

A Cross-Sectional Study on Nursing Errors and Prevention Strategies among Nursing Students

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ABSTRACT

Background: In healthcare, nursing errors are a serious problem that frequently arise from a lack of experience, insufficient information, or difficult clinical settings. Developing successful preventative tactics and improving patient safety require an understanding of the types and prevalence of these errors among nursing students. **Objective:** This study aimed to determine the incidence of nursing errors among nursing students and explore the strategies of clinical instructors in controlling nursing errors. **Methods:** A cross-sectional exploratory sequential design was used, with 332 students recruited from the third and fourth years of nursing school to investigate the incidence of nursing errors. Five clinical instructors who taught these students were interviewed to explore their strategies for decreasing students' nursing errors. Data were examined quantitatively using descriptive statistics and qualitatively using content analysis. **Results:** The most common nursing errors noted by students were not cleaning the thermometer while measuring body temperature (2.38 + 1.41) and providing care without the proper equipment (2.31 + 1.25). In contrast, the least common nursing error was giving oxygen to a patient with the incorrect equipment (1.20 + 0.61) and giving oxygen regardless of the patient's illness (1.10 + 0.43). The study demonstrated significant differences between gender, year of education, career interest, and nursing errors ($p < 0.05$). The primary reasons for these errors were a lack of clinical skills and pharmacological knowledge. The results from qualitative analysis suggested that the clinical instructors' strategies for dealing with these errors among students can be explained from different perspectives, including theoretical, practical, and clinical teaching environments. **Conclusion:** According to study findings, nursing errors can be caused by various factors. During clinical courses, all students committed at least one nursing error, most of which derived from a lack of clinical skills and pharmacological knowledge. In addition, clinical instructors must change their teaching approaches and integrate nursing error information into the curriculum. Technology in education is one of the innovative approaches to minimize nursing errors.

Keywords: Nursing Errors; Nursing Students; Patient Safety

INTRODUCTION

Patient safety is one of the most critical problems in the healthcare system. Medical errors are a significant hazard to patient safety. Unsafe practices in medical facilities lead to approximately 134 million adverse health events annually in low- and middle-income countries, contributing to approximately 2.6 million deaths and one-tenth of patients being recognized as victims of medical errors related to health care delivery (WHO, 2023). Among them, errors related to nursing work account for a relatively large number in nursing care practice, and these errors are known as nursing errors (Eslamian *et al.*, 2010). According to Mohsenpour *et al.* (2017), nursing errors are complex, unintentional, preventable, but unavoidable errors related to the nurse's work in patient care that cause unexpected health, financial, organisational, and professional consequences. According to recent statistics, these nursing errors include errors in medication use (Fathizadeh *et al.*, 2024), incomplete checking of patient information, incorrect recording, mistakes in the nursing process, improper use of equipment or lack of equipment while performing nursing care, patient falls, or injuries due to the use of equipment (Eslamian *et al.*, 2010; Mohsenpour *et al.*, 2020). The result of these errors not only directly affects the health of patients and staff

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and the treatment costs of patients and hospitals. According to statistics, approximately 15% of total hospital operations and expenditures are the direct result of adverse events and nursing errors (WHO, 2023).

To reduce these adverse events related to nursing care, the role of nursing education is vital, and clinical practice is one of the most essential parts of training students to become real nurses (Tseng, Wang & Weng, 2013). Learning and practicing in a complex clinical environment in a hospital creates specific pressures for students when providing patient care. Among them, the pressure of nursing errors is a challenge for students. The results of many previous studies showed that the rate of nursing students making nursing errors is relatively high (Asensi-Vicente, Jiménez-Ruiz & Vizcaya-Moreno, 2018; Bam *et al.*, 2021), of which medication-related errors account for the highest rate of 76%, including omitting medications and taking medications at the wrong time (Bam *et al.*, 2021). In addition, other common nursing errors are wearing the wrong gloves, not washing hands properly, not cleaning the thermometer before use, injecting at the wrong location, and mismeasuring blood pressure (Mohsenpour *et al.*, 2020; Ahmalia, Aljaberi & Said, 2024). As a result, these errors affect patient safety and cause a loss of the patient's trust in the medical staff. In particular, the role of clinical instructors is essential in controlling the above nursing errors. Previous research has also shown that if clinical instructors were well trained and provided students with good knowledge and skills related to preventing and controlling nursing errors, there is a significant improvement in the behavior of nursing students regarding patient safety issues (Noviyanti, Handiyani & Gayatri, 2018; Ariffin *et al.*, 2020). Therefore, reasonably controlling nursing errors in patient care practice is an essential and mandatory requirement for clinical instructors and students.

