are unable to visit a dental office due to Covid-19 restrictions or concerns. Reducing the number of people visiting a dental office can aid in curbing the transmission of the virus ⁽⁷⁾.
- Screening and triage: Teledentistry can be used to screen patients for Covid-19 symptoms and risk factors prior to scheduling an in-person appointment. One possible reformulation could be: by doing so, it becomes possible to detect individuals who might be vulnerable to COVID-19, thus allowing for adequate safety measures to be implemented when they come for medical appointment ⁽⁷⁾.
- Continuing care: Teledentistry can be used to provide ongoing care and support to patients who are unable to visit a dental office regularly due to Covid-19 restrictions or concerns. This can help to maintain oral health and prevent dental problems from getting worse ^(7, 43).
- Education and prevention: Teledentistry can be used to provide educational resources and preventive care to patients, including oral hygiene instructions, dietary advice, and information about the importance of regular dental check-ups ^(4, 28, 43-44).

However, sometimes we have no choice but to intervene physically in certain urgent cases, causing important symptoms, for which medication alone does not have sufficient effect to calm the pain. This is particularly true in the case of dental abscesses, broken teeth due to recent trauma, and especially in the case of oral lesions that persist for more than two weeks. The latter can sometimes be ulcerated or accompanied by inflammation or swelling, and in extreme cases can cause orofacial pain or even paresthesia of the trigeminal nerve ⁽⁴⁵⁾.

Faced with the risks of contamination that a simple scaling can cause, new measures have emerged. In 2019, faced with the pandemic, the health world is trying to evolve as quickly as possible to protect its patients and health professionals. For this, new preventive measures, techniques, materials and protocols are adjusted and applied during dental treatments requiring the manual action of a professional. PPE, Personal Protective Equipment, is an example of the new measures introduced at Covid-19. They allow to protect the dentist and the accompanying staff from any risk of contamination by aerosols ⁽³⁶⁻³⁷⁾.

Mouthwashes are also being studied. Several mouthwashes are tested in order to reduce the viral load to a minimum before any dental treatment. The most used is the one composed of hydrogen peroxide, which has shown some effectiveness against Covid-19.

There are also other mouthwashes, which during their trial, have also proven to be effective in reducing the viral load, especially those composed of Listerine ⁽³⁷⁾.

Ventilation of the room where the chair is located becomes mandatory. If the architectural installation does not allow it, then the room must be ventilated by a more conventional means. If there is no way to change the air in the room, the chair will have to be closed to patients ⁽³⁶⁻³⁷⁾.

Many new measures have appeared, in order to limit the risk of contamination during and after Covid. Indeed, the wearing of the mask remains mandatory during an appointment in a health center, the PPE are still used when the number of positive cases to Covid increase again and in some cases of risk of contamination by the patient, of certain systemic diseases, causing a danger for the dentist and his team. The mouthwash on arrival of the patient in the dental chair, is in most cases maintained until the total eradication of the virus. Finally, in spite of a decrease of the viral load and its power of propagation, it is strongly recommended to be vaccinated against Covid, for the patient but especially for any professional working closely or remotely in health and in contact with patients more or less at risk ^(4, 9, 36, 39).

1.4 Limitations of Teledentistry: Ethics and Confidentiality

The effectiveness of teledentistry has been demonstrated, particularly in light of the Covid-19 pandemic. Nevertheless, certain limitations of the approach have been brought to attention.

In particular, during the diagnosis of certain pathologies, Teledentistry sometimes has difficulties in evaluating the dentition of certain patients and their mucosa, especially when it comes to the posterior areas of the oral cavity. Other areas or oral diseases also remain complicated to diagnose correctly. Some caries, but also some lesions and swellings, whether intraoral or extraoral, are obstacles for Teledentistry and its current technologies. Teeth with some mobility or orthodontic or prosthodontic emergencies are also put to the test when it comes to evaluating and replacing them. Finally, for all orthognathic surgeries, head and neck cancer, TMJ or salivary gland problems, it is preferable to consult a dentist or specialist in a face to face consultation ^(2, 8, 25, 31).

Other barriers could be highlighted, such as the creation of an online information exchange and chat system through a mail box. Upon initial inspection, it is evident that this online consultation and chat system provides a notable benefit in terms of efficient and high-quality information exchange between patients and dental clinics. However, it requires a dedicated staff that needs to be trained beforehand. Indeed, the dentist and his assistants cannot devote all of their time to answering the requests and questions of all patients who make their consultation online. This is why in the majority of cases and clinics that have adopted this virtual consultation system, a team is trained and dedicated solely to the online service. Thus, all the administrative work is done by this staff before the dentist starts the online consultation and diagnosis. This saves a lot of time and avoids all non-urgent consultations or abuse of certain patients, which in any field can happen, especially in dentistry ^(2, 46-47).

Unfortunately, this requires quality equipment and good internet connectivity. The poor quality of the video image and the sound are the parameters listed as the most deficient at the moment. They are random and sometimes some failures can be persistent and require the intervention of a specialized company and this has a cost. Some studies have shown that Teledentistry can be a time and money saver, but this is true when everything is working properly, otherwise sometimes equipment repairs can greatly reduce the benefits of Teledentistry ^(1-2, 46-47). Figure 9.

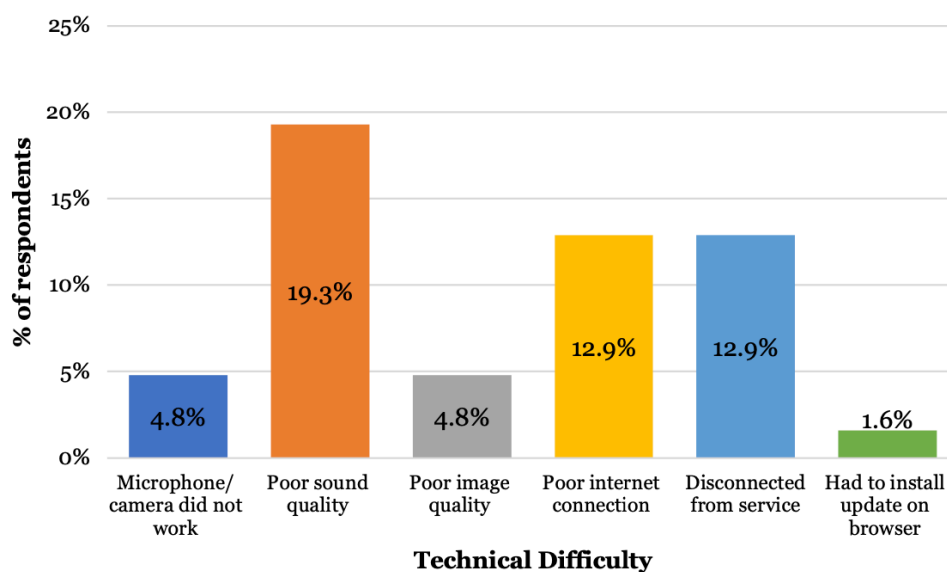


Fig.9 Frequent technical difficulties encountered using Teledentistry ⁽⁴⁷⁾.

Finally, despite the general satisfaction of the majority of patients who have experienced virtual consultations, some patients remain in favor of a face-to-face consultation with their practitioner. Some feel more reassured, especially older people or retirees, who refer to being overwhelmed by the technology and its operation. Moreover, from a confidentiality point of view, not all patients are reassured. For the most part, they express an interrogation about how their data is kept and who can access it. For many of them, the paper format is still a more secure means and only they have access to it. This is how Teledentistry can be in contradiction with the ethical side of certain visions coming from the patient as well as from certain professionals who think that the private part is still not assured ^(2, 46-48). Figure 10.

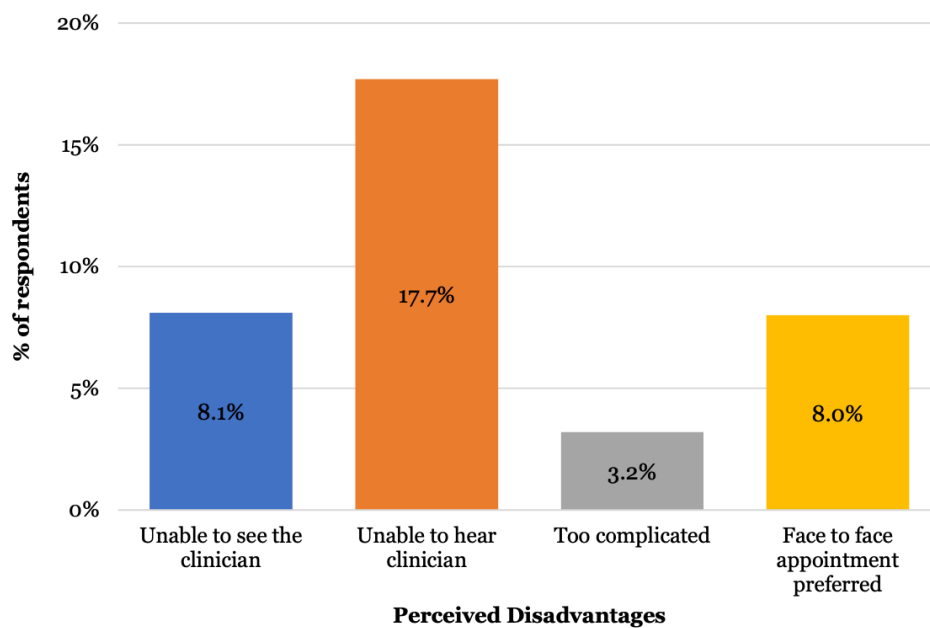


Fig.10 Patient's satisfaction regarding the use of Teledentistry ⁽⁴⁷⁾.

1.5 Future of Teledentistry

Despite the existence of Teledentistry since the 90's, there was an exponential increase in its use and effectiveness during the period of Covid-19 and its various lockdowns. Many elderly and disabled people were unable to go out during these periods due to their illnesses and symptoms ⁽²⁾.

It is then that a new era begins, and a more advanced use of Teledentistry. Indeed, the majority of people today are connected, that is to say, the Internet is an integral part of their day, whether via email, social networks or applications of all kinds. The dental industry is also involved with the creation of several mobile applications, available more and more on different operating systems such as IOS or Android ^(18, 49-50).

M-health, from Mobile-Health, is an application commonly used in various fields of medicine and recognized by the World Health Organization (WHO). It allows the remote assistance of patients of any age and to be able to answer in real time to their questions ^(4, 28-29).

Other applications exist and have a more advanced interaction. This is the case of Exodont, an innovative application used for patients who have undergone surgery. It has demonstrated numerous positive effects post-surgery, advising patients on the dosage of their medication, but also providing instructions to encourage optimal healing of the tissues and offering assistance in case of any questions or concerns regarding the course of their treatment. These applications have saved the specialist a lot of time ^(6, 19, 43, 51).

Teledentistry is very innovative but it is even more so when it is linked to Telemedicine in general. Indeed, it opens up future possibilities when domains and applications, are used together and aiming at an improvement of Global Health. This can be seen in Education, where since Covid, many students have had to take their classes and practices online. Many of these technologies and software have become part of everyone's daily routine. Students and professors continue to use them and use them for a more in-depth application of the topics studied. It was thus possible for the students to have examples of situations and demonstrations in real time, in patients who agreed to participate in these virtual sessions ^(14, 52-54).

