Nursing Interns' Experiences and Perceptions of Clinical Cardiopulmonary Resuscitation Training and Application: A Qualitative Study (Post-print)

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Abstract

Objective: To gain an in-depth understanding from the student perspective of undergraduate nursing students' cognitive experiences and application perceptions regarding their participation in clinical cardiopulmonary resuscitation (CPR) training and teaching, explore the barrier factors in clinical CPR training and practice for nursing students, and provide references for improving CPR training quality and practice. Methods: A phenomenological research approach was adopted; fifteen nursing interns were selected through purposive sampling for semi-structured interviews, and Colaizzi's seven-step method was employed to analyze the research data. Results: The clinical CPR training experiences and application perceptions of nursing interns could be summarized into seven themes: the importance of objective feedback system devices; limited training venues and duration with unclear training intervals; desire for personalized cultivation guidance; expectation for flexible and diverse training formats and multi-dimensional training content; lack of popularization and promotion of first-aid skills; enhancement of self-efficacy; and strengthening of psychological construction related to CPR application. Conclusion: From a long-term perspective, it is recommended that hospitals establish a high-quality CPR training management organizational structure, conduct more frequent regular training covering relevant knowledge including applied psychological construction to improve the effectiveness of CPR training practice, and undertake the task of popularizing CPR among patients, families, and the public community outside the hospital, rather than being confined to individual nurses.

Full Text

Preamble

A Qualitative Study of Nursing Interns' Perceptions of Clinical Cardiopulmonary Resuscitation Training Experience and Application

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Abstract

Objective: To deeply understand undergraduate nursing students' cognitive experiences and application perspectives regarding their participation in clinical cardiopulmonary resuscitation (CPR) training and teaching from the student perspective, and to explore the obstacles in nursing students' clinical CPR training and practice, thereby providing references for improving the quality and practical effectiveness of CPR training.

Methods: Using a phenomenological research approach, nursing interns were selected through purposive sampling for semi-structured interviews, and the research data were analyzed using Colaizzi's seven-step method.

Results: Nursing interns' CPR clinical training experiences and application perspectives could be summarized into seven themes: the importance of objective feedback system devices; limited training venues and duration with unclear training intervals; desire for personalized training guidance; expectation for flexible and diverse training formats and multi-dimensional training content; delayed popularization of first-aid skills; enhancement of self-efficacy; and strengthening psychological construction related to CPR application.

Conclusion: From a long-term perspective, it is recommended that hospitals establish a high-quality CPR training management organizational structure, conduct more frequent regular training covering knowledge including applied psychological construction to improve the practical effectiveness of CPR training, and undertake the task of CPR popularization for patients, their families, and the public community outside the hospital, rather than restricting it to individual nurses.

Keywords: nursing students; cardiopulmonary resuscitation; training experience; qualitative research

Introduction

Cardiopulmonary resuscitation (CPR) is the most fundamental and important clinical procedure and one of the essential emergency skills for medical staff. For patients with sudden cardiac arrest, failure to receive timely and effective CPR may result in severe, irreversible damage to the heart, brain, and other vital organs within minutes. Currently, the incidence of heart disease and cardiac

arrest is rising annually worldwide, urgently requiring a large number of qualified emergency personnel trained through standardized programs to address this critical public health issue. Standardized training and rigorous assessment are essential elements for mastering high-quality CPR techniques. However, cardiovascular emergency and CPR systematic research started relatively late in China, and a unified, standardized training model for different levels has not yet been formed. Hospitals currently implement fragmented and periodic identical training based only on relevant guidelines or successful clinical training experiences, which is not conducive for interns who have just entered clinical positions to quickly and effectively master CPR skills. Since CPR skill proficiency is directly related to clinical work duration, rescue experience, and department characteristics, while most interns have problems such as weak CPR knowledge, unskilled operations, and lack of clinical thinking. As nursing students are the main force of future nursing careers, their emergency skills will directly affect the quality of future medical care and rescue. To improve nursing interns' CPR techniques and promote their transformation into more active clinical roles, it is necessary to understand nursing students' feelings and experiences during clinical CPR training and practice. Therefore, this study adopts a phenomenological research method to further explore new insights from the perspective of nursing students and improve clinical CPR training practice programs, continuously enhancing the effectiveness of clinical CPR training.

1. Data and Methods

Research Participants: Using purposive sampling, nursing interns who had undergone clinical teaching practice at a tertiary Grade A hospital in Guangxi and had completed CPR training and assessment were interviewed. The sample size was determined based on the principle of "information saturation," meaning sampling continued until no new thematic information emerged. Inclusion criteria included: nursing interns who had rotated through the emergency department and participated in CPR training and assessment; had no communication barriers; voluntarily participated in the study and signed informed consent. Exclusion criteria included those who withdrew from the study midway for various reasons. This study included a total of [number missing] interview participants, including [number missing] males, with an average age of [age missing] years.

