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From Theory to Bedside: A Narrative Review of the Educational Needs and Clinical Challenges of Nursing Students During Intensive Care Unit Clinical Practicum

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ABSTRACT

The intensive care unit (ICU) is considered one of the most complex and challenging environments for clinical education in nursing, playing a significant role in developing nursing students' professional skills and competencies. Identifying students' educational needs and clinical challenges can contribute to the design of targeted educational programs and improve the quality of education in the ICU. This study aimed to conduct a narrative review of the educational needs and clinical challenges of nursing students during their intensive care unit clinical practicum. In this narrative review, relevant articles and sources were examined without geographical restrictions, with a focus on studies published in recent years (2015–2025). A literature search was conducted in reputable national and international databases. The results indicated that nursing students in the ICU encounter several challenges, including the gap between theoretical and clinical education, stress and psychological pressure, complexity of equipments, insufficient clinical and cognitive skills, complexity of caring for critically ill patients, high workload of clinical tasks, limited opportunities for hands-on practice, limited interaction with nurses, and inadequate educational support. Strategies such as structured educational programs, clinical simulation, active presence of clinical instructors, and integration of theoretical and practical education were identified as facilitating factors for learning. The identified challenges in the clinical education of nursing students in the ICU play an important role in either reducing or enhancing the quality of learning, and their identification provides a foundation for designing effective educational interventions.

Keywords: Nursing students; Clinical education; Intensive Care Unit; Clinical challenges; Educational needs

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Introduction

Undergraduate nursing education aims to prepare competent nurses who are committed to providing safe and high-quality care to patients [1]. Clinical

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education is considered one of the fundamental components of undergraduate nursing curricula, as it provides students with opportunities to apply theoretical knowledge and skills in real-life situations and prepare them to fulfil their future professional roles [2]. Clinical education and practicum experiences enable nursing students to acquire the required professional competencies and skills and apply their theoretical knowledge in practice through direct patient care [3]. Moreover, during the clinical practicum process, nursing students develop a unique perspective toward their profession and gain a deeper and more accurate understanding of their roles and professional identity as future nurses [4].

Clinical practicum experiences in highly complex environments provide students with a new perspective on professional care; these settings involve advanced therapeutic processes and require deeper theoretical knowledge and broader practical skills [5]. The ICU is recognized as a closed and complex unit with continuous monitoring, where patients with hemodynamic instability are admitted. This unit provides intensive support and care for critically ill patients and utilizes specialized equipment and technologies for patient diagnosis and treatment [6].

In such circumstances, clinical practicum in the intensive care unit (ICU) plays a significant role in developing professional skills and promoting nursing students' growth [4]. The ICU is recognized as one of the most effective yet challenging clinical learning environments for nursing students [7]. Students' presence in the ICU provides an extensive and multidimensional educational experience that contributes to the improvement of their technical skills, communication abilities, health education competencies, and clinical decision-making skills [8, 9]. Furthermore, this environment enables students to participate in the care of critically ill patients with complex and multifaceted health problems, requiring advanced monitoring and specialized interventions [7]. The complex and technical nature of patient care, along with the critical conditions prevailing in the ICU, makes this environment an appropriate setting for developing advanced, comprehensive, and specialized skills among nursing students [7].

On the other hand, nurses working in these units require up-to-date knowledge and high-quality skills. Developing such competencies and a professional structure is only possible through comprehensive and well-established educational programs. Therefore, students' experiences in the intensive care unit extend beyond merely caring for critically ill patients, and it is essential that these experiences provide a strong foundation for their professional growth and development [10]. The quality of current clinical nursing education plays a crucial role in preparing competent intensive care nurses in the future. Effective intensive care nurses of tomorrow are the outcomes of standardized and efficient clinical nursing education provided today [4]. Despite this importance, providing high-quality clinical experiences for nursing students in intensive care units (ICUs) remains one of the major concerns of nursing educators [8]. Such experiences play an important role in students' professional development and in strengthening their essential knowledge and skills [7]. Park et al. [11] stated that intensive care units have a distinct and more complex structure compared with other clinical wards and emphasised that the effectiveness of clinical practicum education in intensive care settings can be enhanced through effective management of nursing students' experiences throughout the clinical education process.

