ADVANCEMENT IN DENTISTRY

The utilization of digital technology has become an essential component of our everyday lives, connecting the world's population like never before. Innovation, particularly in the realm of digital technology, is occurring at an unparalleled rate. Nonetheless, the potential for digital health solutions to enhance the health of populations remains largely untapped.

WHO acknowledges the influence of digital technology and health innovation in hastening global health and well-being. The Global Strategy on Digital Health, embraced by the World Health Assembly in 2020, provides a plan to incorporate the most recent advancements in digital health and implement them to enhance health outcomes.

One of WHO's strategic visions is to guarantee that digital health supports fair and all-encompassing access to quality health services. Digital health can amplify the efficiency and sustainability of health systems, enabling them to offer affordable, fair, and high-quality care.

These objectives are challenging to accomplish, particularly for low- and middle-income countries. The Global Strategy on Digital Health aims to assist countries in fortifying their health systems through the application of digital health technologies, in accordance with the vision of health for all. The strategy is designed to be adaptable and accessible to all Member States, including those with limited access to digital technologies, goods, and services.

Importance of Technological Advancements in Dentistry

In spite of the general understanding of the importance of oral hygiene and its connection with overall health, many people still feel discomfort when it comes to visiting the dentist. However, the field of dentistry is currently going through a revolution with the introduction of new technologies like virtual reality, artificial intelligence (AI), and CRISPR. It is important to embrace these advancements and understand their associated pros and cons. The potential for alternative treatments, improved workflow, increased productivity, and higher quality of care is on the horizon. Similar to other healthcare sectors, dentistry has undergone a transformation with computer-based technologies, new preventive measures, and enhanced diagnostic methods. Digitalization, cloud computing, and the integration of applications with smartphones and other devices allow patients to continuously monitor their oral health. Additionally, wearable biosensor technology like fitness trackers, smartwatches, and glucose monitors have become an essential part of our daily lives.

The future tech of dentistry

Technologies are gradually becoming ubiquitous in modern human life. The exponential growth in health data and the maturation of health-care AI have made it possible to integrate smart algorithms within the health-care system. These algorithms can analyse health data, research findings, and treatment techniques to offer diagnostic and therapeutic recommendations for individual patients. Currently, AI is rapidly advancing beyond text-based, image-based dental practice.

The digitization of dentistry is entering a new phase, with dentists using software to gain insights into clinical decision-making. Patient care is also becoming more mobile-oriented, and AI-based devices are crucial in allowing patients to monitor their health and share data with dental practitioners easily. In addition to analysing health data, AI-based algorithms can help specialists better manage dental conditions. In 2019, researchers developed a machine learning method to accurately quantify immune cells near oral cancer cells, providing better insights

into the spread of and resistance to cancer and improving the determination of survival chances. Others are using neural networks to improve the detection of dental decay and periodontal disease from radiographs. These approaches may become standard practice in the near future. The potential applications of AI in health care are limitless

Intelligent Toothbrush

Smart toothbrushes are equipped with numerous advanced features like cameras, sensors, and more to monitor brushing activity and simulate a dental check-up during regular brushing. This allows dentists to examine the individual's teeth using the camera data during brushing. Additionally, the attached pressure sensors can be utilized to determine if the brushing process is being carried out correctly.

All the information can be sent to the dentist in real-time, thereby improving the preventive care process.

The intelligent brush can also capture intraoral images, which are then transmitted to the server. AI algorithms analyses these images and search for indications of cracks, cavities, or other abnormalities that require a specialist's attention. If the initial scans indicate any concerns, both the patient and the clinician are alerted through mobile apps, and the patient is advised to schedule an appointment at the dental clinic.

Augmented Reality (AR)

The technology of enhanced reality offers supplementary virtual information in combination with the physical environment, presenting diverse opportunities in various fields. Medical education and training have extensively integrated this technology, particularly in the realm of oral and maxillofacial surgery in dentistry, where the most frequent applications are dental implant placement and orthognathic surgery. Ongoing technological advancements are facilitating the exploration of new possibilities in restorative dentistry, orthodontics, and endodontics.

Enhanced Reality can be utilized alongside a mannequin, allowing students to perform procedures while receiving immediate feedback as their movements are tracked. This enables them to quickly identify areas for improvement and enhance their skills in the process. Additionally, AR can be beneficial in dental reconstructive and aesthetic procedures, providing patients with a preview of their post-treatment appearance. AR apps use the camera of a phone or tablet to overlay virtual images of the improved set of teeth before the actual procedure. This allows patients and dentists to personalize various features of the teeth such as height and spacing according to their preferences even before entering the surgery room.

