Effect of Implementing Standardized Designed Nursing Guidelines on Outcomes of Severe Traumatic Brain Injury Patients

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Abstract

Background: Severe traumatic brain injury is a global problem that leads to morbidity and mortality particularly among young people. So this study **aimed** to determine the effect of implementing standardized designed nursing guidelines on outcomes of severe traumatic brain injury patients. **Quasi-experimental research design** was utilized. **Setting**: this study was carried at Trauma intensive care unit at Sohag University Hospital. **A purposive sample** of 70 adult severe traumatic brain injury patients were matched & randomly assigned into 2 equal groups**. Three tools** were used; **Tool I:** Traumatic brain injury assessment sheet**, Tool II**: Neurological assessment sheet, **Tool III:** Clinical outcome evaluation sheet. **Results** of current study revealed a statistically significant difference between study and control group regarding clinical outcomes includes prolonged Mechanical Ventilation, Re-intubation and number of death in addition to occurrence of complications as fever, bed sores and infection. **Conclusions:** application of standardized designed nursing guidelines improves outcomes and help to reduce occurrence of complications for patients with Severe Traumatic Brain Injury. **Recommendation**: Future researches are needed to examine the effect of the standardized designed nursing guidelines in the different age groups such as older adults and child to improve the outcomes.

Keywords: Standardized Designed Nursing Guidelines Sever Traumatic Brain Injury, and Outcomes.

Introduction

Traumatic brain injury (TBI) is defined as a physiologically substantial disruption of brain function caused by the application of external physical force, such as acceleration or deceleration forces. There are several signs of impaired brain functioning at the time of external physical force, including an episode of unconsciousness, memory loss of immediate events that occurred before the trauma (retrograde amnesia) or memories that occurred after the trauma (anterograde amnesia), all of which are referred to as posttraumatic amnesia; in addition, an alteration of mental state due to focal neurological deficit can be observed **(Mckee, & Daneshvar, 2015)**.

TBI severity is classified as mild, moderate, or severe, depending on the duration of loss of consciousness, posttraumatic amnesia, and/or the Glasgow Coma Scale (GCS) score at the time of admission to the hospital. Neuropsychological abnormalities, such as impaired attention, memory, and cognitive processing efficiency, are a key category of potential negative TBI-related outcomes for more severe TBIs and can result in significant functional impairment. However, the evidence that lesser brain lesions cause chronic cognitive deficits or functional impairment without regard to mental variables is less evident **Mckee & Daneshvar, 2015)**.

Complications that may occur after traumatic brain injuries are mostly determined by the severity of the injury. After a traumatic brain injury, non-neurological organ dysfunction is prevalent and contributes to morbidity and mortality on its own. It's a risk factor that might be treated, and early detection and management could help improve the outcome. Infections, heart rhythm problems, protein-calorie malnutrition, and complications connected to immobility such as bedsores and multiple organ system failure are among the issues associated with hospitalization or systemic complication after TBI. Systemic difficulties following a TBI can arise as a result of neurogenic factors like the large catecholamine and neuro-inflammatory response associated with brain injury, or as a therapeutic complication. Difficulties of the

nervous system or complications connected to the nervous system (**Goyal K, et al. 2018).**

Standardized Nursing care guidelines are includes; preventing complications, restoration of damage and intensive monitoring of vital signs, control of hemorrhages, shocks, intracranial pressure, and level of consciousness. Another important factor is the monitoring of the hydro-electrolytic balance /hour, and it is necessary to maintain a calibrosus venous access, and verification of serum electrolytes, due to the cerebral trauma being able to cause hormonal dysfunctions and Metabolic, which is the case of electrolytic regulation (**Daniele et al., 2019).**

Critical care nurses are responsible for the continuous monitoring and maintenance of physiological parameters associated with sever traumatic brain injury. Therefore, nurses as health care team members are the best positioned to detect and prevent complications associated with TBI and to improve the patient's clinical outcomes through application of standardized nursing care guidelines to those patients. Therefore this study aims to determine the effect of implementing standardized designed nursing guidelines on outcomes of severe traumatic brain injury patients.