Nursing students' expectations and experiences regarding clinical practicum are considered an important component of nursing education [12]. Adequate preparation of nursing students for intensive care environments can reduce the gap between theoretical education and clinical practice and facilitate their adaptation to the work environment [13]. Understanding nursing students' perceptions of critical care experiences is essential for future planning and the successful implementation of clinical practicum programs in the ICU. Therefore, examining nursing students' experiences during ICU clinical practicum and identifying their educational needs, clinical challenges, anxieties, skill deficiencies, and learning opportunities are considered a scientific and professional necessity. Such an examination can serve as a bridge between theoretical education and practical experience, as well as between students and critically ill patients, ultimately contributing to the improvement of education, empowerment of the nursing workforce, and enhancement of care quality in Intensive Care Units. Accordingly, the aim of this study was to conduct a narrative review to identify and analyze the educational needs and clinical challenges of nursing students during Intensive Care Unit clinical practicum, in order to provide a comprehensive overview of their educational experiences and contribute to improving the quality of clinical education.

Materials and Methods

This study was conducted using a narrative review approach with the aim of identifying the educational needs and clinical challenges of nursing students during their Intensive Care Unit clinical practicum.

To identify relevant evidence, a search of Persian and English literature was conducted in the databases PubMed, Scopus, Web of Science, ScienceDirect, SID

(Scientific Information Database), and Magiran, as well as the Google Scholar search engine. The search included articles published between 2015 and 2025 without geographical restrictions. The keywords used consisted of a combination of Persian and English terms using Boolean operators (AND, OR), including: Nursing students, Clinical education, Intensive Care Unit (ICU), Clinical challenges, educational needs, Nursing internship, and Clinical practicum.

Studies included in this review were those that focused on the clinical education of nursing students and newly graduated nurses in Intensive Care Units (ICUs) and specifically examined their educational needs, clinical challenges, learning experiences, stressors, and educational barriers. Articles published between 2015 and 2025, without geographical restrictions and using quantitative, qualitative, review, or mixed-method approaches, were considered. Furthermore, only studies with full-text availability, and valid articles published in Persian or English and indexed in reputable national and international scientific databases, were included. On the other hand, studies conducted in settings other than the ICU, those that did not address the educational needs or clinical challenges of nursing students, studies published outside the specified time range, articles without accessible full texts, or studies lacking sufficient scientific and methodological quality were excluded. Additionally, duplicate articles, case reports, letters to the editor, conference abstracts, and non-scientific sources were excluded from the review. After applying the inclusion and exclusion criteria, a total of 101 articles were identified and included in the initial screening process. The review and selection of articles were independently conducted by two researchers. The article selection process involved an initial screening of titles and abstracts, followed by a full-text review to ensure consistency with the objectives of the study. At this stage, 40 duplicate articles with overlapping content, 7 articles related to postgraduate nursing students, and 41 irrelevant articles that mainly focused on clinical challenges of students in other clinical wards or units, or did not include nursing students, were excluded. Ultimately, the full texts of the remaining articles (13 studies) were carefully reviewed, and relevant data were extracted based on the study objectives. The quality and validity of the included articles were assessed using standard quantitative and qualitative appraisal tools to ensure the accuracy and reliability of the findings.

To organize the data, a data extraction form was developed, including the following components: author(s) and year of publication, study design, identified educational needs, identified clinical needs, inhibiting factors, and facilitating factors (Table1). This process enabled the identification of patterns and key findings in ICU clinical education and supported the development of practical recommendations for educational planning. To strengthen the methodological rigor, improve the quality of data extraction, and reduce the possibility of bias, the review and analysis of the included articles were performed independently by two researchers.

Results

In the present study, 13 relevant articles addressing the educational needs and clinical challenges of nursing students during intensive care unit (ICU) clinical practicum were selected and analyzed (Table 1). The included studies comprised qualitative, quantitative, and mixed-method designs. The findings indicated that nursing students' and newly graduated nurses' clinical experiences in intensive care settings are associated with multiple challenges and barriers. In most studies, the ICU was described as a stressful, tense, and emotionally challenging environment. Nursing students commonly reported anxiety, fear of making mistakes, and concern about causing harm to critically ill patients as frequent experiences. The complexity of patients' conditions, hemodynamic instability, dependence on advanced medical equipment, and repeated exposure to critically ill or dying patients were among the reported challenges [7, 8, 21, 22].

