

# Using an Evidence-Based Care Package to Improve Emergency Nursing Management of Patients with Traumatic Brain Injury

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## Abstract

**Background:** Immediate evaluation and management of brain trauma patients improves disease outcomes and reduces the neurobehavioral consequences of the injury. Emergency nurses are expected to manage patients based on the best available evidence.

**Aim:** The present study was performed with aim to develop and implement an evidence-based care package for the management of brain trauma patients.

**Method:** This semi-experimental study was conducted on 60 nurses in the emergency departments from November 2022 to May 2023. The subjects were randomly assigned to intervention (n=30) and control (n=30) groups. The data collection tool included a demographic questionnaire and a brain trauma management checklist. The intervention included 4 training workshops based on the comprehensive evidence-based care package during two weeks. Both groups were assessed through a checklist before and after the intervention during 8 weeks.

**Results:** There was a significant difference between the two groups in the mean scores of care management before the intervention ( $p<0.001$ ). In addition, the variables of employment status and education level were not the same in the two groups. Therefore, the pretest score, employment status, and education level were included in the model as a covariate, and their effect was adjusted. The mean score of care management after the intervention in the intervention group was 12.3 points higher than that of the control group ( $p<0.001$ ).

**Implications for Practice:** Evidence-based care package improved the management of brain trauma patients, so it can be considered a simple and affordable solution to implement evidence-based practice and overcome the existing obstacles.

**Keywords:** Brain Trauma, Care Package, Emergency Nursing, Evidence-Based Practice, Nursing Management

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## Introduction

One of the leading causes of mortality, disabilities, and high healthcare costs in the world is moderate to severe traumatic brain injury (TBI) (1). The global yearly incidence of TBI is reported to be 200 cases per 100,000 people, which is equivalent to approximately 15 million people (2). In developing countries, the incidence of TBI is higher, which is associated with more mortality (3). In Iran, the incidence of brain trauma is almost 20 times higher than the global mean incidence, the main cause of which is the high use of motor vehicles and the high prevalence of road accidents (4, 5). In developing countries, brain injuries occur frequently and have a poor prognosis (1). Considering the high prevalence of brain trauma and the high incidence of death and complications resulting from it, which accounts for almost half of the deaths caused by trauma, and since it affects not only individuals, but also their families, and imposes a heavy financial burden on society, the skill of health care team, especially emergency nurses, is essential in managing these patients to prevent secondary brain injuries and control irreversible complications and mortality (2).

Caring for brain trauma patients requires adherence to the guidelines to prevent secondary complications such as seizures, increased intracranial pressure, cerebral edema, and other conditions that weaken the prognosis of the disease. Nurses are expected to use the best evidence on a wide range of issues and, due to the dynamic nature of the clinical environment, to keep abreast of research developments and ensure that their practice is based on the best clinical evidence (6,7).

One of the most important problems in nursing is the gap between theory and clinical training in nursing graduates, which can have a negative effect on how they provide cares. Evidence-based care has been proposed in recent years as a method for healthcare and treatment based on the latest findings. The implementation of evidence and scientific resources has a fundamental role in educational decisions and ensuring the quality of care. Currently, clinical and evidence-based guidelines have been developed for the management of severe trauma in western countries, and it is necessary to adapt these guidelines according to the specific context. Most of these guidelines are related to medical interventions and despite the need for evidence-based practice, there are no consistent guidelines for nursing interventions (8). On the other hand, most nurses have limited time, resources, or skills to access and evaluate the high-quality research and evidence for evidence-based nursing practice. Nurses in emergency departments due to lack of time and high workload often provide traditional care which can cause an increase in secondary brain damage and death (9-14). A study in 2016 on nurses in Bushehr hospitals showed that evidence-based care is a new approach for many nurses, so they are not familiar with its concept and have never been trained in this field. Since nurses are the largest professional workforce in the health care system, the challenges of implementing evidence in their practice are particularly important (15). More than 40% of patients' mortality occurs within the first 24 hours after injury. Therefore, emergency care should be the main focus of management to decrease the mortality rate in emergency settings (16).

