

## EMERGENCIES IN NURSING: CURRENT VIEWS ON THE ROLE OF THE NURSE IN PROVIDING EMERGENCY CARE AND ASSESSMENT OF EFFECTIVENESS

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**Introduction.** The rapid increase in the number of complex cases is overloading healthcare systems, requiring highly skilled nurses. Simulation training helps healthcare professionals better prepare for such cases by imitating real clinical situations and improving their knowledge, skills, and confidence. Despite the obvious benefits, this method requires further research to develop standard assessment protocols.

**The aim of the study** – to assess the impact of simulation training on the level of knowledge, mastery, and improvement of practical skills and competencies of nurses working in emergency care settings.

**The main part.** During the autumn semester of 2024, 94 nurses underwent a series of training sessions developed according to a special program by the Department of Simulation Medical Technologies of Odessa National Medical University (ONMedU), which included as its basis the standard for examining and providing assistance to casualties according to the ABCDE algorithm from the international Advanced Trauma Life Support course. The final number of participants who completed all stages of the study was 89. The following parameters were used to assess the effectiveness of simulation training: time to perform practical skills; quality of skill performance; dynamics of changes based on the results of pre- and post-tests. According to the results regarding practical skills, the average time to complete tasks decreased by 20% (from 9.0 to 7.2 minutes;  $p < 0.05$ ). Regarding quality of performance, the scores on checklists increased from  $71.8 \pm 8.1$  to  $87.2 \pm 6.5$  ( $p < 0.01$ ). Regarding test results, the mean post-test score increased by 32 % compared to the pre-test ( $58.7 \pm 9.1$  vs.  $77.5 \pm 7.8$ ;  $p < 0.001$ ).

**Conclusions.** The results confirmed the effectiveness of simulation training in improving the professional competencies of nurses. The improvement in technical skills and theoretical knowledge indicated the feasibility of implementing such programs on a wider level.

**Key words:** nurses; simulation training; medical education; continuing education; emergencies; simulation scenarios; competency-based approach.

## НЕВІДКЛАДНІ СТАНИ В МЕДСЕСТРИНСТВІ: СУЧАСНІ ПОГЛЯДИ НА РОЛЬ МЕДИЧНОЇ СЕСТРИ В НАДАННІ НЕВІДКЛАДНОЇ ДОПОМОГИ ТА ОЦІНКА ЕФЕКТИВНОСТІ

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**Вступ.** Швидке зростання кількості складних випадків перевантажує систему охорони здоров'я, вимагаючи від медичних сестер високої кваліфікації. Симуляційне навчання, імітуючи реальні клінічні ситуації, допомагає медичним працівникам ліпше підготуватися до таких випадків, покращуючи їх знання, навички та впевненість. Незважаючи на очевидні переваги, цей метод потребує подальших досліджень для розробки стандартних протоколів оцінки.

**Мета роботи** – оцінити вплив симуляційного навчання на рівень знань, оволодіння та покращення практичних навичок і компетентностей медичних сестер, які працюють за умов надання невідкладної допомоги.

**Основна частина.** Протягом осені 2024 р. 94 медичні сестри пройшли серію тренувань, які розробили за спеціальною програмою працівники кафедри симуляційних медичних технологій Одеського національного медичного університету МОЗ України. В основу вони включили стандарт огляду і надання допомоги постраждалим за алгоритмом ABCDE з міжнародного курсу Advanced Trauma Life Support. Кінцева кількість учасників, які пройшли всі етапи дослідження, становила 89. Для оцінки ефективності симуляційного навчання використовували такі параметри, як: час виконання практичних навичок;

якість виконання навичок; динаміка змін за результатами пре- і пост-тестів. За результатами: практичні навички: середній час виконання завдань зменшився на 20 % (з 9,0 до 7,2 хв;  $p < 0,05$ ). Якість виконання: бали за чек-листами підвищилися з  $71,8 \pm 8,1$  до  $87,2 \pm 6,5$  ( $p < 0,01$ ). Результати тестів: середній бал пост-тесту збільшився на 32 % порівняно з пре-тестом ( $58,7 \pm 9,1$  проти  $77,5 \pm 7,8$ ;  $p < 0,001$ ).