Significance of the study:

Trauma is the most common cause of death in people under age of 40 years in our society and the planetary - burden of trauma- is expected to increase in the next 20 years **(Seliman, et al; 2014).**

According to Statistics of Egyptian trauma intensive care unit at Sohag University Hospital in the years of (2018) revealed that the number of patients admitted to trauma unit with STBI were 200 patients **(Hospital records of Sohag University 2018).**

Aim of the study:

The aim of this study was to determine the effect of implementing standardized designed nursing guidelines on outcomes of severe traumatic brain injury patients

Research hypotheses: - to fulfill the aim of the study the following research hypotheses were formulated:

- Severe traumatic brain injury (STBI) patients who will be exposed to the standardized designed nursing guidelines will have more hemodynamic stability than patients who receive the routine nursing care.
- Severe traumatic brain injury (STBI) patients who will be exposed to the standardized designed nursing guidelines will be less exposed to get complications as (fever, seizures, infection, hydrocephalus, re-intubation, and prolonged mechanical ventilation) than patients who receive the routine nursing care.
- Severe traumatic brain injury (STBI) patients who will be exposed to the standardized designed nursing guidelines will be have less ICU stay and less number of deaths than patients who receive the routine nursing care.

Materials and methods

Materials

Research design:

A quasi-experimental research design was used in this study.

Setting:

The study was conducted at the trauma intensive care unit at Sohag university hospital.

Sample:

A purposive sample of 70 adult severe traumatic brain injury patients calculated by using OpenEpi, Version 3 software, open source calculator. The sample had been estimated with margin of error at 5% and confidence interval level at 95%. They were randomly and sequentially recruited equally into two groups; control and study group (35 patients each).

Inclusion criteria:

- Age: 18-60 years old.
- Glasgow coma scale score: 3-8
- Non penetrating head injury

Tools:

Three tools were used for data collection after reviewing the related literatures.

Tool I: Traumatic brain injury assessment tool:

This tool was developed by the researcher based on the related literature to assess the brain injury, it consists of four parts:

- **Part one**: **Patient's socio-demographic data** including: patient's age, sex, marital status, and level of education.
- **Part two: clinical data** including: date and time of admission, medical diagnosis, past medical and surgical history and length of stay.
- **Part three: Physiological parameters:** it consisted of vital signs: - body temperature, heart rate (HR), blood pressure (systolic & diastolic), mean arterial blood pressure (MAP), respiratory rate (RR), central venous pressure (CVP).
- **Part four: arterial blood gases** (PH, PaO2, PaCO2, HCO3 and oxygen saturation (SO2).

Tool II: Neurological assessment. It consists of two parts:

- **Part one: Glasgow coma scale (GCS),** The scale provides a structure for assessment of patient's neurological status according to three sensory responses including visual, verbal and motor response. Each measure is scaled according to the level of impairment. The score is usually categorized as: 'mild TBI' with score 13 to 15; 'moderate TBI' with score 9 to 12; and 'severe TBI' with score 3 to 8 (with 3 being the minimum score) **(Saatman, et. al. 2008).**

Part two: Injury severity score (ISS):

Injury severity score is an anatomical scoring system that provides an overall score for patients with multiple injuries. Each injury is allocated to one of six body regions (Head, Face, Chest, Abdomen, Extremities, and External body parts). Only the highest score in each body region is used. The ISS score takes values from 0 to 75, the 3 most severely injured body regions have their score squared and added together to produce the ISS score **(Rapsang & Shyam, 2015).**

Tool III: Clinical outcome evaluation tool:

This tool was developed by the researcher based on reviewing the recent related literature. It aimed to assess the clinical outcomes for sever TBI patients. The clinical outcomes evaluation included the followings:

- **Complications.** It includes seizures, increase intracranial pressure, hydrocephalus, CSF leakage, infection, hyperthermia, bed sores, and high blood glucose level.
- Duration of mechanical ventilation and intubation
- Increase length of ICU stay
- Death.

Methods

The study was conducted though out three main phases, which are preparatory phase, implementation phase and evaluation phase.