Study Aim

1. To identify common nursing errors among students and their contributing causes.
2. To explore the strategies of clinical instructors in controlling nursing errors.

Research Hypothesis

Do nursing errors in students commonly occur, and are there any specific strategies to prevent these errors?

Research Question

1. What is the incidence of nursing errors among nursing students?
2. What strategies are used to prevent these nursing errors?

METHODOLOGY

Sample and Sampling

The study was conducted on 347 3rd-year and 4th-year nursing students at Hue University in Vietnam. The total number of questionnaires distributed was 347, and 332 questionnaires were received that met the criteria for inclusion in the study. The response rate was 95.67%. All participants in this study consented to complete the survey and participate in the research by providing a written agreement after reviewing the recruitment details and research participation instructions.

Inclusion Criteria

1. The students were in their third and fourth years of full-time nursing school, had clinical experience at the hospital, and volunteered to participate in research.
2. Clinical instructors were nursing faculty lecturers who had at least two years of experience as clinical instructors in hospitals and volunteered to engage in the study.

Study Design

A cross-sectional exploratory sequential design was used.

Instruments

The questionnaire “Nursing errors and related factors in nursing students” developed by Mohsenpour *et al.*

(2020) was used to survey nursing students' errors at the hospital. This instrument has 22 items concerning nursing errors on a Likert-5 scale: 1 refers to no occurrence, 5 shows more than three occurrences, and a section asks students to point out the factors that contributed to their errors. This instrument was translated into Vietnamese using the back-translation method and evaluated for reliability on 17 nursing students. The results showed that the Cronbach alpha index was 0.93. Furthermore, in-depth interviews with five nursing lecturers from various majors were done to comprehend clinical instructors' strategies for reducing nursing errors among students.

Data Collection

The questionnaire was distributed to 347 nursing students at the University of Medicine and Pharmacy, Hue University, from February 2023. All students were asked to agree to study; they were provided a QR code to access the questionnaire on their cell phones. In addition, in-depth interviews were conducted with five clinical instructors to explore the strategies for preventing these common nursing errors. Participants were interviewed through a semi-structured interview guide. Open-ended, semi-structured question examples were:

1. How often do nursing errors occur in students, and what are the different types?
2. How do clinical instructors identify these errors?
3. How can clinical instructors avoid these nursing errors among students? Face-to-face interviews lasted 30-40 minutes and were recorded using digital recorders.

Data Analysis

After checking for appropriateness, the researcher coded all collected data. Data were described and analyzed using SPSS 20.0 software. Frequent (*n*) and proportion (%) describe qualitative variables. Quantitative variables are described using mean and standard deviation. Analyze the correlation between independent and dependent variables using the chi-square test. For qualitative data, it was fully transcribed. Participants were assigned IDs ranging from P1 to P5. The qualitative content analysis method was used to explore the strategies of clinical instructors in controlling nursing errors among students.

Ethical Consideration

The study was approved by the Scientific Research Committee of Hue University, Vietnam according to Reference Number 1986/QĐ-ĐHYD, on 1st June, 2022.

RESULTS

The Incidence of Nursing Error and Its Causes among Nursing Students

The nursing students were mainly female, accounting for 91.3%. The number of students in the third and fourth years is almost the same at 48.8% and 51.2%, respectively (Table 1).

Table 1: Personal Characteristics of Nursing Students

Personal Characteristics	N	%
Gender		
Female	29	8.7
Male	303	91.3
Age		
20	77	23.2
21	134	40.4
22	103	31.0
>22	18	5.4
Class		
3 rd Student	162	48.8
4 th Student	170	51.2

Table 2 shows that the most common nursing error among students is not cleaning the thermometer when measuring body temperature (a total of 790 times, an average of 2.38 times per student). Some patients received care despite not having all the necessary equipment (a total of 767 times, an average of 2.31 times per student) and were unable to use a medical device properly due to a lack of adequate knowledge (total of 699 times, an average of 2.11 times per student). On the contrary, the least common nursing mistake is to provide oxygen to the patient regardless of equipment and to provide oxygen to the patient regardless of the patient's illness.

