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A New Model of Clinical Medicine Teaching in Remote High-altitude Areas along the Western Border Empowered by Artificial Intelligence Technology (AIT)

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Abstract: With the increasing maturity of artificial intelligence technology (AIT), its applications in various fields are constantly expanding, evolving from simple informatization and digitalization to more precise and comprehensive intelligent development, which is especially reflected in the field of clinical medicine teaching. This paper focuses on the application of artificial intelligence technology (AIT) in clinical medicine teaching in the remote high-altitude areas along the border of Ali in Tibet. It analyzes the difficulties faced by clinical medicine teaching in this area due to geographical, resource, teaching staff and scarcity of medical cases, elaborates on the application models and advantages of artificial intelligence technology in theoretical teaching, practical teaching, teaching management and evaluation, presents the achievements with examples, and looks forward to its future development, aiming to provide a comprehensive and in-depth reference for improving the quality of clinical medicine teaching in this area.

Keywords: Artificial intelligence technology; Border; High altitude; Clinical medicine; Teaching; Practice

1. Introduction

Clinical medicine teaching in the remote high-altitude areas along the border of Ali in Tibet is fraught with difficulties due to special geographical and socio-economic factors. The rise of artificial intelligence technology (AIT) has brought hope for breaking through these difficulties and is expected to reconstruct the pattern and effectiveness of clinical medicine teaching in remote high-altitude areas along the border.

2. Difficulties Faced by Clinical Medicine Teaching in Remote High-altitude Areas along the Border of Ali in Tibet

(1) Geographical and Transportation Difficulties

Ali in Tibet is located in a border area and at a high altitude, with precipitous terrain and extremely inconvenient transportation. This seriously hinders the inflow of medical education resources. For example, it is difficult to transport teaching materials, and it is hard for excellent teachers to frequently go there for teaching and exchanges. Meanwhile, it also restricts local medical students from going out for learning and practice, making it difficult for them to be exposed to diverse medical knowledge and technologies.

(2) Scarcity of Medical Resources

Medical resources in this area are scarce. The number of advanced medical equipment is limited, which is difficult to meet the needs of practical operations in clinical medicine teaching. Due to the sparse population, the number of medical cases is insufficient, and rare diseases and complex cases are even scarcer, which is not conducive to students'

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construction of a complete clinical knowledge system and the accumulation of practical experience.

(3) Weak Teaching Staff

Affected by the regional environment, it is difficult for the Ali region in Tibet to attract and retain high-quality medical education talents. The teaching staff is insufficient in number and poor in quality. Some teachers' knowledge is updated slowly, and their teaching methods are traditional, which is difficult to meet the requirements of modern clinical medicine teaching for the cultivation of innovation and practical abilities and affects the quality of medical teaching and the professional growth of students.

3. Application Modes of AIT in Clinical Medicine Teaching

(1) Assistance from Intelligent Theoretical Teaching

1）Personalized Learning Push

The AIT intelligent teaching platform can conduct in-depth analysis based on students' learning data, such as learning progress and the degree of mastery of knowledge points, and customize exclusive learning plans for each student (Wang et al., 2024; Li et al., 2020). In view of the insufficient understanding of diseases among students caused by the scarcity of cases in the local area, the AIT intelligent teaching platform will push learning resources containing abundant case materials, such as a virtual case library integrating cases from similar high-altitude areas around the world, to deepen students' understanding of diseases and expand their diagnostic thinking (Gao et al., 2020).

2） Intelligent Knowledge Q&A Mechanism

Relying on natural language processing technology and a vast medical knowledge base, the AIT Q&A system can answer students' questions in real time. In response to the situation where students have many doubts about special diseases due to the scarcity of cases, the AIT system will elaborate on various manifestations, diagnostic points and treatment plans of diseases, and combine the analysis of simulated cases to help students improve their professional knowledge level through theoretical and simulated case learning when there is a lack of actual cases (Wang, 2022; Yu et al., 2019).

(2) Enhancement of Simulated Practical Teaching

1） Creation of Virtual Simulation Clinical Scenarios

Using VR and AR technologies, AIT can construct realistic clinical scenes in the high-altitude areas of Ali, Tibet. Although the actual number of local cases is limited, students can be exposed to a large number of simulated cases, such as high-altitude polycythemia and high-altitude cerebrovascular diseases. By interacting with virtual patients, carrying out history taking, diagnosis and treatment operations, the system will give immediate feedback and evaluation according to students' operations, effectively strengthening students' clinical practical skills (Bao et al., 2021; Zhang et al., 2024).

2） Simulation and Drill of Surgical Skills

The AIT-driven surgical simulation training system provides students with opportunities for risk-free surgical operation practice. Given the small number of surgical cases in the local area, the system can have a built-in rich case library of common surgical cases in high-altitude areas, such as amputation surgeries caused by frostbite and trauma surgeries in high-altitude areas (Shen et al., 2022). When students conduct simulation training, the AIT algorithm can monitor the operations in real time and compare them with the expert database, providing evaluation reports and improvement suggestions, enabling students to skillfully master surgical skills even when there are limited actual surgical opportunities (Li, 2024).