Preparatory phase:

- An official permission was taken before conducting the current study from the Trauma ICU administrator to facilitate the implementation of the study after explanation the aim of the study.
- All tools were tested for content validity by three panels of juries' expertise in the field of critical and emergency care nursing and medical biostatistics and modifications were done accordingly.
- All tools of the study were tested for reliability using Cronbach alpha. It was 0.830 for tool I and 0.859 for tool II which represents a highly reliable tool.
- **A pilot study:** A pilot study was carried out before starting data collection on 10% of both studied patients to evaluate the clarity, feasibility, and applicability of the tools as well as estimate the time needed to collect data.
- Written approval was achieved from the relevant (for comatose patients) after the researchers clarified the aim of the current study.
- Privacy and data confidentiality were assured to all studied patients.

- The studied patients had the right to withdraw from the current study at any time of the research process.
- The standardized nursing guidelines of care used in the current study are safe for the studied patients.

Data collection:

The study patients who were willing to participate in the current study and fulfilled the inclusion criteria had been observed by the researcher. Data was collected from the study patients of both groups daily form admission to discharge.

The duration of data collection was extended from the period of the beginning of May 2019 until the end of October 2019.

Implementation phase:-

- During this phase 35 legible patients who were willing to participate in the study were selected to constitute the control group, then their matches 35 patients who were willing to participate in the study group.
- The study and control groups were assessed using Traumatic brain injury assessment sheet (tool I) to obtain baseline data on admission such as GCS, injury severity scale, hemodynamic data and also the researcher take basic information from the records such as past medical history, and mechanism of injury and then the patients were assessed every day to obtain changes in the hemodynamic parameters, level of consciousness and arterial blood gases.

Regarding the control group

- The control group was exposed to routine care in trauma intensive care unit as prescribed by the resident physician.
- The three designed study tools used to assess the patients daily for fifteens days and detect the clinical outcomes of the patients.

For study group

- Implementation of the established standardized nursing guidelines **(Carney et al; 2017)** for the study group was done daily by the researcher from admission till fifteen days including the following:

1) Maintain ICP < 20 mmHg & CPP at 50-70 mmHg:

Improving venous drainage from the brain:

- Elevation of the head of the bed to 30 c, Good neck alignment – head in the neutral position, Ensuring ties holding the endotracheal tube in place do not compress the neck veins, and Immobilize the patient's cervical spine with sandbags and tape rather than restrictive neck collars**(Carney et al; 2017)**.

Reducing cerebral edema:

- Use mannitol (an osmotic diuretic) 0.25-1g/ kg every 4-6 hrs. OR aliquots of hypertonic saline as an alternative, Use furosemide (a loop diuretic) 0.5-1mg/kg, and Maintain serum Na+in the range 140-145mmol/l.

Reduction of the cerebral metabolic rate for oxygen:

- Close temperature regulation and Anticonvulsant if the patient has a witnessed seizure.
- **Reducing CSF** volume**:** Use of an external ventricular drain (EVD) allows drainage of CSF to relieve raised ICP.

2) Prevent hypoxemia, hypocarbia & hypercarbia:

- Administer oxygen therapy, Proper ventilator management and Suctioning

3) Prevention of hypotension:

- Intake & Output's q hour, notify physician if the urine < 30 cc/hr. OR > 200cc/hr, Maintain MAP at 60-90 mmHg, Maintain adequate fluids resuscitation, Keep CVP 8:10 cmH2O, Maintain systolic blood pressure at > 90 mmHg, and Administer of vasopressors as ordered.

4) **Preventing seizure:**

- Administer prophylaxis antiepileptic drugs for the first 7 days' post injury as ordered, Monitor all seizure duration and focus and inform doctor or nurses in charge, Maintain adequate sedation with protocol as ordered, for treatment give midazolam 0.1-0.3 mg/kg.

5) Preventing deep vein thrombosis (DVT) and pressure ulcer:

- Pharmacological anticoagulation and Mechanical prophylaxis:
- Nursing intervention as; Applying elastic stocking, Change the patient's position every 2 hours with good body alignment, Use air matrices for all pt., Range of motion and massage for lower limbs.

6- Maintain adequate nutrition

- Maintain hydration with early enteral feeding, Initiate feeding within 72hrs, and Avoid routine use of prokinetic agents.

7- Glycemic control:

- Maintain blood glucose level 70-120 mg /dl, Monitor levels / 2-4 hours, Administer intensive insulin therapy for serum glucose greater than 120 mg /dl as ordered, Avoid administering glucose containing fluids.