Table 2: Incident of Nursing Errors among Students

Item	Contents	Frequencies				
		Mean	SD	At least One	None	Total
1	I did not inject the medicine in the right place and in the correct manner	2.07	1.3	51.5	48.5	687
2	I calculated the dose of the medication incorrectly.	1.54	0.950	32.2	67.8	510
3	I did not wash my hands before and after performing sterilization techniques	1.82	1.21	39.8	60.2	603
4	After performing each technique, I did not remove my gloves and did the rest of the care with the same pair of gloves.	1.94	1.30	44.9	55.1	644
5	I did some care despite not having the necessary supplies.	2.31	1.25	66	34.0	767
6	I did not pay attention to my patient's safety (i.e., bedside railings).	1.65	1.07	35.2	64.8	549
7	I put the thermometer in the patient's mouth without cleaning it.	2.38	1.41	62.3	37.7	790
8	I put the thermometer in the patient's mouth while it was still wet	1.27	0.72	15.4	84.6	421
9	I did not pay attention to the drug interactions	1.79	1.17	94.4	5.6	593
10	I did not pay attention to the patient's ability to eat and the amount of help she/he needed	1.84	1.17	44.6	55.4	610
11	I did not pay attention to the patient's ability to eat and the amount of help she/he needed	1.51	0.87	32.8	67.2	500
12	I prescribed the wrong medicine because of its similarity to another one in the name or appearance	1.16	0.50	11.7	88.3	386
13	I did not use a mask when dealing with the patient's fluids (i.e., blood).	1.21	0.71	10.8	89.2	402
14	I did not plan the care and interventions ahead	2.06	1.27	52.4	47.6	684
15	I provided an amount of oxygen for the patient regardless of the tool I had.	1.20	0.61	12.7	87.3	398
16	I provided oxygen for the patient regardless of the patient's disease.	1.10	0.43	6	94.0	364
17	While preparing and prescribing the medication, I was called on another care, and I forgot the prescription.	1.33	0.75	20.2	79.8	440
18	I could not use a tool properly due to my lack of adequate knowledge of it.	2.11	1.17	60.5	39.5	699
19	I did not close the cuff correctly when measuring blood pressure	1.45	0.89	26.2	73.8	483
20	I did not hear the heartbeats accurately when measuring blood pressure.	2.01	1.23	50.9	49.1	668
21	While my patient needed heat therapy and cryotherapy, I didn't do it at the right time or in the right way.	1.40	0.87	23.2	76.8	466
22	I used the bed number instead of the patient's name to identify the patient	1.28	0.78	15.1	84.9	426

Figure 1 shows nursing students' perceptions of the causes of nursing errors. The result indicates that lack of knowledge about medications (65.42%) and lack of clinical skills (59.65%) were the main reasons for nursing

errors among students. In contrast, students were less likely to report a lack of relationships amongst classmates (5.76%), inability to mark instruments/equipment (8.93%), and giving drugs with inadequate information (8.93%) as contributing factors to their nursing errors.

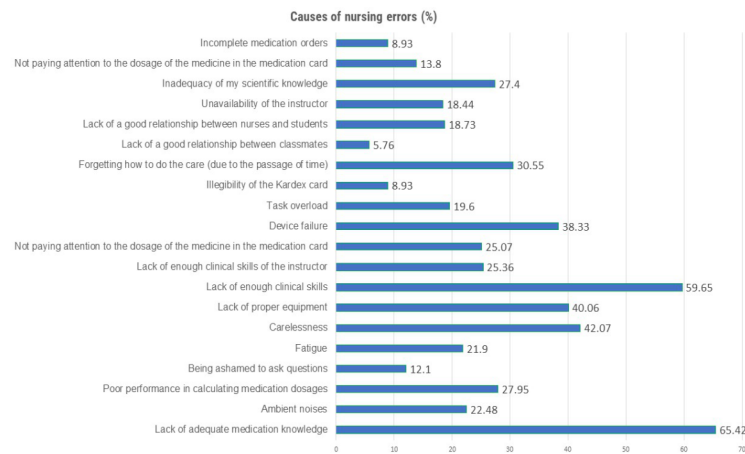


Figure 1: Causes of Nursing Errors

Furthermore, determining factors influencing nursing errors among students shows that gender, grade level, and interest in nursing were all associated with nursing errors. Nursing errors, such as incorrect drug dose calculation, improper use of medical equipment, improper hot and cold therapy, and identification by bed/room numbers rather than patient names, were found to be significantly related to grade level ($p < 0.05$). Gender was significantly related to errors in putting the thermometer into the armpit before drying ($p < 0.01$) and forgetting to administer medication to the patient ($p < 0.01$). Additionally, nursing career interest was related to improper medical device use ($p < 0.05$) and incorrect heat and cold treatment timing ($p < 0.05$).

