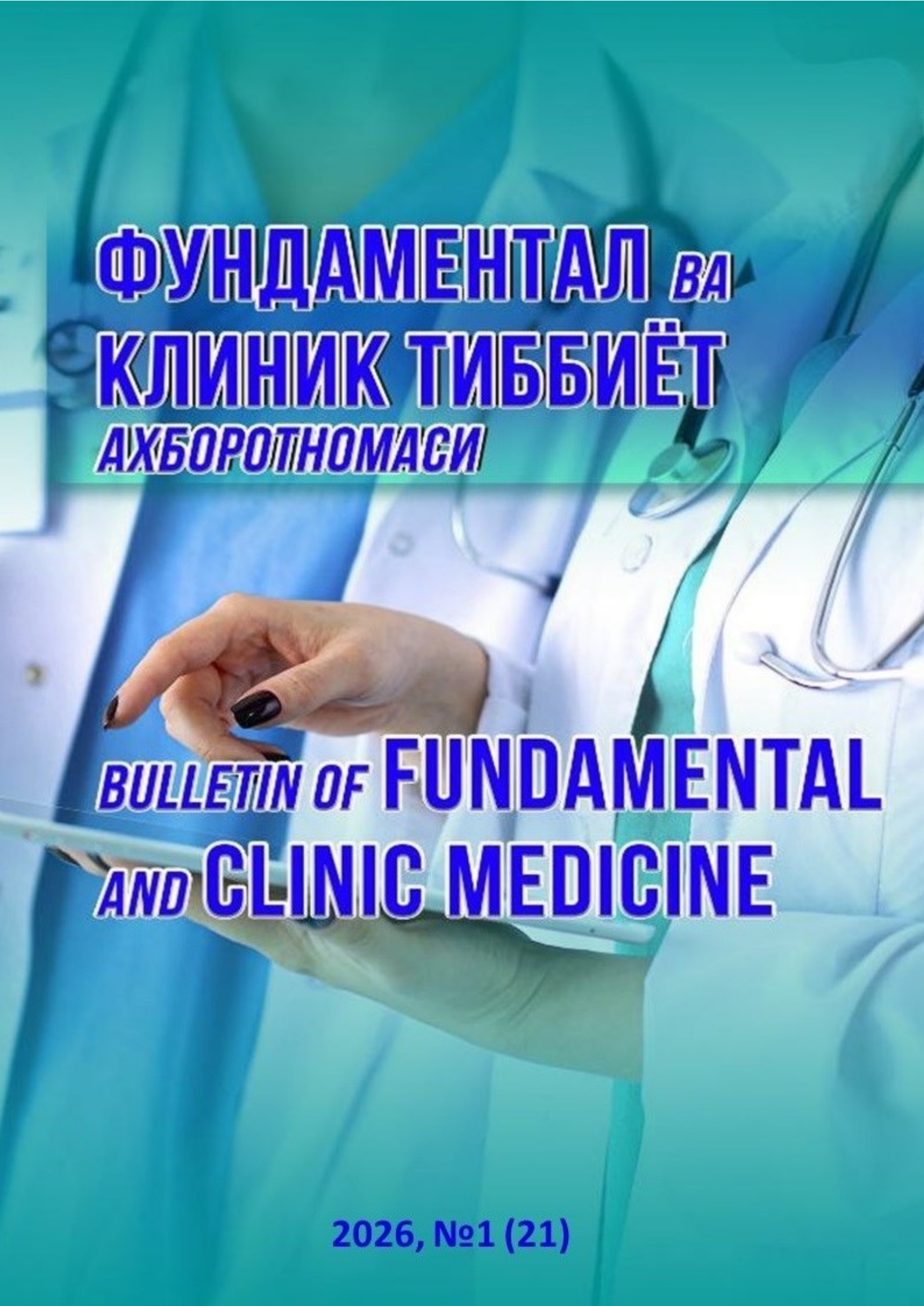

ФУНДАМЕНТАЛ ВА КЛИНИК ТИББИЁТ АХБОРОТНОМАСИ

BULLETIN OF FUNDAMENTAL AND CLINIC MEDICINE

2026, №1 (21)

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LITERATURE REVIEW: DEVELOPMENT OF ARTIFICIAL INTELLIGENCE IN DENTAL PRACTICE

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Resume. *Artificial intelligence is a rapidly advancing technology increasingly integrated into contemporary human existence. Dentistry represents one of the most potential applications. Modern technology enables artificial intelligence to enhance the effectiveness of diagnosing, treating, and preventing oral diseases. Artificial intelligence in dentistry enables dentists to operate with enhanced precision and efficiency. Moreover, it accelerates treatment, augments patient comfort, and improves the overall quality of the patient experience. This article examined the applications, advantages, and disadvantages of artificial intelligence. Methods and instruments for enhancing the processes of diagnosis, treatment, and prevention were analyzed. The healthcare system may see a substantial transition due to emerging technology, which can reduce clinic costs while concurrently enhancing service quality. To optimize results in the diagnosis, treatment, and prevention of oral diseases, artificial intelligence will ultimately assume a pivotal position in dental practice.*