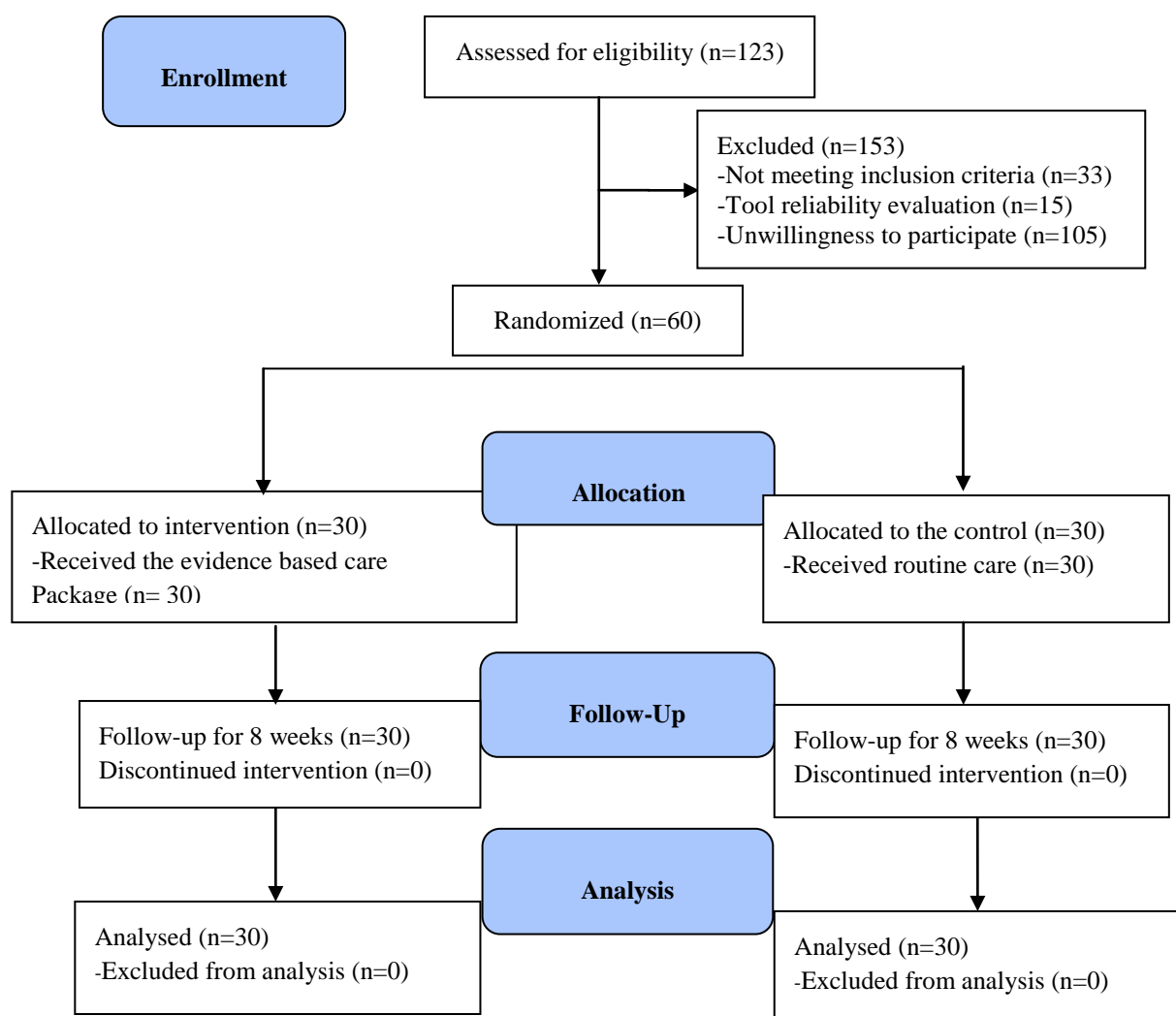
Emergency nurses should be provided with evidence-based training in the nursing management of acute TBI to improve clinical care and reduce the risk of complications or secondary brain injury. Therefore, it is necessary to provide opportunities for continuing evidence-based education of emergency nurses to reduce the gap between the best available evidence and nursing practice (17). The evidence suggests that different packages of care application in the emergency department (ED) facilitate patients' care (18), improves their clinical outcomes (19), and reduces mortality rate (20). Despite the availability of equipment needed for its implementation, TBI care bundle is not yet used in most Iranian hospitals. In addition, there are limited researches on the effect of this bundle on the patients' outcomes, particularly in Iran. Therefore, this study was performed with aim to develop and implement an evidence-based comprehensive care package to facilitate evidence-based clinical practices and investigate its impact on the quality of nursing care for the management of patients with moderate to severe brain trauma.

