Research on Children's Oral Health Management in the Era of "Digital Intelligence"

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Abstract: At present, the caries rate of deciduous teeth in Chinese children remains high, and there is a huge gap with the actual consultation rate, indicating that children's oral health management has a long way to go. Against this background, doctors should comply with the development of the "digital intelligence" era and actively explore the innovative application of digital intelligence technology in children's oral health management to solve the practical dilemmas of children's oral health. Based on this, this paper will briefly analyze the importance of children's oral health management in the era of "digital intelligence" and the current status of children's oral health management, and discuss the improvement strategies of children's oral health management in the era of "digital intelligence".

Keywords: "Digital intelligence" era; Children's oral cavity; Management strategy

1. Introduction

The traditional children's oral health management model that relies on doctors' clinical experience and medical devices can no longer meet the physiological, psychological, developmental and long-term health needs of contemporary children. In recent years, the application and innovation of digital intelligence technology in the medical field have provided new possibilities for children's oral health management. More and more doctors have applied digital intelligence technology and equipment to the entire process from early screening and diagnosis of children's oral diseases to personalized preventive intervention, and achieved good results. In this regard, pediatric dental specialists should continue to explore effective application strategies of digital intelligence technology in various links of children's oral health management to protect the oral health of Chinese children.

2. Importance of children's oral health management in the era of "digital intelligence"

2.1. Optimize the experience of children's oral health management

Due to their young age and immature physical and mental development, traditional oral diagnosis and treatment

are likely to make children feel uncomfortable and generate strong fear. In the era of "digital intelligence", digital intelligence technology has provided a more personalized and comfortable service model for children's oral diagnosis and treatment and health management, which can effectively solve these problems. For example, in the diagnosis link, traditional oral impression taking requires putting impression materials into children's mouths. Many children move around due to nausea, resulting in long time-consuming and sometimes unsatisfactory results. With the help of digital intelligence technology, three-dimensional intraoral scanning can be used for rapid impression taking, which not only greatly improves the acceptance of young patients but also increases the reliability of diagnosis [1]. In the treatment link, CAD/CAM technology can realize the rapid production of personalized restorations, and tooth restoration can be completed in one visit, reducing the need for children to visit repeatedly in the past.

2.2. Strengthen proactive prevention in children's oral management

Due to some parents' unscientific cognition such as "deciduous teeth will be replaced sooner or later", traditional children's oral health management mainly focuses on treatment after the occurrence of oral diseases. The application of digital intelligence technology can strengthen the awareness of proactive prevention in children's oral management through artificial intelligence, big data technology and intelligent equipment. For example, based on the establishment of big data technology and unified data standards, it can break the current situation of parents, medical institutions and health departments being independent and data silos [2]. Parents can check children's oral management knowledge at any time through online platforms, obtain targeted prevention suggestions for families, and make online appointments for children's inspections and consultations. Doctors can retrieve children's medical records and historical inspection data through the platform to better predict the development trend of children's oral health. Health departments can timely grasp the local children's oral health status based on platform data, thereby conducting precise management and assisting in the formulation of relevant policies.

2.3. Help improve the quality and efficiency of children's oral management

Children's oral diseases are usually highly hidden and develop rapidly. Oral diagnosis mainly relies on doctors' treatment experience and imaging examinations, and most potential problems such as early caries and impacted teeth cannot be found. Treatment can only be carried out after children show corresponding symptoms, at which time the treatment difficulty and cost have increased significantly. In the era of "digital intelligence", doctors can quickly complete children's oral screening using digital intelligence tools. For example, AI-assisted diagnosis can quickly intelligently analyze cases and imaging data to identify subtle lesions such as early childhood caries and enamel hypoplasia in children, achieving "early detection and early intervention" [3]. At the same time, with the help of digital platforms, parents can communicate with doctors online about treatment or intervention plans, which not only effectively shortens the waiting time for children's medical treatment but also improves the allocation efficiency of medical resources, enabling children's oral health management to cover more groups in need.

3. Current status of children's oral health management

3.1. Weak awareness of children's oral health care

In daily life, some parents do not pay enough attention to children's oral health, such as not needing to pay too much attention to the deciduous tooth stage, and thus fail to guide children to develop good oral hygiene habits

such as brushing teeth in the morning and evening and rinsing mouth after meals, leading to problems such as caries and irregular dentition in some children during the deciduous tooth stage. Moreover, children are young, with limited self-control awareness and ability, and occasionally eat a lot of foods that are not conducive to oral health such as sweets, which also increases the possibility of oral diseases [4]. At present, although oral health management publicity and education are widely carried out in kindergartens and primary schools, most of them are in the form of playing promotional videos, distributing popular science brochures and holding lectures, which are difficult for children to truly understand and recognize the importance and specific methods of oral health management. At the same time, the social allocation of resources for children's oral health services are relatively weak, lacking regular professional children's oral examinations or free clinic activities.