It remains to be seen whether new software and technologies will be put in place in the future, to facilitate the work of the professionals, the learning process of the students and, last but not least, the comfort of the patient. It has been noted that patients would like to have a simpler way of using these programs, more intuitive and especially the possibility of automatic translation to avoid any language barrier ^(2, 54-55).

Additional research is required to compare the pricing disparity between a virtual consultation and an in-person office consultation. This is due to the fact that the usage of software programs incurs costs and necessitates furniture adjustments and staff training ⁽⁶⁾.

It would also be interesting to study the professional/patient relationship over time. How does trust evolve during these online exchanges and how is our work perceived. Trust is a key point for good patient follow-up and treatment ⁽⁵⁶⁻⁵⁷⁾.

To conclude, Teledentistry has been able to make its place during the Covid-19 period and has evolved over time. In spite of all these technological innovations, at the present time, Teledentistry cannot be used alone in all fields and meet all expectations. It is however recommended to use these virtual consultations in combination with more traditional ones ^(2, 54, 58).

2 JUSTIFICATION

After the appearance of Covid-19, we understand the importance of Teleodontology. Indeed, thanks to its technologies and its numerous applications, Teledentistry has made it possible to avoid any source of contamination with the virus. It has also allowed some patients living in rural areas or with certain disabilities and systemic diseases, to be treated and monitored over time without the need to travel and thus reducing the risk of contamination.

Many of these technologies and virtual sessions have been maintained since the health risk has stabilized and some means of protection have been added to conventional everyday practices. For this reason, the realization of the present work is justified.

3 HYPOTHESIS AND OBJECTIVES

Research question: What is the acceptance of teleodontology by patients and dentists?

3.1 Hypothesis

- *H1: Tele-dentistry will be well accepted by both patients and dentists as it provides a convenient and accuracy alternative to traditional face-to-face dental care, without compromising the quality of care.*
- *H0: Teleodontology will not be well accepted by both patients and dentists.*

3.2 Objectives

- Establish the most frequent indications for the use of Teleodontology.
- Determine the accuracy of Teleodontology.
- Assess the acceptability of Teleodontology from patients and professionals 'point of view.

4 MATERIALS and METHODS

4.1 TYPE OF RESEARCH

Considering the characteristics of this study, a bibliographic review research was developed with a systematization of the available review concerning the subject under study. In this case, it is Teleodontology and its different indications. On the other hand, it was also tried to highlight its explosion during the period of Covid-19 and its quarantines, in order to present all the measures kept post-Covid in daily practices.

4.2 RESEARCH STRATEGY:

A literature review is conducted using articles collected from PubMed. We will focus on articles highlighting the evolution and effectiveness of Teleodontology during and after Covid- 19 and how Teleodontology is implemented in daily dental practice. We obtained more articles putting: “Teledentistry” rather than “Teleodontology”.

First, we selected all articles less than 10 years old (2013-2023), except for one particularly interesting article, showing the evolution of Teledentistry since the 1990s. Then we focused only on free full-text publications. In the end, we excluded articles that were repetitive as well as those that solely centered on the Covid-19 pandemic, or investigated the psychological aspects of certain professionals dealing with Covid.

In total, 58 publications were used, containing the most recent information possible, especially on the different applications of teledentistry, and its new technologies that appeared during and after the Covid-19, including the limitations and future perspectives of teledentistry.

All abstracts were reviewed and articles meeting the inclusion and exclusion criteria were selected.

4.3 RESEARCH EQUATION:

("Teledentistry" AND "applications") ("Teledentistry" AND "Covid-19") ("Teledentistry" AND "new technologies") ("Teledentistry" OR "traditional consultation")

4.4 INCLUSION CRITERIA

1. Studies published between 2011 and 2023 that research the history and evolution of Teledentistry since the 1990s.
2. Other studies published between 2013 and 2023 related to the different indications of Teledentistry.
3. Papers published between 2019 and January 2023 investigating Covid-19 and its various means of contamination during dental treatment and the consequences this has had on the oral health of populations worldwide.
4. Articles and studies highlighting the current limitations of Teledentistry and its possible future perspectives.
5. Research conducted in English and French.
6. Articles and books available in their entirety.

4.5 EXCLUSION CRITERIA

1. Studies published outside the established study periods.
2. Studies not completed.
3. Studies conducted in languages other than English and French.

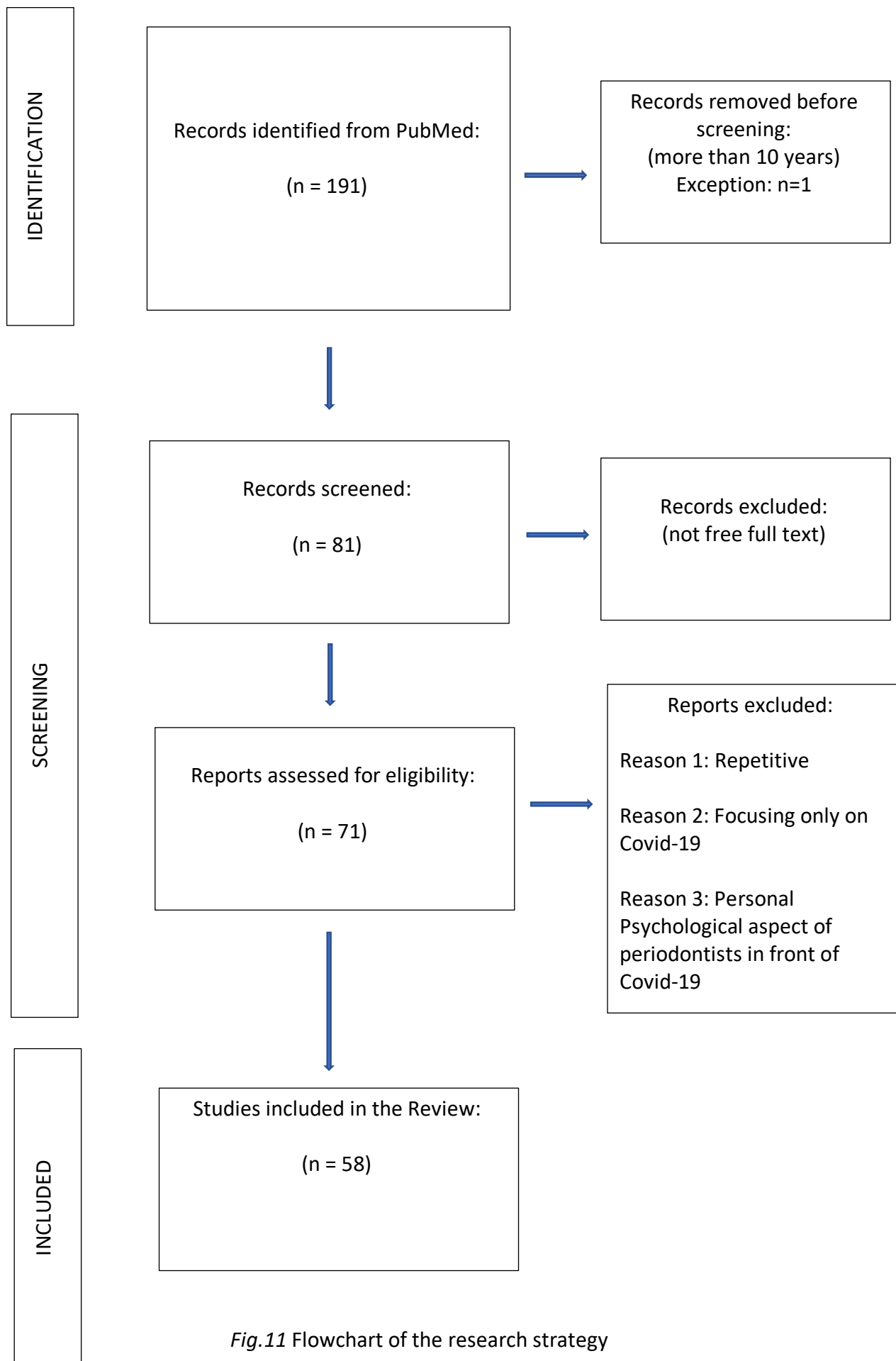


Fig.11 Flowchart of the research strategy

5 RESULTS

Authors/Ref./Year	Data	Description
Jampani et al. (1) 2011	Objectives	To show a comprehensive overview of teledentistry, encompassing its inception, underlying principles, applications, essential components, prerequisites, existing research findings, as well as ethical and legal considerations associated with its practice. Finally, we will discuss the potential trajectory of teledentistry as an innovative mode of dental care delivery.
	Methodology	This is a review article that offers a comprehensive summary of teledentistry. The authors examine existing literature on the topic and offer perspectives on the ethical and legal considerations associated with teledentistry.
	Results	Teledentistry merges the fields of dentistry and telecommunications to enable remote transmission of clinical data and images for dental consultations and treatment planning. This technology has the potential to enhance access to oral healthcare, elevate the standard of oral healthcare delivery, and reduce its expenses. Moreover, it can bridge the gap in oral health care quality between rural and urban areas. Nevertheless, ethical and legal concerns must be resolved to ensure the dependable and efficient utilization of teledentistry.
	Conclusions	Teledentistry presents a new approach to providing dental care, with the potential to enhance oral healthcare accessibility and alleviate disparities in dental treatment. Nonetheless, it is crucial to tackle ethical and legal concerns associated with this practice to ensure its safety and efficacy. Additionally, more research is necessary to assess its impact on oral health outcomes and establish protocols for its secure and efficient application.
Islam et al. (2) 2022	Objectives	Examine how the COVID-19 pandemic has contributed to the rise in popularity of teledentistry, particularly the use of live video conferencing, and its potential to serve as a valuable tool for dentists and patients.
	Methodology	This is a narrative review that examines the advantages and obstacles associated with teledentistry, specifically focusing on the use of live video calls, in the context of the COVID-19 pandemic. The authors additionally offer suggestions to dental practitioners on how to build strong doctor-patient rapport and guarantee adherence to privacy regulations.
	Results	The field of dentistry has seen a surge in the use of teledentistry, particularly real-time videoconferencing, amid the COVID-19 pandemic. This approach to online consultations offers several benefits, including cost and time savings, as well as increased convenience for both dentists and patients. However, dentists need to prioritize building strong doctor-patient relationships and complying with privacy laws to ensure the safe and effective use of teledentistry. Providing patients with detailed information on the limitations, advantages, and disadvantages of online consultations is also crucial.
	Conclusions	The utilization of teledentistry, particularly through live video conferencing, has proven to be a beneficial resource for dental practitioners and patients amidst the COVID-19 outbreak. Remote consultations have the potential to reduce expenses, optimize scheduling, and offer more accessible healthcare options. Nevertheless, it is imperative that dentists establish a strong rapport with their patients and adhere to privacy regulations to ensure secure and effective application of teledentistry. Additional studies are required to assess the efficacy of teledentistry in promoting better oral health outcomes not only during the pandemic but also in the future.

