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Research Progress of Standardized Patient Teaching Model in Ultrasound Clinical Teaching

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Abstract

Ultrasound medicine has its unique professional characteristics. Although it belongs to imaging medicine, the entire medical process is inseparable from the interaction with patients and cannot "see the disease but not the person". The traditional clinical teaching mode of ultrasound medicine has deficiencies, and the teaching effect cannot be effectively guaranteed. Standardized patients (SP), also known as simulated patients, refer to normal people or patients who have undergone standard and systematic training and can stably and realistically replicate the characteristics and medical history of a specific disease for medical treatment. At the same time, they can provide feedback on the operations of medical students. The introduction of SP in the teaching of ultrasound medicine has improved the traditional teaching methods. It enables students to face "real" patients, conduct "real" practical operations and have "real" communication conversations with patients during the learning process. This is conducive to enhancing the teaching effect of ultrasound medicine, cultivating students' comprehensive clinical thinking ability and doctor-patient communication ability, and stimulating students' interest in learning.

Keywords: standardized patient, ultrasound, teaching

Clinical internship is the connection point that organically combines medical theory and clinical practice work, and it is an indispensable link for medical students to enter clinical work. The purpose of clinical practice is to connect theory with practice, enabling students to further acquire theoretical knowledge in various clinical disciplines and receive basic clinical skills training. The quality of clinical practice directly affects the cultivation of medical students' clinical abilities (Zhang, Zhao, Xu, et al., 2021). Ultrasound has its unique professional characteristics. Although it belongs to imaging medicine, the entire medical process is closely related to the interaction with patients, and it cannot be "seeing the disease but not the person" (Li, Wang, & Reng, 2017). At present, many general hospitals in our country still adopt the traditional teaching mode for instruction, that is, the teaching mode mainly based on unilateral lectures by teachers. Although it can quickly impart theoretical knowledge, due to the fact that this teaching mode involves unilateral lectures by teachers, students' awareness of active learning is not strong, and their ability to digest and absorb knowledge is limited. Therefore, the teaching effect is not good. It is of vital importance to explore an effective clinical practice teaching model. With the continuous deepening of medical teaching reform, in order to further improve the level of medical teaching and adapt to the constantly changing medical environment, various new teaching models have been gradually implemented for reform in clinical practice at present, such as standardized patients(SP), case-based learning

(CBL), problem-based learning (PBL), have all received favorable feedback (Shen, Luo, Zhao, et al., 2025). In recent years, the SP teaching method has been increasingly widely applied in medical education and has demonstrated excellent educational potential. Therefore, this study analyzes the characteristics and advantages of SP in ultrasound medical teaching.

1. The Current Situation of Ultrasound Teaching

At present, the teaching of ultrasound diagnosis is carried out by multiple teachers teaching different chapters. Teachers collect their own case data encountered in clinical practice and explain them. There is no uniform inclusion standard for teaching cases. It is very difficult to form a deep impression of the typical imaging features of the disease and apply them to future clinical work (Yang, & Li, 2021).

The current ultrasonic clinical teaching model in China has some problems, such as putting more emphasis on theory than practice, monotonous form of practical training teaching, and a large gap between the content of practical training and clinical reality. In addition, due to the abstractness of ultrasonic knowledge, students often find it difficult to deeply understand theoretical knowledge and fully master clinical operation skills, which is also the main reason for the poor ultrasonic teaching effect (He, Wang, Chang, et al., 2020; Benacerraf, Minton, Benson, et al., 2018; Birrane, Misran, Creaney, et al., 2018).

According to the current situation of ultrasound teaching, it is difficult to ensure that each student has sufficient clinical skills training time at the examination table. Moreover, influenced by traditional ideas and the particularity of some organs, some patients are unwilling to cooperate or even refuse to be the subjects of clinical demonstration. The undergraduate internship and practice, postgraduate clinical practice and standardized training for resident physicians adopt a departmental rotation system. However, the cases encountered in clinical work are random, and it cannot be guaranteed that the disease and various critical and severe case data required by the teaching syllabus are available at the time of clinical teaching implementation. Specifically, regarding the disease itself, the manifestations of the same disease vary among different patients, and it is difficult to cultivate students' clinical thinking ability within the limited clinical teaching time (Yang, & Li, 2021).

