Impact of a Designed Head Trauma Nursing Management Protocol on Critical Care Nurses' Knowledge and Practices at Emergency Hospital Mansoura University

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Abstract: Background: Literature review cited that, Traumatic head injury (THI) is one of the major causes of disability, death and health related costs. The primary goal of nursing management in traumatic head injury is to maintain adequate cerebral tissue perfusion. Nursing and medical management are overlapped, with the special focus on nurses' knowledge and practices. Intensive care unit (ICU) nurses are responsible for the continuous monitoring and maintenance of physiological, psychosocial, injury prevention, and therapeutic environment values associated with THI. Thereby, this study aimed to evaluate the impact of a designed head trauma nursing management protocol on critical care nurses' knowledge and practices at Emergency University Hospital. **Material and methods** a quasi experimental (pre/post-test design) research design was utilized. The study was conducted on convenience sample of 50 nurses who provide direct care for traumatic head injury patients at ICUs at Emergency Hospital Mansoura University. Data were obtained using two main tools; head trauma care knowledge assessment questionnaire with the socio-demographic data sheet, and head trauma care practice observational checklists. The instructional protocol was designed based on an extensive revision of the related, recent literature. The protocol was delivered throughout ten weeks. Each week involved three sessions. Every session lasts about forty to sixty minutes. Nurses were divided into 10 groups, 5 nurses each. **Results** revealed that the mean knowledge and practice scores of nurses are increased immediately after implementation of the protocol with a significant statistical difference. This increased level slightly decreased following two months of protocol implementation. Also, a positive correlation was found between knowledge and practice scores of the study subjects. Therefore, the two stated research hypothesis were supported **Conclusion** intensive care unit nurses were lacking some knowledge and practices regarding head trauma management. The simple educational handout, demontrations and the designed protocol showed a positive impact in improving nurse's knowledge and practices. **The study recommended that** establishing a written updated head trauma nursing management protocol to ensure enough knowledge and safe nursing practice. Moreover, Periodical evaluation should be conducted by the nurse educator to ensure that the standards of knowledge & practices regarding head trauma nursing management are maintained.

1. Introduction

Trauma is defined as a physical injury caused by external forces or violence. Trauma or unintentional injury is the most leading cause of death all over the world Gonzalez & Brunstein (2009). The recent data reported 10729 about 13.2/100000 population by the year 2010 deaths related to trauma in Egypt, primarily from motor crashes vehicle (MVCs). However, every year an estimated 50 million people are injured severely enough to require medical treatment, and the majority of the injuries can be preventable WHO (2010). Trauma is frequently referred to the disease of the young, because the majority of injured persons range in age from 16 to 40 years Sole *et al.,* (2013). An overarching goal in trauma care is prevention. However, the priority when traumatic injuries occur is early and aggressive interventions to save life and limb.

Traumatic head injury (THI) is trauma that leads to injury of the scalp, skull, or brain. These injuries can range from a minor bump on the skull to serious brain injury. Injury, including traumatic brain injury (TBI), It has been major cause of morbidity and mortality worldwide, especially in children and young adults. It has been continuing a difficult problem in intensive care units Sole *et al.,* (2013). Each year, 1.1

million traumatic brain injury occur, resulting in 50,000 immediate deaths and hospitalization of 235,000 individuals. Males are 1.5 times as likely as females to sustain traumatic brain injury.

Survival after THI is dependent on prompt emergency treatment and focused management of primary and secondary injuries Swadron *et al.,* (2012). Initial assessment and management of these patients should follow the Advanced Trauma Life Support algorithm. Neurological examination should focus on the Glasgow Coma Score, pupillary size and reaction, and focal neurology Tsang & Whitfield (2012).

Several studies have reported the impact of implementation of guidelines-based management for THI on patient's treatment and outcome Arabi *et al.,* (2010) .These studies have clearly demonstrated that the implementation of guidelines for the management of severe THI, incorporating recommendations from the guidelines, is associated with substantially better outcomes such as mortality rate, functional outcome scores, length of hospital stay, and costs. However, there is still considerable and wide institutional variation in the care of patients with THI Fakhry *et al.,* (2004), Bullock (2007) .

Intensive care unit (ICU) nurses are responsible for the continuous monitoring and maintenance of physiological values associated with THI. Therefore, nurses as health care team members are the best positioned to detect and prevent secondary brain injury. However, nurses vary in their practice, and little is known about how ICU nurses manage secondary brain injury. Evidence-based guidelines for care of THI patients have been established, but the extent to which these guidelines influence nursing practice in the management of secondary brain injury is not known Brain Trauma Foundation (2007), McNett *et al.,* (2010).