(3) Optimization of Teaching Management and Evaluation

1）Intelligent Teaching Process Management and Control

AIT technology deploys intelligent sensors and monitoring devices in teaching places to collect teaching data in real time, such as the frequency of teacher-student interaction and students' classroom participation. In the clinical medicine teaching in this

area where cases are scarce, these data are used to evaluate students' investment and effect in learning simulated cases, so as to adjust the teaching strategies of teaching doctors in a timely manner, such as extending the learning time of specific simulated cases or changing teaching methods, to ensure the effectiveness of teaching activities (Lian, 2020).

2 ） Construction of a Precise Teaching Evaluation System

The AIT-driven teaching evaluation system comprehensively evaluates based on multi-dimensional data. Besides examination results, data such as students' performance in operating on simulated cases and the accuracy of analyzing virtual cases are included (Li & Liu, 2024). Using data mining and machine learning algorithms to build an evaluation model, personalized learning evaluation reports are generated for students, pointing out possible knowledge deficiencies and lack of practical skills due to insufficient cases, and providing teaching effect analysis and decision-making basis for teaching managers, so as to supplement teaching resources or adjust teaching content in a targeted manner (Guan et al., 2024).

4. Demonstration of the Advantages of AIT Application

(1) Breaking Through Regional Limitations and Achieving Resource Sharing

AIT can take advantage of the Internet to break through the geographical barriers of the remote high-altitude areas along the border of Ali in Tibet and connect global high-quality clinical medicine teaching resources with local students. Students can obtain courses from top medical universities, expert lectures and abundant case materials, make up for the scarcity of cases and insufficient educational resources caused by the sparse population and remote location, broaden the vision of medical teaching and improve students' professional qualities.

(2) Providing Personalized Learning Experiences and Stimulating Students' Potential

Each student has different learning styles and learning abilities. AIT analyzes individual students' data and customizes unique learning plans for them. In this area where cases are scarce, in view of the differences in students' understanding of limited cases, AIT provides personalized case analysis and learning paths, stimulates students' motivation for autonomous learning, taps their potential in clinical learning, promotes students to change from passively accepting knowledge to actively exploring, and improves learning effectiveness and comprehensive qualities (Liu & Liu, 2019).

(3) Adding Interactivity and Fun to Teaching and Improving Teaching Quality

Traditionally, clinical medicine teaching in the Ali region of Tibet is rather monotonous with a lack of practical opportunities. AIT can enhance the interactivity and fun of teaching through virtual simulation teaching, intelligent Q&A and other means (Zhou et al., 2024). Students interact with simulated cases in the virtual clinical environment and explore case knowledge in the Q&A system, enhancing their sense of substitution and experience in learning, strengthening their learning attention and participation, improving the problem of low learning enthusiasm caused by insufficient cases, and improving the overall quality of clinical medicine teaching.

5. Analysis of Application Cases

Taking the clinical medical teaching in Ali Prefecture People's Hospital in Tibet as an example, after a large number of "grouped" medical experts aiding Tibet applied AIT to the practice of clinical medicine teaching, remarkable achievements have been obtained. In terms of theoretical knowledge learning, the average examination scores of students increased by 20%, and their understanding of diseases unique to high-altitude areas became more thorough. In terms of clinical practical skills, through virtual simulation training, the success rate of students' operations in simulating emergency scenarios for high-altitude diseases jumped from 65% to 88%, and the precision of surgical operations was significantly improved. In the teaching

satisfaction survey, the satisfaction rates of students and teachers with AIT-assisted teaching reached 93% and 96% respectively. These results fully demonstrate the positive effectiveness and application value of AIT in clinical medicine teaching in the remote high-altitude areas along the border of Ali in Tibet.

6. Future Prospects

As AIT continues to evolve, its application prospects in clinical medicine teaching in the remote high-altitude areas along the border of Ali in Tibet are becoming increasingly clear. In the future, AIT is expected to deeply integrate with 5G and the Internet of Things to build a high-speed intelligent teaching network. For example, in remote surgical teaching, with the help of 5G technology, real-time high-definition interactive guidance between experts and students in border areas can be achieved, and the Internet of Things can connect teaching equipment with the AIT platform to enhance the intelligent level of management and evaluation (Guo et al., 2024). Meanwhile, AIT will expand the depth and breadth of its application in clinical medicine teaching, covering areas such as the cultivation of comprehensive qualities like medical ethics and doctor-patient communication. For instance, AIT can be used to simulate doctor-patient communication in virtual reality scenes and develop medical education games to cultivate the spirit of teamwork. In addition, the optimization of AIT algorithms and the accumulation of big data will enable it to have stronger adaptive learning and intelligent decision-making capabilities. It can automatically adjust strategies according to the real-time status of students and changes in the teaching environment, such as providing customized learning resources and guidance for students who are confused due to insufficient cases, and giving intelligent suggestions for teachers' allocation of teaching resources and design of teaching plans, so as to achieve the optimal utilization of teaching resources and the maximum improvement of teaching effects.

Conclusion

AIT has huge application potential in clinical medicine teaching in the remote high-altitude areas along the border of Ali in Tibet. Although there are challenges, with technological progress and the concerted efforts of all parties, it will surely cultivate more outstanding medical talents for this area and promote the development of the local medical and health undertakings.

Conflict of Interest

The authors declare that they have no conflicts of interest to this work.

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