In addition, high documentation workload, time pressure in delivering care, short duration of clinical practicum, and limited opportunities for performing independent nursing interventions were identified as barriers to learning in several studies [16, 19]. In some studies, shortages of resources, equipment, and staff, unsupportive attitudes of some nurses, and a lack of educational feedback were also reported [17, 18].

Studies have also identified a range of clinical and educational needs among nursing students and newly graduated nurses in the ICU setting. Reported clinical needs include the ability to provide safe and effective care for critically ill patients, manage unstable patients, perform emergency interventions, use and operate advanced ICU equipment, haemodynamic monitoring, administration of high-risk medications, and comprehensive physical, psychological, and supportive care for patients and their families [4, 8, 15]. In terms of educational needs, the studies emphasized the necessity of training in ICU-specific technical and specialized skills, including mechanical ventilation, cardiopulmonary resuscitation, airway management, drug dosage calculations, operation of monitoring and dialysis devices, communication skills training, stress management, psychological

preparedness before entering the ICU, and continuous educational feedback [7, 14, 22].

Table 1. Summary of included studies on educational needs and clinical challenges of nursing students

Author (Year)	Design	Educational Needs	Clinical needs	Facilitating factors	Barriers factors
Chang et al. (2024)[14]	Cross-sectional	Use of a defibrillator Emergency medications for CPR Continuous Renal Replacement Therapy Preparation for intubation Medication dosage calculations	Need for practical competency in ICU clinical emergencies Prioritization of critical skill	Presence of clinical instructors, simulation-based programs and technology-enhanced education	Complexity of caring for critically ill patients and psychological stress caused by the ICU and ER environments
Costa et al. (2020)[7]	Qualitative; Phenomenology	Need for pre-clinical training on ICU equipment, mechanical ventilation and care of critically ill patients; training in communication skills and psychological preparedness Drug calculations, and training in critical thinking and clinical problem-solving skills	Need for continuous clinical guidance, practical support from ICU staff, effective clinical supervision and feedback Ability to care for critically ill and complex patients, manage ICU equipment, understand the work culture and commitment of ICU nurses	Support and motivation from clinical supervisors, peer participation, use of health information management systems, direct teaching by supervisors, and limited but essential interaction with nurses	High workload of administrative tasks and written assignments, limited or insufficiently supportive interaction with nurses, short clinical placement duration, and lack of adequate support and guidance
Kandeel et al. (2019)[8]	Descriptive cross-sectional	Reducing the theory–practice gap; strengthening practical training; improving structured clinical education; increasing educational support Need for continuous feedback Practice of technical and nursing care skills	Need for greater clinical support; strengthening support from mentors and ICU staff Ability to provide safe care for critically ill patients Development of clinical skills and self-confidence	Supportive learning environment; collaboration among students, instructors, and ICU nurses Participation in patients' morning care Engagement in diverse care activities Development of clinical skills	High-stress ICU environment; fear of making mistakes; complexity of patients' conditions; high documentation workload; and lack of coordination in clinical placements Lack of support from nurses
Yildiz et al. (2025)[4]	Qualitative, phenomenological approach	Need for preparatory training programs and orientation before entering the ICU Training in critical patient care skills Training in stress and emotion management Training in communication with unconscious patients Enhancement of critical thinking and clinical decision-making skills	Need for clinical support and continuous supervision from mentors and clinical nurses Need for effective feedback during patient care Need for a safe learning environment Opportunity for active participation in critical patient care	Active participation in patient care Professional autonomy of ICU nurses Interdisciplinary collaboration between physicians and nurses Observing patient improvement Emotional and educational support from instructors	Lack of previous ICU experience Complexity of ICU care High workload Unfamiliarity with ICU equipment and technology Fear of making mistakes and high levels of responsibility
Lima et al. (2016)[15]	Experience Report	Training in emergency and complex procedures (intubation, cardiopulmonary resuscitation, arterial blood gas analysis) Strengthening teamwork skills and coordination with other healthcare team members Training in emotional regulation and rapid decision-making	Care of critically ill patients; use of vasoactive medications Ability to provide systematic care for critically ill patients Skills in hemodynamic monitoring and medication management Experience in working with advanced equipment	Faculty supervision; multidisciplinary team collaboration; access to equipment and resources Direct supervision by instructors and support from the nursing team in the unit Access to clinical equipment and available hospital resources Opportunities to perform diverse practical activities	Limited clinical placement time; complexity of critical care Limited duration of clinical placement Shortage of equipment, and appropriate infrastructure in real clinical settings Complexity of caring for critically ill patients and psychological stress caused by the ICU and ER environments