Virtual Reality (VR)

Virtual reality (VR), not to be mistaken for AR, is a technology that completely immerses the user in a simulated environment by isolating them from the outside world with a dedicated headset. By wearing such a headset, aspiring dental surgeons and students can be transported to the operating room (OR) from the comfort of their sofa, while patients can visualize a soothing landscape to enhance their experience while sitting in the dreaded dentist's chair.

Currently, only a limited number of students are able to observe surgeries up close, making it challenging to learn the complexities of the profession. However, with the assistance of virtual reality cameras, surgeons can broadcast operations worldwide, allowing medical students to observe procedures in real-time using their VR goggles. Dentistry has been particularly swift in adopting this technology, which can also be used to assist dentists in developing empathy through simulations that place them in their patients' shoes or in difficult situations.

On the patient side, VR can be an effective tool for distraction in dentistry, potentially easing anxiety associated with dental appointments. Patients can wear goggles displaying tranquil natural scenes, which can help them remember their treatments more positively afterwards.

Augmented reality and virtual reality have been widely embraced in all areas of dentistry and dental education as digital tools. Virtual articulators, in particular, enable a comprehensive analysis of occlusion with dental models that can simulate all movements of the lower jaw in both still and moving positions. When combined with additional software, virtual articulators can enhance education and practice, enable faster and more accurate personalized diagnoses, and facilitate discussions of dental treatment planning options with patients during their initial appointment.

Digital Patients

and communication. This allows them to practice and improve their communication skills in a controlled and safe environment before interacting with real patients. Additionally, virtual patients can provide a wide range of scenarios and medical conditions, allowing students to gain exposure to a variety of cases that they may not encounter during their clinical training. This exposure helps them develop critical thinking and problem-solving skills, as they learn to diagnose and develop treatment plans for different patients. Overall, the integration of technology and virtual patients in dental education offers a valuable tool for enhancing the training and preparation of future dental professionals.

Phone dentistry

Visiting healthcare facilities can be difficult for patients with specific needs or the elderly residing in nursing homes. Moreover, distance is a major concern as individuals living in rural areas seldom have access to dental services and often have no alternatives available. However, this situation can change dramatically with the widespread use of tele dentistry.

Tele dentistry solutions provide convenient access to oral and dental care, are significantly more affordable, promote preventive practices, and allow patients to consult with healthcare professionals who may not be otherwise accessible. It also offers a comprehensive tele dentistry platform that enables patients to capture images, transmit relevant information to a dentist remotely, and engage in live consultations. The dentist can initiate a video chat with the patient and caregiver, enabling the medical professional to communicate with the patient, establish a rapport, offer assistance, and arrange for a visit to the clinic if necessary.

Recent years have witnessed notable technological advancements in the field of dentistry. The utilization of computers, telecommunication technology, digital diagnostic imaging services, devices, and software for analysis and follow-up has all progressed. Consequently, the field of dentistry has made significant strides in terms of remote care. Advanced information technology has not only enhanced the quality of dental patient management but has also made

it feasible to manage them partially or entirely from thousands of kilometers away from healthcare centers or qualified dentists. Telemedicine's dental sector, commonly referred to as "tele dentistry," encompasses the entire process of networking, sharing digital information, remote consultations, workup, and analysis.

Intelligent Teeth

The incorporation of advanced microchips into artificial limbs or the extraction of a fragment of the existing tooth to implant a microchip could allow for the monitoring of different factors. These microchip implants could aid in the creation of "smart teeth" that are capable of determining the acidity level of saliva, food intake, the quantity of acidic beverages and meals consumed, blood alcohol concentrations, and additional information. The information gathered could subsequently be examined utilizing AI and big data analysis to detect trends and connections. This could potentially result in a rise in individualized suggestions for preventive dental care for every individual.

Computer-Assisted Design and 3D Printing

The use of computer-aided design (CAD) and computer-aided manufacturing (CAM) has become more popular in the field of dentistry over the past 25 years. This technology is used in both dental labs and dental offices to create inlays, onlays, veneers, crowns, fixed partial dentures, implant abutments, and even full-mouth reconstruction. Additionally, orthodontic treatments are also starting to incorporate CAD/CAM technology.

The development of CAD/CAM technology aimed to address three main concerns. Firstly, it aimed to ensure that restorations, especially those for back teeth, were strong enough. Secondly, it aimed to create restorations that look natural. Lastly, it aimed to simplify and speed up the process of tooth restoration while improving accuracy. In some cases, CAD/CAM technology allows for same-day restorations for patients.