Data Collection Methods: A semi-structured interview approach within qualitative phenomenological research was employed. Based on literature review and research objectives, a preliminary interview outline was developed. To obtain more authentic experiences and feelings from nursing interns, interviews were conducted at [time missing] after CPR training and assessment completion in a quiet, comfortable, undisturbed department conference room. Before the interview, nursing interns were informed about the study's purpose, significance, data collection methods, and data processing procedures. They were also informed that the interview would be recorded, and they were assured that all collected data would be anonymized and used solely for this research without other

purposes. Participants had the right to pause, terminate, or withdraw from the interview at any time. During the interview, the researcher listened carefully while simultaneously noting respondents' expressions, tone, speech rate, and physical changes. After the interview, participants were thanked for their cooperation and contribution, and informed that results would be fed back to them for verification after data analysis to ensure authenticity. Interview duration was not limited and depended on participants' willingness or depth of discussion, with actual interview times ranging from [time missing] minutes. Sample size was determined when no new thematic information emerged and data reached saturation.

Data Analysis Methods: Colaizzi's data analysis method was adopted. Data analysis and theme extraction were conducted in three stages. Within [time missing] hours after each interview, audio recordings were transcribed and extracted. Two researchers independently conducted transcription, extraction, and analysis, repeatedly listening to recordings and reading transcripts to fully familiarize themselves with the collected data. The texts were read word by word, extracting meaningful statements related to CPR training experience and themes. Recurring statements were coded to construct meaning units. Further meanings were summarized and refined, gradually clustering themes. Themes were connected with research phenomena for detailed description. Similar viewpoints were identified, elevated to thematic concepts, and the final results were returned to participants for verification and confirmation. Corresponding modifications and improvements were made based on feedback to ensure the authenticity of extracted results.

Quality Control: Researchers had systematically studied qualitative research-related courses, understood qualitative research implementation methods and basic interview techniques, and conducted pilot interviews before formal interviews. Interview recordings were transcribed, themes extracted, and texts classified and summarized by two researchers separately, with cross-checking performed. Both researchers independently implemented the coding process. Final themes were determined through group discussion to reduce subjective bias.

2. Results

This study interviewed [number missing] participants with a total of [number missing] interviews, accumulating approximately [time missing] hours of interview duration, and transcribing [number missing] ten thousand words of text. Through layer-by-layer coding, categorization, and in-depth analysis of the transcripts, [number missing] meaning units and [number missing] categories were constructed, ultimately identifying seven themes: the importance of CPR training with objective feedback system devices; limited training venues and duration with unclear training intervals; desire for personalized training guidance; expectation for flexible and diverse training forms and multi-dimensional training content; delayed popularization of first-aid skills; enhancement of self-efficacy;

and strengthening psychological construction related to CPR application.

Themes Related to Clinical Training Experience

Theme 1: Importance of Objective Feedback System Devices
Most respondents indicated that the greatest advantage of clinical CPR training was the clinical feedback mechanism, which could intuitively and objectively evaluate the effectiveness, standardization, and standard compliance of compressions and ventilation during CPR operation training. As one participant noted: "The feedback mechanism in clinical CPR training allows my operations to be more standardized." Another stated: "The feedback system can guide compression frequency and depth." A third respondent reflected: "When there was no feedback mechanism in school CPR practice classes, I couldn't perceive specific defects in my operations and could only rely on teachers' subjective guidance, which was not conducive to effective CPR training."

Theme 2: Limited Training Venues and Duration with Unclear Training Intervals
Some respondents believed that hospital clinical CPR training teams and venues were mainly concentrated in the emergency department. Once outside the emergency department, they could not access formal operation practice equipment and venues, and there was no clear training interval. One participant stated: "Other departments cannot meet training requirements due to condition limitations, but emergency department training time is limited, the venue is small, and cannot meet demand." Another noted: "Too many students need practice, each training session is insufficient, requiring much more training time to basically complete one round of operations." A third respondent added: "Although there are [number missing] hours of training each time, the time is obviously insufficient and cannot effectively digest and practice CPR skill points." Another mentioned: "Only when rotating through the emergency department can we receive professional training, and after rotating out, it's gone, and it's easy to forget."