**Висновки.** Отримані результати підтверджують ефективність симуляційного навчання у підвищенні професійних компетенцій медичних сестер. Покращення технічних навичок і теоретичних знань вказує на доцільність упровадження таких програм на ширшому рівні.

**Ключові слова:** медичні сестри; симуляційне навчання; медична освіта; безперервне навчання; невідкладні стани; симуляційні сценарії; компетентнісний підхід.

**Introduction.** The rapid increase in the number of emergencies related to both military and civilian injuries, acute infections, and chronic diseases is placing significant pressure on the healthcare system both globally and in Ukraine [1–3]. In most cases, nurses are the first to encounter a patient with an emergency condition and therefore must play a key role in providing first aid in such situations. However, existing approaches to the functional responsibilities and competency requirements of a nurse are significantly limited and do not meet modern international standards. The increasing number of patients with serious illnesses requires nurses to have a higher level of knowledge, skills and confidence in making decisions about emergencies in a time-sensitive environment. Insufficient practical training leads to errors in care and negatively affects treatment outcomes [4, 5].

Scenario-based simulation training using highly realistic technologies, which simulate real clinical situations, is recognized as one of the most effective tools for improving the skills of nurses and significantly improving the quality of emergency medical care [6]. It allows nurses to practice their skills and increase their confidence in their actions. Studies show that simulation training contributes to better theoretical knowledge acquisition, improved practical skills and reduced stress levels when providing real-life care [7, 8]. Simulation training not only improves nurses' technical skills, but also develops their clinical thinking and ability to make informed decisions under uncertainty. Studies show that participants in simulation training demonstrate higher levels of critical thinking and confidence in their actions compared to those who did not receive such training [4, 9]. In addition, simulation training allows to identify gaps in nurses' knowledge and skills, which contributes to the development of individual plans for further training [10].

Despite the significant potential of simulation training, there is relatively little research that directly evaluates its effectiveness specifically for nurses

working in uncertain environments and providing emergency care [11]. Most studies have focused on medical students or physicians. Furthermore, there are no standardized protocols for evaluating the effectiveness of simulation training for this category of learners, making it difficult to compare results across studies.

The aim of the study is to assess the impact of structured simulation training on the level of knowledge, mastery, and improvement of practical skills and competencies of nurses working in emergency care settings.

**The main part.** The study was approved by the Ethics Committee of the ONMedU (Odesa National Medical University), protocol No 25 dated 04 September 2024, and conducted according to the guidelines of the Declaration of Helsinki.

The Department of Simulation Medical Technologies of ONMedU, together with the Odesa Regional Basic Professional Medical College, developed a special thematic improvement program for nurses of the ONMedU University Clinic "Basic Emergency Care for Nurses", which basically included algorithms for examining and providing assistance to casualties from international courses BLS, Advanced Trauma Life Support, and BEC, including examination according to the ABCDE algorithm [12–15].

During the classes, conditions were consistently created for independent performance of diagnostic and therapeutic manipulations under the guidance of the department's teachers. The training was conducted in small groups, using models, phantoms, dummies and simulation robots of adequate and high accuracy. We used several scenarios of simulation of emergency and critical conditions in accordance with the Unified Clinical Protocols of Emergency Medical Care (Ministry of Health of Ukraine, MOH of Ukraine).

The study involved 94 nurses working in different departments of the University Clinic ONMedU. All participants had different work experience, experience

working in different departments with different pathologies. Participants were randomly assigned to groups. The group included nurses from different departments. The groups underwent training according to a created schedule for 5 working days.

Due to various reasons (illness, inability to attend all classes, etc.), not all participants completed the full course of study. The final number of participants who completed all stages of the study was 89.

