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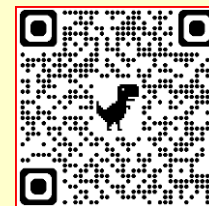
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## Opportunities and Challenges of Artificial Intelligence for Surgical Nursing Curriculum

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### ABSTRACT

*Under the strategic background of “Healthy China 2030” and “Stronger Education”, artificial intelligence (AI) is closely related to the development of the Chinese medicine industry. Under the background of the “Healthy China 2030” and “Education for a Strong Country” strategy, the combination of artificial intelligence and medical education has become an inevitable trend. Surgical Nursing, as a core nursing course, it is significant to integrate AI technology into teaching. This study attempts to use AI for the teaching practice of assigning homework by teachers and classroom discussion by students. It is found that AI can effectively assist teachers in realizing interdisciplinary knowledge integration, promote the cultivation of students' innovative, critical, and cross-border thinking, and comply with the national demand for cultivating new medical talents, but it also brings challenges such as the difficulty of changing teachers' roles and adapting to student's learning styles, which requires the collaboration of multiple parties to promote the application of AI in medical education.*

**KEY WORDS:** Artificial intelligence; Surgical nursing; Medical education; OBE concept

### Introduction

With the development of China's economy and society, the people's demand for health is increasing, and at the same time, facing the deepening of population aging, the State Council issued the Outline of the “Healthy China 2030” Plan in 2016, to realize the great rejuvenation of the Chinese nation and The State Council issued the “Healthy China 2030” plan in 2016 to lay a solid health foundation for realizing the great rejuvenation of Chinese nation. Medical education is closely connected with the two strategies of “Healthy China” and “Stronger Education”, and the combination of Artificial Intelligence (AI) and medical education is an inevitable trend of the

times. Since the concept of artificial intelligence was put forward in 1956 [1], it has entered the stage of explosive growth (wide application and rapid development). Various “AI+” applications are constantly emerging, among which the combination of AI and the medical field has attracted much attention [2]. As of May 14, 2024, the state has released about 154 AI-enabled medical education policy texts to promote the application of AI in the field of medical education.

Surgical Nursing, as one of the core courses in the nursing program, is crucial for developing students' clinical nursing abilities. In today's fast-changing technology, the rise of AI technology has

brought profound changes to the field of education. How to integrate AI technology into the teaching of the Surgical Nursing course, improve the quality of teaching, and cultivate high-quality nursing talents to meet the needs of the times has become an urgent issue for educators to think about.

## 1. AI Application in Medical Education

At present, many universities and medical institutions in the United States have used artificial intelligence technology to analyze medical images, study pathology, and formulate personalized treatment plans, etc. [3]. Japan has applied artificial intelligence to assist diagnosis in the teaching of medical diagnosis, and diagnosis of mental diseases, such as diagnosis of dysphagia, etc., and even artificial intelligence robots are used in surgical teaching or drug development teaching.