8- Preventing hyperthermia:

- All head injured patients cooled to moderate hypothermia, Most STBI patients maintained at normothermia (36-37C), Administration of the antipyretic paracetamol is the most common first-line treatment, When first-line methods failed to bring about a fall in temperature, different combination of the following methods used (Circulating air- cooling blanket, Tepid sponging or wet soaks and Convection fans). Administration of cold fluids via the circulation.

Evaluation Phase: Evaluating standardized nursing guidelines Outcomes:

Evaluation was done for all studied patients of both groups after implementation of standardized nursing guidelines provided by the researcher to evaluate patient's physiological parameters, neurological assessment, and mortality rate using study tools.

The efficacy of the nursing guidelines was determined by measuring patient's outcomes. By using tool I, tool II and tool III; the outcomes of both control and study groups was compared to measure the following outcomes:

- Durations of intubation
- Durations of mechanical ventilation
- Morbidity rate; complications was monitored and recorded through the patients' hospitalization period.
- Mortality.
- The length of patient's ICU stays from admission till discharge.

Statistical analysis:

Date entry and data analysis were done using SPSS version 19 (Statistical Package for Social Science). Data was presented as mean and standard deviation. Chi-square and Fisher Exact tests were used to compare qualitative variables. Mann-Whitney test was used to compare quantitative variables in case of non-parametric data. P-value was considered statistically significant at $P < 0.05$.

Results

Table (1): Showed that, the mean age was 30.20±7.2 years old in the study group and 33.7±9.6 years old in the control group. **As regard gender**, 20 (57.1%) of the study group versus 18 (51.4%) of the control group were male. **Regarding marital status,** (45.7%) of study group versus (28.6%) of control group was single. This table also reveals the patient's level of education of each study and control group where with no statistical significant difference (p= 0.638). In relation to **current diagnosis or event related to injury**, it was observed that the highest percentages of event related to injury was the motor car accidents were 57.1% in study group and 62.9% in control group. Moreover, there was no significant difference between both groups where (p= 0.254). This table also reveals that there was no significant correlation between both groups in relation to the patient's past medical history.

Table (2) showed that, regarding Glasgow Coma Score there was no significance difference between study and control group at 1st day, and highly significance difference at 7th & 15 days, also it revealed highly significant increase in study group compared with control group from 7th day.

Table (3) illustrates that, in relation to the Injury Severity Score (I.S.S) there were no significant correlation between both groups on admission where (p= 0.653).

Table (4):- Demonstrates that, regard **temperature** there were improvement in study group with statistical significance difference between study & control groups in 7th and 15th days with (p=0.003 &0.001 respectively). As regard **respiration** there were statistical significance difference between study & control groups at 7th & 15th days with (P<0.009). Also it revealed a statistical significant difference in **heart rate** between study and control group where (P<0.001) at 15th day. And a statistically significant difference between both group regarding **systolic and diastolic blood pressure** was observed were P value (P<0.001&0.001) respectively. As regard **main arterial pressure (MAP)** there was statistical difference between the study and control group (P<0.001). In addition to the mean value of central venous pressure (CVP) was 7.7±2.5in the control

group and increased to 9.1±1.0in the study group and the significant difference was (P<0.003).

Table (5):- Showed that, regarding arterial blood gases there was no a statistical significant difference between the mean value of arterial PH, and partial pressure of carbon dioxide between both groups during study days, While there was a statistically significant difference between both groups regarding mean arterial oxygen saturation at 7^{th} and 15^{th} days (P value = 0.003 and 001 respectively). And also there were statistically significant difference between both groups in the same day of study in relation to partial pressure of arterial oxygen (PaO_2) (p = 0.001).

Table (7): Illustrate that there were statistically significant differences between both groups regarding occurrence of fever, bed sores and infection, where p. value (0.008, 0.033, and 0.041 respectively). While on the other hand, there were no significant differences between study and control groups in relation to occurrence of high blood glucose, hydrocephalus, seizures, increase intracranial pressure, cerebrospinal fluid leakage where p. value (0.708, 0.509, 0.152, 0.708 and 0.509 respectively).