So, Nursing management protocol for THI patients at our institution resulted in significant improvements in morbidity and mortality, ICU and hospital lengths of stay, and hospital charges. Consequently, it is essential that nurses demonstrate that the care they provide is based on good clinical evidence where possible. Thererfore, this study was conducted to design and implement nursing management protocol for THI patients based on their needs.

Significance of the study

Trauma is the commonest cause of death in people aged under 40 years in our society and the global "burden of trauma" is set to increase over the next 20 years [12]. Provision of such knowledge and practices related to the head trauma nursing management would be beneficial for nurses in different ways. It could have a direct positive reflection upon the quality of patient care, and could support the important role of the nurse related to head trauma nursing management. Also, it might generate an attention and motivation for further researches into this area. Which improved patient's outcomes and shorten patient's length of ICU stay. Therefore, the current study was carried out to evaluate the impact of a designed head trauma nursing management protocol on critical care nurses' knowledge and practices at Emergency Hospital- Mansoura University.

Aim of the study:

The aim of this study was to evaluate the impact of a designed head trauma nursing management protocol on critical care nurses' knowledge and practices at Emergency Hospital- Mansoura University through three folds aims: 1- assess nurses' knowledge and practices regarding head trauma nursing management protocol in ICUs. 2- Design head trauma nursing management protocol based on the actual assessment of nurses' knowledge and performance in ICUs. 3- Implement and evaluate the effect of head trauma nursing management protocol on nurses' knowledge and practices levels.

Research hypothesis:

Nurses' knowledge will be improved after implementing of head trauma nursing management protocol. Nurses' practices regarding head trauma nursing management will be improved after implementing of the protocol.

2. Material and Methods
Materials:-
Research Design:

A quasi experimental research was utilized in this study (pre-test/post-test design).

Setting:

This study was conducted in the Intensive Care Units (ICUs) of Emergency Hospital at Mansoura University. All ICUs provide services for traumatized patients transferred from emergency room, operating room, and hospital wards. The nurse patient ratio in this units is 1:2 in all shifts (morning, afternoon and night shifts).

Subjects:

A convenience sample of 50 female nurses who had more than two years of working experience in the ICUs and involved in providing direct care for traumatic head injury patients in previously mentioned setting. The nurses that were participate voluntarily and gave consent were recruited in the study.

Tools:

Data were collected using two tools in order to achieve the aim of the study. Two tools were developed by the researcher after reviewing the related literature.

Tool one: Nurses' Head Trauma Care Knowledge Questionnaire. This tool was assessed nurses' knowledge about head trauma nursing management before and after conducting the protocol. This tool covering twelve aspects of nurses' knowledge regarding head trauma nursing management. Seventy seven questions were included in this tool in a form of true/false questions, and multiple choice questions. Additionally, tool I was initiated to collect socio-demographic characteristics of nurses such as age, educational level, job title, years of working experience in the ICUs.

Tool two: Nurses' Head Trauma Care Practice Checklists. This tool was assessed nurses' practices regarding head trauma nursing management in the clinical field. This tool covering eleven different aspects composed of 21 checklists were included 225 steps.

Scoring system of the tools:

Nurses' head trauma care knowledge questionnaire: each correct answer had (1) mark and incorrect answer had (zero). The scores obtained for each set of questions was summed up to get the total scores 77 for nurses' knowledge. The questions were included (22) multiple- choice and (55) true and false questions. Those who got scores equal to or more than 80% were considered satisfactory knowledge level, while scores less than 80% were considered unsatisfactory knowledge level.

Nurses' Head Trauma Care Practice Checklists: each practical item scored on the bases of "Done correct", "Done incorrect", "Not done" and "Not applicable". Done correct scored (1 point). But done incorrect scored (zero), not done scored (zero), and not applicable were omitted from the calculation. The scores obtained for each step was summed up to get the total maximum score of (225) for nurses' practices. Total scoring was classified into two categories as follows: scores equal to or more than 80% were considered satisfactory practice level, while scores less than 80% were considered unsatisfactory practice level.

Method:
Administrative design:

The present study was approved by the Scientific Research Ethics Committee of the Faculty of Nursing Mansoura University .Approval permission to conduct

the study was obtained from the hospital administrative personnel based on the official letter after explanation the aim and nature of the study. Informed consents were obtained from the nurses before the beginning of the study after explanation of the purpose and nature of the study.

Ethical consideration:

Ethical consideration approval was obtained from Scientific Research Ethics Committee of the Faculty of Nursing–Mansoura University. The researcher explained to the participants that there was no risk or hazards related to the study. Privacy and confidentiality of the collected data were assured. Each participant was informed that his participation in the study was voluntary and they could withdraw at any stage without any responsibility.