Avula H. (3) 2015	Objectives	Introducing a novel concept called tele-periodontics, which integrates telecommunications technology with periodontics. The objective is to offer periodontal care specialists to patients residing in remote and underserved regions, resulting in improved delivery of treatment and information.
	Methodology	This article explores the notion of tele-periodontics and its possible advantages. It suggests that tele-periodontics can enable periodontal experts and their patients to communicate remotely using methods such as video conferencing and the exchange of supportive information. Additionally, the article delves into various potential applications of tele-periodontics, including tele consultation, tele training, tele education, and tele support.
	Results	The concept of tele-periodontics has the potential to improve access to periodontal specialists for patients in rural and underprivileged areas, thereby facilitating the effective delivery of therapy and information. With tele-periodontics, specialists and patients can interact in real-time or share supportive information over long distances, thus overcoming geographic barriers.
	Conclusions	Tele-periodontics offers limitless opportunities to improve periodontal care delivery by exploring various possibilities. It has the potential to bridge the healthcare delivery gap by providing access to specialized care for individuals residing in rural or underprivileged areas. This article serves as an introductory guide to the tele-periodontics concept, and additional research can delve into its practical implementation and effectiveness in enhancing periodontal care.
Kui et al. (4) 2022	Objectives	Evaluate whether the perceptions of both dentists and patients towards teledentistry have undergone any changes since the onset of the COVID-19 pandemic, and determine if the adoption of teledentistry is likely to persist beyond the pandemic period.
	Methodology	Between August 2021 and January 2022, a literature search was conducted using the PubMed, Scopus, and Science Direct databases. The search was focused on articles published between 2012 and 2022 and employed a combination of Mesh terms such as "COVID-19", "pandemic", "oral telemedicine", and "teledentistry".
	Results	Out of the 52 papers included in the study, 9 were published from 2011 to 2019, while the remaining 43 were published after 2020. Of the papers published before 2020, 7 out of 9 were reviews and the remaining 2 were original research. On the other hand, out of the 43 papers published after 2020, 18 were reviews and the remaining 25 were original research.
	Conclusions	The dental industry has witnessed a significant surge in the adoption of teledentistry and teleassistance, particularly during the COVID-19 pandemic. It is imperative for dental practitioners to stay abreast of technological advancements, and patients should also be educated about the various options available for receiving specialized oral healthcare.

Maspero et al. (5) 2020	Objectives	How can technologies for long-distance patient monitoring reduce the need for in-office appointments, and what is the reliability of these technologies?
	Methodology	A review of the literature was conducted following the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P). To assess the quality and limitations of the studies, randomized clinical trials, cross-sectional, observational, and case-control studies were evaluated using the Mixed Methods Appraisal Tool.
	Results	80 articles were initially searched, out of which 69 were excluded as they were deemed non-relevant based on factors such as the abstract, title, study design, bias, and/or lack of relevance. The remaining 12 articles were included in the qualitative analysis.
	Conclusions	Teleorthodontics has the capacity to effectively address a wide range of emergencies, providing reassurance and remote patient monitoring. The implementation of dental teleassistance has successfully minimized the need for in-person visits, while still ensuring consistent monitoring and achieving satisfactory outcomes. While more research is necessary to evaluate the effectiveness, cost-effectiveness, and long-term results, we remain optimistic that teleassistance will become increasingly important in the field of orthodontics in the coming years.
Tella et al. (6) 2019	Objectives	Examine the origins of teledentistry and its effectiveness in addressing oral health care challenges in rural areas compared to urban areas.
	Methodology	A search was conducted on PubMed and Scientific Electronic Library Online (SciELO) using relevant keywords associated with telemedicine and teledentistry to gather information on their usage. The literature reviewed was limited to English publications from the past decade (2008-2018).
	Results	Teledentistry has the ability to enhance the accessibility and affordability of oral health care, and can also serve as a complementary tool to conventional methods of dental education. This approach effectively addresses the issue of geographical barriers between qualified oral health care providers and patients residing in rural or remote areas. Nonetheless, despite its potential to improve oral health care delivery, teledentistry is accompanied by certain challenges and obstacles.
	Conclusions	Teledentistry offers a cost-effective means of enhancing access to and provision of oral health care, and can also serve as a valuable supplement to conventional dental education approaches. Despite its potential to improve the delivery of oral health care, teledentistry is beset by certain problems and challenges.

Nair et al. (7) 2021	Objectives	The objective is to evaluate the level of understanding and outlook of adults regarding both COVID-19 and dental care, as well as to appraise the accessibility of dental services and patient contentment amidst the pandemic.
	Methodology	A self-designed electronic questionnaire was used to conduct an online survey that evaluated participants' knowledge and attitudes towards COVID-19 in relation to dental scenarios. The questionnaire also included questions on the availability of dental treatment during the pandemic. Knowledge scores were calculated on a scale of 0 to 8, and descriptive statistics were used to analyze the attitudes and dental treatment availability questions.
	Results	The study involved 495 participants, who had an average age of 36.6 years. The participants obtained a mean knowledge score of 7.12 ± 0.99 , indicating good awareness and positive attitude towards COVID-19. However, a significant proportion of participants were not aware of the risks associated with dental treatment and the restrictions imposed on dental procedures. During the lockdown period, approximately 18% of the participants reported experiencing some form of dental complaints. Furthermore, 4% of participants did not have access to any form of dental treatment.
	Conclusions	The objective is to enhance the public's knowledge of the potential for cross-infection during dental procedures and encourage the utilization of virtual resources, such as tele-dentistry, to ensure that no dental emergencies are left untreated while also avoiding unnecessary hospital visits during the pandemic.
Eggmann et al. (8) 2021	Objectives	Evaluate whether the emergency service of a prominent dental institution in Switzerland encountered distinct requirements, such as patient influx, treatment requirements, and dental care attributes, during a lockdown implemented to alleviate the COVID-19 outbreak, relative to the weeks preceding and following it.
	Methodology	A retrospective evaluation was conducted on patient data from a university dental medicine center in Basel, Switzerland. The evaluation covered the periods of pre-lockdown, 6-week lockdown, and post-lockdown, specifically focusing on patients who received urgent care.
	Results	Between February 2 and June 5, 2020, 3109 dental emergency visits were analyzed. The study found that daily caseloads increased during the lockdown period. Orthodontic emergencies, abscesses, and surgical follow-ups were more common during the lockdown period, while the incidence of dento-alveolar injuries decreased (≤ 0.048). Intraoral radiographs were used less frequently during the lockdown period for urgent dental care ($p < 0.001$). Aerosol-generating procedures decreased significantly from 56.1% before the lockdown to 21.3% during lockdown ($p < 0.001$). On the other hand, teledentistry follow-ups increased in frequency ($p < 0.001$) during the same period.
	Conclusions	The dental emergency service was notably affected by the lockdown in terms of the diagnoses and treatment requirements of patients, as well as the nature of the urgent care provided.

Tiwari et al. (9) 2022	Objectives	Assess the US dentists' attitudes towards the extent and significance of teledentistry in their practices, as well as their readiness to incorporate virtual consultations as a means of delivering care.
	Methodology	A mixed-methods design with a cross-sectional approach was used to conduct an electronic survey among Denta Quest Network providers. The survey aimed to evaluate the effects of COVID-19 on dental practices, including patient volume, staffing, treatment protocols, dental insurance carriers, as well as pre- and post-COVID finances.
	Results	Approximately 23% of dentists utilized tele-dentistry or virtual platforms. The results demonstrate that those who adopted tele-dentistry early on perceived its benefits to outweigh its drawbacks, whereas late or hesitant adopters were less knowledgeable about its advantages and placed more emphasis on its drawbacks, including upfront costs. Furthermore, late adopters were apprehensive about the quality of care delivered through tele-dentistry.
	Conclusions	Teledentistry was acknowledged as having significant value in increasing the availability of dental care.
Mathivanan et al. (10) 2020	Objectives	One possible reformulation could be: Evaluate the level of familiarity, mindset, and implementation of teledentistry among general dental practitioners operating within and nearby Coimbatore district, located in the Tamil Nadu region of India.
	Methodology	A closed-ended questionnaire was created for self-administration, with questions divided into three sections covering knowledge, attitude, and practice. The responses were recorded in Microsoft Excel for data analysis.
	Results	Roughly speaking, most dentists lacked knowledge regarding teledentistry, while approximately 73% of them think that it could allow rural populations to access specialist care.
	Conclusions	Ninety percent of dentists concur that teledentistry will be a significant advancement in the future. Nevertheless, there is a need for a defined operational module and effective promotion of the module going forward.
Lin C et al. (11) 2022	Objectives	Explain the patient-driven Teledentistry care model adopted by DHSV (Dental Health Services Victoria) during the height of COVID transmission in Victoria.
	Methodology	Cohort Study
	Results	From May 2020 to April 2021, Telehealth services were accessed by 2492 patients, of whom around 39% were not born in Australia. The patient-reported experience measures (PREMs) received were 489. The majority of patients (87-90%) agreed or strongly agreed that the care they received during their visit met their needs, they received answers to their questions, they were aware of what is next after their visit, they felt they were taken care of during their visit, and they were involved in their treatment.
	Conclusions	During the height of the pandemic, Teledentistry provided patients with a safe and remote means to initiate access to care and consult with dental professionals.

Heimes et al. (12) 2022	Objectives	Examine the differences between conventional and telephone follow-up methods for minor dentoalveolar surgery using specific aftercare questionnaires.
	Methodology	A randomized, monocentric study was conducted on 60 patients who underwent dentoalveolar surgery using local anesthesia. These patients were randomly assigned to two groups, and after an average of four days, they received either telephone follow-up (test) or conventional personal aftercare (control). The study evaluated various subject areas such as symptoms, complications, practitioner satisfaction, travel, waiting time, and preferred follow-up care, based on a questionnaire.
	Results	There was no significant difference observed in the frequency of symptoms or complication rates. However, patients in the test group exhibited a clear inclination towards telephone follow-up, with 83.3% showing a preference for it compared to only 16.7% preferring conventional aftercare. This difference in preference was found to be statistically significant with a p-value of 0.047.
	Conclusions	Based on the data, it appears that there is a strong level of acceptance for follow-up appointments conducted solely over the phone following dentoalveolar surgery. Incorporating telemedicine into this process could potentially offer a convenient and cost-effective option for patients and healthcare providers alike, while also expanding healthcare access beyond traditional limitations of time and location.
Desai V, Bumb D.(13) 2013	Objectives	Explain the importance of digital photography in the field of dentistry and offer recommendations for taking precise and informative orofacial structure and radiograph images.
	Methodology	This article is a narrative review that explores the significance of digital photography in dentistry and presents recommendations for capturing dental images. The authors offer insights into the technological innovations in digital photography and how they have influenced the dental field. Additionally, they highlight the advantages of utilizing digital photography in dentistry, such as enhancing patient education, record-keeping, treatment planning, and case presentations.
	Results	The article underscores how crucial it is to have precise and comprehensive dental images for educating patients, documenting their cases, and devising treatment plans. The authors stress the significance of adhering to uniform techniques for capturing dental images and furnish directives for capturing intraoral and extraoral photographs as well as radiographs. They also expound on how proper lighting, camera settings, and positioning of patients are indispensable for obtaining dental images of the highest quality.
	Conclusions	This article outlines guidelines for dental professionals to utilize digital photography as an indispensable tool for precise diagnosis, treatment planning, and patient education. Following these guidelines can ensure the production of high-quality dental images suitable for documentation, patient education, and treatment planning purposes.