Keywords*: artificial intelligence, dental care, preventative measures, diagnostics, advancements.*

АДАБИЁТЛАР ТАҲЛИЛИ: СТОМАТОЛОГИК АМАЛИЁТДА СУНЪИЙ ИНТЕЛЛЕКТНИНГ РИВОЖЛАНИШИ

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Резюме. *Сунъий интеллект инсон ҳаётининг барча соҳаларига тобора кенг жорий этилаётган жадал ривожланаётган технологиялардан бири ҳисобланади. Стоматология ушбу технологияни қўллаш учун энг истиқболли йўналишлардан бири ҳисобланади. Замонавий технологиялар сунъий интеллектдан фойдаланиш орқали оғиз бўшлиғи касалликларини аниқлаш, даволаш ва олдини олиш жараёнларининг самарадорлигини ошириш имконини бермоқда. Стоматологияда сунъий интеллектни қўллаш шифокор фаолиятининг аниқлиги ва самарадорлигини оширади, даволаш жараёнини тезлаштиради, беморлар учун қулайлик яратади ҳамда тиббий хизматлар сифатини яхшилайди. Мазкур мақолада сунъий интеллектнинг қўлланиш соҳалари, афзалликлари ва камчиликлари кўриб чиқилган. Диагностика, даволаш ва профилактика жараёнларини такомиллаштиришга қаратилган усуллар ва воситалар таҳлил қилинган. Ушбу технологияларнинг ривожланиши соғлиқни сақлаш тизимида сезиларли ўзгаришларга олиб келиши, клиника харажатларини камайтириш билан бирга хизматлар сифатини ошириши мумкин. Келажакда сунъий интеллект стоматологик амалиётда муҳим ўрин эгаллаб, оғиз бўшлиғи касалликларини аниқлаш, даволаш ва олдини олишда оптимал натижаларга эришишни таъминлайди.*

Калит сўзлар: *сунъий интеллект, стоматологик ёрдам, профилактик чоралар, диагностика, инновациялар.*

ЛИТЕРАТУРНЫЙ ОБЗОР: РАЗВИТИЕ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В СТОМАТОЛОГИЧЕСКОЙ ПРАКТИКЕ

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Резюме. *Искусственный интеллект является стремительно развивающейся технологией, которая всё активнее интегрируется в современную жизнь человека. Стоматология представляет собой одну из наиболее перспективных областей его применения. Современные технологии позволяют использовать искусственный интеллект для повышения эффективности диагностики, лечения и профилактики заболеваний полости рта. Применение искусственного интеллекта в стоматологии способствует более точной и эффективной работе врача-стоматолога, ускоряет процесс лечения, повышает комфорт пациентов и улучшает общее качество медицинской помощи. В статье рассматриваются области применения, преимущества и недостатки искусственного интеллекта. Проанализированы методы и инструменты, направленные на совершенствование процессов диагностики, лечения и профилактики стоматологических заболеваний. Развитие данных технологий способно привести к существенным изменениям в системе здравоохранения, снижая затраты клиник*

при одновременном повышении качества оказываемых услуг. В перспективе искусственный интеллект будет играть ключевую роль в стоматологической практике, обеспечивая оптимизацию диагностики, лечения и профилактики заболеваний полости рта.

Ключевые слова: *искусственный интеллект, стоматологическая помощь, профилактические мероприятия, диагностика, инновации.*

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Introduction. Contemporary medicine is becoming innovative and technologically sophisticated on a daily basis. Consequently, artificial intelligence (AI) is being used across all aspects of medical practice. One domain in which AI has already been implemented is dentistry. Modern technologies enable AI to enhance the effectiveness of oral disease diagnosis, treatment, and prevention. This article will examine the use of AI in dentistry, including its advantages, disadvantages, and functionalities.

1. A Comprehensive Examination of the Application of Artificial Intelligence in Dentistry Artificial intelligence is one of the most exhilarating domains in medical study. Artificial intelligence in dentistry have the capacity to improve the identification, treatment, and prevention of oral diseases. Let us analyze the prospective uses of artificial intelligence in dentistry with more specificity.

Assessment Initially, let us analyze the use of artificial intelligence in the diagnosis of oral diseases. The two most common conditions are periodontitis and dental caries. Oral diseases are identified using radiographic evaluations and ocular inspections. Nonetheless, radiological evaluations may adversely affect the patient's health, and visual inspections may not always provide an accurate appraisal of the disease's existence and severity. Artificial intelligence may be very advantageous in this context.

