Caspian Journal of Neurological Sciences
"Caspian J Neurol Sci"

Journal Homepage: http://cjns.gums.ac.ir

Research Paper

Effect of Education on Self-efficacy in ICU Patients With CNS Injuries

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Citation Aghahosseini ShS, Masih S, Vadaei S. Effect of Education on Self-efficacy in ICU Patients With CNS Injuries. Caspian J Neurol Sci. 2026; 12(1):34-40. https://doi.org/10.32598/CJNS.12.44.579.1

Running Title Educational Interventions and Self-efficacy in ICU Patients

https://doi.org/10.32598/CJNS.12.44.579.1

Article info:
Received: 02 Feb 2025
First Revision: 25 Feb 2025
Accepted: 26 May 2025
Published: 01 Jan 2026

ABSTRACT

Background: Patients with central nervous system (CNS) injuries in intensive care units (ICUs) often face reduced self-efficacy, which negatively affects rehabilitation. Despite the potential benefits of educational interventions, evidence on their effectiveness in improving self-efficacy in this group is limited.

Objectives: This study evaluated the impact of structured education on self-efficacy among ICU patients with CNS injuries

Materials & Methods: This experimental study was conducted in 2025 at a teaching hospital in Lahore, Pakistan, involving 60 patients with CNS injuries admitted to the ICU. Participants were randomly assigned to the intervention group and the control group. The intervention group received self-efficacy training, while the control group did not. Data were collected using the Scherer's self-efficacy questionnaire. Statistical analyses, including descriptive and inferential methods, were performed using SPSS software, version 26.

Results: The difference in the mean self-efficacy between the two groups, intervention and control, was not statistically significant (P>0.005) before the intervention. However, after the intervention, the difference in the mean self-efficacy was statistically significant (P<0.001).

Conclusion: Considering that self-efficacy in patients with CNS injuries is a crucial component of their treatment and care, it is recommended that targeted educational programs be implemented to enhance and develop this important factor.

Keywords: Self-efficacy, Central nervous system (CNS), Intensive care unit (ICU)

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Highlights

- Targeted education can enhance rehabilitation outcomes in CNS-injured ICU patients.
- Self-efficacy significantly increased after the educational intervention.

Introduction

Central nervous system (CNS) injuries, including traumatic brain injury (TBI) and spinal cord injury (SCI), are among the leading causes of long-term disability worldwide. Epidemiological data indicate that approximately 69 million individuals suffer from TBI annually, and the global prevalence of SCI is estimated at 40–80 cases per million populations [1, 2].These injuries often result in profound physical, cognitive, and psychological impairments, significantly reducing patients' quality of life and increasing the burden on healthcare systems [3, 4]. ICU admission is frequently required for patients with severe CNS injuries, exposing them to additional stressors, such as pain, anxiety, and uncertainty about prognosis, which can hinder recovery and rehabilitation [5, 6].

Self-efficacy, defined as an individual's belief in their ability to manage their condition and actively participate in recovery, has been identified as a critical factor influencing rehabilitation outcomes among CNS injury patients [7]. Evidence suggests that patients with higher self-efficacy demonstrate better adherence to rehabilitation protocols, improved coping with illness-related stress, and enhanced psychological well-being [8, 9]. Conversely, low self-efficacy is associated with increased risk of depression, anxiety, and slower functional recovery [10, 11].

Educational interventions have been recognized as an effective approach to enhance self-efficacy, particularly in ICU settings. These interventions may include individualized or group education on CNS injury management, rehabilitation exercises, coping strategies, and psychological support [12, 13]. Recent studies have reported that structured educational programs can significantly improve patients' confidence, reduce psychological distress, and facilitate engagement in the recovery process [14-16]. However, despite growing evidence, there remains a lack of comprehensive research focusing specifically on ICU patients with CNS injuries, particularly in evaluating the effectiveness of targeted educational interventions on self-efficacy [17].

Addressing this gap is crucial, as improving self-efficacy in this vulnerable population may lead to better clinical outcomes, shorter ICU stays, and improved long-term quality of life. Therefore, this study aimed to investigate the impact of educational interventions on self-efficacy among ICU patients with CNS injuries.

Materials and Methods

This interventional study was conducted over a period of six months, from January to June 2025 at a teaching hospital affiliated with the University of Lahore, Pakistan. The study population included patients admitted to the ICU with diagnosed CNS injuries, such as TBI and spinal cord lesions. Inclusion criteria were age over 18 years, relative consciousness (Glasgow coma scale (GCS) ≥13), ability to communicate verbally or non-verbally, and willingness to participate in the study. Patients with severe psychiatric disorders, profound communication disabilities, or unstable critical conditions were excluded.