Haddad et al. (14) 2014	Objectives	Examine the utilization of information and communication technologies (ICT) in the context of health, education, and research, with a particular focus on the area of dentistry and telehealth. The article presents an overview of the present state of teledentistry and telehealth in Brazil, and explores the possibilities of increasing collaborative efforts and using ICT to reach new frontiers in scientific knowledge generation and dissemination.
	Methodology	A review article presents a broad perspective on the present status of teledentistry and telehealth in Brazil, while highlighting the latest trends in information and communication technology (ICT) usage in research and education. The authors suggest practical steps to foster cooperation and leverage ICT for enhancing scientific knowledge creation and dissemination.
	Results	Brazil has introduced Pro-Saúde and PETSaúde initiatives to reinforce the implementation of its guidelines for dental and other health-related undergraduate programs. These programs have integrated the utilization of ICT, comprising teledentistry and telehealth, to fortify the application of research to teaching and broaden oral healthcare accessibility. Additionally, the article explores the possibility of extending cooperative efforts and leveraging ICT to accomplish novel advancements in the generation and distribution of scientific knowledge.
	Conclusions	The utilization of ICT, particularly teledentistry and telehealth, has played a critical role in broadening oral healthcare access and reinforcing the integration of research into teaching in Brazil. The authors suggest extending collaborative efforts and employing ICT to achieve innovative advancements in the creation and distribution of scientific knowledge in the healthcare and dentistry sector. Additional research is necessary to assess the efficacy of teledentistry and telehealth in enhancing oral health outcomes and increasing access to oral healthcare.
Abdelrahim et al.(15) 2020	Objectives	Investigate the feasibility of implementing a tele-dental approach to manage Non-Traumatic Dental Condition visits (NTDCs) in Emergency Department (ED) and Urgent Care (UC) settings by examining the potential use of remote tele-dental consultations.
	Methodology	The study involved individuals with non-traumatic dental conditions (NTDCs) in emergency departments/urgent care centers (ED/UCs), who underwent both extra and intra-oral examinations. The examinations were conducted through four methods: 1) in-person by an ED provider, 2) remotely by a trained dentist using high-tech equipment, including intra-oral and pan-tilt-zoom (PTZ) cameras, 3) in-person by the treating dentist after the ED/UC visit (if applicable), and 4) a secondary evaluation by a tele-dental reviewer. The diagnoses and recommended treatments provided by the ED/UC providers, tele-dental examiner, treating dentist, and tele-dental reviewer were compared.
	Results	The study involved thirteen patients, and the results showed that there was high interrater agreement between the tele-dental examiner and tele-dental reviewer. However, the agreement was low between the tele-dentists and the ED providers.
	Conclusions	Initial trials of tele-dental interventions in the ED/UC environment have shown promise in managing non-traumatic dental conditions (NTDC) in these settings. However, to confirm the effectiveness of this approach and assess its impact on factors such as cost, ED/UC operations, and patient outcomes, larger intervention studies in multiple locations are necessary.

Pentapati et al. (16) 2017	Objectives	Assess the dependability of teledentistry-assisted intra-oral cameras for detecting oral illnesses during screening.
	Methodology	A proficient examiner employed an intra-oral camera in conjunction with clinical assessment to scrutinize caries, plaque, calculus, tooth erosion, and fluorosis, as well as stains, in children's oral cavities. The examiner's equipment was well-tuned and calibrated for optimal results.
	Results	The use of an intra-oral camera resulted in significantly higher mean DT and DMFT compared to clinical examination ($p=0.001$ and 0.001 , respectively). However, there was a positive, strong, and significant correlation between the intra-oral camera and clinical examination for DT, MT, FT, and DMFT ($r=0.721$, $p<0.001$; $r=0.908$, $p<0.001$; $r=0.869$, $p<0.001$; $r=0.876$, $p<0.001$, respectively). The reliability of the intra-oral camera compared to clinical examination varied from substantial to almost perfect agreement for various oral conditions. While mature plaque was clearly demonstrated, disclosed immature plaque was not clear.
	Conclusions	The use of intra-oral camera has demonstrated its reliability in detecting prevalent oral illnesses. However, additional research is necessary to examine its effectiveness in various applications, such as sealant retention, pre-cancerous lesions, recurrent aphthae, gingival recession, dental malocclusion, and regular screening.
Abril-Gonzalez et al.(17) 2017	Objectives	Create and verify a manual for incorporating dental digital imaging reports into an electronic health record system, using the Health Level Seven (HL7) International Standard of Health Informatics to attain interoperability with the system and maintain dental records.
	Methodology	The guide was created following the guidelines of the HL7 standard, with the participation of a team comprising dentists and three specialists in information and communication technologies from diverse institutions, who were responsible for its development and validation.
	Results	The guide demonstrates the standardization of patient health records and dental images into a Clinical Dental Record document, utilizing international informatics standards such as the HL7-V3-CDA document (dental document Level 2). This involves converting diagnostic images from conventional radiology or radiovisiographs into the Digital Imaging and Communications in Medicine (DICOM) format while ensuring the preservation of patient information. The resulting standardized document can be transmitted, stored, or displayed using various devices, regardless of the platform used.
	Conclusions	The utilization of dental images and record systems for interoperability purposes offers several benefits, such as reducing the occurrence of adverse events, enhancing patient security, and optimizing resource utilization. This study provides valuable insights into the realm of telemedicine in dental informatics and could serve as a useful reference for electronic medical record projects that incorporate dental documentation.

Madi et al. (18) 2021	Objectives	Assess the dependability of WhatsApp in contrast to the reference standard of images viewed on a workstation monitor (considered the gold standard) for detecting and interpreting radiographic images of jaw abnormalities.
	Methodology	The assessment of jaw pathologies in 150 panoramic radiographs was conducted on a workstation monitor. The radiographs were sent to Observer A and B via WhatsApp® Messenger and viewed independently on smartphones. A structured proforma was utilized to evaluate the radiographs and determine the presence or absence of various radiographic pathological characteristics.
	Results	Observers A and B showed almost perfect agreement (with Kappa coefficients ranging from 0.8 to 0.97) in assessing the reliability of WhatsApp across different characteristics, such as vital structures, pathological fractures, periodontal ligament widening, and root resorption. Additionally, the pre-categorized radiographic impressions had Kappa coefficients of 0.95 and 0.97, indicating almost perfect agreement between the two observers when using WhatsApp.
	Conclusions	Expert teleradiology consultations through WhatsApp could serve as a viable and efficient substitute for interpreting radiographic images.
Krishna et al. (19) 2021	Objectives	Create, build, and verify the effectiveness of ExoDont, a novel application aimed at enhancing compliance with postoperative guidelines following dental extractions.
	Methodology	A team comprising of oral and maxillofacial surgeons, general dentists, software engineers, graphic designers, and applications architect collaborated to create a postoperative treatment plan. They then determined the clinical and technological requirements of ExoDont, an app designed to offer timely reminders for medication and postoperative care. The app underwent field testing and was assessed for its usability using the User Version of the Mobile Application Rating Scale.
	Results	ExoDont's software design followed a 3-tier architecture, which included a user interface application, logical layer, and database layer. Upon testing and validation, the Perceived Impact component received the highest mean score among all rated aspects, with a mean score of 4.6 and a standard deviation of 0.5. In contrast, the Engagement component received the lowest mean score of 3.5 and a standard deviation of 0.8.
	Conclusions	To rephrase: The usability, functionality, and impact of the ExoDont app have been tested and validated to ensure it benefits patients. The app was created with the patient's welfare in mind, using a user-friendly design that helps patients follow their prescribed drug regimen and provides easy and efficient access to postoperative instructions. The ExoDont app could greatly improve patient compliance and reduce complications following dental extractions.

Flores et al. (20) 2020	Objectives	Provide a brief overview of how teledentistry is utilized for diagnosing oral lesions.
	Methodology	In August 2018, a systematic search of literature was conducted across four databases to gather articles published up to December 2018. The studies were then evaluated for their methodological quality using the Quality Assessment of Studies of Diagnostic Accuracy. The search results were assessed independently by two reviewers, with a third reviewer making the final decision in cases where uncertainty arose regarding inclusion of an article. The studies that were included focused on the use of teledentistry for diagnosing oral lesions.
	Results	The study comprised 11 articles, published between 1999 and 2018, with a predominant focus on developing countries. The majority of patients evaluated in these studies belonged to rural areas or remote locations from major centers. To gather patient data, various tools were employed such as smartphones, videoconferencing, emails, questionnaires, histopathological exams, and telemedicine applications/systems. The quality of 9 out of 11 studies was deemed good.
	Conclusions	By utilizing teledentistry, the diagnosis and management of oral lesions can potentially be improved, while also reducing the distance between patients requiring specialized diagnoses and the corresponding specialists.
Vetchaporn et al. (21) 2021	Objectives	Create and assess the dependability and accuracy of an intraoral camera that utilizes a combination of autofluorescence and LED white light for teledentistry screenings of OPMDs and oral cancer.
	Methodology	The effectiveness of using the combination method was evaluated in comparison to solely utilizing the autofluorescence method.
	Results	The device offered satisfactory image quality for initial diagnosis purposes. When using the combination method, the device's sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were 87.5%, 84.6%, 63.6%, and 95.7%, respectively. These values were superior to those obtained by using the autofluorescence method alone in all aspects. The agreement rate for dysplastic lesions was 85.29%, and the agreement rate for lesion category was 79.41%. The combination method demonstrated higher validity and reliability for dysplasia screening in OPMDs compared to the autofluorescence method alone.
	Conclusions	The utilization of an intraoral camera with fluorescent aids for screening oral potentially malignant disorders (OPMDs) can be implemented through teledentistry.

Lin et al. (22) 2021	Objectives	Develop guidelines for taking intraoral photographs during oral mucosal examinations that produce clear and meaningful images for effective triage, risk evaluation, and ongoing monitoring of oral lesions.
	Methodology	The article explores techniques for attaining optimal lighting, mirror positioning, camera perspective, and focus when capturing intraoral photographs, and suggests that these strategies can be applied to commonly accessible smartphones or point-and-shoot cameras.
	Results	The article suggests guidelines for taking clear and comprehensible intraoral photos, which can be useful for both healthcare practitioners and patients. These guidelines cover various aspects such as appropriate lighting, mirror positioning, camera orientation, and retraction techniques.
	Conclusions	Intraoral photographs play a vital role in promptly assessing, evaluating the risk of, and keeping track of oral lesions. To guarantee the quality and consistency of these photographs, it is essential to establish standardized recommendations for intraoral photography in oral mucosal screening. These suggestions can be easily customized to fit various camera technologies and may also serve as a foundation for the development of future teledentistry platforms.
Torres-Pereira et al. (23) 2013	Objectives	Assess the suitability of telediagnosis in the field of oral medicine by examining the use of email to transmit clinical digital images.
	Methodology	60 consecutive patients who visited the oral medicine services at the Federal University of Paraná, located in southern Brazil, were included in the sample. Their clinical history and images of oral lesions were documented using clinical electronic charts and a digital camera, respectively, and then shared with two oral medicine consultants via email.
	Results	Out of 60 cases, in 31 cases (51.7%), both consultants correctly diagnosed the condition, while in 17 cases (28.3%) only one consultant made the correct diagnosis, and in 12 cases (20%), neither consultant accurately diagnosed the condition. Hence, in 80% of cases, at least one consultant provided the correct diagnosis.
	Conclusions	By utilizing information technology, the precision of consultations in oral medicine can be enhanced. It was found that involving two experts from remote locations raised the likelihood of arriving at a correct diagnosis.