The following simulation dummies and simulators were used during the training: Super CHLOE™ S222.100.250 – Nursing Patient Simulator, TraumaMan Surgical Simulator, EZ-IO® Bone Drill set, trainer for packing bleeding wounds, intravenous trainer (S402 Arterial and Venous Patient Training Arm) and intraosseous access, tension pneumothorax simulator.

**Research program:**

1. Pre-test: At the beginning of the study, all participants took a pre-test at the ONMedU test center, which included standard computer tests with clinical questions and answer options from the BLS, Advanced Trauma Life Support, and BEC training test database. The purpose of the pre-test was to assess the initial level of knowledge and skills of the participants.

– Simulation sessions: Three simulation sessions were conducted during the study. Each session included the following practical skills:

- Stop critical bleeding
- Effective cardiopulmonary resuscitation
- Ensuring airway patency with a laryngeal mask airway
- Treatment of tension pneumothorax
- Intravenous access placement
- Intraosseous access placement

2. Post-test: After completing all simulation sessions, participants were retested to assess the dynamics of changes in the level of knowledge and skills.

The following parameters were used to evaluate the effectiveness of simulation training:

- Dynamics of changes based on the results of pre- and post-tests: The results of pre- and post-tests were compared to assess the overall dynamics of changes in the level of knowledge.
- Time to perform practical skills: The time required to perform each skill at the beginning and at the end was recorded.
- Quality of skill performance: It was assessed using specially developed checklists that included the main assessment criteria for a specific practical skill (Table 1).

**Table 1. Example of a checklist for management of critical bleeding**

Critical bleeding management:	
Using gloves:	Yes/No
Assessment if the bleeding is critical:	Yes/No
Wound tamponade:	Yes/No
Applying a tourniquet:	Yes/No
Correct tourniquet application: (check for pulsation distal to the tourniquet)	Yes/No
Fixation of the tourniquet:	Yes/No
Tourniquet application time note:	Yes/No
Manipulation time:	___ minutes

A 100-point scoring system was used to assess skill performance (during analysis, results were standardized by converting raw scores to a 100-point scale (0-100 points)) [16].

For statistical data processing, SPSS 21.00 was used. The following statistical analysis was performed:

- Calculation of means and standard deviations for all indicators.
- Normality of distribution was verified using the Shapiro-Wilk test.
- Comparison of pre- and post-test results, skill completion time, and scores at the beginning and end of the course was performed using the paired Student's t-test for normal distribution and the Wilcoxon test for non-normal distribution.

**Results**

The nurses' practical skills improved significantly after participating in the simulation training. A 20 % reduction in average task completion time was recorded (from 9.0 minutes to 7.2 minutes;  $p < 0.05$ ), indicating increased responsiveness and improved technical proficiency. Each of the skills assessed showed a trend toward shorter completion times, which is critical for successful emergency response. For example, securing a patent airway with a laryngeal mask airway took an average of 2.9 minutes after training, compared to 4.8 minutes before training, reflecting the effectiveness of the learned technique (Table 2).

The quality of practical skills also improved significantly. Checklist scores increased from a mean of  $71.8 \pm 8.1$  to  $87.2 \pm 6.5$  ( $p < 0.01$ ), indicating a more clear and structured task performance. High results were demonstrated in all parameters, including airway

management, tension pneumothorax management, and other key skills. Such improvements indicate the development of quality standards in practical training (Table 3).

The test scores also confirmed the positive impact of simulation training. The mean post-test score was  $77.5 \pm 7.8$ , which is 32 % higher than the pre-test ( $58.7 \pm 9.1$ ;  $p < 0.001$ ). This indicates a significant improvement in both theoretical knowledge and the ability to apply it in practical situations (Table 4).

In addition, the activity of nurses from different departments was interesting. Joint work in training teams contributed to the discussion of the specifics of algorithms, taking into account the characteristics of their units. Such interaction not only strengthened the understanding of the material, but also improved team spirit. The development of leadership qualities was noted, which allows each participant to more effectively coordinate actions during emergency situations.

