

Application of Big Data in the Field of Oral Health of the Elderly

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Keywords: Big data; Oral health; Health information

Abstract: The quality of life of oral health-related elderly people has become a research hotspot in stomatology. This paper puts forward the significance and value of big data technology for oral health management of the elderly, the classification of oral health information and related information, and puts forward the development strategy of China's health management industry in the era of big data.

1. Introduction

China has gradually entered an aging society, the proportion of the elderly population is growing. According to the 2010 national census, the population of the elderly over 60 years old in China is about 165 million, accounting for 13% of the total population, and 113 million people over 65 years old, accounting for 9% of the total population. It is estimated that the total number of the elderly over 60 years old will reach 400 million people in 2050.[1]With the progress of population aging, health-related topics have become increasingly prominent. In 2012, WHO surveys showed that oral problems were one of the top ten events affecting the lives of the elderly.[2]Therefore, helping the elderly to improve their oral health-related quality of life has become a research hotspot in stomatology.

2. Oral Health-Related Quality of Life in the Elderly

Oral health is an important part of human health. With the increase of age, the structure and physiological function of the human body will be aging, and the oral tissue will degenerate with the increase of age. The degenerated tissue will increase the susceptibility to diseases. The self-repairing ability of the elderly is weakening year by year, and the possibility of the elderly suffering from systemic diseases is increasing. Therefore, oral diseases are general problems that the elderly people need to be faced. Many elderly people suffer from oral diseases for a long time, which can cause problems such as chewing difficulties, inarticulate speech, and social decline. These problems have a great impact on their social and psychological health, ultimately seriously affect the health and life of the elderly, and directly affect the well-being of the elderly. Therefore, helping the elderly to improve their oral health-related quality of life has become a research hotspot in stomatology. Oral health-related quality of life refers to a comprehensive assessment of the effects of oral diseases and their prevention and treatments on the physical, psychological and social functions of patients.[3].It is a subjective evaluation system that comprehensively reflects the new medical model and new health concept. It is conducive to the choice of treatment methods for oral diseases, the monitoring of patients' prognosis, and the tracking of oral health risk factors and so on.

3. Significance of Big Data Technology in Oral Health Management of the Elderly

With the rise of Internet of Things, Cloud Computing, Mobile Internet and other emerging technologies, the development of microprocessors, sensors and communication technologies, the types and quantities of data in human society are exploding in geometric series.[4]Human health management has emerged and gradually become the main strategy that can effectively reduce medical costs, which has been widely recognized. The Platform for Action to Promote the

Development of Big Data in China points out that big data is a data set characterized by large capacity, multiple types, fast access speed and high application value.[5]But big data is not simply a large amount of data, but the value of data is extracted, data is used, data is transformed into information, then information into knowledge, and finally implemented to assist decision-making.[6]

Large data technology can meet the personalized characteristics of oral health management. The specific practice of oral health management is to provide targeted scientific health information for the elderly, and create conditions for action to improve health. The personalized customization of oral health for the elderly determines that the amount of data generated by each individual every day is extremely huge and complex. Traditional data processing technology can not achieve real-time collection, analysis, processing and feedback. In today's tense medical and patient problems, it is difficult to achieve personalized, one-to-one manual service.

4. Classification of Oral Health Data

Oral health data is a data set generated in the process of human activities related to dental medicine and life health. According to the source of oral health activities, oral health data of the elderly can be divided into oral data information, clinical medical data and personal health data.

4.1 Oral Data Information.

Due to the decline of physiological function of the elderly, people often need to take multi-use health care drugs or medicines to treat diseases in daily life. Dental hard tissues, periodontal tissues and oral microenvironment of the elderly will undergo degenerative changes. For example, enamel and dentin will be continuously worn down with age, dentin will become sensitive, and gingiva will atrophy; with normal alveolar bone physiological absorption. In addition, the elderly will face the root exposure, the adjacent space of the teeth widens, and food impaction is easy to occur; salivary secretion function decreases due to age, secretion decreases, and oral self-cleaning function also decreases; the above reasons will lead to the elderly vulnerable to oral diseases.

The five oral health standards formulated by WHO in 1981 are "clean teeth, no caries, no pain, normal gingival color and no bleeding phenomenon", which are aimed at the whole people. Different countries in the world also put forward different oral health standards according to different national conditions. However, according to our oral health care work and clinical practice, the above information can not fully reflect the oral health, especially the oral health of the elderly. Nor can it fully reflect the long-term goal of oral health of the general public and fail to achieve the universal popularization of oral health. According to the current situation of oral health reported in the fourth national oral epidemiological survey in China [7], according to the relationship between oral health and overall health, and according to the medium and long-term oral health care plan, especially the long-term oral health care objectives, it is suggested that oral health standards should be added on the basis of the standards proposed by the World Health Organization: orderly arrangement of teeth, normal color of teeth, no missing teeth, no obstruction, occlusion comfort (no discomfort), no halitosis [8].These data and information are related to oral health information of the elderly, which requests the doctors to establish a complete data and information archive for the oral health of the elderly every year.

