

Progress in the Application of Simulated Teaching in Diagnosis and Internal Medicine Teaching

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ARTICLE INFO

Article history

Received: 15 October 2024

Accepted: 30 December 2024

Published Online: 30 December 2024

Keywords:

Simulated teaching

Diagnostic science

Internal medicine teaching

Application Progress

ABSTRACT

With the rapid development of modern medical education, traditional teaching methods are unable to meet the needs and have obvious limitations. In this situation, simulation teaching, as an innovative teaching method, has gradually become a focus in the educational practice of diagnosis and internal medicine, demonstrating irreplaceable advantages. Simulated teaching is a teaching strategy that involves the careful design and guidance of a mentor, role-playing, entering a special context constructed by the mentor, using professional teaching equipment, and reproducing real medical scenes in a simulated environment. Simulation teaching, as an effective alternative method, has gradually become increasingly important in the field of medical education, receiving widespread attention and application, and has become an important way to solve current teaching problems.

1. Introduction

With the expansion of enrollment scale, schools are facing a dual shortage of teaching staff and facilities, resulting in a decrease in opportunities for students to practice and train on campus. Under the pressure of maintaining the efficiency of outpatient and inpatient services, hospitals often adopt conservative strategies for interns' outpatient internships, sometimes even not arranging them at all, which affects their participation in clinical diagnosis and treatment activities. The strict requirements of current laws and regulations make it difficult for teachers to fully demonstrate diagnostic skills during bedside teaching, and to easily allow students to practice, depriving interns of key opportunities for practical learning. Simulated teaching, with its characteristics, can reproduce the physiologi-

cal structure and function of the human body and analyze the clinical characteristics of patients. Control disease progression, provide a realistic training environment for medical students, and deepen their understanding and mastery of clinical skills. By arousing students' curiosity and utilizing various learning methods such as auditory and oral communication, we aim to deepen their memory and application of professional knowledge. Through simulated teaching, clinical skills such as consultation and physical examination can be practiced without contact with real patients, enhancing their practical abilities. Simulated teaching can also evaluate the communication skills and diagnostic techniques of medical students, provide timely feedback and guidance, and promote comprehensive growth.

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2. Types of simulated teaching

2.1 Virtual Reality (VR) Simulation

By utilizing virtual reality (VR) technology, a highly simulated computer simulation environment can be constructed, allowing participants to experience and interact in an immersive manner. Virtual reality technology, relying on high-performance computer graphics processing units (GPUs) and professional head mounted display devices, has successfully constructed highly simulated virtual environments, allowing users to experience an immersive experience as if traveling to a brand new virtual world. In the fields of diagnosis and internal medicine, this technology has brought revolutionary changes to medical education, especially showing great application prospects in surgical simulation training and ward management process simulation. Through virtual reality technology, medical students can practice repeatedly in simulated surgical scenarios, improve their surgical skills, and lay a solid foundation for future actual surgical operations, in pursuit of better treatment outcomes. This technology can also accurately simulate the ward environment, allowing learners to immerse themselves in the ward management process and effectively improve their practical operation and management level^[2-3].

2.2 Augmented Reality (AR) Simulation

Augmented reality (AR) technology achieves a perfect combination of virtual and real by overlaying virtual information on top of the real world. This technology captures real images through cameras and generates virtual content through computer processing. Augmented reality (AR) technology opens up avenues for technological innovation by overlaying virtual information in the real environment. Its application in the medical industry is particularly prominent, especially in remote medical consultation, surgical navigation, and customized medical plan planning, demonstrating significant potential and value. In medical education, especially in the teaching practice of diagnosis and internal medicine, AR technology plays a vivid and effective auxiliary teaching role, helping students to have a deeper understanding of the ideas and treatment steps of disease diagnosis. For example, through AR glasses, medical professionals can view and analyze patients' health data and imaging information in real time, conduct virtual examinations, and develop more accurate treatment plans. AR technology can also simulate the action process of drugs in the human body, visually demonstrating the effects and possible adverse reactions of drugs to doctors.

2.3 Standardized Patient (SP) Simulation

Standardized patients (SP) are normal individuals or patients who can simulate actual clinical problems through systematic training^[4]. They are able to accurately simulate the clinical symptoms and manifestations of actual patients. In the field of medical education, especially in the teaching activities of diagnosis and internal medicine, SP plays an indispensable role, mainly used for training key skills such as simulating clinical consultations and physical examinations. Through interaction with SP, medical students can learn various manifestations of diseases and their treatment methods in an approximately real medical scenario, thereby effectively improving their clinical operational skills. In addition, SP can provide fair evaluation of students' clinical skills and offer beneficial feedback, allowing students to continuously improve their clinical skills and promote the sustainable development of their professional skills.

2.4 Case Teaching and Problem Based Learning (PBL)

Although case-based teaching and problem-based learning (PBL) are not entirely within the scope of simulation teaching, they are often combined with simulation teaching in medical education. In the teaching process of diagnosis and internal medicine, case-based teaching method and problem-based learning (PBL) are two widely recognized and efficient teaching modes. The case teaching method encourages students to deepen their understanding and application of knowledge through the design of highly realistic clinical cases. On the other hand, the PBL method focuses on problems and stimulates students' self-learning, critical thinking, and problem-solving abilities through group discussions, thereby cultivating their clinical thinking and evidence-based medicine skills^[5-6].