Many domestic universities and research institutions have begun to explore and practice the application of AI in the field of medical education. For example, in 2023, "Xuetang Online" relied on Tsinghua University, Peking University and other universities to create a smart course (AI course) based on generative artificial intelligence technology, such as in the teaching practice of the "Medical Immunology" course, to realize the functions of intelligent lesson planning, 24-hour intelligent learning companion, intelligent teaching management, intelligent question and so on. Some researchers developed an AI-assisted teaching robot as a virtual patient and applied it to the training of undergraduate nursing students with a view to improving the communication skills ability of nursing students [4]. The keyword "artificial intelligence (AI) medical education" was used to search 83 articles on China Knowledge Network (CNN), covering the disciplines of ophthalmology, pathology, medical laboratory science, oncology, pharmacy, endocrinology, medical microbiology, hygiene chemistry, biochemistry and molecular biology, orthodontics, and nursing, and so on [5]. There are basic nursing courses. For example, in 2022, Wang Xin and other teachers from the Department of Medicine of Kaifeng University tried to rely on the AI diagnosis and treatment system of the Department of Ophthalmology of Kaifeng Downtown Hospital (Zhongshan Ophthalmology Center AI cooperative unit), and tried to implement the immersive teaching method combining traditional teaching + AI in the Basic Nursing course, which was found to significantly increase the learning motivation of nursing students, and significantly improve the clinical thinking ability and learning effect of the students[6]. The program has been implemented in the Basic Nursing Science course. However, with the keyword "Artificial Intelligence (AI) Surgery" on China Knowledge Network, we found one piece of related literature, such as Chen Hongxu from the Department of Neurosurgery of West China Hospital of Sichuan University, who attempted to integrate AI into the teaching of Neurosurgery in 2024, and to create a risk-free, high-fidelity surgical simulation environment through the in-depth integration of AI with Virtual Reality(VR)/Augmented Reality (AR) technology, and led the students in a risk-free, high-fidelity surgical simulation environment. high-fidelity surgical simulation environment, leading students to practice simulated surgery, thus enriching the access and depth of students' knowledge acquisition [7]. And the current application of AI in Surgical Nursing is still a gap.

## 2. Application of AI Technology in the Teaching of Surgical Nursing Curriculum

### 2.1 Curriculum Characteristics of Surgical Nursing

#### 2.1.1 Comprehensive

Surgical Nursing is a clinical nursing discipline that elaborates and researches holistic nursing care for patients suffering from surgical diseases, which emphasizes on the basis of the three basics of knowledge (basic knowledge, basic theories, and basic skills), and pays more attention to holistic nursing, humanistic caring, judgmental Cultivation of thinking and comprehensive analysis ability [8]. It involves the knowledge of multiple medical disciplines, such as human anatomy, physiology, pathology, pharmacology, etc., and covers the practical content of surgical nursing and postoperative rehabilitation nursing. Students need to comprehensively apply multidisciplinary knowledge to fully grasp the course content.

#### 2.1.2 Outstanding Practicality

Surgical Nursing focuses on the cultivation of practical operation ability, and students need to master a variety of surgical nursing skills, such as identifying and preparing surgical instruments, the preparation of surgical personnel (disinfection of the hands and arms, wearing surgical gowns and sterile gloves), the preparation of the patient's surgical site (disinfection, laying of sheets, etc.), placement of the surgical position, and common surgical first-aid techniques (such as bandaging, hemostasis, immobilization, etc.), etc. Practical teaching sessions are crucial to the improvement of students' clinical practice ability and professionalism.

#### 2.1.3 Rapid updating of knowledge

With the continuous development of medical technology, especially the country's vigorous development of the new medical science, promoting the transformation of medical education mode to the "new mode of medical education supported by medical literature, medical engineering, medical science and medical X cross-disciplinary disciplines", the surgical methods and nursing concepts are also constantly updated. Students need to understand and master the latest surgical nursing knowledge and technology to meet the needs of clinical work.

### 2.2 Application of AI into the teaching of surgical nursing course

Due to the limitations of teaching conditions and the cost of AI technology, our institution has not been able to build an AI course, but the application of AI in teaching is unstoppable, so I have tried to apply AI in the teaching of Nursing (Specialized Education Program) under the educational concept of "student-centered, student outcome-oriented (OBE)". Therefore, under the educational concept of "student-centered, student outcome-oriented (OBE)", I try to use AI technology when assigning homework and classroom discussion to nursing (postsecondary) students.