## Methods

This semi-experimental two-group study was conducted on 60 nurses working in 4 emergency wards of main trauma centers in north, south, east and west of Tehran (Taleghani, Haftam Tir, Imam Hossein and Luqman Hakim hospitals). Inclusion criteria for nurses were at least 6 months of continuous clinical work experience in the emergency department and at least a bachelor's degree in nursing. Nurses' participation in courses related to the study, transfer to other departments or centers,

failure to attend more than two sessions in training sessions, and the inability to make up for sessions and participation in the reliability phase of the instruments were among the exclusion criteria of nurses. Since the care of patients under the age of 18 years is different from that of adults, the inclusion criteria for patients were being at least 18 years old at the time of the accident and having a level of consciousness between 3 and 12 at the time of admission.

According to a similar study (21) and by using the formula, considering the test power of 80% and the effect size of 0.50, the sample size was estimated to be 54 that considering the 10% drop of the samples, it was estimated to be 60 subjects. Out of 213 nurses working in research settings, 48 nurses were excluded from the study due to lack of inclusion criteria. Finally, out of 165 qualified nurses, 60 who were more willing to participate in the research were included in the study. Nurses were randomly assigned to one of the intervention (n=30) and control (n=30) groups by tossing a coin (Figure 1).



**Figure 1. Flow diagram of the study process**

Data collection tools included a demographic questionnaire and a care management checklist for brain trauma patients. Due to the lack of such a tool in Iran and the lack of access to its non-Iranian version, it was prepared by the researcher and psychometrically analyzed by studying extensive texts and using the opinion of 15 specialists in the field of emergency care. This checklist has 38 items and is scored on a five-point Likert scale from "It does not apply" (score 0) to "complete and independent" (score 3). The maximum score obtained from the tool is 114 and a higher score indicates a higher quality of nursing care. The item that "does not apply" is subtracted from the total and the average is calculated. Content validity ratio and content validity index were reported above 0.49 and 0.79, respectively. For the reliability of the checklist, two researchers of this study independently evaluated

15 emergency nurses while caring for a brain injury patient and completed the checklist. Then the intraclass correlation coefficient (ICC) was calculated for these two evaluators (ICC=0.929). The internal consistency of the checklist was evaluated by calculating Cronbach's alpha coefficient, which was 0.963 in this study.

After obtaining the code of ethics and official approval, the purpose and method of the study were explained to the participants and then written consent was obtained. In order to prevent leakage of information between the two groups, first the information of the control group was completed and then the intervention group was examined. Demographic information questionnaire was completed by 30 nurses of the control group. The quality of care of moderate to severe brain trauma patients in the control group was completed based on the observation by the checklist and documentation of the patients' files during 8 weeks for 3 brain trauma patients. Two weeks after completing the checklist in the first stage, the checklist was completed again in this group for 3 other brain trauma patients. Then the intervention group was initially examined in the same way. The evidence-based training package for the care management of brain trauma patients was taught to the nurses of the intervention group during two weeks in 2-hour classes. In order to eliminate the effect of observation, the observer (the person completing the checklists) was selected from the nurses working in the ward with history and experience in the field of caring for trauma patients.

Care package was developed by the researcher through literature review, review of evidence based on the available context, and opinions of key stakeholders such as emergency nurses, nurses, emergency physicians and neurosurgeons and finally using the opinion of a panel of experts (clinical professors of the nursing school with relevant expertise). The final revisions were made to the content of the care package with the input of the research team. This package focuses on airway management, spinal protection, oxygen and ventilation management, circulation and fluid balance, disability and intracranial pressure management. Content of training program adopted from Youmans and Winn Neurological Surgery (2022) (22). It provides a standardized approach to the care of brain trauma patients.

Meetings were held in two shifts, morning and evening, and in groups of 4 to 6 nurses, in the special meeting room of the emergency department. After the evidence-based package training, the checklist was completed again for the intervention group within 8 weeks. Finally, the average performance of the two groups before and after the intervention was compared separately. Data analysis was done using paired t-test, independent t-test, chi-square, Fisher's exact test and analysis of covariance.  $P < 0.05$  was considered statistically significant.

### **Ethical Consideration**

After receiving the code of ethics from the Joint Organizational Ethics Committee of Shahid Beheshti School of Nursing and Midwifery (IR.SBMU.PHARMACY.REC.1401.104), and receiving a letter of introduction from the vice president of research and presenting it to the hospitals, the researcher explained the purpose and method of conducting the research to the relevant officials. In all stages of the research, ethical considerations such as obtaining informed consent, information confidentiality and the possibility of withdrawing from the study at each stage was taken into account.