Theme 3: Desire for Personalized Training Guidance
Most respondents had weak points and difficulties in CPR operation. One participant stated: "I think the operation of the simple breathing bag is difficult. Controlling ventilation volume is very important; it cannot be ineffective ventilation nor excessive ventilation." Another noted: "During compression, I often unconsciously use my body's impact force instead of gravity. This compression force point is difficult to master." A third respondent said: "I find opening the airway very difficult with poor operation technique, often giving invalid ventilation, and hope to receive specialized training." Another added: "The compression frequency is too fast; I hope to receive training targeted at my own weaknesses."

Theme 4: Expectation for Flexible and Diverse Training Forms and Multi-Dimensional Training Content

Most respondents indicated that current clinical CPR training adopts a "CPR theory step-by-step systematic explanation + operation demonstration" approach. While such systematic and detailed theoretical teaching and standardization benefit newcomers to clinical positions, they lack multi-perspective, multi-dimensional case integration and scenario simulation training. One participant stated: "If cases could be integrated into training, there would be more sense of immersion during operation." Another suggested: "I think more clinical practice cases should be combined with theory in training, so that when encountering sudden emergency events in the future, we can quickly perceive, judge, and rescue patients in time. For example, when encountering an electrocuted patient in the wild, we know that quickly assessing patient environmental safety means first using a wooden stick to move the wire away to ensure our safety." Another respondent noted: "I think training may need to focus on skills and techniques, but in-hospital rescue and out-of-hospital rescue are different. The rescue of various diseases may differ between textbooks and clinical practice. For example, I generally thought defibrillation is only performed when there is ventricular fibrillation, but later in clinical practice, arrhythmias with hemodynamic changes can be defibrillated immediately if a defibrillator is available. Therefore, I suggest increasing training for various scenarios both inside and outside the hospital." Another added: "More training cases should be added, and they should be combined with clinical reality as much as possible. Otherwise, even if we know the CPR rescue process, we sometimes still feel at a loss and cannot determine the priority of rescue." One participant also mentioned: "Pediatric CPR and defibrillation techniques have less training and involvement."

Theme 5: Delayed Popularization of First-Aid Skills

Respondents indicated that emergency techniques including CPR operation, simple breathing bag use, and defibrillator operation are so important for clinical medical staff that they should be popularized earlier. One participant stated: "Only in the third year of university do we first encounter CPR training and other rescue skills. The contact is relatively late, and we cannot effectively master them. Sometimes when encountering a suddenly fainted patient on a train, without solid skills, we dare not step forward to rescue, which is very regrettable." Another noted: "Only when rotating through the emergency department can we receive more formal CPR training and other operations. For those who rotate through the emergency department later in their clinical internship, they may not receive training throughout the entire previous internship stage, which is not good." A third respondent added: "The training is too late, and the time to receive training is also late, resulting in relatively low popularization and mastery rates. It is recommended to start training courses from the first year of university or even earlier."

Theme 6: Enhancement of Self-Efficacy

Most respondents indicated that after receiving more formal and professional CPR training in clinical settings, only [percentage missing]% of students who had undergone actual combat experience were willing to undertake rescue tasks

outside the hospital, while nursing students without actual combat experience only had [percentage missing]% who dared to undertake rescue tasks in real situations. One participant stated: "A simulated person is different from a living body. If outside the hospital, I cannot rescue in time due to my inadequate CPR operation, I cannot bear this responsibility." Another noted: "Improper operation being photographed and posted online may bring shame to the school and hospital." A third respondent reflected: "I am still relatively timid, but if an out-of-hospital patient's condition is very critical and no one organizes the rescue, I will definitely rush to the front." Another added: "I will rush forward to help without hesitation; professionally trained people definitely have stronger operations."

Theme 7: Strengthening Psychological Construction Related to CPR Application

Most respondents indicated that although school and hospital CPR training made them feel capable of implementing high-quality CPR technology, they would still be timid when applying it in actual combat. One participant stated: "Clinical training has enhanced my confidence in completing CPR, but I still have concerns about actual operation, worrying about the difference between simulated training and real human operation." Another noted: "As long as I haven't undergone actual combat, I have no confidence in implementing high-quality CPR."

3. Discussion

Overall Positive Perception of Training Experience with Need for Improved Training Programs

This study's results show that the combination of theory and simulation training demonstration is feasible and enhances patients' self-efficacy in implementing CPR technology, especially when using simulation machines with feedback system devices. Since evaluating full chest recoil and appropriate tidal volume has significant subjectivity, standardized feedback systems are needed for objective assessment and feedback guidance, which received praise from all students. Research by Zhu Yongcheng et al. using the SimPad feedback system and Tian Dan et al. using the ZOLL real-time feedback system both showed that feedback systems can dynamically record key CPR parameters in real-time, enabling precise assessment and quality control of CPR operation essentials, ensuring full chest recoil and effective ventilation. However, this study's results also indicate that training programs need further discussion and enrichment, as nursing students expect different case presentations and more personalized training. The theoretical teaching and demonstration simulation training process needs to connect with actual clinical cases, following the principle of "from practice to practice." Basic Life Support (BLS) training has been widely carried out globally, while public CPR training in China is still in its infancy. Although some medical institutions and regions have launched corresponding training programs, there is currently no standardized training model that conforms to national conditions.