Table (8): This table demonstrates that a statistically significant difference between study and control group regarding prolonged MV, Re-intubation and number of death at p. value (0.041, 0.0321 and 0.026 respectively). In relation to length of ICU stay the table shows that 82.9% of study group patients stayed from 7 to 15 days as compared to about 45.7% of control group patients who stayed more than or equal 15 days, with a statistical significant differences between both groups at P. value= 0.020.

Table (1): Comparison between study and control groups according to the Scio-demographic and clinical data

Variables / Groups		Study group N=35		Control group N=35		P. value
		No.	%	No.	%	
Age	20 - 30 years	18	51.4	16	45.7	0.366
	31 - 40 years	10	28.6	9	25.7	
	41 - 50 years	7	20.0	7	20.0	
	51 - 60 years	0	0.0	3	8.6	
	Mean ±SD	30.20±7.2		33.7±9.6		0.089
Gender	Male	20	57.1	18	51.4	0.810
	Female	15	42.9	17	48.6	
Marital status	Single	16	45.7	10	28.6	0.313
	Married	14	40.0	20	57.1	
	Divorce	0	0.0	1	2.9	
	Widow	5	14.3	4	11.4	
Level of education	Illiterate	20	57.1	15	42.8	0.638
	Read and write	2	5.7	4	11.4	
	Basic education	5	14.3	6	17.2	
	Secondary education	8	22.9	10	28.6	
Occupation	Not working	5	14.3	8	22.9	0.347
	Manual	12	34.3	7	20.0	
	Professional	18	51.4	20	57.1	
Current diagnosis	Assault from other	2	5.7	4	11.4	0.254
	Firearm injury	2	5.7	5	14.3	
	Falling From High	6	17.2	2	5.7	
	Falling on ground	5	14.3	2	5.7	
	Motor Car Accident	20	57.1	22	62.9	
Past medical history	Diabetes Mellitus	3	8.6	4	11.4	0.928
	Heart Disease	4	11.4	3	8.6	
	Hypertension	2	5.7	4	11.4	
	Others	2	5.7	3	8.6	
	Non	19	68.6	21	60.0	

P > 0.05 non-significant ****P≤0.05 significant***

Table (2): Comparison between study and control groups in relation to total Glasgow Coma Score (GCS)

Total GCS score	Study group N=35	Control group N=35	P. value
	Mean ± SD	Mean ± SD	
1st day	4.9±1.3	4.9±0.8	1.000
7th day	9.5±2.2	7±1.9	<0.001**
15th day	13.2±1	9.9±1.2	<0.001**

P > 0.05 non-significant ****P≤0.05 significant***

Table (3): Comparison between study and control groups according to Injury Severity Score (I.S.S) on admission

Groups / Variables	Study group N=35	Control group N=35	P. value
	Mean ± SD	Mean ± SD	
Head & Neck Injury Description	13.8±3.2	14.1±3.9	0.717
Face Injury Description	4.0±0.0	4.0±0.0	-
Chest Injury Description	13±3.7	12.5±3.8	0.817
Extremity Injury Description	5.3±2.3	4.7±1.9	0.605
External Injury Description	12.7±18.1	1.0±0.0	0.548
Total Injury Severity Score (ISS)	19.3±7.4	18.5±6.4	0.653

P > 0.05 non-significant ****P≤0.05 significant***

Table (4) comparison between study and control group according to hemodynamic parameters

Variables	Days	Study group N=35	Control group N=35	P. value
		Mean± SD	Mean± SD	
Temperature	1st	39.2±1.3	39.8±1.9	0.127
	7th	37.1±1.0	38.5±2.5	0.003**
	15th	37.2±0.8	39.4±1.9	<0.001**
Respiration	1st	33.2±7.7	35.5±7.1	0.251
	7th	27.4±4.6	31.3±4.5	0.002**
	15th	21.2±3.8	25.3±6.4	0.009**
Heart rate	1st	80±6.9	82.6±6.6	0.111
	7th	86±2.5	85.0±5.0	0.293
	15th	85±1.9	90.6±4.6	<0.001**
Systolic B.P	1st	110±11	112±8	0.387
	7th	122±8	120±20	0.584
	15th	120±15	132±13	<0.001**
Diastolic B.P	1st	74±4	72±5	0.170
	7th	73±2	75±6	0.065
	15th	75±7	70±7	0.003**
MAP	1st	90±5	89±3	0.313
	7th	88±6	90±6	0.167
	15th	93±7	86±7	<0.001**
C.V.P	1st	10.7±2.5	10.1±2.0	0.271
	7th	9.5±3.5	10.1±0.9	0.329
	15th	7.7±2.5	9.1±1.0	0.003**