### **Results**

The mean age of the participants in the control and intervention group was  $34.2 \pm 4.85$  and  $33.37 \pm 5.39$ , respectively. In addition, 78.3% of the participants were female. The results showed that there is no significant difference between the intervention and control groups in terms of demographic characteristics except the employment status and education level (Table 1).

Total mean score of care management before the intervention in the control group was  $57.05 \pm 8.60$  and in the intervention group was  $53.34 \pm 5.73$ ; the results of independent t-test showed that the difference in the mean scores before the intervention in the two groups was significant ( $p = 0.001$ ). Moreover, total mean score of care management after the intervention in the control group was  $55.67 \pm 5.46$  and in the intervention group was  $71.70 \pm 6.82$ ; the results of independent t-test showed that the difference in the mean scores after the intervention in the two groups was significant ( $p < 0.001$ ).

**Table 1. Demographic characteristics of the participants in the two groups**

Variable	Group, N(%)		P-value
	Intervention	Control	
<b>Gender</b>			
Male	18 (20)	21 (23.3)	0.590*
Female	72 (80)	69 (76.7)	
<b>Age (yrs)</b>			
25-29	21 (23.3)	33 (36.7)	0.340**
30-34	21 (23.3)	12 (13.3)	
35-39	27 (30)	24 (26.7)	
>39	21 (23.3)	21 (23.3)	
<b>Marital status</b>			
Single	36 (40)	18 (20)	0.120*
Married	51 (56.7)	66 (73.3)	
Divorced	3 (3.3)	6 (6.7)	
<b>Education level</b>			
Bachelors	90 (100)	84 (93.3)	0.030***
Master	0 (0)	6 (6.7)	
<b>Employment status</b>			
Permanent	48 (53.3)	54 (60)	0.001*
Temporary-to-Permanent	9 (10)	24 (26.7)	
Training nurse, Contractual Nurse	33 (36.7)	12 (13.3)	
<b>Job position</b>			
Staff Nurse	3 (3.3)	0 (0)	0.100***
In charge Nurse	24 (26.7)	33 (36.7)	
Junior Nurse	63 (70)	57 (63.3)	
<b>Total work experience (yrs)</b>			
1-5	33 (36.7)	24 (26.7)	0.320**
6-10	21 (23.3)	27 (30)	
>10	36 (40)	39 (43.3)	
<b>Emergency work experience (yrs)</b>			
1-5	48 (53.3)	54 (60)	0.190**
6-10	24 (26.7)	27 (30)	
>10	18 (20)	9 (10)	

\* Chi-Square test; \*\* Mann-Whitney test; \*\*\* Fisher's Exact test

The paired t-test was used to compare the care management scores before and after the intervention, and the results showed that in the control group, the nurses' care management scores in the initial examination and re-examination two weeks later decreased by 1.38, and this difference was not statistically significant ( $p=0.14$ ), but in the intervention group, the care management scores after the intervention increased by 18.36 compared to the scores before the intervention, and this difference was statistically significant ( $p<0.001$ ) (Table 2). Considering that the pre-test scores as well as the variables such as employment status and education level in the two groups were not the same, analysis of covariance (ANCOVA) was used to compare the care management scores of nurses after the intervention. In this test, the pre-test score, employment status, and education level were included in the model as covariates, and their effects were adjusted. The results of ANCOVA showed that the score after the intervention in the intervention group was 12.3 points higher than that of the control group ( $p<0.001$ ) (Table 3).

**Table 2. Comparison of nurses' care management scores before and after the intervention, separating the intervention and control groups**

Group	Total score (Mean±SD)	
	Control	Intervention
Before	57.05±8.60	53.34±5.73
After	55.67±5.46	71.70±6.82
Difference of before and after	-1.38	18.36
Paired t-test	$p=0.14$	$p<0.001$

**Table 3: The results of covariance analysis related to the comparison of care management scores of nurses after the intervention in the intervention and control groups**