The ultrasound department is different from traditional imaging departments. Ultrasound physicians need to face patients directly, and the entire clinical medical work process cannot do without communication with patients and their families (Yang, Wang, Wang, et al., 2019). Ultrasound physicians deal with patients of all ages and diagnose diseases of various systems. The doctor-patient communication scenarios they encounter are rather complex. Any doctor-patient communication problems that may be encountered in various clinical departments may be involved in the ultrasound department. Moreover, clinical work needs to be completed independently. Due to their youth and limited experience, junior physicians are more likely to be questioned by patients. Ultrasound examination may involve the exposure of private parts, the collection of private medical histories, and be targeted at some special patient groups, such as pediatric patients who have difficulty cooperating with the examination and anxious tumor patients (Zhang, Chen, Zhao, et al., 2022). Therefore, good doctor-patient communication skills are of vital importance to ultrasound physicians.

In conclusion, the traditional clinical teaching model of ultrasound medicine has deficiencies, and the teaching effect cannot be effectively guaranteed. There is an urgent need for an effective and practical-based teaching method to improve the level of ultrasound teaching.

2. Standardized Patient

In 1963, Professor Barrows first proposed standardized patients. Standardized patients refer to those who have received specific training and have a thorough understanding of the patient's medical history, clinical symptoms and psychological state. They can realistically imitate the patient's relevant symptoms and play multiple roles such as performers, assessors and teaching guides in clinical teaching. At present, many disciplines have applied SP in clinical teaching. In clinical teaching, SP can answer some private questions related to medical care on behalf of real patients, which can avoid problems such as non-cooperation or medical disputes caused by asking patients (Liu, Li, Wang, et al., 2021; Liu, Wang, Wang, et al., 2023). SP is a healthy population that can accurately represent the clinical problems of patients after standardized training, which can effectively avoid the problem of difficulty in finding representative cases in previous clinical teaching (Sun, & Liu, 2023; Zhang, & Ding, 2022; Leng, Tan, Xia, et al., 2022). The most common SPS mainly include Student Standardized patients (SSP) and Teacher Standardized patients (TSP) (Fu, & Yang, 2021), each with its own characteristics. They all play an important role in clinical practice teaching. TSP is taught by clinical instructors with relevant teaching experience who play the role of patients and instruct students. Compared with standardized patients, students have a more comprehensive grasp of knowledge and more logical thinking. SP teaching can not only help medical students cultivate their ability to diagnose diseases, but also make them attach great importance to their

own humanistic care quality and doctor-patient communication skills. They can reflect and analyze problems in the simulation process in a timely manner, actively summarize experiences and lessons, maintain a good doctor-patient relationship, and thereby improve doctor-patient communication skills and cultivate good medical humanistic quality (Deng, Tan, & Pan, 2019).

3. The Advantages of SP in Ultrasound Medical Teaching

3.1 SP Teaching Can Enhance the Teaching Effectiveness of Ultrasound Medicine

Standardized patients are a practical teaching model that has been widely attempted by various medical colleges and universities in recent years. This model helps to enhance students' understanding of the learning content and thereby improve their professional skills. Multiple studies have shown that the application of standardized patients in teaching is conducive to the effectiveness of ultrasound teaching. Standardized patients, after professional training, can simulate the symptoms, signs and medical history of real patients, creating an examination environment for students that is close to clinical reality. Students can practice ultrasound operations in simulated scenarios, such as adjusting the probe Angle and identifying lesions, to enhance their understanding of the correlation between ultrasound images and actual anatomical structures (Xiao, Wang, & Luo, 2019), making up for the deficiencies of pure theoretical teaching or the use of models. Standardized patients can repeatedly participate in teaching. Students can practice ultrasound sections multiple times and obtain feedback from standardized patients in a timely manner to understand whether the operation is standardized and whether important information has been missed (Sun, Yu, Qin, et al., 2023). This is helpful for correcting errors, improving operational proficiency and diagnostic accuracy.