3.2. Insufficient construction of professional medical teams

At present, the number of pediatric dental specialists is far from meeting clinical needs, especially in front-line grassroots medical institutions and remote areas, where doctors with both solid pediatric dental diagnosis and treatment technology and good communication skills are scarce resources. The dental departments of most general hospitals mainly face adult patients, which are likely to ignore the particularity of children's oral problems and cannot provide high-quality personalized services during diagnosis and treatment. In addition, due to the long training cycle of pediatric dental specialists and high requirements for doctors' comprehensive abilities, professional talents are often in short supply [5]. At the same time, affected by policies, funds and other factors, the investment and updating of equipment in children's oral departments of some medical institutions are relatively slow, failing to keep up with the times, and lacking special diagnostic instruments and intelligent equipment suitable for children, which also affects the quality and efficiency of children's oral health management to a certain extent.

3.3. Data standard construction still needs improvement

At present, although electronic medical record systems and intelligent diagnostic equipment have been widely used in medical institutions such as public hospital dental departments, private dental clinics, and community health service centers, the online platform systems and equipment data collection standards adopted by different medical institutions are inconsistent, and the port protocols are not compatible, making it difficult to achieve standardized docking of children's medical information and medical records in different medical institutions [6]. This may lead to doctors being unable to fully grasp the child's historical medical records, treatment plans and changes in oral health, which directly affects the continuity and accuracy of diagnosis and treatment. At the same time, the weak construction of data standards also increases the possibility of repeated inspections and resource waste. In addition, with the application of intelligent diagnostic methods such as AI-assisted diagnosis based on machine deep learning in children's oral health management, the protection of patients' personal information is crucial. However, the current data collection work still has great room for improvement in terms of data anonymization processing and secure storage technology [7].

4. Improvement strategies of children's oral health management in the era of "digital intelligence"

4.1. Introduce digital intelligence technology and optimize top-level design

In the era of "digital intelligence", children's oral health management should keep pace with the times and

use artificial intelligence technology. In view of the characteristics of children's oral diseases such as strong concealment and unobvious early symptoms, innovate AI-assisted screening methods, break the time and space limitations of traditional children's oral diagnosis and treatment, and quickly identify children's oral diseases in the early stage. Led by health departments, joint medical institutions and schools to establish a cross-regional and cross-institutional children's oral health data sharing platform, and unify data collection standards and interface protocols. Enable pediatric dental specialists to easily retrieve children's oral health records in different medical institutions, so as to fully grasp the child's historical medical information and oral health change trends. For example, local children's oral health management platform has accumulated more than 300,000 registrations, and through the platform's data coordination function, the precise implementation of public welfare projects such as children's pit and fissure sealing has been realized, and the permanent tooth caries rate of local children is lower than the national average [8]. In this process, relevant government departments should increase policy support and capital investment in the research and development of intelligent diagnostic equipment for children's oral cavity and the digital transformation of medical institutions, and promote the upgrading of the children's oral health management system towards intelligence and precision from the top-level design.

In addition, medical institutions can cooperate with AI technology enterprises with the support of local health departments to jointly develop intelligent oral health monitoring equipment [9]. Parents log in to the mobile APP to record and upload data such as children's sugar intake and oral cleaning frequency in daily life. Then, based on natural language processing technology and the suggestions and guidance of pediatric dental specialists, a customized child's oral health management plan is generated to reduce the risk of children's oral diseases from the source.

4.2. Innovate popular science education and cultivate prevention awareness

Traditional popular science education on children's oral health management is usually a monotonous "preaching" activity. Not only do children "not understand", but parents may also find it boring and the mastery effect is not ideal. In the era of "digital intelligence", both schools and medical institutions should innovate the use of digital means such as virtual simulation technology and interactive games to build vivid and interesting popular science education methods and carriers for children's oral management. For example, pediatric dental specialists can cooperate with technology enterprises to develop oral health popular science games. Through interactive links such as simulating brushing scenes and tooth bacteria battles, children can intuitively understand the growth and protection of teeth, how caries form, and correct oral cleaning methods in the process of playing games [10]. At the same time, this study will cooperate with animation enterprises to produce AR popular science animations, transforming abstract oral knowledge into three-dimensional and vivid visual images to enhance the attractiveness of popular science education to children. For example, let children use their parents' mobile phones to scan specific patterns to see how three-dimensional teeth become caries under sweets and unscientific cleaning habits, making children realize the importance of eating less sweets and brushing teeth carefully.