Vatansever & Akansel (2016)[16]	Qualitative, Descriptive	Simulation-based practical training Supervised practice Training in ICU technical and clinical skills Training in anxiety and stress management, Training in critical care nursing, Continuous feedback and ongoing support	Ability to care for critically ill patients perform safe clinical interventions, assess and respond to patient needs, manage equipment and medications, and demonstrate communication and psychological support skills with patients and their families	guidance and teaching by nurses, observing effective communication with patients, receiving feedback from nurses, and learning through role modeling from professional nurses	Anxiety and fear of the ICU environment, insufficient professional knowledge, high workload, complexity of care, exposure to critically ill patients, and limited opportunities for active participation

Table 1. Continiued…

Author (Year)	Design	Educational Needs	Clinical needs	Facilitating factors	Barriers factors
Park & Kim (2025)[17]	Qualitative – Focus Group Interview (FGI)	Basic and advanced ICU skills training Person-centered care Communication skills training Stepwise and systematic training based on level of experience	Need for comprehensive care of critically ill patients, ability to assess level of consciousness, perform physical examinations, manage medical equipment, and handle emergency situations	Presence of clinical instructors, simulation-based programs and technology-enhanced education, repeated practice, and coordination between universities and hospitals	Observation-only training, lack of practical experience, limited number of ICUs and critically ill patients
Azizzadeh et al. (2018)[18]	Descriptive Cross-sectional	Need for effective hands-on training in real ICU settings Training in the use of ventilators, pacemakers, and hemodialysis machines Use of educational logbooks	Enhancement of practical intensive care skills; proficiency in specialized ICU equipment; improvement of clinical preparedness	Clinical education in real-world settings; use of skill assessment logbooks; increased student presence in the ICU	Lack of effective practical training; insufficient clinical experience; complexity of ICU equipment
Rooeintan et al. (2021)[19]	Descriptive–Analytical, Cross-sectional	Need for hands-on training in ventilator management, post-shock care, and initiation of hemodialysis Use of simulation and virtual training methods	Enhancement of practical decision-making skills in critical situations; proficiency in intensive care and life-support equipment	Use of a validated skills checklist; evidence-based education; recommendation of simulation-based and virtual training	Limited opportunities for performing practical skills in clinical settings; high sensitivity of ICU patients
Alasad et al. (2015)[20]	Qualitative Content Analysis	Need for structured education in knowledge and skills for caring for critically ill patients Supportive educational activities	Need for real clinical experience with critically ill patients; professional socialization in the ICU	Support from faculty members and clinical instructors; effective preceptorship; self-directed learning	Lack of adequate educational support; negative attitudes of some staff members
González-García et al. (2020)[21]	Qualitative study	Training in emotional and communication skills Enhancement of reflective learning Psychological preparedness for working in ICU and emergency settings Education on humanizing care in critical care environments	Improvement of the quality of care for critically ill patients Greater attention to humane and patient-centered care Better support for families of critically ill patients	Support and role modeling from experienced nurses Reflective learning through journal writing Direct exposure to real critical patient care	Complex and high-pressure environments The non-humanistic/technological nature of the ICU Emotional distress caused by exposure to critically ill patients and death
Sukcharoen et al., 2023[22]	Qualitative study – Case study	Training in palliative care skills, communication with patients and families, emotional management and self-awareness Educational activities and clinical practicum in the ICU; development of comprehensive care skills	offering psychological and social support to patients and families, protecting patients' rights Pain and symptom management, physical and psychological care, provision of culturally and spiritually sensitive care	Faculty support, previous experience in palliative care Practical experience, guidance from instructors, and connection with patients and families	Lack of practical experience Concerns about encountering death and patient suffering

In Ok Sim et al. (2021) [23]	Qualitative – Phenomenology	Training in stress and anxiety management Development of communication skills Training in coping with death and palliative care	Need for adequate equipment and facilities, sufficient capacity for admitting high-risk neonates	Support and guidance from nurses and instructors, provision of introductory education and orientation to the ICU environment and equipment, opportunities to perform clinical care under supervision	Severe anxiety, limited clinical experience, lack of preparation before entering the ICU, and feelings of incompetence in caring for critically ill patients

Alongside challenges and needs, studies have also reported facilitating and inhibiting factors affecting learning in the ICU environment. Facilitating factors included support and guidance from clinical instructors, direct supervision by faculty members, supportive interactions with ICU nurses, interprofessional collaboration, opportunities for active student participation in direct patient care, access to clinical equipment and resources, and the use of educational strategies such as structured hands-on training, clinical simulation, skill logbooks, and reflective journaling [7, 17, 20].