A total of 60 eligible patients were randomly assigned to two groups: Intervention (n=30) and control (n=30). Sample size was calculated based on the formula for comparing two independent means (Equation 1) [18]:

$$1.\ n=\frac{\left(Z^2_{1-\alpha/2}+Z^2_{1-\beta}\right)^2 * 2 * \sigma^2}{d^2}$$

It is worth noting that the patients in the two groups were matched in terms of demographic characteristics. The educational program was conducted in the ICU of the hospital. The intervention consisted of seven structured sessions, each lasting 45–60 minutes, delivered individually to each patient by a trained nurse educator. The program focused on improving self-efficacy in managing CNS injuries, enhancing coping skills, and facilitating active participation in recovery (Table 1). The control group received standard ICU care without any specific educational intervention. Content validity of the materials was examined with several medicine and nursing professors and faculty members who taught in neurology and neurosurgery, and after their suggestions,

Table 1. Educational intervention sessions

Sessions	Duration (m)	Content	Methods	Materials
1	45	Introduction to CNS injuries and ICU environment	Lecture & discussion	Slides, handouts
2	45	Understanding common complications	Lecture & case examples	Slides, handouts
3	60	Symptom management: pain, mobility, and fatigue	Demonstration & practice	Handouts, equipment
4	60	Rehabilitation exercises	Demonstration & supervised practice	Exercise tools, handouts
5	45	Coping strategies for anxiety and stress	Counseling & guided practice	Relaxation audio, handouts
6	45	Enhancing self-efficacy in daily activities	Interactive discussion	Checklists, handouts
7	60	Family involvement and support	Family education session	Brochures, handouts

corrections were made to the texts. Likewise, face validity of the text was conducted with 10 patients who had a literacy level below a high school diploma. In this way, the materials were sent to them with prior coordination and after a few days, the patients read the materials and identified phrases or sentences that were difficult and complex for them and did not understand their meaning and significance. Afterward, the researcher tried to fix the problems by replacing words and phrases that were appropriate and understandable to the patients after reviewing and re-reading several times and adjusting it in simple language and at the level and understanding of the patients.

Data were collected using a demographic questionnaire and the general self-efficacy (GSE) scale, administered at two time points: Before the intervention and 3 months after the program was completed. The GSE Scale was designed by Scherer et al. in 1982 [19]. This questionnaire has 17 items, with items 15, 13, 9, 8, and 3 having negative scores and the rest having positive scores, and a higher score indicating higher self-efficacy. This questionnaire has three subscales: Propensity to initiate, propensity to extend effort to complete the task, and resistance to facing obstacles. Scherer believes that this scale measures three aspects of behavior, including propensity to initiate behavior (items 1, 4, 14, and 15), propensity to extend effort to complete the task (items 3, 5, 8, 9, and 13), and resistance to facing obstacles (items 2, 6, 7, 10, 11, 12, 16, and 17). It is scored on a 5-point Likert scale as follows: Strongly disagree (1), disagree (2), no opinion (3), agree (4), and strongly agree (5). If the questionnaire scores are between 17 and 34, the level of self-efficacy is weak, between 34 and 51, the self-efficacy level is medium, and if the scores are above 51, the self-efficacy level is high. In the present study, to ensure the reliability of the instrument in the target population, Cronbach's α was calculated for the entire questionnaire, which yielded a value of 0.85.

All ethical principles related to research, such as adequately explaining the objectives and methods of the research to the patients and obtaining written informed consent from them, were maintained. The confidentiality of their information was upheld, and sufficient information was provided to ensure that participation in the research was voluntary and that they had the right to withdraw at any stage of the study. It should be noted that no patients were excluded from the study.

Data analysis was performed using SPSS software version 26. Independent t-tests were used to compare the mean self-efficacy scores between the two groups, and paired t-tests were used for within-group comparisons. $P<0.05$ was considered statistically significant.

Figure 1 illustrates the study process.

Results

The results showed that there was no statistically significant difference between the intervention and control groups in terms of demographic variables. In other words, the two groups were homogeneous with respect to the examined variables (Table 2).