Kochhar et al. (24) 2020	Objectives	Examine the difficulties encountered by individuals with oral cancer amid the COVID-19 outbreak, as dental services have been halted in some countries due to concerns about the transmission of the virus through saliva and aerosols. The article explores the dentist's responsibility in delivering dental care to cancer patients, the hazards connected with oral illnesses, and the significance of upholding good oral hygiene.
	Methodology	This paper examines published literature and guidelines related to dental treatment for cancer patients prior to, during, and after cancer treatment. It also addresses the difficulties dental practitioners encounter when providing care during the COVID-19 pandemic and recommends tele-dentistry as a solution to ensure continuity of care.
	Results	The article emphasizes the significance of consistent dental care for patients with oral cancer, underscoring the critical role of dentists in providing both therapeutic and palliative care. To ensure patient well-being, the article suggests the use of tele-dentistry to provide support during oncotherapy. Additionally, the article recommends contingency plans for urgent treatment and outlines infection prevention and control procedures.
	Conclusions	Continuous dental care is necessary for patients with oral cancer, even during the COVID-19 pandemic, and it is the responsibility of dentists to ensure that such care is not disrupted. To this end, the article suggests the use of tele-dentistry to support patients undergoing oncotherapy and maintain their overall well-being while adhering to infection prevention and control measures. The authors emphasize the importance of staying up-to-date with federal, national, and international guidelines to protect both patients and the dental team.
Torul et al. (25) 2021	Objectives	Investigate the practicality and precision of tele-dentistry in monitoring various diagnostic categories of Turkish patients undergoing maxillofacial surgery.
	Methodology	The study involved assigning follow-up patients into four categories: dental implant, minor surgical procedure, MRONJ, and TMD. Remote video examination was conducted for all groups, followed by an in-person clinic examination. The video call quality and accuracy were evaluated by a single investigator, and patient satisfaction with the video call was assessed through a questionnaire.
	Results	The study involved 21 patients, comprising 12 females and 9 males aged between 18 and 71 years old (mean age of 38.90 ± 17.88). The results of the post-examination questionnaires showed that 71% of patients strongly preferred video calls, whereas 95% strongly preferred face-to-face examinations.
	Conclusions	A promising solution for reducing clinical visits in routine practice while maintaining reliability equivalent to in-person visits is the remote monitoring of diagnostic groups that can benefit from teledentistry.

Almazrooa et al. (26) 2021	Objectives	Examine the feasibility and dependability of utilizing teledentistry for diagnostic purposes in dentistry, and assess the opinions of dentists in Saudi Arabia regarding its advantages and potential drawbacks.
	Methodology	A digital survey consisting of 40 questions was created, verified, and circulated via email and social media platforms to dentists specializing in various fields throughout Saudi Arabia.
	Results	The survey was completed by 148 dentists. Results showed that half of the participants (50%) have utilized teledentistry in their clinical practice. The majority of the participants had computers (90%) and electronic medical records (72%) with uploaded radiographs and clinical images. Smartphones were the most commonly owned device (91%) and were used more frequently (74.3%) than conventional cameras (54.1%) to capture and share patients' clinical images over communication applications (74.3%) rather than emails (62.2%). Overall, 83% of the dentists expressed confidence that teledentistry could enhance their daily dental practice, especially in the areas of oral radiology, endodontics, and oral medicine.
	Conclusions	Teledentistry is a nascent technology that has the potential to enhance the provision of diagnostic dental care for populations that have restricted or no entry to dental experts.
Pentapati et al. (27) 2019	Objectives	Examine the noteworthy uses of intraoral cameras (IOC) in the field of dentistry and analyze how their implementation may influence patients' adherence to dental treatment.
	Methodology	This review article examines the prevalent use of computerization in dentistry, with a focus on the Intraoral Optical Impression System (IOC). By surveying relevant literature, the authors present compelling evidence for the significance of IOC technology in dental practice.
	Results	In the article, the authors examine the various benefits of using IOC in dentistry, including its ability to uncover unnoticed or concealed dental defects, assist in patient education and record-keeping, aid in lectures and publications, and provide web connectivity for complex cases. Additionally, the article discusses the potential impact of IOC on patient compliance with dental treatment.
	Conclusions	IOC (Intraoral cameras) have brought a revolutionary change in the field of dentistry by enabling dental professionals to visualize, document, and communicate oral health conditions in a more efficient way. With IOC, patient education can be enhanced, diagnoses can be made more accurately, and patient compliance for dental care can be improved. The wide-ranging applications of IOC in dentistry have significant advantages for both dental professionals and patients.

Xiao et al. (28) 2021	Objectives	Introducing a novel dental examination approach known as mobile dentistry (mDent), which integrates conventional dental practice with virtual consultations to ensure optimal dental care, affordability, and safety of patients and dental health care personnel (DHCP) in the face of infectious disease pandemics.
	Methodology	The proposal put forward by the authors is to utilize digital mobile health (mHealth) tools, such as intraoral cameras, to provide virtual oral examinations, treatment planning, and interactive oral health management to a wider population. This approach takes advantage of the reliability of teledentistry, which involves using intraoral photos and live videos to make diagnostic decisions.
	Results	The utilization of the mDent model offers a viable and economical alternative to the conventional dental examination methods that necessitate physical contact, pose sanitation challenges, and consume significant amounts of advanced PPE. By incorporating mHealth technology, specifically intraoral cameras, the model can deliver precise and dependable diagnostic data, while also improving patients' dental care accessibility.
	Conclusions	The authors suggest that the mDent model shows great potential as a viable solution for dental exams in the future, particularly during periods of infectious disease pandemics like COVID-19. They recommend conducting additional research to assess the efficacy of the mDent model in delivering high-quality dental care and enhancing patient accessibility to dental services.
Alklayb et al. (29) 2017	Objectives	How does the efficacy of a mobile application for educating mothers of children under six years old on preventative dental care compare to other methods?
	Methodology	An application called iTeethey™ was created for iPhone and Android platforms, and it was made available for free on both Google Play and the App Store. The application was subsequently distributed to 3879 mothers who have children under the age of 6, with 1989 of them located in the Riyadh Region and 1890 in the Najran Region. Out of those who downloaded the app, 1055 mothers completed the 3-month recall process.
	Results	The application led to a noteworthy enhancement in the mothers' knowledge in both regions. However, mothers from Najran demonstrated a more significant improvement than those from Riyadh. Moreover, the application was particularly efficacious for mothers who had more than one child as opposed to first-time mothers.
	Conclusions	The utilization of a mobile phone application in this study resulted in a noteworthy enhancement in mothers' understanding of their child's oral health.

Estai et al. (30) 2020	Objectives	Assess the effectiveness and overall economic advantages of a new tele-dentistry approach to dental care, with a focus on its ability to enhance oral health outcomes for school-aged children.
	Methodology	A non-inferiority randomized controlled trial involving 250 children from schools in Western Australia will be conducted. The trial will be parallel and two-armed, with schools randomly assigned to either the control or teledental group. All participants will receive a standard dental examination and have their teeth photographed using a smartphone camera. The control group will receive screening results and advice based on the visual dental screening, while the teledental group will receive screening results based on the assessment of dental images by a remote dental practitioner. After 9 months, a final visual dental screening will be conducted for all participants.
	Results	The research is currently in progress, and the outcomes are still pending.
	Conclusions	The objective of this research is to utilize mobile technology to capture dental images of children's mouths in school settings and offer remote dental guidance. By employing teledentistry, this research seeks to prioritize at-risk children and offer prompt treatment options while avoiding unnecessary referrals or travel. The findings of this study may establish a framework for establishing long-lasting dental care for school children in Western Australia.
Kohara et al. (31) 2018	Objectives	In this study, we aim to evaluate the validity of two smartphone models and a conventional camera in detecting caries lesions at varying stages of progression in deciduous molars. We will compare the performance of these devices and analyze their validity parameters.
	Methodology	The study was divided into two parts: a laboratory phase and a clinical phase. During the laboratory phase, 20 primary teeth with caries lesions at various stages were compared using two smartphones (iPhone and Nexus 4) and a conventional macro camera setup. Two examiners evaluated the images independently using the International Caries Detection and Assessment System (ICDAS). The clinical phase involved analyzing images of 119 primary molars from 15 children aged 3 to 6 years, and two examiners assessed the images independently using the same system. In both phases, two experienced examiners directly examined the teeth and came to a consensus, which was considered the reference standard. Validity parameters, such as correct answer percentage, agreement with the reference standard, sensitivity, specificity, and inter-examiner agreement, were calculated.
	Results	The examiners exhibited comparable performance in the laboratory and clinical trials. In the laboratory, the inter-examiner reliability of all devices was about 0.7, while in the clinical setting, it was around 0.7 for the macro camera photography system but approximately 0.9 for the iPhone and Nexus images captured in vivo. In both laboratory and clinical settings, the most accurate responses were recorded for sound and severe caries lesions. Nevertheless, regardless of the camera devices used, the accuracy rate for early and moderate lesions was considerably lower during clinical assessment.
	Conclusions	It is possible to use smartphone images for photographic diagnosis to distinguish between healthy tooth surfaces and severe caries lesions with accuracy. Nevertheless, this method is not effective for detecting early or moderate caries lesions with precision.

Livas et al. (32) – 2019	Objectives	Evaluate the precision of two smartphone-based cephalometric analysis applications in contrast to Viewbox software.
	Methodology	50 orthodontic patients (20 males, 30 females) with a mean age of 19.1 years (SD=11.7) were included in the study. Digital lateral cephalograms taken before treatment were traced twice using two different apps (CephNinja and OneCeph). Viewbox was used as the reference standard software program. The measurements included seven angular and two linear measurements based on Steiner cephalometric analysis.
	Results	In terms of validity, the ICCs for OneCeph vs Viewbox and CephNinja vs Viewbox ranged from .903 to .983 and .786 to .978, respectively. For intratool reliability, the ICC values ranged from .647 to .993. All measurements taken with CephNinja met the recommended cutoff values for ICCs, indicating high reliability.
	Conclusions	In terms of validity, OneCeph outperforms Viewbox, whereas for reliability, CephNinja is the superior alternative to Viewbox. There is great potential for smartphone apps to supplement traditional cephalometric analysis.
Hansa et al. (33) 2020	Objectives	Examine the impact of Dental Monitoring® GoLive® on Invisalign® treatment by comparing its effects on various factors such as treatment duration, number of appointments, number of refinements, total number of refinement aligners, and time to initial refinement, in comparison to Invisalign® without DM GoLive®.
	Methodology	An online survey was conducted, where 155 Invisalign® patients (88 DM and 67 control) who met the inclusion and exclusion criteria were included consecutively.
	Results	According to the results of the questionnaire, 68.8% of the respondents (44 individuals) reported that performing DM scans was either "easy" or "very easy," while 25% (16 individuals) found it "difficult" or "very difficult." Furthermore, 71.9% (46 individuals) expressed satisfaction with the level of communication with their orthodontist using DM, whereas 10 respondents (16%) reported feeling dissatisfied. In addition, 88% of patients (56 individuals) preferred to have as few office visits as possible, while 8 individuals (12%) indicated a preference for additional office visits.
	Conclusions	In general, patients had a positive response to DM. Nevertheless, a minority (typically less than 15%) expressed discontent with DM in different ways and favored more frequent and conventional in-person appointments.