**Table 2. Dynamics of time for performing practical skills during the first session of simulation classes and the third session (n=94)**

Practical skill	First session, time, minutes, mean±st.dev.	Third session, time, minutes, mean±st.dev.	Difference
Stop critical bleeding	4.2±1.1	2.8±0.9*	-33.3 %
Effective cardiopulmonary resuscitation	32.5±3.8	28.7±3.2*	-11.7 %
Ensuring airway patency with a laryngeal mask airway	4.8±1.2	2.9±0.8*	-39.6 %
Treatment of tension pneumothorax	4.1±1.0	3.0±0.9*	-26.8 %
Intravenous access placement	3.9±0.8	2.6±0.7*	-33.3 %
Intraosseous access placement	4.5±1.0	3.2±0.8*	-28.9 %
<b>Average value</b>	9.0	7.2*	-20.0 %

\* Statistically significant differences in execution time during the third simulation session compared to the manipulation during the first session ( $p < 0.05$ ).

**Table 3. Quality of performance of practical skills (checklists, n=94)**

Practical skill	First session, points, mean±st.dev.	Third session, points, mean±st.dev.	Difference
Stop critical bleeding	70.2±8.1	86.4±6.5*	+16.2 %
Effective cardiopulmonary resuscitation	74.5±8.98	89.8±7.2*	+15.3 %
Ensuring airway patency with a laryngeal mask airway	72.1±7.8	87.3±6.9*	+15.2 %
Treatment of tension pneumothorax	72.3±8.4	88.6±6.7*	+16.3 %
Intravenous access placement	71.0±8.0	86.5±6.8*	+15.5 %
Intraosseous access placement	70.8±7.9	85.9±6.6*	+15.1 %
<b>Average value</b>	71.8	87.2*	+15.4 %

\*Statistically significant differences in scores during the third simulation session compared to the manipulation during the first session ( $p < 0.01$ ).

**Table 4. Test results before and after simulation training (n=94)**

Indicator	Pre-test, mean±st.dev.	Post-test, mean±st.dev.	Difference
Total test score	58.7±9.1	77.5±7.8*	+32 %

\*Statistically significant differences Post-test compared to Pre-test ( $p < 0.001$ ).

**Conclusions.** Several studies have demonstrated direct improvements in clinical outcomes from the use of simulation for training. One of the main problems is the lack of focus on learning the algorithm of actions in extreme situations, especially on quick decision-making and smooth execution of manipulations in unusual circumstances in cooperation with colleagues in different fields. The implementation of simulation training is a priority task of modern medical education due to the large gap between traditional training and the requirements of modern medicine.

Simulation training is an important tool in preparing nurses for work in emergency situations. The experience of the Department of Simulation Medical Technologies of ONMedU proves its effectiveness.

Development of clinical thinking: joint simulation trainings for nurses from different departments create a unique platform for the development of clinical thinking. By discussing different approaches to providing care, training participants learn to analyze complex clinical situations from different perspectives, taking into account the specifics of different departments. This allows them to expand their knowledge and skills, as well as develop critical thinking necessary for making informed decisions in conditions of uncertainty.

Improving the quality of patient-centered care: by involving nurses from different departments in joint simulation training, we create a model for a more

holistic approach to the patient. The exchange of experience and knowledge allows nurses to better understand the needs of patients and provide them with more comprehensive care. This is especially important when treating patients with emergency conditions, which often require the coordination of efforts of different specialists.

The main common element in the projects cited above and our study is the belief that simulation training aims to improve the health outcomes and survival of individual patients with critical conditions that have a high prevalence. One limitation of our study is that we did not evaluate the cost-effectiveness of simulation training. However, we set this as a goal for the future. This includes reducing the time of temporary disability, the number of complications and mortality, in addition, there are other possible directions for further research: studying the long-term effect of simulation training; comparing the effectiveness of different simulation training methods; determining the optimal frequency and duration of simulation training; assessing the impact of simulation training on nurses' job satisfaction and motivation.

It is expected that the results of this study will contribute to the development of effective simulation training programs for nurses working in emergency medicine settings and improve the quality of medical care.

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