Operational design:

This design involved the preparatory phase, pilot study, and fieldwork.

Preparation phase

This study involved two tools; tool I "Nurses' head trauma care knowledge questionnaire "and tool II "Nurses' head trauma care practice checklists ".

The researcher explained to nurses the aim and nature of the study and the time needed to answer the knowledge tool and collecting them. The study tools were developed by the researcher after reviewing of the recent literature and seeking experts' advice. Tool I was translated into simple Arabic language by the researcher and vise verse. Tool II was developed by the researcher in a form of practical checklists to observe nurses practice. Tools were tested for content validity by 5 experts in the field of Critical Care & Emergency Nursing and Critical Care Medicine from the Faculties of **Nursing and Medicine.**

The researcher conducted the necessary modifications for the items, both in language and linguistic structures, to become more easy, simple and clear to be understood by the participants. The overall reliability of the tools (I & II) were measured using alpha Cronbach's test and the values of alpha Cronbach's were (0.953 & 0.977) respectively. The study tools were used three times for evaluation (pre-protocol, immediately post protocol implementation, and two months post protocol implementation).

The researcher designed head trauma nursing management protocol based on the nurses' educational needs using different strategies. In addition to the recent medical & nursing textbooks and the related literature to review core components of head trauma nursing management. The protocol consisted of two main parts theoretical content and practical skills for nurses. The protocol was tested for validity by 5 experts in the academic field from the Faculties of

Nursing, Education, and Medicine. Head nurses of ICUs were helped the researcher in data collection after explaining to them the data collection process and what exactly their job was in the pre- test, immediately post test and 2 months following up.

Pilot study

A pilot study was carried out before starting data collection on 10% of studied nurses' sample (5 out of 50) who were excluded from the study subjects to test clarity, feasibility, objectivity and consistency of the tools and to detect ambiguity in the study tools. Based on the findings of the pilot study, necessary modifications were done accordingly. Some items have been added and others were rephrased to be clear and understood, like rewriting statements and questions in more understandable way.

Fieldwork

Pre protocol assessment phase

During this phase, the researcher assessed nurses' knowledge regarding head trauma management and collect socio-demographic data, using tool I. After that, each nurse was given a code number to be used as an identifier throughout the protocol phases. The researcher explained head trauma care knowledge questionnaire, read some questions, clarified the ambiguity, and invited for any questions related to the interview schedule. Each interview lasted for 30-35 minutes, then the researcher collected the sheets and checked any unanswered questions.

Assessment of clinical practices provided by nurses to traumatic head injury patients and their families were evaluated using tool II to determine level of achievement of care practice. Direct observation was conducted by the researcher to appraise nurses' practical level; each nurse was observed by the researcher throughout the different shifts, on an average 6 hours a day- 3 days a week for one month using tool II, the researcher was filling out the observational checklists and was documented nurses' practices related to head trauma management.

Protocol implementation phase

Head trauma nursing management protocol was delivered throughout ten weeks, each week involved three sessions, and every session took about forty to sixty minutes, The total number of groups were 10 groups (for each 5 nurses). The session timing was between morning and afternoon shift, or throughout morning shift after giving the routine care to the critically ill patients. Theoretical sessions focused on: definition of head trauma, mechanism of injury, types, severity, and complications of traumatic head injury, assessment of traumatic head injury patients, and nursing management strategies for their patients.

Practical session focused on the following items: assessment, how to perform primary & secondary

survey, and demonstration of nursing management for traumatic head injury patients. divided as follows: each week involved three sessions (sixty minutes for each) in small groups about 5 nurses discussing with them in their working area to facilitate the meeting. Each session included displaying simple training videos for practical skills related to head trauma nursing management using audiovisual aids. Each nurse received the Arabic instructional booklet " head trauma nursing management protocol " to attract her attention, motivate and support her learning and practicing.

Protocol evaluation phase:

Pre test evaluation: Pre test assessment was carried out for all participants before conducting the protocol, it was including head trauma knowledge assessment questionnaire and observational checklists filling (1st evaluation).

Immediate post test evaluation: Post test evaluation was conducted immediately after the implementation of the protocol (theoretical and practical part) on the sample of nurses using the same tools (2nd evaluation).

Follow up evaluation: Re-evaluation and follow up data collection was conducted again after two months from the conduction of the protocol using the same tools. (follow up).