P > 0.05 non-significant ****P≤0.05 significant***

Table (5): Comparison between the intervention and control group as regards arterial blood gases:

Arterial Blood Gases (ABGs)	Days	Study group N=35	Control group N=35	P. value
		Mean ±SD	Mean ±SD	
PH	1st	7.38±0.02	7.39±0.04	0.190
	7th	7.40±0.03	7.39±0.14	0.680
	15th	7.38±0.01	7.37±0.03	0.065
Pao_2	1st	94±5.48	95±4.08	0.389
	7th	98±1.58	93±5.58	0.001**
	15th	99±0.8	94±5.82	0.001**
$PaCO_2$	1st	39.29±2.07	38.34±2.54	0.090
	7th	38.5±3.3	37±10.6	0.426
	15th	28±6.1	30.8±10.3	0.170
HCO_3	1st	25.1±5.1	27±4.0	0.087
	7th	20.8±4.4	22±4.5	0.263
	15th	19.1±3.1	21±2.2	0.004**
Sao_2	1st	90.42±1.18	89.53±1.89	0.021*
	7th	98.32±1.50	97.40±0.96	0.003**
	15th	99.42±0.54	96.53±1.86	0.001**

P > 0.05 non-significant ****P≤0.05 significant***

Table (7): Comparison between study and control group in relation to occurrence of complications

Complications	Study group N=35		Control group N= 35		P. value
	No.	%	No.	%	
Fever	10	28.6	22	62.8	0.008**
Bed sores	0	0.0	6	17.1	0.033*
High blood glucose level	3	8.6	5	14.3	0.708
Infection	7	20.0	16	45.7	0.041*
Hydrocephalus	4	11.4	7	20.0	0.509
Seizures	2	5.7	7	20.0	0.152
Increase intracranial pressure	3	8.6	5	14.3	0.708
cerebrospinal fluid (CSF) leakage	4	11.4	7	20.0	0.509

P > 0.05 non-significant ****P≤0.05 significant***

Table (8): comparison between study and control group regarding clinical outcomes

Clinical outcome	Study group N=35		Control group N=35		P. value
	No.	%	No.	%	
Prolonged MV	7	20.0	16	45.7	0.041*
Re-intubation	5	14.3	14	40.0	0.0321*
No. of death	2	5.7	10	28.6	0.026*
Length of stay in the ICU					
7-15 days	29	82.9	19	54.3	0.020*
≥ 15days	6	17.1	16	45.7	
Mean ±SD	12.1±3		13.7±2.5		0.028*

P > 0.05 non-significant ****P≤0.05 significant***

Discussion

Critical care nurse at the trauma intensive care units provide a vital role in the care of patients with severe TBI as the only health care professionals by the bedside 24 h a day, 7 days a week. Critical care Nurses' role is multifaceted including monitoring of patient's oxygenation and ventilation, intracranial pressure (ICP), cerebral perfusion pressure (CPP), and neurological assessment, and how nurses fulfill these responsibilities influences patient mortality and outcomes **(Varghese, Chakrabarty, & Menon, 2017).**

Trauma nurses are responsible for essential nursing care such as obtaining vital signs, turning position, provision of hygiene, as well as using a self -inflating bag to assist nurses during the process of endotracheal suctioning. Hence the present study was conducted to determine the effect of implementing standardized designed nursing guidelines on outcomes of severe traumatic brain injury patients.

The current study indicated that 70 patients who were admitted to the trauma intensive care unit at Sohag university hospital starting from May 2019 until the end of October 2019. And diagnosed with sever traumatic brain injury and were equally divided into two groups 35 patients in each one. Our current study indicated that the highest number in each group were aged from 20 to 30 years old and were male with no statically significant difference between groups. This was supported with the study done by J **Damkliang et al. 2015** who reported that among forty-five studied patients with severe TBI 38 were male versus only 7 were female.