Image analysis is a method via which AI is used to diagnose oral disorders. Concurrently, AI analyzes X-rays and photographs of teeth and gums [2], [3]. Neural networks, trained on extensive datasets, can accurately identify cavities, periodontal disease, and other oral conditions.

"Caries Diagnosis" by Dental Monitoring is an effort that employs artificial intelligence in dentistry. This research use artificial intelligence to detect cavities in a dental picture. Patients get an accurate diagnostic and therapy recommendations derived from the analysis results.

Therapeutic Intervention AI has the capacity to improve the effectiveness of oral illness therapy as well as diagnostics. AI may be used, for example, to determine the optimal treatment strategy for periodontitis that will provide the most results for each patient. The creation of customized implants and prosthesis exemplifies the use of AI in the treatment of oral illnesses. Artificial intelligence may generate implants and prostheses that are meticulously tailored to each patient, accounting for their specific requirements and anatomical features. NextDent's "3D Printing of Teeth" initiative exemplifies this technology [5]. This work use artificial intelligence to generate accurate 3D models of a patient's teeth and gums. Custom implants and prostheses are fabricated using these models, ensuring the patient optimal comfort and precision [2, 4, 6]. 2.1.3. Prevention AI may be used to prevent oral problems as well as to diagnose and cure them. Artificial intelligence may be used to develop personalized preventive strategies for each patient, including their dietary choices, lifestyle, and anatomical traits.

The "Smart Toothbrush" initiative by Oral-B exemplifies this kind of technology. This study use artificial intelligence (AI) to develop a personalized dental care regimen by evaluating a patient's dietary and lifestyle habits. Each patient receives a tailored oral health assessment and treatment suggestions.

Consequently, AI in dentistry have the capacity to significantly enhance the effectiveness of oral disease identification, treatment, and prevention. Artificial intelligence may be used to develop personalized preventative programs, determine optimal therapeutic strategies, and create bespoke implants and prostheses. In conclusion, it is important to emphasize the significant potential for enhancing healthcare standards via the use of AI in dentistry. Artificial intelligence may be used to avert oral problems, determine the optimal therapeutic approach, and enhance diagnostic precision [6]. AI facilitates the creation of customized implants and prosthetics that account for the anatomical features of people [2]. Although artificial intelligence (AI) in dentistry remains a nascent subject, several programs and technologies are now using AI efficiently inside dental practice. Artificial intelligence is likely to assume a pivotal role in dentistry in the future, facilitating optimal results in the prevention and treatment of oral diseases. Attributes of Dental Artificial Intelligence Applications.

Utilizing AI in dentistry has both advantages and disadvantages. This chapter will examine the key ones. The advantages of artificial intelligence in dentistry encompass: - Enhanced diagnostic accuracy: AI enables the precise diagnosis of oral problems. Enhancing treatment strategies: AI may aid dentists in determining the optimal treatment plan for a patient by analyzing medical data and the results of previous inter-

ventions. AI can scan data using machine learning algorithms and scrutinize extensive datasets to identify abnormalities that may be overlooked in a conventional visual evaluation. This enables the development of tailored preventative programs: AI enables the development of tailored oral disease prevention strategies for each patient, considering their distinct requirements and anatomical features. Artificial intelligence may detect sickness risks and provide personalized preventative strategies by using machine learning algorithms and analyzing medical data. - creating tailored implants and prosthetics: AI may be used to design customized implants and prostheses. Artificial intelligence may generate implants and prosthetics that closely resemble a patient's physical characteristics by using 3D modeling and medical data analysis. The prohibitive expense of technology and the need for comprehensive and complex staff training may be the primary factors limiting the use of AI in dentistry. Additional disadvantages encompass: - Restricted access to technology: A key barrier to the use of AI in dentistry is the insufficient availability to appropriate technologies. Artificial intelligence is an expensive technology that requires development and implementation by skilled professionals and substantial financial investment. Nonetheless, the wider adoption and use of AI in dentistry is becoming attainable owing to technical progress and the emergence of novel funding options. The potential for mistakes constitutes an additional disadvantage of using AI in dentistry. Some enterprises provide solutions that enable dental practices to use AI technology without the need of acquiring their own computational resources and software.

Artificial intelligence is not infallible, despite its capability to analyze extensive datasets and provide decisions based on its evaluations. Moreover, since AI depends on algorithms that may not account for all scenarios, errors might arise; inadequate data is an additional obstacle to the use of AI in dentistry. Artificial intelligence requires a considerable volume of data for effective analysis to operate optimally.

Nonetheless, many dental specialties may lack sufficient data for AI training; the use of AI in dentistry requires proficient personnel capable of managing data and using appropriate technologies; also, ethical and legal issues are raised by the application of AI in this field.