Group	Coefficient Estimation	Std. Error	t	P- Value	%95 Confidence Interval	
					Upper Bound	Lower Bound
Intercept	0.843	0.130	6.505	0.000	1.099	0.587
Before Total Score	0.507	0.098	5.158	0.000	0.701	0.313
Education Level	-0.25	0.081	-0.306	0.760	0.135	-0.185
Employment Status	0.156	0.042	3.691	0.078	0.239	0.072
Intervention	12.30	3.15	3.90	0.000	18.55	6.05
Control	-	-	-	-	-	-

## Discussion

The purpose of the present study was to determine the effect of an evidence-based care package by emergency nurses in the care management of brain trauma patients. As the results of this study revealed the performance scores of nurses in the pre-test stage and the employment status and education level were significantly different in the control and intervention groups before the intervention. Therefore, the score before the intervention was entered into the model as a covariate and its effect was adjusted. In the pre-test stage, the control group had a higher performance score compared to intervention group, but this difference was not significant. In the post-test stage, performance scores of nurses in the intervention group were significantly higher compared to the control group. These results are inconsistent with the results of the study by Mokhtari et al. (2017) and Madershahian et al. (2019), in which there was no difference between control and intervention scores of performance in the pre-test phase. This is an expected result because both groups have not yet been exposed to the training program (23, 24).

On the other hand, the results of the present study showed that there was a significant difference between the performance score of nurses in two groups after the intervention. The intervention group had a significant change in their performance after the intervention, while the performance of the control group did not change significantly, which indicates the positive effect of the training package in increasing the quality of nurses' performance in the care management of brain trauma patients in the emergency department. This result is consistent with the results of Galliano et al.'s study (2022) that a great improvement was observed in the knowledge, attitude and performance skills of nurses based on evidence after the intervention of the educational program (25).

Also, the study of Tudela et al. (2018) on the second-year nursing students of one of the Spanish universities indicated that evidence-based education improved the knowledge and attitude of the students, but this type of education did not improve their skills in patient's care (26). Perhaps this difference is because patient care as a skill which requires practice and repetition, compared to students in the clinical environment, nurses are more skilled in patient's care due to experience and repetition. The study conducted by Azizi et al. showed that the implementation of evidence-based training was effective on the awareness of fourth-year nursing students in the care of hemodialysis vascular accesses (27). Also, Albert et al. (2018) in their study showed that the use of evidence-based care packages reduces surgical site infections in colorectal surgeries (28). Furthermore, in Zamani et al.'s study (2013), training and implementation of evidence-based guidelines improved the quality of nursing care (29). The difference between the two groups can be explained by the fact that the study group received an evidence-based training package and was systematically trained in terms of knowledge and practice on how to manage brain trauma patients, while the control group did not receive this program. In the study of Rezaian et al. (2013), the six-week intervention of the evidence-based care package was not effective on the gross motor development of the infant, and the effect was determined after 8 weeks of the intervention (30). Another study by Vaajoki et al. (2018) in Finland evaluated the nurses of a university hospital who participated in two separate EBP programs in two different years and completed a pre- and post-questionnaire about evidence-based practice and attitudes toward evidence-based practice. The nurses reported that evidence-based practice and skills significantly improved and were updated after each training program (31,32).

Therefore, evidence-based care package as a simple and cost-effective solution for implementing evidence-based practice can be effective in improving the quality of nursing care. By creating an

environment in which the clinical situations and objective experiences of the participants are discussed and adapted to the current scientific evidence, the workshops can become the basis for the improvement of nurses' care management. Considering the effectiveness of evidence-based nursing education on raising the awareness of nurses, it is expected that strengthening this skill is one of the educational goals in the field of nursing before and after graduation.

One of the limitations of this study is that the nurses did not cooperate properly due to the high workload, which was tried to strengthen their cooperation by giving incentives with the cooperation of the responsible department. To reduce the effect of observation bias, three observations were made for each nurse and the observer was selected from the experienced personnel of the same department.

### **Implications for practice**

According to the findings of the present study, it can be concluded that implementation of evidence-based care package training had a positive effect on the performance of emergency nurses regarding the care management of brain trauma patients. Therefore, the evidence-based training program can be used in emergency departments to develop the knowledge and practice of nurses based on the basic needs of moderate and severe brain trauma patients. The results of this study can be used in nursing planning for more effective and high-quality care of brain trauma patients and the prevention of secondary injuries and mortality in these patients. It is recommended to the educational managers of the hospitals to include the training of evidence-based practice instructions in the in-service training of nurses and to repeat it periodically and pay attention to its implementation.

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### **Conflicts of interest**

The authors declared no conflict of interest.

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