Regarding the level of consciousness, in the current study GCS was used to assess patient level of consciousness as it very useful because low GCS scores correlates well with TBI severity **Silva, Souza, Feitosa, & Cavalcante, 2017.** And the current study findings revealed the significant increase in the conscious level in the study group compared to the control group in the 7^{th} and 5^{th} days with statically significant difference between the groups. This agrees with **Sheriff & Hinson, 2015** who reported that the consistency of vital signs assessment is very important where it helps detecting any deterioration or concerns about the patient's condition. Nursing assessment of vital signs and neurological status must be recorded as it is necessary to note trends and for other staff to understand the patient's condition and to revise progress of condition. A number of guidelines for care of patients with head injury recommend assessment of vital signs, GCS and pupils half-hourly.

From the researchers' point of view, these findings is related to the applications of clinical guidelines that concerned with monitoring of level of conscious and increased intracranial pressure which effect on LOC. Such nursing intervention help to maintains ICP < 20 mmHg including elevation of the head of the bed to 30 c, Good neck alignment – head in the neutral position, immobilize the patient's cervical spine and Close temperature regulation.

In relation to hemodynamic parameters, the researcher use part three (Tool one) to assess theses parameters from the day of admission which showed no significant difference in the 1^{st} day between the two group and also the patients in both groups reveled high body temperature. Also current study results noted a significant decrease in the body temperature in study group in subsequent days compared to control group, and a significant improvement in the hemodynamic parameters in study group versus to control group with a statically significant difference in the 7^{th} and 5^{th} day, It may be proposed that the frequency of nursing assessment of vital signs improved as a result of application of standardized nursing guidelines that focused on the importance of adequate oxygenation and ventilation of patients with severe TBI, and the importance of blood pressure monitoring and assessment of respiratory rates.

In relation to occurrence of complications during the study time, the current study results indicated statistically significantly fewer patients with fever in the study group than the control group, which suggests that the implementation of the strategies outlined in the methodology that applied for management of hyperthermia as the use of cooling blankets, ice

packs, and cooled intravascular fluids as recommended in the nursing guidelines parallel national and regional trends in hyperthermia management and decision making by neuroscience nurses help to decrease the temperature in the study group.

The present study agrees with **Abouzeid, et al; 2018** who reported that there were found statistically significantly improved the management of hyperthermia in the intervention group than the control group. This suggests that the implementation of strategies outlined in the clinical pathway were informed by the best available evidence. The use of antipyretic medication, cooling blankets, ice packs and cooled intravascular fluids

Bed sores are serious complications that frequently develop in patients with severe traumatic brain injury. Bed restriction predisposes risk factors to the development of pressure injuries and thromboembolic events in those critically ill patients **Borghardt et al; 2016.** Our current study findings demonstrate a statistically significant difference between study and control group regarding development of bed sores during study period where no patients with pressure ulceration reported in the study group compared to six reported in the control group. The researcher explain that the adherence to standardized pressure ulcer prevention nursing practices outlined in the STBI standardized nursing care guidelines (Changing patient position every 2 hours, maintaining good body alignment, use of air matrices, applying range of motion exercises, massaging the lower limbs and back, sitting the patient out of bed and maintenance of adequate nutrition) contributed to these differences between groups.

This finding was supported with the findings of **Kennerly, et. al. 2015** who indicated that nutrition has a major role in supporting tissue viability and the maintenance of skin integrity, both of which are critical for prevention of bed sores and healing of existing ulcers. The most frequent nursing interventions faced by this problem include: Change in decubitus every 2 hours (except if there are contraindications); Use of emollients in dry skins, such as essential fatty acids for hydration; Use of comfort cushions in bony prominences; Keep skin clean and without moisture, as well as constant exchange of diapers and bed linens that are damp; Skin inspection and risk assessment for the development of pressure injuries on admission and daily assessment of clients, such as the application of scales in order to prevent this problem **Mendonça, Loureiro, Frota, & Souza, 2018.**