Farooq et al. (34) 2020	Objectives	Evaluate how teledentistry could contribute to maintaining dental education during the COVID-19 pandemic.
	Methodology	The authors reviewed literature on the application of teledentistry in dental education, clinical training, and patient care to provide an overview of its potential role in continuing dental education.
	Results	According to the study, the global closure of dental schools and universities due to the COVID-19 pandemic has caused a disruption in dental education. However, teledentistry, a branch of telemedicine, can serve as a viable solution to facilitate ongoing dental education, clinical training, and patient care. Through the use of video conferencing technology, teledentistry can provide remote educational activities, advice, and diagnosis on treatment, making it an effective means of preventing any further disruption to dental education. With the aid of modern and updated devices and tools, teledentistry has the potential to be highly beneficial.
	Conclusions	Teledentistry has the potential to facilitate dental education, clinical training, and patient care amidst the COVID-19 pandemic. By leveraging advanced tools and devices, it can serve as an efficient means to prevent any disruptions in dental education and ensure the continuity of the learning process.
Chopra SS, Sahoo NK. (35) 2021	Objectives	Identify the obstacles encountered by dental education in the COVID-19 era and suggest measures to adjust to the "new normal" and equip for prospective pandemics.
	Methodology	This article examines the effects of COVID-19 on dental education and suggests strategies to accommodate the present circumstances and potential future outbreaks.
	Results	Due to limited access to clinical learning avenues for students caused by the COVID-19 pandemic, dental education has been greatly impacted. In response, the authors suggest creating a COVID-proof curriculum by redefining learning outcomes, improvising teaching protocols, and adapting assessment practices to adapt to the "new normal." The authors believe that implementing these changes will better prepare dental educators for future pandemics.
	Conclusions	The article highlights the importance of dental educators being prepared for future pandemics by adjusting to the "new normal" and creating a COVID-resistant curriculum. The authors argue that by redefining learning objectives, innovating teaching procedures, and modifying evaluation methods, dental educators can be better equipped to face any future pandemics while maintaining excellent dental education standards.

Marya et al. (36) 2021	Objectives	Provide an in-depth overview of the current situation in the Southeast Asian region regarding the use of teledentistry during the COVID-19 pandemic. Teledentistry involves the transfer of patient information across remote distances for online consultation and treatment planning.
	Methodology	A review article summarizes the current state of the COVID-19 pandemic in the ASEAN region, recent research findings, and the potential applications of teledentistry. The authors offer suggestions for future improvements and explore various forms of teledentistry, as well as how regulatory agencies can integrate it into dental practices in this area.
	Results	In Southeast Asia, dentists have implemented various measures to minimize the possibility of person-to-person transmission within dental clinics. To ensure patients can receive diagnoses or check-ups during their treatment, many clinics have adopted online consultations using teledentistry. The utilization of teledentistry is especially significant during the COVID-19 pandemic, as it reduces the risk of virus transmission and facilitates patients' access to oral healthcare. The article also examines different types of teledentistry and puts forward recommendations for the future, such as incorporating teledentistry into dental practices through regulatory authorities in the region.
	Conclusions	During the COVID-19 pandemic, teledentistry has emerged as a valuable tool for dentists and patients in Southeast Asia, helping to mitigate the risk of virus transmission while improving access to oral healthcare. However, further research is required to determine the efficacy of teledentistry in enhancing oral health outcomes in this region. It is recommended that regulatory bodies integrate teledentistry into dental practices to guarantee its safe and effective implementation.
Zhou et al. (37) 2022	Objectives	Examine how dental professionals perceive and approach the effects of COVID-19 on their professional practice, career choices, and provision of patient care.
	Methodology	An online survey was used to gather data from dental practitioners who are registered in New South Wales (NSW), Australia, in a cross-sectional study.
	Results	This study showcases the consistent upheaval in Australian dental practice caused by the COVID-19 pandemic, and the difficulties encountered by dental practitioners as a result. Although survey responses indicate that respondents felt supported by professional associations, the importance of evidence-based clinical guidelines in determining infection control measures and clinical practice should be emphasized. Additionally, the pandemic has revealed a disconnect between the dental care system and other healthcare sectors.
	Conclusions	To enhance the availability of dental care services in both regular and emergency situations, it is essential to endorse and encourage the implementation of technologically advanced care models, which have already gained popularity in other healthcare domains, within the field of dentistry.

Sen Tunc et al. (38) 2021	Objectives	Assess the knowledge, attitudes, and behaviors of parents in Northern Turkey towards self-administered dental care for their children during the COVID-19 pandemic.
	Methodology	Following the lifting of COVID-19 lockdown measures, a cross-sectional survey was conducted in the pediatric dental clinic at Ondokuz Mayıs University, Faculty of Dentistry, Department of Pediatric Dentistry. The survey aimed to gather data on parents' knowledge and attitudes concerning drug usage for their children, as well as their medication practices. To gather this information, a questionnaire comprising 18 items was designed. The data collected were analyzed using descriptive and analytical statistics, including the chi-square test.
	Results	Out of the total number of parents surveyed (n=273), 70.2% reported using self-medication for their children's dental issues. Among these parents, a majority (n=179; 62.2%) preferred using previously prescribed medications. Analgesics were the most commonly used medicines, with 98% of parents opting for them in their self-medication for their children's dental problems.
	Conclusions	Teledentistry and other novel healthcare services can prove beneficial in mitigating issues stemming from children resorting to self-medication in times of restricted access to healthcare providers, such as in the case of pandemics.
Sycinska-Dziarnowska M, Paradowska-Stankiewicz I. (39) 2020	Objectives	Examine the alterations in online search patterns for dental-related keywords amidst the COVID-19 outbreak, using Google Trends.
	Methodology	Data was gathered between January 1, 2020, and August 23, 2020, through the use of the Google Trends tool. The study analyzed global and US, UK, Poland, Italy, and Sweden search terms "toothache", "dentist", and "stay at home". Correlation analysis was employed to investigate the connection between the search terms.
	Results	Amid the lockdown, there was a reduction in online queries for the term "dentist," which was followed by a surge in searches for "toothache" a week later. On a global scale, the highest proportionate search volume for "toothache" was observed on April 12, 2020.
	Conclusions	The pandemic has caused a significant shift in internet search interest related to dental care. The decrease in searches for "dentist" during lockdown has been followed by an increase in searches for "toothache." These changes indicate a potential surge in demand for dental services in the post-pandemic period. The study recommends the implementation of teledentistry programs in future pandemic outbreaks, considering the observed changes in search behavior.

Saraswati et al. (40) 2022	Objectives	Evaluate how patients view and embrace a teledentistry initiative amid the COVID-19 outbreak.
	Methodology	A pilot survey was conducted using a cross-sectional design to record demographic characteristics of patients and administer a 24-question survey. Statistical analysis included a Chi-square test and ANOVA test, with a significance level of $P \leq 0.05$.
	Results	Nearly half of the patients (48%) expressed their interest in utilizing teledentistry services, with 45% of the participants preferring this mode of visit over a traditional dental appointment.
	Conclusions	It seems that teledentistry satisfies the requirements and desires of our patients.
Menhadji et al. (41) 2021	Objectives	The objective is to examine how dentists and patients perceive dental video consultations (also known as tele-dentistry) and find ways to enhance their overall experience.
	Methodology	An online survey using a cross-sectional pre-post design was conducted to gather information from patients and dentists before and after video consultations. Out of 249 respondents who accessed the survey, 228 agreed to participate in the study and completed the online questionnaire.
	Results	Approximately 70% of patients expressed strong agreement that the video consultation proceeded smoothly, while 75.7% strongly concurred that they felt at ease accessing the consultation from home instead of physically attending it. Additionally, almost 80% of patients indicated that they would recommend the video consultation.
	Conclusions	According to this study, tele-dentistry appears to be a viable solution for facilitating dental care and satisfying both dental patients and service providers, as it is well-received by both parties.
Inquimbert et al. (42) 2021	Objectives	Simplify the dental consultation procedure that is mandatory during the initial visit for newly incarcerated individuals.
	Methodology	1-year Observational Study
	Results	In 2018, a total of 1051 detainees were registered, of whom 651 (58.9%) underwent an oral examination via teledentistry. Out of those examined, only one inmate did not require treatment, and a staggering 88.06% had at least one untreated cavitated carious lesion. Additionally, 44% of those who received a teledentistry check-up were referred to a dentist for emergency dental care.
	Conclusions	Teledentistry implemented during the initial oral health screening in a detention facility can streamline the process and improve the effectiveness of inmate oral healthcare, while also avoiding unnecessary demands on the dentist's time.

Hung et al. (43) 2022	Objectives	Analyze the execution, obstacles, approaches, and advancements associated with teledentistry amid the COVID-19 pandemic's confinement period.
	Methodology	A scoping review was conducted to assess the utilization of teledentistry during the COVID-19 pandemic. The review involved a search of articles on PubMed and Google Scholar, using keywords such as teledentistry, tele-dentistry, covid-19, coronavirus, telehealth, telemedicine, and dentistry.
	Results	Teledentistry was utilized in both synchronous and asynchronous modes for virtual consultations, employing commercial applications such as WhatsApp, Skype, and Zoom. The primary purposes for dental professionals to use teledentistry were for triage, reducing in-person visits, and scheduling and conducting consultations remotely. There were several challenges identified with teledentistry, including the acceptance of the practice by both patients and clinicians, the need for adequate infrastructure, reimbursement issues, and concerns related to security. To address these challenges, strategies such as training for clinicians and patients and the use of Health Insurance Portability and Accountability Act-compliant applications were employed. Teledentistry provided benefits such as delivering care to patients during the pandemic and extending care to areas with limited access to dental services.
	Conclusions	The implementation of teledentistry was initiated as a result of pandemic lockdowns, primarily for triage purposes, but also for non-procedural care and follow-up appointments. Teledentistry proved to be effective in reducing the need for in-person visits and improving access to dental care in remote areas. However, there are still challenges such as inadequate technology infrastructure, insufficient provider skills, billing complications, and privacy concerns that need to be addressed.
Martins et al. (44) 2022	Objectives	Examine the obstacles faced in delivering dental services amidst the COVID-19 outbreak, and assess the viability of employing teledentistry to treat dental patients during this time. Additionally, evaluate the advantages and drawbacks of teledentistry, focusing on its role in telescreening, teletriage, pharmacological treatment, and tele-education in dentistry.
	Methodology	The article conducts a literature review on the utilization of teledentistry for treating dental patients amidst the COVID-19 outbreak. In addition, the authors share their personal experience with EstomatoNet, a tele-diagnosis service, and how teledentistry can be applied in dental education.
	Results	The authors propose that the COVID-19 pandemic has presented novel obstacles in dental patient care, specifically because of PPE scarcity and lockdown measures. They propose teledentistry as a useful solution for managing dental patients during this time. The potential benefits of teledentistry are explored, including telescreening, teletriage, pharmacological management, and tele-education in dentistry. Additionally, the authors provide evidence that teledentistry can be an effective tool for acquiring knowledge and educating dental professionals.
	Conclusions	The COVID-19 pandemic has caused strain on the healthcare system, requiring a revamp in the delivery of dental care. To mitigate the spread of SARS-CoV-2 and minimize associated consequences, experts propose the use of teledentistry. Specifically, telescreening, teletriage, pharmacologic management, and tele-education in dentistry can serve as viable options for managing dental patients during this time.