3. The Application of Simulated Teaching in Diagnosis

3.1 Simulated medical history collection and physical examination

In diagnostic education, medical history collection and physical examination constitute the core content, and simulation teaching plays a significant role^[7-8]. By creating a simulated medical history collection scenario, students can practice how to systematically inquire about the patient's main symptoms, medical history, personal background, and family history, and comprehensively understand the patient's health status. Simulated physical examination

training helps students master the skills of detecting patients' vital signs, observing skin and mucosal conditions, learning lymph node examination, as well as practical operations such as abdominal palpation, lung percussion, and cardiopulmonary auscultation.

3.2 Simulate diagnostic thinking and decision-making process

Diagnostic thinking is the process in which doctors analyze, judge, and differentiate a patient's condition by synthesizing various information such as medical history, physical examination, and laboratory results. Simulated teaching involves designing various clinical scenarios and disease development models to allow students to experience real diagnostic thinking and decision-making processes. During this process, students need to practice disease analysis, develop diagnostic plans, choose examination methods, and develop treatment strategies based on examination results.

3.3 Application of Simulation Diagnostic Technology

With the development of medical technology, various advanced diagnostic techniques continue to emerge. Simulated teaching has value in teaching the operation process of technology, simulating the operation steps and result interpretation of imaging examinations such as electrocardiogram, echocardiogram, CT, MRI, as well as the sample collection, processing, and analysis process of laboratory examinations, so that students can familiarize themselves with relevant operations and precautions. Combining advanced technologies such as virtual reality (VR) and augmented reality (AR), simulate teaching to create a realistic operating environment, such as using VR technology to simulate surgical operation scenes or conducting virtual anatomy practice through AR technology, to enhance students' learning effectiveness and practical skills.

4. The Application of Simulated Teaching in Internal Medicine

4.1 Simulate the diagnosis and treatment of common diseases

Internal medicine covers a wide range of common diseases, including cardiovascular, respiratory, and digestive diseases. Simulation teaching method, as an effective teaching strategy, allows medical students to directly experience the typical manifestations of these diseases in a simulated environment and conduct preliminary diagnosis and treatment operations. Taking cardiovascular disease

simulation training as an example, students can use electrocardiogram and echocardiography equipment to diagnose diseases such as hypertension and coronary heart disease based on the patient's medical history and clinical manifestations. In the simulation of respiratory system diseases, students have the opportunity to simulate lung function tests and chest X-ray examinations to identify diseases such as COPD and asthma. Through simulation exercises, students can not only deepen their understanding of disease mechanisms and clinical characteristics, but also master relevant treatment techniques proficiently, laying a solid foundation for their future clinical internships and professional careers.

4.2 Comprehensive management of simulated complex diseases

Internal medicine also involves dealing with complex diseases involving multiple organs and systems, requiring comprehensive and integrated management. Simulated teaching provides a practical platform for students to explore comprehensive assessments of complex diseases and analyze customized treatment plans. The diseases involved in internal medicine are often complex and intricate, and treatment management requires interdisciplinary collaboration. In this context, assist students in mastering comprehensive management skills for dealing with these complex illnesses. Taking the simulated training of diabetes as an example, students need to simulate and formulate personalized nutrition plans, exercise prescriptions and drug treatment plans, with the aim of effectively regulating the blood sugar level of patients and preventing related complications. For simulated teaching of cardiovascular diseases, students need to simulate complex surgeries such as coronary angiography and heart bypass surgery, and comprehensively consider the patient's preoperative preparation, postoperative care, and long-term health management. Through simulation exercises, students can gain a deeper understanding of the essence and techniques of comprehensive management of complex diseases, thereby improving their abilities in clinical decision-making and interdisciplinary teamwork.

4.3 Simulated treatment and care of severe patients

In internal medicine education, the treatment and care of critically ill patients are important components of internal medicine. Simulated teaching can help students become familiar with and master the treatment process and nursing skills for critically ill patients. For example, in the simulation teaching of acute myocardial infarction, students need to simulate emergency coronary intervention

treatment, as well as perform emergency operations such as cardiopulmonary resuscitation and defibrillation. In simulated teaching of respiratory failure, students need to simulate respiratory support treatments such as mechanical ventilation and oxygen therapy, while also monitoring the patient's vital signs and administering medication. Through simulated teaching, students can better understand the treatment process and nursing skills of critically ill patients, improve their emergency response and teamwork abilities, and be fully prepared for future clinical practice.

5. Conclusion

The simulation teaching method has made breakthrough achievements in the educational practice of diagnosis and internal medicine, bringing revolutionary changes to medical education. By creating realistic or highly realistic clinical scenarios, we provide students with a safe and efficient practical platform to enhance their clinical skills and ability to cope with complex medical situations. In terms of diagnosis, not only does it help students proficiently master basic skills such as medical history collection, physical examination, and diagnostic reasoning, but it also strengthens students' deep understanding and application of disease diagnosis and treatment strategies by reproducing the diagnosis and treatment process of common and difficult diseases. It emphasizes the cultivation of students' communication skills and teamwork spirit, as well as effective interaction with patients and colleagues. In the education of internal medicine, simulation teaching simulates the handling of critically ill patients and high-risk clinical operations such as nursing, allowing students to accumulate experience in practical operations and enhance their ability to handle complex diseases and emergency situations. At the same time, simulation teaching also promotes innovation and development of teaching methods, making medical education more adaptable to the requirements of the times and the personalized development needs of students. With the rapid development of technology and the continuous progress of medical education, the application of simulation teaching in diagnosis and internal medicine will become more extensive and in-depth. Integrating advanced technologies such as virtual reality (VR) and augmented reality (AR) will enhance the sense of participation and interactivity in simulated

teaching, allowing students to learn and practice in a more realistic environment.

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