Providing Positive Support and Effective Training Environment, Standardizing Clinical Nursing Training (Training Venues and Intervals, Training Mechanisms)

This study's results show that BLS technical training venues and duration are limited, and training intervals are not unified. Standardized training environments, processes, assessment standards, and clear training intervals are crucial for high-quality CPR technology. Nurses play three main roles in emergency response: bedside emergency personnel, resuscitation team members, and clinical or administrative leaders. Research has found that hospitals providing more support differ from those with less support in that they emphasize training and competency at all nursing levels, provide organizational flexibility and responsive capabilities for nursing roles, and have significantly higher CPR success rates than hospitals with less support. This is related to providing better training environments, conditions, and more standardized processes, which indirectly proves that hospitals' emphasis on nurses' basic life support technical capabilities, practice importance, and training quality are proportional. Any nursing staff in clinical positions may become the first emergency responder. Whether based on job requirements or future emergency team succession, hospitals and relevant personnel are responsible for providing better environments and establishing standardized training processes and assessment systems.

Evidence supports brief, frequent CPR training, but the optimal training interval has not been determined. Unclear intervals can easily lead to knowledge and skill retention issues after CPR training for nursing and medical staff. Research shows that for students learning CPR techniques and other novices, training opportunities over consecutive days or weeks may be beneficial, and if trainees are aware of specific errors, they can more easily correct performance and improve skills when there is less time between practice sessions. Anderson et al. randomized CPR participants to training intervals of 1, 3, or 6 months, with training including repeated two-minute CPR skills, including visual feedback and verbal coaching, until excellent CPR was achieved, with a maximum of 6 attempts. All groups were assessed for CPR performance at 6 months. Results analysis showed that the proportion of participants achieving excellent CPR scores in the monthly training group (47%) was significantly higher than all other groups ($P<0.05$), supporting short-term distributed CPR training. Monthly training is more effective than training every 3 or 6 months, which is worth learning from. The Guidelines Update also recommends that medical staff regularly engaged in emergency response should receive more frequent regular training rather than being restricted to knowledge updates only once a year to improve CPR operation proficiency.

Early Joint Establishment of Basic Life Support Technology Courses and Related Training in Institutions

Most respondents in this study indicated that the third year of university was their first exposure to CPR knowledge, simultaneously indicating that domestic students' CPR courses are offered late and have low popularization rates. If this

is the case in medical schools, the awareness rate in ordinary schools and community populations would be even lower. A cross-sectional survey of domestic citizens showed that only [percentage missing]% of the public are familiar with CPR operation, and only [percentage missing]% of witnesses could correctly implement rescue in simulated situations. In addition to the public's lack of relevant knowledge, by understanding hospital operation routines, it was found that emergency standards vary across hospitals, and processes are not updated in a timely manner, resulting in some medical staff themselves not mastering emergency techniques proficiently. In contrast, foreign emergency technology training and popularization are relatively successful. As early as [year missing], a U.S. survey showed that [percentage missing]% of the public were confident in handling emergency events, [percentage missing]% of the public could recognize cardiac arrest, and about [percentage missing]% of out-of-hospital cardiac arrests were performed by witnesses. The high mastery and popularization rates of basic life support technology among foreign populations are inseparable from early, effective, popular, and developed training systems. It is reported that in [year missing], the AHA, as a world emergency authority, began offering emergency-related education programs to the public, which were rapidly popularized. For reference, the urgent task for CPR technology popularization is to unify and standardize various operations according to international guidelines, establish effective training systems suitable for national conditions and various populations, and explore efficient scientific training methods. Simultaneously, institutions should offer basic life support technology courses and related training early, advance the intensity and popularization of CPR training for students and the public, and effectively improve the entire population's emergency awareness.

Nursing students face many challenges in theory and practice during their internship period, and these fundamental reasons for the theory-practice gap affect the quality of nursing education and nursing services during the internship stage. Teachers and hospitals, as main factors in the academic and educational environment, can narrow the theory-practice gap by correcting these factors. This study discusses and provides recommendations on the methods, timing, frequency, and application psychology of CPR training conducted by institutions from the perspective and experience of nursing students, with the hope of further improving training programs.

Conflict of Interest Statement: The authors declare no conflict of interest in this article.

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Note: Figure translations are in progress. See original paper for figures.