The combined teaching of standardized patients with scenario simulation or cases yields better results. Gao Yong (Gao, 2022) selected 60 resident physicians specializing in ultrasound for their study and randomly divided them into an experimental group and a control group, with 30 in each group. The experimental group adopted SP combined with scenario simulation teaching, while the control group adopted traditional scenario simulation teaching. The teaching effects of the two groups of resident physicians were compared. The results indicated that the on-computer practical operation scores of the resident physicians in the experimental group were higher than those in the control group, and the differences were statistically significant ($P < 0.05$). In Sun Xue's study (Sun, Yu, Qin, et al., 2023), the control group adopted a standardized patient model for ultrasound professional teaching, while the experimental group adopted a blended teaching model based on a network platform on the basis of the control group. Both groups of students received 36 class hours of teaching, and the teaching effects of the two groups were compared. The results indicated that the theoretical knowledge and case analysis assessment scores of the students in the experimental group after practical training were higher than those in the control group, and the differences were statistically significant ($P<0.05$). In the study by Wu Cungang (Wu, Li, & Hou, 2019), the experimental group adopted a combined teaching model of standardized patients and cases for ultrasound imaging teaching, while the control group used the traditional teaching model. The final exam results indicated that the average score and the number of students with excellent grades in the experimental group were significantly higher than those in the control group. The combined teaching mode of standardized patients and cases has obvious advantages in improving students' final exam scores of this course.

In addition, compared with real patients, teaching with standardized patients will not cause harm to patients due to operational errors. Students can be more assured to try new methods, new skills, and accumulate practical experience, especially for beginners.

3.2 SP Teaching Is Conducive to Improving Students' Comprehensive Clinical Thinking Ability

Through ultrasound examination, diagnosis and differential diagnosis of SP relying on cases, ultrasound physicians can think deeply about the disease, which is conducive to integrating theoretical knowledge with clinical practice and promoting the formation of clinical thinking. Adhering to the purpose of learning from each patient, Wu Cungang (Wu, Li, & Hou, 2019) adopted the combined teaching mode of standardized patients and cases, and used the clinical work process as the carrier of electronic technology to collect case imaging data to establish a case database. They also carefully made and improved the teaching PPT, designed the teaching links in detail, and showed students as much information about patients as possible in order to cultivate students' clinical thinking. The results of the questionnaire showed that the students thought that this teaching model was helpful to improve their clinical thinking ability. In the research results of Gao Yong (Gao, 2022), the practical operation scores of the ultrasound resident physicians in the experimental group were significantly higher than those in the control group ($P<0.05$), indicating that the introduction of SP enables ultrasound resident physicians to face a "real" patient. During the scanning process, for a specific clinical manifestation, they can deeply understand the significance and importance of each standard section.

By integrating SP with scenario simulation practical teaching, when students face a "real" patient and complete the practical operation before writing the ultrasound diagnosis report, they can more clearly understand what important contents the ultrasound diagnosis report should describe and what important imaging information that can help with diagnosis and differential diagnosis should be provided to the clinical department. Be able to objectively describe the ultrasound features of the lesion using professional terms, and closely combine the patient's past medical history, clinical symptoms and laboratory tests, and provide the most accurate ultrasound diagnosis based on one's own clinical experience. Sun Xue (Sun, Yu, Qin, et al., 2023) conducted a research based on the need for cultivating high-quality ultrasound talents. The standardized patient simulation teaching included practical demonstration, practice and assessment links. The practical training subjects included ultrasound diagnosis and differential diagnosis of ectopic pregnancy, ultrasound diagnosis and differential diagnosis of scar pregnancy, etc. After the practical training teaching was completed, students were invited to evaluate the teaching effect. The students believed that this mode was conducive to improving clinical thinking ability. SP cases usually involve complex conditions, and students need to analyze, reason and make decisions based on the information provided by the SP. This kind of training helps students learn to integrate information from multiple sources, formulate reasonable diagnosis and treatment plans, cultivate the rigor and comprehensiveness of clinical thinking, and is conducive to achieving the goal of cultivating talents in ultrasound.