The Strategies of Clinical Instructors in Reducing Nursing Errors among Students

According to interviews with experienced nursing lecturers in different specialties, including surgery, pediatrics, internal medicine, obstetrics, and geriatrics, the results show that clinical instructors are essential in guiding nursing students to participate in clinical practice at the hospital. When asked if clinical instructors have ever heard about nursing errors, most clinical instructors have heard about this incident. However, this is still a rarely used term because most medical staff are familiar with “medical incident” or “medical error.” Several nursing errors that clinical instructors pointed out, such as “...those are errors related to steps of the nursing process” (P3), “...inappropriate assessment of patient's health problems...” (P3), “...did not do the five rights in medication use...” (P1), “...some other technical errors such as measuring blood pressure in the wrong location, taking the wrong pulse, clamping the thermometer incorrectly, not ensuring sterility in some nursing procedures ...” (P2).

Practically, identifying these errors in nursing students is not simple for many reasons. According to the clinical instructor, there were the following explanations: First, there are not enough instructors to monitor the students: “...the number of students is large while the clinical instructors are few, so it is difficult to manage and supervise students during practice...” (P1). Second, blame culture continues to be a barrier in addressing patient safety: “...many students make mistakes and do not proactively report them to their instructors for fear of being reprimanded...” (P5). Third, awareness of student nursing errors deficiency: “...students do not know whether the errors they make are nursing errors or not, or whether there are errors that students think are not necessary to report or are not serious...” (P4).

The results from qualitative data analysis suggested that the clinical instructors' strategies for dealing with these errors among students can be explained from three different teaching perspectives (Figure 2).

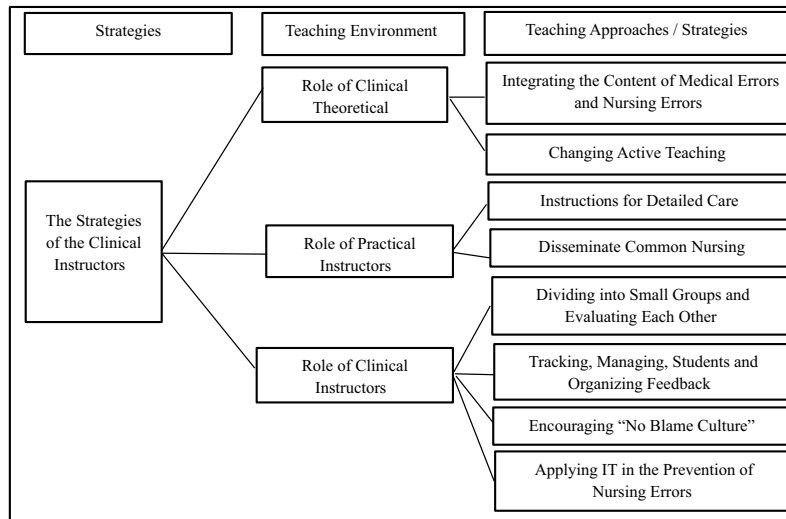


Figure 2: The Strategies of the Clinical Instructors in Reducing Nursing Errors

Role of Theoretical Instructors

To reduce nursing errors in students, as theoretical instructors, it is necessary to raise student's awareness of nursing errors and their consequences on patient safety. A lecturer said: "...many students do not know that their mistakes are nursing errors..." (P1), "...To decrease nursing mistakes in clinical practice, students should be taught about preventative approaches..." (P3). In addition, it is necessary to apply active teaching methods to improve students' soft skills and professional attitudes, especially problem-solving skills. In particular, one instructor emphasized simulation-based teaching approaches that allow students to make mistakes, recognize them, and correct them: "I thought that the simulation teaching method plays an important role because it creates an environment and circumstances for learning, practicing, and solving problems close to reality. This will help students be more confident when practicing at the hospital..." (P2).

Role of Practical Instructors

In the skill-lab teaching environment where students practice their nursing skills on manikins or other students before moving to a natural practicing environment at the hospital, a lecturer proposed that "...practical instructors need to give specific instructions on nursing procedures to students and need to re-evaluate students to ensure students can do the techniques..." (P2). Furthermore, one instructor commented that to help students recognize common nursing errors, "...In my view, the teacher should advise students about typical faults while doing nursing procedures; this will assist students in comprehending and avoiding these problems when practicing at the hospital..." (P1).