Popular science education for parents is also crucial. Children's oral health management is not a one-day task and requires continuous intervention and supervision from parents. In this regard, with the help of big data technology, parents are divided according to their children's different age groups and oral health conditions, and personalized popular science content is pushed to them [11]. For example, for parents of young children, push popular science pictures, texts and short videos related to deciduous tooth protection, complementary food addition and oral health; for preschool children, push content related to brushing skills and pit and fissure sealing, so that

popular science education on children's oral health management can truly penetrate into daily life.

4.3. Strengthen team construction and improve diagnosis and treatment quality

In response to the limited number of pediatric dental specialists and the lack of high-quality talents in grassroots and remote areas, in the era of "digital intelligence", a talent training system combining online and offline can be built through digital intelligence technology. An online distance medical education platform can be built to irregularly invite excellent pediatric dental specialists to conduct regular training for grassroots doctors through online lectures and live teaching to improve their clinical capabilities [12]. In addition, medical institutions can use VR technology to create children's oral diagnosis and treatment scenarios, and exercise doctors' operational capabilities and emergency response capabilities in a virtual simulation environment. Furthermore, oral majors in colleges and universities should integrate advanced technologies such as AI-assisted diagnosis and digital implant restoration into professional curriculum teaching to cultivate compound pediatric dental specialists adapting to the "digital intelligence" era in advance. At the same time, encourage on-the-job pediatric dental specialists to actively participate in academic conferences and scientific research training related to the application of digital intelligence technology in children's oral diagnosis and treatment, and stimulate doctors' initiative and practical enthusiasm to actively learn and apply digital technology through incentive measures such as technical allowances.

In the diagnosis and treatment process, artificial intelligence technology can be used to realize the intelligence of children's oral disease diagnosis and treatment. For example, automatically match suitable doctors based on the child's age, main complaint information, past medical history and other information; with the help of natural language processing technology, convert the oral symptoms described by parents and children into standardized medical record data, reducing doctors' transactional work and allowing them to focus more on formulating treatment plans [13]. In addition, an intelligent medical equipment management system can be introduced to digitally track and manage special diagnostic instruments and intelligent equipment for children's oral cavity, ensuring that the equipment is always in good operating condition and providing hardware support for high-quality diagnosis and treatment.

4.4. Improve technical specifications and build a solid safety line

Children's oral health data involves personal privacy, so in the use of digital intelligence technology to carry out children's oral health work, the whole-cycle safety protection of data should be carried out. First, strictly follow the relevant national laws and regulations on medical data security, set permissions and encrypt data collection, processing, storage, transmission and other links to prevent data leakage. At the same time, the operator of the system platform should establish an emergency mechanism to prevent data security risks, and strengthen data security training for staff to standardize the use process of different data [14]. When parents log in and use the platform system, clearly explain the specific scope and purpose of data use to parents to obtain corresponding authorization. Second, in the application of digital intelligent diagnosis and treatment equipment for children's oral cavity, unify technical operation specifications and quality control standards, and clarify the scope of application, workflow and maintenance requirements to ensure the safety of the application of digital intelligent diagnosis and treatment equipment for children's oral cavity [15]. For example, doctors should regularly calibrate and test the functions of three-dimensional intraoral scanners and participate in professional training organized by equipment development enterprises.

In addition, establish a clinical application evaluation mechanism for digital intelligent diagnosis and

treatment technology, conduct continuous monitoring and evaluation of the functionality, safety and applicability of new technologies and equipment, timely find and solve problems in practical applications, and provide reliable technical support for children's oral health management.

5. Conclusion

In summary, the research and practice related to the application of digital intelligence technology in children's oral health management are still in rapid development. In the development of children's oral health management, the implementation of strategies such as introducing digital intelligence technology, innovating popular science education, strengthening team construction, and improving technical specifications will help deepen the organic integration of digital intelligence technology and medical services, thereby extending oral health management from school-age children to children of all age groups, and realizing the beautiful vision of every child having healthy teeth.

Disclosure statement

The author declares no conflict of interest.

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