3.3 SP Teaching Is Conducive to Improving Students' Doctor-Patient Communication Skills

Introducing SP for teaching enables students to face "real" patients during the learning process. The realistic performance and scenario presentation of SP allow students to immerse themselves in the real "cases". Zhang Fan (Zhang, Chen, Zhao, et al., 2022) applied the CBL combined with the SP teaching method to cultivate the doctor-patient communication skills of resident physicians in the ultrasound department. Based on the unique doctor-patient communication scenarios and cases of the ultrasound department, they first conducted CBL teaching mainly based on group case discussions for the research group, and then carried out SP teaching mainly based on situational dialogues. After the teaching session, the assessment scale was applied to evaluate the research group and the control group. The results of the Doctor-Patient Communication Ability assessment scale show that the total score of the research group and the scores of communication skills and comprehensive evaluation sections are significantly higher than those of the control group. Some researchers have encouraged standardized patients to exhibit common clinical situations such as fear, anger and non-cooperation in the simulation teaching of gynecological ultrasound examination. This not only helps to enhance classroom interactivity and students' interpersonal communication skills, but also enables standardized patients to truly understand the psychological state of clinical patients, thereby promoting the formation of good professional ethics among ultrasound physicians (Sun, Yu, Qin, et al., 2023).

The SP teaching method is highly feasible in the cultivation of humanistic qualities in the ultrasound department. Although the doctor-patient communication scenarios faced by resident physicians in the ultrasound department in clinical work are complex and cover a wide range, they are relatively easy to reproduce through cases and the performance of SP. During the teaching process, resident physicians come into contact with various classic cases. Through thinking and discussion, they learn the skills of doctor-patient communication and the handling principles of various cases. With the application of SP teaching, all kinds of doctor-patient communication scenarios can be reproduced, and residents can further learn the practical application and detail processing of doctor-patient communication skills. Through the simulation of real scenarios and the real conversations of SP, resident physicians can learn from practice how to handle these doctor-patient communication problems frequently encountered in actual clinical work, thereby being able to handle these clinical predicaments calmly and properly in real scenarios and avoid doctor-patient conflicts (Zhang, Chen, Zhao, et al., 2022).

3.4 SP Teaching Helps to Stimulate Students' Interest in Learning

Standardized patients, through realistic performances and interactions, recreate the real daily work of the ultrasound department, allowing students to experience the pressure and challenges of clinical work in advance. This immersive learning approach breaks the abstraction of traditional theoretical teaching, enabling students to directly confront "real" patients and stimulating their interest in learning. Some studies have shown that the application of SP teaching can stimulate students' interest in learning and enhance their learning initiative (Xiao, Wang, & Luo, 2019; Gao, 2022). The symptoms of SP are typical and closer to those in textbooks. For students who are encountering clinical practice for the first time, it is easier to get started, which enhances their learning initiative, increases their confidence and ability to interact with patients, and improves teaching satisfaction (Liu, Li, Wang, et al., 2021; Jia, Ma, Gao, et al., 2023). When interacting with standardized patients, students need to take the initiative to ask questions, conduct ultrasound examinations, make diagnoses, etc., shifting from

passively accepting knowledge to actively exploring problems. This all-sensory participation learning model makes students more engaged, enhancing their enthusiasm and initiative in learning. Through communication with standardized patients, ultrasound examinations, diagnostic reasoning, etc., students fully engage their senses such as vision, hearing and touch, deeply experience the daily scenarios of the ultrasound department, and enhance their interest in learning.

4. Limitations

Standardized patients play a significant role in medical education and assessment, but they also have some limitations, mainly including the following aspects: (1) Limitations in role representation: Although SP are trained, it is difficult to fully simulate the complex emotional responses of real patients. The emotions of real patients may be more delicate and changeable, and SP may not be able to accurately reproduce these details. (2) Cultural and individual differences: SP from different cultural backgrounds may have different ways of understanding and expressing diseases. Some patients may be more inclined to conceal their symptoms or adopt specific communication methods, which may affect students' adaptability to cross-cultural medical scenarios. (3) Subjectivity of assessment: Different SPS may have different understandings and evaluation criteria for students' performance, leading to subjectivity in scoring. For instance, different SPS may have different criteria for judging students' communication skills or the standardization of ultrasound examinations.

In conclusion, the introduction of SP in the teaching of ultrasound medicine has improved the traditional teaching methods. It enables students to face "real" patients, conduct "real" practical operations and have "real" communication and conversations with patients during the learning process. This is conducive to enhancing the job competence of ultrasound physicians and laying a foundation for them to become excellent ultrasound physicians in the future.

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