Role of Clinical Instructors

The clinical teaching setting differs significantly from the theoretical classroom in that students directly interact with real people and patients. Every error directly impacts the patient, family, and community; thus, teachers' accountability is critical. Dividing students into small groups is an excellent approach to controlling nursing errors in the hospital: "...Practicing in small groups, self-checking, or evaluating each other is one of the solutions that can help limit errors..." (P5). Furthermore, the number of clinical instructors remains a barrier to clinical instruction, as one instructor must supervise many learners. One lecturer stated that "...clinical instructors need to strengthen student monitoring and management..." (P2). Another lecturer suggested increasing the number of full-time or part-time lecturers to facilitate education for hospital students better: "...Faculty of nursing should invite more nurses in wards to participate in teaching and managing students..." (P1).

In addition, to meet clinical teaching objectives, it is critical to develop a strategy for educating, monitoring, supervising, and assessing students to reduce nursing mistakes. Many instructors think that: "...organizing feedback sessions and comments on common mistakes made by students during clinical

practice is a significant activity, helping students in class and groups recognize errors, how to fix them and avoid repeating those mistakes next time..." (P3). "...In each morning report session, instructors may ask students to report their clinical activities, including learning process, achievement, and problems; by this method, other students will learn together from advantages and disadvantages..." (P4).

Another critical strategy to avoid nursing errors in students is the culture of no blame. In practice, many students fear reporting mistakes to instructors for fear of being blamed, losing points, reprimanding, etc. This leads to students not having the opportunity to share these mistakes with instructors and other students in the class, and vice versa; instructors will not be aware of their students' mistakes. To encourage students to be more active in reporting their studies and mistakes, one instructor proposed that "... It is vital to reject the blame culture and encourage students to disclose faults so that they may learn from them; this may assist instructors in recognizing our students' errors and changing the way they teach..." (P4).

The final strategy for managing nursing errors among students is applying information technology, as mentioned by many lecturers. In particular, using QR codes to report and manage medical incidents and nursing errors is a strategy consistent with current technology trends. "...Lecturers can provide QR codes attached to students' practice programs syllabus, not only so that students can easily report nursing errors, but lecturers can also manage and track errors that my students often make..."(P5).

DISCUSSION

This study described the common nursing errors among nursing students and their factors in the third and fourth nursing students. The study's findings revealed that almost 100% of students make at least one mistake while practicing at the hospital. The most frequently made nursing errors are injecting medication at the wrong place and incorrectly, performing some care without the necessary equipment, placing a thermometer in a patient's armpit without cleaning, providing care and intervention for patients without prior planning, and not being able to use a medical device properly due to inadequate knowledge, and not accurately listening to the rhythm heart when measuring blood pressure. The results of this study are different from the study by Mohsenpour *et al.* (2020), where the high error rate focused on hand washing techniques before and after implementing aseptic techniques, using sharing gloves to care for multiple patients, not cleaning the thermometer when measuring oral temperature, not using a mask when there is a risk of contact with fluid/blood from the patient, and not identifying the patient's name when providing care. In contrast, the current study results are comparable to those of Silvestre and Spector (2022) on mistakes made by 204 nursing students in the United States, which showed that errors in medicine usage were 58.8%, not following the care procedure was 12.6%, and not fully preparing instruments while delivering care was 5.3%. In Vietnam, Vu *et al.* (2019) found that 18.8% of nursing students made drug mistakes during clinical practice.

The present study findings also indicated that the most common causes of these mistakes include a lack of basic medication knowledge, clinical skills, carelessness, and inappropriate equipment. This is logical because nursing students typically have limited clinical practice time in clinical departments. Third- and fourth-year students only have time to practice in the morning department. The number of students is large, the number of diseases/rooms is restricted, and clinical pharmacy knowledge is not adequately taught in class. As a result, students' medication knowledge and clinical skills are lacking, making nursing mistakes unavoidable. According to the findings of Valiee, Fathi, and Shahoei (2019), the reasons for mistakes in nursing students were separated into two factors: personal traits and training factors. Personal traits include a quick pace of work at the hospital, stress, and a lack of enthusiasm to study. Training factors are overcrowded student distribution, lack of lecturers, nurses/teachers with excessively high expectations of students' practical ability, students accompanying nurses at the hospital, and inadequate communication. The results of this study suggest that, in the nursing training program, it is necessary to add additional clinical pharmacy modules/content for students. Furthermore, procedures must be synchronized between the university and the hospital to ensure students practice according to procedures.