Amtha et al. (45) 2021	Objectives	Use factor analysis to describe how satisfied oral medicine patients were with teledentistry services during the COVID-19 pandemic.
	Methodology	A cross-sectional study was carried out in the Oral Medicine Clinic with 31 patients who utilized teledentistry services during the onset of the COVID-19 pandemic after giving their informed consent. The questionnaire was modified and validated using the Rasch model analysis. The factors contributing to satisfaction were analyzed through factor analysis, and the satisfaction scores were categorized into five levels: very dissatisfied, not satisfied, moderate, satisfied, and very satisfied.
	Results	In the questionnaire, the Cronbach's alpha value is 0.83 and the reliability item is 0.95, with a separation of 4.49. The factor analysis indicates that two components, convenience and communication, contribute to satisfaction. All participants (100%) reported being either satisfied or very satisfied.
	Conclusions	During the COVID-19 pandemic, teledentistry services were found to be very satisfactory and convenient by oral medicine patients, resulting in a 100% satisfaction rate in the satisfied and very satisfied categories. The patients were particularly pleased with the quality of communication during the consultations.
Aboalshamat KT. (46) 2020	Objectives	The objective is to explore the understanding, perceptions, and behaviors related to teledentistry among dental students and teaching staff in the Makkah province of Saudi Arabia, as well as to identify any obstacles hindering its adoption.
	Methodology	A group of 314 dental students took part in a cross-sectional study approved by Umm Al-Qura University in Saudi Arabia. The study utilized a reliable self-reported questionnaire to evaluate participants' knowledge, attitudes, and practices related to teledentistry, as well as any barriers they may have encountered.
	Results	Initially, only 17.2% of the participants were familiar with the term "teledentistry." However, upon receiving an explanation, they were able to accurately respond to 25.16% to 62.42% of questions related to teledentistry. A majority of participants, 67.83%, expressed a willingness to practice teledentistry, while 70.7% supported the implementation of teledentistry on a national level as part of Vision 2030. Although only 25.16% of participants had previously used teledentistry, 56.05% had undergone dental consultations via smartphone. The main obstacles to the implementation of teledentistry were patient satisfaction with physical presence of a dentist, concerns about privacy violations, and inadequate public education.
	Conclusions	Although dental students have limited knowledge about teledentistry, they exhibit a willingness to learn and utilize this technology. It is recommended to incorporate the topic of teledentistry in their ongoing dental education, specifically in terms of its application during health crises such as the COVID-19 pandemic.

Crummey et al. (47) 2022	Objectives	Assess how patients view video consultations and investigate whether those who had virtual consultations were provided with the same level of information by checking if patient information leaflets (PILs) were sent out in compliance with audit standards.
	Methodology	An audit was conducted retrospectively to evaluate the records of 100 video consultations, examining whether Patient Information Leaflets (PILs) were sent and through which method. The department implemented a new system where PILs were digitalized, and clinicians could email patients a PIL hyperlink through a clinical mailbox. The audit was repeated for 88 video consultations, and feedback was obtained from both patients and staff through online surveys.
	Results	To put it differently: At first, the criteria for a Patient Information Leaflet (PIL) were met by 51% of cases, and only 16% of patients received PILs. After the mailbox was introduced, the criteria were met by 53% of cases and 94% of patients were sent PILs, all of them through email. Patients and staff had a favorable response towards video consultations and digital PILs. However, technical issues were reported in 44% of cases.
	Conclusions	Virtual consultations are viewed positively by patients and the addition of a mailbox improves video consultations in a way that is both efficient and cost-effective. Digital Patient Information Leaflets (PILs) can be standardized for all types of consultations. The implementation of a mailbox can lead to various improvements in care as departments adopt post-pandemic changes.
Al-Khalifa KS, AlSheikh R. (48) 2020	Objectives	Investigate how dental professionals in Saudi Arabia perceive the advantages of teledentistry in enhancing dental practice and patient care.
	Methodology	A cross-sectional study was conducted to investigate the perceptions of dental professionals in Saudi Arabia regarding teledentistry. The study used a validated questionnaire consisting of 26 items rated on a 5-point Likert scale to assess the usefulness of teledentistry for patients and dental practices, the potential of teledentistry to improve practice, and the existing concerns about its use. An electronic survey was used to collect data from the participants.
	Results	The study had a participation rate of 28.6%, with 286 dental professionals taking part. Over 70% of those who responded agreed or strongly agreed that teledentistry could enhance communication with colleagues, provide better guidance, and lead to the referral of new patients. However, a significant percentage of respondents (60-70%) expressed doubts about technical reliability, privacy, and diagnostic accuracy.
	Conclusions	A need exists to assess the preparedness of dental professionals for involvement in teledentistry. Additionally, further exploration of the teledentistry business model is required to comprehend the associated challenges and readiness. To promote awareness and understanding of the technology's potential, targeted educational campaigns for both dentists and the public are imperative.

Maqsood et al. (49) 2021	Objectives	Evaluating the influence of teledentistry on the enhancement of dental practice and clinical care globally, including its utilization, effects, and current developments.
	Methodology	A global survey was conducted among dental professionals using an electronic questionnaire. The survey, which included a validated form with 26 questions and a 5-point Likert scale response, was divided into four domains: the effectiveness of teledentistry for patients, its usefulness in dental practice, its potential to enhance current practice, and any associated concerns.
	Results	The study involved 506 dental professionals, and the response rate was 89.39%. The majority of respondents (50-75%) viewed teledentistry as a valuable tool for enhancing both clinical practice and patient care. Additionally, 69.96% of participants believed that teledentistry would decrease the expenses associated with dental practices. However, approximately 50-70% of dental professionals expressed apprehensions about patient consent and data security.
	Conclusions	Dental professionals showed a positive attitude towards incorporating teledentistry into their clinical practice, but concerns regarding this modality were significant obstacles to its integration into the oral health system.
Boringi et al. (50) 2015	Objectives	Evaluating the level of familiarity and consciousness regarding teledentistry among dental practitioners affiliated with a dental institution in India.
	Methodology	A survey on teledentistry was conducted among dental professionals in an Indian dental college using a questionnaire to evaluate their knowledge and awareness. The study utilized a cross-sectional design and the questionnaire was circulated among the participants.
	Results	The questionnaire was completed by 406 individuals. The study revealed that postgraduates (7.23%) and interns (9.38%) had a significantly lower level of knowledge and awareness of teledentistry compared to I & II BDS. However, the majority of respondents believed that teledentistry involves providing dental services through different forms of media, but has limited application in dentistry and is not associated with any legal issues.
	Conclusions	The study revealed that a significant proportion of respondents demonstrated a lack of sufficient knowledge and awareness about teledentistry. Consequently, there is a pressing need to educate dental professionals about teledentistry given its potential for transforming the field through technological advancements. This objective can be achieved through the implementation of Continuing Dental Education (CDE) programs and awareness campaigns at various levels. Such initiatives can mark the dawn of a new era in dentistry.

Sybil et al. (51) 2022	Objectives	Evaluate the level of adherence among individuals to the prescribed treatment and postoperative instructions, and analyze any variations in the occurrence of postoperative complications in patients who belong to three groups - those who received verbal instructions only, those who received verbal and written instructions, and those who were given instructions through the ExoDont app.
	Methodology	A nonrandomized and prospective comparative study was conducted to evaluate postoperative compliance and complications in patients following tooth extraction. Participants were divided into three groups (Group A, Group B, and Group C) based on eligibility criteria. Group A received verbal instructions, Group B received verbal and written instructions, and Group C used the ExoDont app. The study included a 1-week follow-up to gather feedback from participants.
	Results	Ninety patients were recruited and evenly distributed into three groups. Group C exhibited the highest compliance with the prescribed medication, with 83% and 93% of the 30 participants completing the entire course of antibiotics and analgesics, respectively. Group C also displayed better adherence to postoperative instructions, specifically with regard to compliance with diet restrictions (P=.001), refraining from rinsing for 24 hours (P<.001), and warm saline rinses after 24 hours (P=.001). However, there was no significant difference in compliance with smoking restrictions (P=.07) and avoiding alcohol (P=.16) among the three groups. Furthermore, there was no statistically significant difference in the incidence of postoperative complications among the three groups (P=.31).
	Conclusions	The ExoDont app can be useful in avoiding the potential for missed dosages and postoperative instructions, and promoting successful recovery for dental extraction patients. Nonetheless, further research is needed to validate the app's effectiveness as a standard method of delivering postoperative instructions in clinical practice.
Giraudeau et al. (52) 2022	Objectives	Conduct a nationwide investigation into how dentists in private practice in France perceive their knowledge, attitudes, and utilization of Teledentistry.
	Methodology	A nationwide descriptive survey based on questionnaires was carried out between 10 November 2020 and 13 December 2020. The survey was conducted on a national level and was anonymous and voluntary. The National Board of Dentists sent the survey to 42,464 private dentists who were officially registered in France. The survey comprised of 36 questions divided into different sections, which included information about the respondents' general profile such as gender, age range, and the university where they completed their dental studies. Additionally, the survey evaluated the respondents' knowledge of telemedicine and their familiarity with current regulations on telemedicine as well as activities that qualify as telemedicine.
	Results	Out of a sample of 2,887 dentists in private practice, only 57.1% reported that they were not familiar with TD. Additionally, only a small percentage of dentists had received training on telemedicine and/or TD during their studies at university (1.5% or 76 dentists), and only a few dentists who practiced TD were aware of telemedicine regulations (1.3% or 26 dentists). Among those who had never practiced TD, 65.7% (2,020 dentists) expressed interest in doing so, while among those who had practiced TD, 74.8% (1,485 dentists) said they would like to continue doing so.
	Conclusions	The study highlights the importance of improving education and training on TD, as well as regulations, in the field of dentistry. Collaboration among all stakeholders may be necessary to address these issues effectively. Furthermore, it is crucial to recognize that TD and telemedicine are public health resources that have the potential to create disparities in medical care access. However, implementing TD appropriately can help reduce inequalities and prevent the opposite outcome.