According to the findings of the current study the study group who were exposed to TBI standardized nursing care guidelines demonstrated significantly fewer cases of hyperglycemia than control group who exposed to hospital routine care. This is possibly because the strategies outlined in the standardized nursing care guidelines were informed by the best available evidence (2-hourly monitoring of blood glucose levels, and the administration of intensive insulin therapy for serum glucose level greater than 120 mg/dl). This is supported by a prospective observational study of 100 patients hospitalized in a Sarajevo, Bosnia and Herzegovina medical intensive care unit. The study painted out a protocol-directed intensive monitoring and insulin therapy to be effective in the treatment of hyperglycemia in critically ill patients **(Godinjak, et. al. 2015).**

From the researcher point of view the frequent monitoring and controlling of blood glucose level in the study group may correlated with the decrease in infection occurrence compared to control group. This comes in line with **Khajavikhan et al; 2016**, who mention that elevated levels of blood glucose may lead to continued anaerobic metabolism and the production of elevated lactate levels, which in turn can aggravate ischemic insult, increase neuronal injury, and worsen the neurologic outcomes**.** Hyperglycemia is also positively correlated with infection, the need for intensive care, hospital length of stay, and mortality

Moreover, the adherence to best practice in infection control as guided by the nursing care guidelines also may have contributed to fewer patients with infection in the study group. This is supported by **Almeida et al., 2018** who reported that care with the CVC from the identification of signs and symptoms suggestive of bloodstream infection such as

hyperemia, drainage of exudate at the catheter insertion site, fever, malfunction of the device, bradycardia, Oliguria and others, Through the care of the insertion ostium, until the manipulation and maintenance of the catheter. It is noteworthy as one of the main recommendations the hand sanitization with antiseptic solution, preferably alcohol.

Regarding occurrence of acute post-traumatic hydrocephalus, the current study demonstrated a declining in the number of patients developed hydrocephalus in both study and control groups over time, with no statistically significant differences. It is possible that these findings could just reflect normal variations in the rate of improvement of hydrocephalus in the non-randomized samples. **Malaiyandi, & Shutter , 2017** alluded to this point in their study of posttraumatic hydrocephalus in Indian patients aged between 10 and 60 years, reporting that some patients show rapid and complete regression of cognitive impairment, while others show slow improvement over a period of weeks or months. These findings highlight the need for longer-term studies to measure the impact of guidelines on the prognosis of post-traumatic hydrocephalus.

In relation to the occurrence of post traumatic seizures a declined in both groups over the 15-day study period was observed, in favour of the study groups. The absence of a statistically significant difference between groups for most time points may relate to the similar approaches used for seizure prophylaxis/ management in both groups. It agrees with **Cesnik, et. al. 2013,** who mention that the prophylactic use of anti-epileptic drugs (AED) is shown to be effective in controlling early triggered seizures, mainly by blocking or delaying epileptogenic mechanisms established after TBI. Thus, treatment with AED should be initiated as early as possible, because poorly controlled epilepsy produces medical and social complications

The current results demonstrates that a statistically significant difference between study and control group regarding prolonged MV, Re-intubation and number of death during study period. From the researcher point of view the significant difference in the outcomes in both groups is related to the standardized nursing care guidelines that help for stabilization of patients condition and improve their outcomes and educe complications occurrence rate

According to the findings of this study, the study group that exposed to the standardized nursing care guidelines showed a substantial decrease in mean length of ICU stay compared to control group that exposed to routine care, These findings may be attributed to a number of factors such as the shorter duration of mechanical ventilation, earlier mobilization, earlier return of oral intake and the education of hospital healthcare providers in the study group. These findings are consistent with those reported by **Varghese, et al; 2017** said that Potential benefits for patients participating in early rehabilitation in the ICU include improved muscle strength, physical function, and quality of life and reduced hospital and ICU length of stay, duration of mechanical ventilation, and hospital costs.

Conclusion:

According to the results of the current study it can be conclude that, applications of standardized designed nursing guidelines significantly increase hemodynamic stability, decrease in ICU stay and less number of deaths. Also significant improving the patient's outcomes and reduction rate of complications occurrence as fever, bed sores and infection for patients with STBI admitted to the ICU are most important nursing goals.

Recommendations:

Based on the results findings it recommended that:

- Future researches are needed to examine the effect of the standardized nursing guidelines in the different age group such as older adults and child to improve the outcome.
- There are need for future studies to more closely monitoring the management and prognosis of number of complications related to TBI such as seizure, hydrocephalus, and Cerebrospinal fluid leakage.

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