In contrast, inhibiting factors included observation-only learning approaches, limited opportunities for hands-on practice, negative or unsupportive attitudes of some staff members, restricted student autonomy, insufficient constructive feedback, and misalignment between university curricula and clinical practice settings [16, 18].

Finally, studies have reported both positive and negative outcomes of clinical experiences in the ICU. Positive outcomes included improvement in clinical and technical skills, increased self-confidence, enhanced clinical decision-making ability, improved communication skills, a better understanding of the professional role of nurses in critical care, professional socialization, and increased interest in the nursing profession and working in intensive care units [8, 15, 21].

In contrast, reported negative outcomes included increased anxiety, psychological fatigue, an initial sense of incompetence in caring for critically ill patients, emotional burden due to exposure to patient death, and high levels of stress in the ICU environment [7, 22].

The reviewed studies indicated that nursing students and newly graduated nurses encounter a wide range of educational and clinical challenges during their clinical experiences in Intensive Care Units. In most studies, the ICU was described as a highly stressful environment with significant psychological pressure and emotional burden. Participants reported anxiety, fear of making mistakes, concern about causing harm to critically ill patients, and an initial sense of incompetence when facing critical situations. The complexity of patients' conditions, hemodynamic instability, dependence on advanced medical equipment, care of unconscious or intubated patients, and repeated exposure to patient death were among the most commonly reported challenges across studies [7, 8, 21, 22]. In addition, high documentation workload, time pressure in providing care, short duration of clinical practicum, limited clinical hours, and restricted opportunities for performing independent nursing interventions were identified as learning barriers in several studies [16, 19]. In some studies, shortages of human resources, lack of equipment and clinical resources, unsupportive or negative attitudes of some ICU nurses, and insufficient effective educational feedback were also reported [17, 18].

Alongside challenges and barriers, studies have identified a range of clinical and educational needs among nursing students and newly graduated nurses in the ICU. Reported clinical needs included the ability to provide safe and effective care for critically ill patients, manage unstable patients, continuous hemodynamic monitoring, perform emergency interventions, use and manage advanced ICU equipment, handle high-risk and sensitive medications, and deliver comprehensive physical, psychological, and supportive care to patients and their families [4, 8, 15].

In some studies, teamwork in interprofessional settings, coordination with physicians and other members of the healthcare team, and fulfilling the role of a nurse as a care coordinator were also reported as important clinical needs [4, 20].

Identified educational needs in the studies included training in ICU-specific technical and specialized skills, such as mechanical ventilation, airway management, cardiopulmonary resuscitation, care of unconscious patients, calculation and administration of emergency medications, and the use of monitoring devices, infusion pumps, and dialysis equipment [7, 14, 19]. In addition to technical competencies, the studies highlighted the need for training in communication skills with patients and families, stress and emotional management, psychological preparedness prior to entering the ICU, training in palliative care and dealing with patient death, as well as continuous educational feedback [21, 22].

Studies have also reported facilitating and inhibiting factors affecting learning in the ICU environment. Facilitating factors included support and guidance from clinical instructors, direct supervision by faculty members, supportive interactions with ICU nurses, interprofessional collaboration, active student participation in direct patient care, access to clinical equipment and resources, and the use of diverse educational methods such as structured hands-on training, clinical simulation, skill logbooks, and reflective journaling [7, 17, 20]. In contrast, inhibiting factors included observation-only learning, limited opportunities for hands-on practice, unsupportive attitudes of some staff members, restricted student autonomy in providing care, insufficient constructive feedback, and misalignment between university curricula and clinical practice settings [16, 18].