According to qualitative research findings, instructors have an essential role in minimizing nursing mistakes in students, and each learning environment has a distinctive teaching purpose. However, in any learning setting, increasing students' awareness, attitudes, and knowledge regarding medical mistakes and risk

factors is essential for avoiding nursing errors (Triantafyllou, Gamvrouli & Myrianthefs, 2023). Early classroom teaching on nursing errors in the curriculum is critical for students to grasp these concepts better, prepare for practice, and potentially improve patient outcomes (Cleary-Holdforth & Leufer, 2013; Eskici, Baydin & Baykal, 2023). The use of active teaching methods such as PBL (Papastrat & Wallace, 2003) and especially the simulation method (Gohal, 2021; Miller, Haddad & Phillips, 2016; Pol-Castañeda, Carrero-Planells & Moreno-Mulet, 2022) has been demonstrated to help students get early exposure to a learning environment similar to reality, and students are allowed to make mistakes and learn from those mistakes to improve safety and professional skills in nursing practice later to improve patient safety. This aligns with the current study's findings; theoretical educators' responsibility is to convey knowledge regarding nursing errors to enhance student awareness, and they should apply suitable active learning strategies in their teaching.

When practicing in the pre-clinical room, teachers need to emphasize to students that errors become an exciting learning tool when students are the ones who discover the errors. According to Moessinger (1977), "A mistake can bring better results than an immediate success because understanding the causes and results of errors will provide knowledge new to the learner and comparing two mistakes will bring new ideas". This is the key to motivating students to have the spirit of self-study, self-detection of errors, and reporting errors. As a result, teachers can monitor and manage errors in their students (Heydarikhayat, Ghanbarzehi & Sabagh 2024).

In clinical practice, early exposure of nursing students to the hospital environment and participation in nursing activities is a way to improve patient safety knowledge through early recognition of the effects, complexity, and prevention of errors in nursing practice. However, the challenge for students is that they have yet to experience many clinical practice environments (Latimer *et al.*, 2020). This is consistent with the previous findings' strategy of learning from errors, which states that medical errors must be analyzed and researched to identify and distinguish when errors occur, and better teaching plans should be developed to prevent such errors (Zunzarren, 2012; Heydarikhayat, Ghanbarzehi & Sabagh 2024). According to research by Reid-Searl and colleagues, four levels of supervision were established: "being with," "being over," "being near" and "being absent". They found that the lowest level of "being absent" was the most common error related to medication errors (Reid-Searl, Moxham & Happell, 2010). Therefore, in practical teaching, to achieve effectiveness and ensure patient safety, lecturers need to know the most common errors in each procedure and provide timely interventions (Zunzarren, 2012). Furthermore, the results of this study were consistent with those of Shiyasi and Norouzinia (2023), who found that educational and therapeutic center management should prioritize improving the mistake-reporting procedure and encouraging students to report problems.

Limitations

This study only looked at the role of clinical instructors and did not discuss students' and hospital nurses' perspectives on managing nursing mistakes. Therefore, there was no multi-dimensional view of controlling nursing errors in students.

CONCLUSION

The clinical learning environment at the hospital is complex. Clinical nursing errors are unavoidable in students, including medication use, incorrect equipment use, and some care procedures that do not ensure sterility. Clinical instructors must notice problems early to implement adequate preventive actions. Furthermore, clinical instructors must be able to utilize successful teaching strategies in various learning situations. Increasing student's awareness of nursing errors, learning from errors, encouraging reporting problems, and creating a supported learning environment were the main strategies to reduce nursing errors among students. Using technology in teaching is critical for improving the inspection and supervision of student learning activities.

In conclusion, while this study provides significant insights into nursing errors among nursing students, several questions remain unanswered. Future research is needed to provide thorough knowledge and preventative solutions for these nursing errors among students, with perspectives from managers, hospital nurses, and students, and to apply more technology in managing nursing errors to advance our understanding further.

Recommendation

Research findings are crucial in identifying common errors among nursing students and the factors

contributing to these mistakes, highlighting areas for improvement that should be incorporated into the curriculum. In practical application, enhancing the role of clinical instructors is essential to raise awareness, manage, and prevent errors made by students. Additionally, a collaborative approach between nurses and clinical instructors in designing the curriculum for both theoretical and clinical training settings can help reinforce error prevention strategies and ensure a comprehensive learning experience.

Conflict of Interest

The authors declare that they have no competing interests.

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