Pradhan et al. (53) 2019	Objectives	Assess the level of knowledge, awareness, and attitudes towards teledentistry among dental postgraduates located in Kanpur city, India.
	Methodology	A descriptive survey was conducted on 120 postgraduate students using a self-structured, close-ended questionnaire consisting of 20 pretested questions. The collected data was systematically compiled and analyzed for frequency, specifically in terms of yes and no responses.
	Results	Out of the total number of postgraduate students surveyed, which was not specified, only 77 responded. Among the respondents, it was noted that 74.4% had knowledge about teledentistry, and 79.2% expressed an intention to practice teledentistry in the future. The study found an overall awareness and positive attitudes towards teledentistry of 71.7%.
	Conclusions	The postgraduate dental students were found to have satisfactory levels of knowledge, awareness, and attitudes.
Bugis BA. (54) 2022	Objectives	Explain how dental care seekers in Saudi Arabia have been using teledentistry services during the pandemic.
	Methodology	A publicly released online self-administered survey was conducted as a cross-sectional descriptive study between March to May 2021, targeting dental care seekers in Saudi Arabia who utilized teledental services during the COVID-19 pandemic.
	Results	Out of the 235 responses that were analyzed, the majority (91.91%) did not make use of any teledental services during COVID-19. On the other hand, a small proportion (8.09%) reported utilizing various teledental services during the pandemic.
	Conclusions	Saudi Arabia boasts a robust technological infrastructure and a highly regarded healthcare system. Despite this, teledental services were not widely utilized by dental patients during the COVID-19 pandemic. To encourage the use of teledentistry among the Saudi population, it is imperative to raise awareness, provide education, and engage in promotional efforts.
Emami et al. (55) 2017	Objectives	Assess the existing literature regarding patient contentment with E-Oral Health services delivered in rural and remote regions.
	Methodology	A comprehensive search strategy will be utilized to explore Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, and Global Health for interventional and observational studies conducted in rural and remote communities worldwide. The studies will include the implementation of E-Oral Health technology as an intervention.
	Results	The aim of this systematic review is to offer valuable insights into how patients perceive the quality of E-Oral Health care in rural and remote communities. This analysis can aid policymakers and healthcare practitioners in comprehending the advantages of E-Oral Health care and how it can be an effective solution to the healthcare difficulties experienced by people in these regions.
	Conclusions	This systematic review aims to assess patient satisfaction with E-Oral Health care, which holds promising potential for enhancing access to oral health care in rural and remote communities with limited resources. The findings of this review could offer valuable insights for policymakers and health care practitioners seeking to optimize the delivery of oral health care services in underserved areas.

Murthy et al. (56) 2022	Objectives	Evaluate the Oral Medicine department's patients' encounters with virtual consultations (phone and video) during the initial phase of the COVID-19 pandemic.
	Methodology	The Patient Experience Team at Guy's and St Thomas' NHS Foundation Trust collaborated to create a validated survey for collecting patient feedback. The survey comprised both previously validated questions and newly validated psychometric questions. It was distributed to all patients who had virtual consultations (via telephone or video), and the collected data was analyzed electronically. Additionally, the qualitative data was thematically analyzed
	Results	In total, 115 surveys were conducted, and more than 82% of the participants rated their experience as good or very good. Additionally, 69% of the respondents indicated a preference for a virtual consultation for their next appointment.
	Conclusions	Oral Medicine virtual consultations were positively received by patients in terms of their experience.
Ali SA, El Ansari W. (57) 2022	Objectives	Evaluate the dependability of using synchronous audioconferencing for teledentistry (TD) to make preliminary diagnoses, and compare it to the accuracy of definitive clinical face-to-face (CFTF) diagnoses. Additionally, explore whether factors such as the dentist's experience, the relationship between the caller and patient, and the timing of the call had an impact on the level of agreement between the diagnoses.
	Methodology	A total of 191 patients who contacted the TD hotline during the COVID-19 pandemic and were identified as needing urgent or emergency care were enrolled in the study. The hotline's dentists triaged the calls and provided tentative audio-dentistry (AD) diagnoses, while the dentists at the referral point confirmed the definitive CFTF diagnosis. The level of agreement between the AD and CFTF diagnoses was evaluated using Cohen's weighted kappa (κ).
	Results	The study found a high level of agreement between AD and CFTF diagnoses, with a significant pairwise agreement of $\kappa = 0.853$ and $P < 0.0001$. Disagreements were more frequent for AD diagnoses of pulpitis and periodontitis. Tele-dentists with 20 or more years of experience had the highest agreement level ($\kappa = 0.872$, $P < 0.0001$). When calls were mediated by mothers, there was perfect agreement ($\kappa = 1$, $P < 0.0001$). Calls received between 7 am-2 pm also had very good agreement ($\kappa = 0.880$, $P < 0.0001$), whereas calls received between 2-10 pm had a slightly lower level of agreement ($\kappa = 0.793$, $P < 0.0001$).
	Conclusions	The use of AD for remote tentative diagnosis is a reliable and secure approach. However, the level of reliability may vary depending on factors such as the dentist's experience, the relationship between the caller and patient, and the time of the call. Nonetheless, overall, the reliability of this method is considered to be quite high.

Zotti et al. (58) 2022	Objectives	Assess the efficacy of utilizing teledentistry, which employs a home intraoral imaging protocol, to detect dental caries. Additionally, compare the precision of this approach with traditional clinical examination methods.
	Methodology	A cross-sectional study was conducted with 43 patients who were recruited for the study. In this study, a protocol was used for taking intraoral photographs at home with a smartphone, which was proposed by the Dental School of Verona. An experienced dentist performed a remote diagnosis of dental caries (TD) using the photographs. Additionally, a second experienced dentist assessed the same caries sites through clinical diagnosis (CD). Statistical tests were conducted to determine the sensitivity and specificity of TD, as well as the positive and negative predictive value of TD (PPV-NPV). Furthermore, a Spearman correlation was performed to examine the relationship between the scores of TD and CD.
	Results	There were 430 photographs submitted, out of which 215 underwent TD and 43 patients were examined. In total, 1201 teeth were analyzed, with a sensitivity of 74.0 and a specificity of 99.1. The PPV of TD was 91.7, and the NPV was 96.4. Additionally, the strong Spearman correlation of 0.816 indicated a high degree of agreement between TD and CD values.
	Conclusions	The research demonstrated that TD holds promise as a viable technique to integrate with standard caries diagnosis procedures in everyday preventive dentistry.

6 DISCUSSION

In 2023, the exchange of information via the Internet is almost ubiquitous, thanks to a population that is increasingly connected and equipped with smartphones and tablets, from an early age.

Teledentistry, since its exponential growth during the Covid-19 pandemic, has also been able to modernize and become more accessible. Indeed, many patients who were followed by health professionals during the quarantines have continued and added these virtual consultations to their routines. In fact, in a study conducted with 148 dentists, 50% of them have implemented Teledentistry in their daily practices and 83% think that it could improve dental treatments of everyday, especially in endodontic treatment and oral pathologies ⁽²⁶⁾. Also, in another study, 73% of dentists are convinced of its effectiveness for populations living in rural areas and 90% that it is an enhancement for the future of healthcare systems ⁽¹⁰⁾. Additionally, in a large number of areas, inter-associate meetings have been maintained online and the same is true in the field of dentistry and general medicine practice.

In addition to avoiding an increase in Covid-19 and other seasonal viruses, Teledentistry has saved time and money. However, the difference in cost between an online consultation and a conventional consultation with the physical presence of a dentist still needs further study. Children are also delighted and most of them report that they are less stressed when they have their first treatment in a dental clinic, due to the trusting relationship established beforehand. Young people, but also older people, appreciate these virtual consultations, describing that they feel more followed and accompanied. Indeed, in a study carried out on 2492 patients, between May 2020 and April 2021, 90% thought they were well-cared for and took an active role in their treatment during the visit ⁽¹¹⁾. Also, in another randomized clinical trial realized in 60 patients, 83,3% would prefer to conduct a call-based follow-up than a typical aftercare procedure ⁽¹²⁾. In a 21 patients' study, aged from 18 to 71 years old, 71% of women and 95% of men, would rather have video calls over other methods., after having experienced it ⁽²⁵⁾. However, there are still some patients who feel overwhelmed by the new technologies and therefore prefer a more traditional consultation.

Some treatments can only be carried out in the physical presence of a dentist, especially when it is a painful emergency. In a study carried out in Switzerland, during the 6 weeks of several confinements from February 2 to June 6 2020, 3109 dental emergencies were

recorded, particularly dental infections, emergency orthodontic issues and post-surgical pain⁽⁸⁾. However, more and more smartphone applications are appearing, that focus on preventing complications following invasive treatment such as a dental surgery.

Confidentiality of information is still a recurrent question among patients and in most cases depends on the software or application used and their security systems. In a survey of 406 professionals, the majority of them raise the issue of the use of limited Teledentistry without involving a legal concern⁽⁵⁰⁾. Furthermore, in another study conducted in 2021, out of 506 dentists, 50–70% of people reported to be worried about the security of information and patient consent⁽⁴⁹⁾. However, the internet is becoming more and more modern and so are the applications, such as a more user-friendly interface, or availability in several languages and above all free of charge for the patient.

However, it is still necessary to combine Teledentistry with a conventional consultation in order to establish a real relationship of trust with the patients and that they feel above all our support, both physical and moral.

7 CONCLUSIONS

1. The most frequent indications in Teledentistry are: oral and maxillofacial surgery, endodontic and restorative treatments, pediatrics, orthodontic treatments, geriatric patients, prosthodontics, periodontal treatments and dental education.
2. The accuracy of Teledentistry varies according to the type of service and the technologies used, but in general, it has proven to be a useful and accurate tool for certain types of consultations and treatment follow-up.
3. The acceptability of Teledentistry may vary according to the experience and familiarity with the technology of both patients and dental health professionals. It is therefore recommended in some cases to combine Teledentistry with a more conventional consultation.

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Figure 1: Jampani ND, Nutalapati R, Dontula BSK, Boyapati R. Applications of teledentistry: A literature review and update. J Int Soc Prev Community Dent [Internet]. 2011 [cited 2023 Feb 13];1(2):37–44. Available from: <https://pubmed.ncbi.nlm.nih.gov/24478952/>

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Figure 3: Abril-Gonzalez M, Portilla FA, Jaramillo-Mejia MC. Standard Health Level Seven for odontological Digital Imaging. Telemed J E Health [Internet]. 2017 [cited 2023 Feb 13];23(1):63–70. Available from: <https://pubmed.ncbi.nlm.nih.gov/27248059/>

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Figure 6: Lin I, Datta M, Laronde DM, Rosin MP, Chan B. Intraoral photography recommendations for remote risk assessment and monitoring of oral mucosal lesions. Int Dent J [Internet]. 2021 [cited 2023 Feb 13];71(5):384–9. Available from: <https://pubmed.ncbi.nlm.nih.gov/33618833/>

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Figure 9: Crummey A, Graham A, Besi E. Virtual consultations for oral surgery patients. BMC Oral Health [Internet]. 2022 [cited 2023 Feb 13];22(1):83. Available from: <https://pubmed.ncbi.nlm.nih.gov/35317799/>

Figure 10: Crummey A, Graham A, Besi E. Virtual consultations for oral surgery patients. BMC Oral Health [Internet]. 2022 [cited 2023 Feb 13];22(1):83. Available from: <https://pubmed.ncbi.nlm.nih.gov/35317799/>

Figure 11: Flowchart of the research strategy