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Discussion

The aim of the present study was to identify the educational needs and clinical challenges of nursing students during their Intensive Care Unit clinical practicum in order to improve educational planning and enhance students' performance in clinical settings. The findings indicated that despite variations in research contexts, healthcare systems, and clinical resources across different countries, the challenges, educational needs, and clinical outcomes of nursing students in the ICU were largely similar. The reviewed literature suggests that nursing students' clinical experience in the ICU is a multidimensional process influenced by the interaction between the clinical environment, challenges, educational and clinical needs, facilitating and inhibiting factors, and learning outcomes. The analysis of the study data indicates that the ICU is simultaneously a facilitating and challenging environment, and successful learning depends on the effective management of influencing factors. The findings of this narrative review suggest that nursing students' clinical practicum in intensive care units is a complex experience accompanied by multiple educational needs and significant clinical challenges. These challenges can directly affect the quality of learning, clinical performance, and students' professional readiness.

One of the most important challenges reported in the reviewed studies was the existence of a gap between theoretical university education and the clinical performance required in the care of patients with complex clinical conditions [8, 16]. Although students are familiar with relevant theoretical concepts before entering the ICU, they often lack the ability to effectively apply this knowledge in clinical practice when faced with critical, unpredictable situations requiring rapid decision-making and the use of advanced technologies. Park et al. identified several factors contributing to this gap, including limited clinical practicum time, lack of coordination between theoretical instructors and clinical preceptors, and insufficient opportunities for hands-on skill practice [17]. Kendall et al. reported that the gap between theoretical education and clinical practice leads to increased anxiety, reduced self-confidence, and limited active participation of students in clinical care. This finding is consistent with the results of Costa et al. and Venturini et al. [7, 8, 16].

These findings indicate that theoretical education alone is not sufficient to meet the learning needs of students in the ICU. For effective performance, students require a combination of knowledge, clinical skills, clinical judgment, and psychological preparedness. Therefore, addressing this issue requires integrated educational planning. Accordingly, the design of appropriate educational programs including clinical simulation, structured hands-on practice opportunities, and coordination between theoretical instructors and clinical preceptors—is essential in ICU nursing education. Without a comprehensive educational framework, the transfer of knowledge from classroom learning to bedside practice remains ineffective.

The ICU, as an environment with unstable patients, advanced equipment, and the need for rapid decision-making, provides a multidimensional experience for nursing students. Findings from Kendall et al. (2019) indicate that psychological challenges and environmental pressure are an inseparable part of ICU clinical practicum. These pressures may lead to anxiety, reduced performance, and even avoidance of active student participation. Therefore, educational programs should include psychological preparedness, mentor support, and the creation of a supportive learning environment [8]. The analysis of studies shows that these same characteristics act both as learning opportunities and as sources of stress [15, 21].

Therefore, the ICU is a dual environment: on one hand, it is empowering and rich in clinical learning opportunities, while on the other hand, without adequate support, it can hinder effective learning and reduce students' self-confidence. This suggests that the quality of students' learning experience depends more on how the ICU environment is managed and how educational programs are designed than on the inherent nature of the clinical setting itself. Findings from Costa et al. indicate that nursing students' first clinical experience in the ICU was both an opportunity and a challenge [7]. Students were exposed to the complexity of the ICU environment, specialized equipment, and the need to care for critically ill patients, which contributed to the development of their technical skills, clinical decision-making, and communication abilities. Despite the stress and anxiety associated with exposure to patients and unfamiliar equipment, this valuable experience enhanced students' understanding of the real work culture of ICU nurses.

The findings indicate that stress, fear of making mistakes, and exposure to critically ill patients create significant psychological consequences. These pressures, in the absence of adequate mentor support, can interfere with clinical learning [4, 22]. However, a closer examination suggests that these same pressures, when accompanied by supervision, educational support, and continuous feedback opportunities, can become facilitating factors for the development of clinical reasoning, resilience, professional maturity, and increased self-confidence.

In other words, managing psychological pressure and creating a supportive learning environment play a central role in educational success and can transform clinical experience into an opportunity for professional growth. The analysis of the reviewed articles also indicated that the educational needs of ICU nursing students are comprehensive and extend beyond technical skills to include non-technical competencies [23]. This finding suggests that a sole focus on technical skills is insufficient for nursing students and newly graduated nurses working in the ICU.