4.2 Clinical Medical Data.

Oral epidemics are closely related to systemic diseases, such as blood pressure, blood sugar and heart status of the elderly. Having health data information of the elderly is an important data basis for dentists to carry out their next work. The clinical data of the elderly mainly consist of electronic health records of the elderly, biomedical images, and medical examination reports and so on. The electronic health record is a personal lifelong health record established by the community personnel for a period of time to manage and store heterogeneous medical data such as outpatient records, drug prescriptions and so on. The electronic health records of the elderly cover all medical information related to the patients, such as the past medical history, the description of the course of the disease,

the choice of medicines, the state of vital signs, the report of the radiology journal, the information of the physician's observation records and the information of fees, etc. Electronic medical records refer to the way using the electronic mode to save, manage, output and transmit patient medical records and health information by means of informatization, which is the basis and important component of the establishment of electronic health records [9]. The electronic dental health records of the elderly can help doctors understand the patient's data more accurate, and also record and track the patient's health data, so as to ensure the accuracy and safety of the data. Electronic medical records can also satisfy many doctors in different regions to view patient's medical records, which can be used as important information when the Old people's travel or visiting relatives. If patients do not know or do not have enough information to provide medical information, electronic health records can solve the problem of seeking medical treatment in different places and facilitate the elderly to see a doctor quickly.

4.3 Personal Health Data Information.

The personal health data information includes the data on lifestyle, environments and behaviors that have an impact on personal health. These data have certain reference value for the treatment of oral diseases. Nowadays, innovative digital health equipment and applications are constantly updated, which provides the unique environment for the elderly to use personal health data for personal health care. On the one hand, health data information makes the elderly play a more active role in self-health management; on the other hand, it also enhances doctors' clinical perception of patients' lives. Health data information can be divided into personal health records, social media health data and potential health data. Personal health data information can also include continuous health data collected by personal self-tracking devices and wearable devices and so on. These information can be used to track ongoing treatment or monitoring, to understand the individual's health management through professional health service personnel, and to develop the ability of the elderly to understand their health status and self-management of the health data as well, such as food tracking, daily movement information, blood pressure, blood sugar testing, etc. Doctors can verify and adjust the diagnosis and treatment plan in time according to health monitoring data. In telemedicine, self-tracking data such as physical activity data has potential in identifying potential patients.

5. Future Development Direction of Oral Health Management Industry for the Elderly in the Big Data Era

5.1 Vigorously Develop Data-Based Oral Health Management for the Elderly.

Our country is about to enter the age of aging, which means that the information of oral health data is huge, varied and growing rapidly. It is the future development direction to rapidly excavate and utilize valuable data resources. Similarly, in the process of oral health management services for the elderly, it needs to collect, analyze and utilize health data in order to truly achieve comprehensive and personalized oral health management. Data-based oral health management for the elderly is also the development direction of future health management industry. The oral health status of the elderly is a constantly updated database. Therefore, in the process of oral health management services, data collection not only exists in the initial stage of services, but throughout the whole process. We should also take into account the personalized oral health management strategy and analyze the oral health data of different individuals and groups, especially the data changes of different ages, regions and genders, so that patients can intuitively feel the value and effect of oral health management services.

5.2 Oral Health Data Sharing and Information Security.

At present, due to the inconsistent format and content and incomplete data records of health data collection in provinces and communities, which makes it difficult to share oral health data. Relevant departments should also standardize the standards of oral health database to avoid data redundancy caused by repeated collection and inconsistent formats of health data among different departments

and accelerate the establishment of a nationwide unified electronic health records system. Besides above, they are supposed to play a good role in actively publicizing and guiding the public to actively share and use personal health data. Clinical and health data also involve sensitive information such as personal health status, diagnosis and treatment methods, drug use and so on. Protecting privacy is still the core issue of data sharing in the era of medical and health data.

With the increasing demand for data, it is necessary to balance the contradiction between the protection of personal privacy of oral data and information sharing. It requests to protect personal privacy as well as open data and data sharing mode of thinking. Innovative methods and ideas are needed to protect personal privacy and data. We should encourage the elderly to share their own information and allow researchers to access privacy data with the knowledge and consent of the elderly. At the same time, information should also be protected within a certain range, in order to prevent other people from using this information to carry out relevant pseudo-treatment actions, affecting the health of the elderly. At present, domestic laws and regulations concerning data sharing have not yet formed a system, so relevant legal safeguards should be established to clarify the scope and boundaries of data storage and sharing, as well as the responsibilities to be undertaken.

5.3 Encouraging Talents to Achieve Technological Research and Development.

To obtain valuable health information from a large number of oral health data for the elderly requires advanced technology and professional skills. Currently, different types of hospitals, such as third-class hospitals and community hospitals, have different clinical environments. Information systems related to them have different requirements for data information formats and forms of existence. However, different system vendors require different data models, which makes oral health database extremely complex. Therefore, the work of removing and identifying data from different systems is full of great challenges. At present, professional and technical personnel are urgently needed to integrate cloud computing, big data, mobile internet and other information technologies to develop a unified oral health data integration system and analysis tools, and highly integrate oral health information of the elderly into a unified and standardized data model. If the data sharing of general data model is realized, which may further confirms the feasibility and time demand of large data participating in clinical analysis.

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