The mean scores of self-efficacy in all three subscales (general, social, and work) significantly increased in the intervention group after the educational program ($P<0.001$). In contrast, although slight changes were observed in the control group, these differences were not

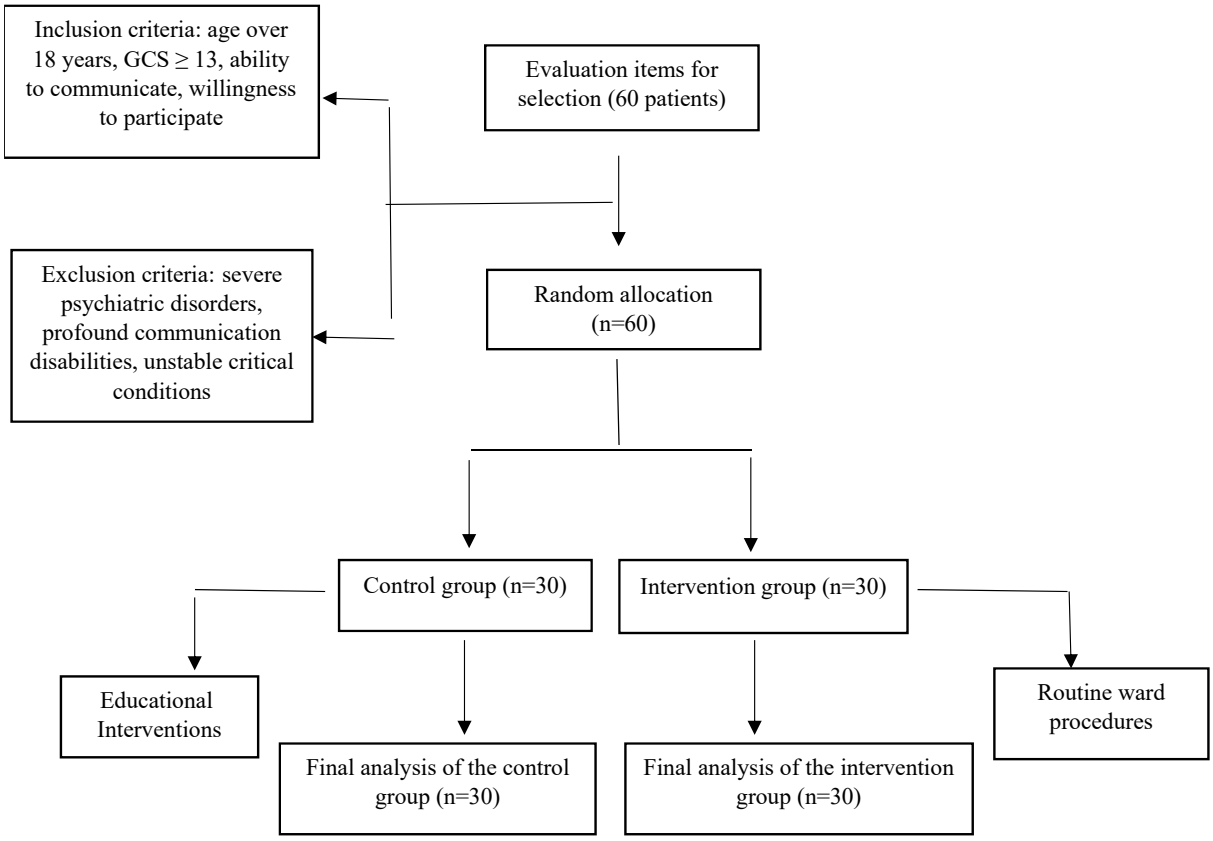

Figure 1. CONSORT checklist

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statistically significant (P>0.05). These results indicate that the educational intervention was effective in improving various dimensions of self-efficacy among patients (Table 3).

Discussion

The findings of the present study showed that the structured educational intervention significantly improved general, social, and work-related self-efficacy in ICU patients with CNS injuries. All self-efficacy subscales increased significantly in the intervention group after the educational program (P<0.001), while changes in the control group were not statistically significant. These results indicate that well-designed educational programs can enhance patients' confidence in coping with their condition even in highly stressful and clinically complex environments such as the ICU.

The results of this study are consistent with previous research, which reported that educational self-care and self-management programs significantly increase self-efficacy in patients with neurological disorders. Studies conducted on individuals with SCI demonstrated that systematic educational interventions can significantly improve patients' self-efficacy and adaptive coping behaviors [20, 21]. Similarly, interventions based on structured patient education have been shown to increase perceived capability and functional participation among patients undergoing neurorehabilitation, particularly when combined with supportive follow-up measures [22, 23].

Several studies support the idea that educational interventions are effective even in acute care settings. Family-centered education and psycho-educational approaches in ICUs have been associated with improved psychological outcomes and better engagement in care [24, 25]. Although most previous work has focused on chronic rehabilitation settings rather than ICU environments, the current findings suggest that educational interventions can be beneficial at early stages of recovery when self-efficacy may be most fragile and strongly influenced by uncertainty and anxiety.