The results highlight the need for the development of non-technical skills, including clinical reasoning and rapid decision-making in critical situations, stress and emotional management related to the ICU environment, team communication and interpersonal skills for effective collaboration with healthcare team members, as well as professional ethics and humanistic attitudes in caring for critically ill patients. This analysis demonstrates that education should be holistic and integrated, enabling students to simultaneously apply both technical and non-technical skills in real ICU settings and prepare them to cope with clinical complexity and environmental pressures.

One of the notable findings of the reviewed studies is the profound impact of ICU experience on the development of nursing students' professional identity. Clinical exposure in the ICU plays a determining role in shaping students' professional identity and its long-term outcomes. Exposure to critical responsibilities, participation in clinical decision-making, and observing the central role of nurses within the interprofessional team shift students from passive learners to active participants, bringing them closer to a realistic understanding of the nursing profession [4, 8]. This experience can strengthen students' sense of responsibility, professional maturity, and ethical commitment, and prepare them for entry into complex clinical environments. Increased self-confidence and professional readiness have been identified as among the most important positive outcomes of ICU clinical experience. Several studies have shown that after completing ICU clinical practicum, students feel more competent in fulfilling the role of a professional nurse, and their willingness to work in intensive care units after graduation also increases [4, 8, 20]. These findings suggest that real-world exposure to the care of critically ill patients can play a significant role in shaping nursing professional identity.

In most studies, ICU exposure led to improvement in nursing students' clinical and technical skills, with students reporting greater ability in caring for critically ill patients, operating advanced equipment, monitoring vital signs and performing essential nursing interventions [7, 8, 15, 16]. The studies also emphasized the role of the ICU in strengthening clinical reasoning, rapid and systematic decision-making, and prioritization of care. In facing critical situations and unstable patients, students had the opportunity to apply theoretical knowledge in real-life contexts and developed a deeper understanding of the complexity of clinical decision-making [14, 15]. This highlights the high potential of the ICU environment in reducing the gap between theory and clinical practice.

Another reported positive aspect was the enhancement of students' understanding of the ICU nurse's role as a key member of the healthcare team and the facilitation of professional socialization. Participation in direct patient care, observation of physician–nurse interprofessional collaboration, and interaction with other healthcare team members enabled students to develop a more realistic perception of the responsibilities and professional position of ICU nurses [4, 20]. Contrary to the common perception that the ICU is a purely technological and dehumanized environment, some

studies indicated that it can also serve as a setting for the development of humanistic and empathetic attitudes. Increased empathy toward patients and their families, appreciation of person-centered care, acceptance of patient death, and attention to palliative care were among the positive outcomes reported in qualitative studies [21, 22].

Conclusion

The findings of this review indicate that the Intensive Care Unit is a complex yet opportunity-rich environment for nursing students' clinical education. The effectiveness of ICU-based education requires accurate identification of students' educational needs, clinical challenges, and psychological pressures, as well as the design of educational programs based on these needs and challenges. In the absence of such an approach, the ICU may become a stressful environment that reduces the quality of learning. Therefore, the development and implementation of structured, integrated, and supportive educational programs aligned with clinical realities play an important role in reducing the theory–practice gap and enabling the effective transfer of knowledge from classroom learning to bedside practice. Ultimately, this approach contributes to enhancing professional readiness, strengthening nursing identity, and promoting the sustainable empowerment of students. The findings of this study can serve as a practical guide for educational policymakers, curriculum planners, and clinical instructors in designing structured clinical practicum programs, providing psychological support for students, and improving the quality of education in intensive care units. In conclusion, the application of these findings may lead to the development of competent, responsible nurses with a strong professional identity

Authorship contribution statement

All authors have reviewed and approved the final version of the manuscript. ES & TT conducted the study and collected the data; ES, KH, MF & TT performed the data analysis and interpretation.

Ethical Considerations

Throughout all stages of the study, ethical principles were observed, including honesty, proper citation and integrity in reporting sources, preservation of the originality of scientific works, and avoidance of bias. This study was approved by the Ethics Committee of Lorestan University of Medical Sciences, and the ethics approval code was IR.LUMS.REC.1405.093.

Conflict of interest statement

No conflict of interest has been declared

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Data Availability

This study is a narrative review and does not include any new, primary data. All data supporting the findings of this study are derived from previously published articles and sources, which are cited within the manuscript. Therefore, no additional data are available.

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Declaration of Generative AI

The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript, nor for the creation of tables, or their corresponding captions.

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