The use of AI, for example, poses the potential of diminishing the quality of healthcare for those without access to this technology. There are potential issues with data security and patient privacy. Moreover, there exists a possibility that AI may ultimately replace human labor. The significance of dentists and dental hygienists may diminish as a consequence, perhaps adversely impacting their career advancement. In conclusion, the use of AI in dentistry offers various advantages that may improve the quality of oral disease diagnosis, treatment, and prevention. This involves automating tasks, reducing data processing duration, and minimizing the likelihood of errors.

Nonetheless, the use of AI technology in dentistry is not devoid of limitations. A significant problem is that AI systems need extensive data for training and optimization, potentially creating challenges in small clinics.

Moreover, the labor of professionals cannot be completely replaced by AI technology, and precise interpretation of results requires a degree of knowledge and training. Nonetheless, the use of AI will provide significant benefits for dentistry. AI technologies has the capacity to enhance the efficiency and time-saving dimensions of dental practice, concurrently augmenting patient access to superior quality treatment. Consequently, the use of AI in dentistry has significant potential to improve individuals' health and quality of life, despite some limitations.

The Prospects of Artificial Intelligence in Dentistry Automating dentistry operations may aid practitioners in executing laborious and time-intensive tasks such as acquiring impressions, inserting implants, and managing root canals. For example, the Yomi robotic dentistry system is used for implant insertion and other surgical operations. Yomi aids dentists in accurately identifying and positioning implants via the use of AI navigation technology. The automation of root canal procedures is a potential use of robots in dentistry. Due to their intricacy, root canals may pose challenges for dentists to manage. Conversely, AI-driven robotic devices may autonomously interpret data and precisely ascertain the channel's width and depth [2]. Teledentistry is another domain where artificial intelligence is used in dentistry. A novel kind of dental treatment, termed teledentistry, enables patients to get diagnoses and consultations without the need of an in-person visit to a facility. Artificial intelligence may be used to create teledentistry systems capable of assessing patient data and delivering a diagnosis. The automation of tedious tasks, improvement of treatment processes, and refinement of diagnostics are all integral to the future use of AI in dentistry. The quality of medical treatment will improve, and the accuracy and efficacy of doctors will increase correspondingly. However, it is crucial to consider the disadvantages of some algorithms' inadequate accuracy, along with apprehensions over patient data security and privacy.

Robots may assist in dental procedures requiring a high degree of accuracy. Robotic equipment may be used for orthodontic procedures, dental implants, and planning. This may improve procedure outcomes

and reduce the likelihood of human mistake. Despite the evident advantages, there are disadvantages associated with the automation of dental treatments. For example, acquiring and maintaining a robot may be very costly. Moreover, sufficient procedural oversight may sometimes need the involvement of a human operator, potentially leading to increased labor costs.

Considering such factors, robots and artificial intelligence in dentistry has a bright future. New technology will enable doctors to diagnose and treat diseases with more precision, reduce errors, and improve procedure outcomes.

However, to mitigate patient risks and comply with regulatory mandates, it is essential to consider the constraints and judiciously use new technologies.

Final Assessment The assessment of AI use in dentistry included the examination of several research and practical applications of AI technology in this medical field. Artificial intelligence in dentistry has shown the following advantages: - augmented accuracy in diagnosing oral and dental ailments; - improved treatment efficacy and reduction of errors; - diminished treatment duration and costs; - streamlined dental clinic operations and elevated patient care; - reduced burden for practitioners and heightened their productivity.

However, there are also disadvantages to using AI in dentistry, such as limited access to technology, the need for extensive data to train algorithms, and the potential for data misinterpretation and misuse of AI during treatment.

The use of AI in dentistry has significant opportunities to improve healthcare quality and optimize dental clinic operations, despite some limitations. Principal pathways for the progression of AI technology in dentistry include the automation of dental treatments, automated diagnostics, and predictive analytics.

For AI to gain prevalence in dentistry, several critical issues must be addressed, including the establishment of a standardized methodology for data collection and processing, the formulation of guidelines and standards for the implementation of AI technologies, and the enhancement of accessibility to these technologies for small and medium-sized dental practices. Their accessibility and use will significantly enhance the efficiency and availability of healthcare. Ultimately, the use of AI in dentistry has significant potential for enhancing treatment standards and optimizing dental clinic operations. To protect patient privacy and prevent errors in diagnosis and treatment, it is essential to consider the dangers and limits of these technologies.

Future developments in AI and robotics technology are expected to provide swifter and more accurate patient diagnosis, treatment, and rehabilitation. They should improve dental clinic management processes and reduce healthcare costs [6]. AI will serve as an instrument for experts rather than a substitute for doctors, notwithstanding its many advantages.

In conclusion, enhancing dental clinic operations and delivering optimal patient care may be accomplished by integrating technology with human skill and intuition. As a result, the use of AI in dentistry is now yielding

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