#### 2.2.1 Teachers use AI to assign homework to students in class

For example, take the chapter "Chapter 2, Section 1: Disorders of Sodium Metabolism" as an example. Input the instruction in Doubao or DeepSeek: As a teacher of nursing in colleges and universities, based on the knowledge of water-sodium metabolism disorders, 6-10 homework questions for nursing students are based on cultural education and culture and humanities, combined with clinical, psychological, disease, society and a hundred philosophies. Note that the "Disorders of sodium metabolism" point in the instruction should be as specific as possible. Once the questions have been obtained, they will be distributed to the Learning Channel and will be given to each group through a group discussion. The questions are as follows:

**In the context of society:** "In natural disaster (e.g., earthquake, flood) rescue scenarios, many injured people suffer from different types of sodium metabolism disorders due to entrapment, injury, and other conditions. Assuming you are a nurse involved in the rescue, how would you determine the type of dehydration and what emergency nursing measures would you take when faced with a patient who has symptoms of both nausea and fatigue, as well as dry mouth and lips, low urine output, and a loss of body fluids up to 5% of body weight in a short period of time? At the same time, think on a societal level about what challenges may be faced in the allocation of medical resources in large-scale disaster relief, and how can you rationalize these challenges in nursing care to secure patient care?"

**Combining ecology:** "In arid regions, residents are prone to hypertonic dehydration due to scarce water sources and insufficient daily water intake. From the perspective of ecology and health, explore the impact of the local ecology on the health of the residents. Assuming you are a nurse traveling to the area for medical assistance, what advice would you provide to the residents about preventing hypertonic dehydration, and how can you utilize the limited resources available in the area to develop a practical rehydration program?"

**Incorporate the mental:** "A patient with severe burns has developed chronic oozing from a large wound, resulting in hypotonic dehydration. While treatment, the patient develops adverse psychological states such as anxiety and depression due to physical pain and concern about his condition. Please analyze the impact of this psychological state on the treatment and recovery of the patient's sodium hydration disorder. As a nurse, how would you use psychological care to help the patient alleviate her adverse emotions and cooperate positively with her treatment?". Combined with philosophy, "In fluid therapy, principles such as fast before slow and salt before sugar are followed. Analyzing from a philosophical point of view, what kind of dialectical thinking do these principles reflect? In nursing practice, how can these dialectical thinking be used to flexibly adjust the rehydration regimen according to the patient's specific situation to achieve the best therapeutic effect?"

**Combining the concepts of a hundred schools of thought:** "Confucianism emphasizes" love and benevolence", and Taoism advocates "conformity to nature". When caring for patients with sodium hydration disorder, how to integrate the Confucian concept of "benevolence and love" into nursing care to reflect the care and respect for patients? How can we understand the human body's own mechanism for regulating water-sodium balance from the perspective of Taoism's "conformity to nature", and how can we avoid over-intervention during nursing care to achieve better therapeutic effects?"

### 2.2.2 Students use AI for classroom discussion.

When students encounter problems, they do not know, they are encouraged to solve them with the help of AI technology and then discuss them with the textbook. For example, when students raise the question "When rehydrating fluids in dehydrated patients, the quantitative and qualitative issues in nursing measures are not well understood", students are asked to take the thinking question 1 on page 28 of the 7th edition of the textbook of Surgical Nursing as the basis, and then take the "Specific content of the question + Calculation of rehydration volume of the patient in the first 24 hours and the second 24 hours, The answer to this question is based on the command "Specifics of the question + Calculate the amount and type of fluid replacement for the patient in the first and second 24 hours", which was entered into beanbag or DeepSeek. However, the

answers were inconsistent with the textbook, for example, the textbook suggests that "only 1/2 of the cumulative loss volume should be replenished in the first 24h, and the remaining 1/2 should be replenished in the second d according to the condition of the patient and the results of the auxiliary examination" [8], while the answer given by AI is to replenish all the volume in the first 24h of the cumulative loss volume, and not to replenish the cumulative loss volume in the second 24h. cumulative loss volume. When encountering such a contradiction occurs, students are encouraged to go to the library to check the information (such as "Surgery", the relevant information of the licensed medical practitioner examination, etc.) and consult with the clinician, and then make a comparison to find the differences and the reasons for these differences, so as to find the most appropriate answer, so that the students' critical thinking ability will be improved unconsciously.