This effect can be interpreted within Bandura's social-cognitive theory, which defines self-efficacy as shaped by mastery experience, vicarious learning, verbal persuasion,

Table 2. Demographic variables of the subjects

Variables		Mean±SD/No. (%)		P
		Intervention Group (n=30)	Control Group (n=30)	
Age (y)		35.6±8.4	34.2±7.9	0.52
Average GCS score		10.6±1.8	10.4±1.9	0.73
Gender	Male	14(46.7)	16(53.3)	0.77
	Female	16(53.3)	14(46.7)	
Education level	Below diploma	4(13.3)	6(20)	0.64
	Diploma	10(33.3)	8(26.7)	
	Academic	16(53.4)	16(53.3)	
Marital status	Single	12(40)	13(43.3)	0.85
	Married	18(60)	17(56.7)	
Insurance status	Yes	26(86.7)	25(83.3)	0.66
	No	4(13.3)	5(16.7)	
Economic status	Low	9(30)	10(33.3)	0.71
	Moderate	15(50)	14(46.7)	
	High	6(20)	6(20)	
Type of CNS injury	TBI	18(60)	16(53.3)	0.68
	SCI	12(40.7)	14(46.7)	

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Abbreviations: BGCS: Glasgow coma scale; CNS: Central nervous system; TBI: Traumatic brain injury; SCI: Spinal cord injury.

and emotional regulation [26]. The structured educational protocol used in the present study included elements, such as guided practice, reassurance, and provision of clear information, which may improve patients' psychological readiness for rehabilitation by enhancing perceived control and reducing fear and confusion.

Supporting evidence also exists in ICU educational research focused on healthcare professionals. For example, studies on delirium-care training for ICU nurses demonstrated that educational interventions can significantly improve self-efficacy among care providers [27], reinforcing the broader principle that self-efficacy is responsive to structured educational strategies in the intensive care context.

Table 3. Self-efficacy scores of the two groups at baseline and post-intervention

Groups	Subscales	Mean±SD		P (ANCOVA)
		Baseline	Post-intervention	
Intervention	GSE	25.3±4.1	32.7±3.8	<0.001
	Social self-efficacy	18.5±3.2	24.1±3	<0.001
	Work-related self-efficacy	10.2±2.1	13.5±2	<0.001
Control	GSE	25.1±4	26±3.9	0.12
	Social self-efficacy	18.3±3.1	18.7±3	0.34
	Work-related self-efficacy	10.1±2	10.5±2.1	0.28

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Overall, comparison with existing literature indicates that although research directly targeting ICU patients with CNS injuries is limited, findings from related neurological and acute-care populations consistently support the effectiveness of education-based interventions in strengthening self-efficacy. The present study extends this evidence into a population that has previously received little empirical attention and highlights the therapeutic potential of incorporating structured educational activities into standard ICU care pathways.

Conclusion

The findings of this review underscore the significant role of educational interventions in enhancing self-efficacy among ICU patients with CNS injuries. These interventions, when appropriately designed and implemented, can effectively address the psychological and informational needs of patients, thereby fostering a greater sense of control, engagement, and confidence in the recovery process. Educational strategies tailored to patients' cognitive capacities and clinical status not only contribute to improved self-management behaviors but also positively influence clinical outcomes, including reduced anxiety, improved adherence to treatment, and enhanced rehabilitation trajectories. Given the complexity of care in ICU settings and the vulnerability of patients with CNS injuries, integrating structured, evidence-based educational programs into routine care appears essential.

One of the limitations of the present study was the selection of participants from a single center, which may limit the generalizability of the findings to broader ICU populations with CNS injuries. Additionally, the potential influence of social, familial, or cultural factors on the educational intervention which could have impacted self-efficacy was not considered. It is recommended that future studies use multi-center designs with larger sample sizes to enhance the generalizability of the findings. Additionally, long-term follow-up after discharge should be conducted to assess the sustainability of the effects of the educational intervention.

Ethical Considerations

Compliance with ethical guidelines

The study protocol was approved by the Research Ethics Committee of the University of Lahore, Lahore, Pakistan (Code: UOL/IREB/25/10/0004). Moreover, informed consent was obtained from the patients who agreed to participate.

Funding

This research did not receive any grant from funding agencies in the public, commercial, or non-profit sectors.

Authors contributions

Conceptualization: Seyed Amirhossein Mousavibahar; Methodology: Saghar Erfani; Investigation: Farah Nazaqat; Writing–Original Draft: Shima Sadat Aghahosseini; Writing–Review & Editing: Shima Sadat Aghahosseini; Funding Acquisition: Saghar Erfani; Resources: Farah Nazaqat; Supervision: Shima Sadat Aghahosseini

Conflict of interest

The authors declared no conflict of interest.

Acknowledgements

The authors would like to express their sincere appreciation to the University of Lahore for its moral support, as well as to all the patients who participated in the study and their families for their valuable cooperation.

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