## 3. Opportunities brought by AI to the implementation of the Surgical Nursing course

### 3.1 AI helps teachers to integrate knowledge across disciplines.

The new medical science aims to break down disciplinary barriers and promote the in-depth integration of medicine and other disciplines, but in the real teaching process, we can also realize that due to the influence of our teachers' own knowledge structure, it is difficult to realize the integration of cross-disciplines, especially in interdisciplinary fields. It is very difficult to realize interdisciplinary integration. So sometimes when we are teaching, it may involve teachers from multiple disciplines to complete a teaching activity and work together, which is not conducive to the reform of teaching. But AI itself is not subject to such disciplinary boundaries, it can break down such disciplinary barriers and help teachers realize the integration of interdisciplinary knowledge. For example, although nursing teachers are good at professional knowledge, they are not necessarily good at psychology, ecological protection, philosophy, sociology, hundreds of concepts, etc., but teachers can effectively make up for these deficiencies with AI technology, and to some extent realize the integration of interdisciplinary knowledge.

### 3.2 AI Helps Promote the Overall Development of Students

#### 3.2.1 AI Helps Cultivate Students' Innovative Thinking and Critical Thinking

As the application of AI technology provides an innovative learning environment for students, students can explore new learning methods and care models, and cultivate innovative thinking and problem-solving abilities through interacting with AI tools, at the same time, AI can stimulate students' interest in emerging technologies, guiding students to pay attention to the frontier of discipline development and laying a foundation for future career development.

#### 3.2.2 AI helps cultivate students' cross-border thinking.

In the past, nursing students' theoretical learning in school was mostly limited to the knowledge, understanding and simple application of textbook knowledge (implementing nursing assessment, making nursing diagnosis, formulating nursing measures, etc., in a given case), whereas with the practice questions generated through AI technology as a carrier, students can be more prompted to apply what they have learned to the society (e.g., when encountering a In large-scale disaster relief, rationally responding to the challenge of medical resource allocation in order to guarantee patient rescue), paying more attention to ecology (e.g., nurses make

use of limited local resources to develop a practical rehydration plan for patients with hypertonic dehydration), implementing psychological care (analyzing the impact of the patient's psychological state on treatment and recovery, and applying psychological care methods to help patients alleviate their bad moods and positively cooperate with the treatment), and Dialectical thinking (e.g., using dialectical thinking in nursing practice, flexibly adjusting the rehydration solution according to the patient's specific situation to achieve the best therapeutic effect), and combining the concept of a hundred schools of thought (when caring for the patient, integrating the concept of Confucianism's "benevolence and love" into nursing work, reflecting the care and respect for the patient). At the same time, the use of AI technology in teaching also effectively urges students to broaden their horizons and learn knowledge in a more comprehensive way, which is in line with the national trend of cultivating medical talents with cross-border thinking in the new medical science.

#### 4. Challenges brought by AI to the implementation of the Surgical Nursing course

For surgical nursing faculty, the introduction of AI technology has shifted the role of faculty from traditional knowledge transmitters to learning guides and facilitators. Teachers need to master the application of AI technology and learn to utilize AI tools for instructional design and instructional management. However, some teachers have limited acceptance of new technologies and lack relevant technical training and practical experience to adapt to this role shift.

For nursing students, the challenge of learning style adaptation. Students are accustomed to the traditional classroom teaching mode and may be uncomfortable with AI-based personalized learning and independent learning modes, coupled with the fact that AI sometimes generates content that may be incorrect, factually incorrect, or even "create something out of nothing" [9], so students should not be overly reliant on AI, but rather should be critical in their choices.

In summary, applying AI technology to the teaching of Surgical Nursing courses implements the educational concept of student-centered and student-learning outcome-oriented, and responds to the national call to cultivate medical talents with innovative ability and cross-boundary thinking, but it also faces a number of challenges, such as the establishment of a medical teaching platform based on AI [10], an exclusive model for medical teaching rather than the current model like the DeepSeek, a generalized big model like DeepSeek. In the future, it is still necessary for education departments, universities, teachers and enterprises to work together to strengthen the research and application of AI technology in the field of medical education.

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