Statistical analysis

Data entry and analysis was performed using the Statistical Package for Social Sciences version 16 (SPSS). Descriptive statistics, Correlation coefficient, Arithmetic mean, Standard deviation(SD), Chi square ($\chi 2$), and Paired sample t- tests were used in the analysis. A significance level was considered at P value = 0.05.

3. Results:

This part represents the current study findings concerning the impact of a designed head trauma nursing management protocol on CCNs' knowledge and practices at Emergency hospital, Mansoura University. Findings of the present study revealed that 36% of the study subjects were in the age group less than 30 years old, while two third (64%) of them are in the age group of 30 years old and more. Their mean age is 32.22 ± 5.29 years. In relation to the level of education, it was noted that only (6%) of the study subjects were technical nursing institute, while the majority (94%) of them have diploma degree. As regards to years of experience, it was found that, more than half (56%) of the study subjects had 15 or more years of experience in the CCUs, while 44% had less than 15 years of experience in the CCU. The mean years of experience in the CCUs were 13.68±5.51.

Table (1) shows the subtotal mean knowledge scores of study group subjects related to management of THI patients all through the study periods. There are highly statistical significant differences in relation to nurses' knowledge regarding all management items between pre and immediately post protocol implementation, and between pre and two months following implementation with P value 0.001** for all. While there is no statistical significant difference concerning fluid & electrolyte, skin, eye, and psychosocial management between immediately post and two months following intervention. This can be owing to the first hypothesis that, nurses' knowledge will be improved after implementing of head trauma nursing management protocol.

Table (2) highlights the subtotal mean practice scores of study group subjects regarding respiratory, cardiovascular, and neurological management all through the 3 assessments. This table documents that a general improvement in practice scores of nurses related to respiratory, cardiovascular, and neurological management in all items of the study during different assessment periods as compared to pre-protocol mean scores. However, a slight decline of nurses' practice scores occurred following two months of protocol implementation. A statistical significant differences were observed at p-values of 0.001** for all. On the other hand, there were no statistical significant differences in relation to nurses' practice regarding CVP measurement only between immediately post and two months following protocol implementation This findings can be attributed to the hypothesis that, nurses' practices regarding head trauma nursing management will be improved after implementing of the protocol.

Table (3), figure (1) and figure (2): highlights that mean scores of nurses' knowledge before the protocol was (41.50). Immediately after the protocol implementation the mean was improved to (70.96). Two months later, the nurses' mean knowledge score was (66.26). So, it can be noted that, there was a highly statistical significant difference with P value 0.001** through all three assessment periods. It is revealed from this table that mean scores of nurses' practice before the protocol was (126.14). Immediately post the protocol implementation the nurses' mean practice scores was improved to (200.20). Two months later, the nurses' mean practice scores was (184.02). It can be noted that, there was a highly statistical significant difference P value 0.001** through all three assessment periods.

Table (4): according to the table, the highest level of knowledge regarding head trauma nursing management were found (71.75 & 67.53 respectively) among nurses aged 30 years and more in immediately post and two months following protocol application. All findings was statistically significant with*P value 0.02 & 0.01 respectively through all three assessment. Concerning the years of experience and the nurses' knowledge scores, it was clear from this table that high mean knowledge scores (44.13) of studied nurses' who had years of experience 15 years and more. While, immediately post the protocol implementation all of them had mean knowledge (72.04 & 68.69 respectively). The difference was statistically significant in post protocol implementation. On the other hand, there is no statistical significant difference all through three assessments regarding educational level and working units.

Table (5): devoted to describe the relation findings between socio-demographic data of the studied subjects (age, level of education, years of experience, and working units) and nurses' practice regarding head trauma nursing management in the critical care units at Emergency university hospital From this table, we can notice that there was a statistical significant difference in mean practice scores regarding age of 30 years and more (P=0.002**) among pre- test, immediately post, and two months following protocol implementation. Concerning the years of experience and the nurses' practice scores, it was clear from this table that high mean practice scores (128.57) of studied nurses' who had years of experience15 years and more. While, immediately post and two months following protocol implementation all of them had mean practice scores (203.14 &190.14) respectively. So, there was statistically significant difference in immediately post and two months following protocol implementation (P =0.013 & 0.043*) respectively. Additionally, there was no statistical significant difference in mean total practice scores of nurses all through three assessment periods regarding educational level and working units.

Figure (3): present correlation between total scores of nurses' knowledge and their total practice scores all through the study periods. From this table, it can be concluded that there is a statistical significant and strong positive directional correlation between knowledge scores and total practice scores of the study subjects in pre-test, immediately post, and 2 months following the protocol implementation. It clear that the improvement of nurses' knowledge were associated with improves in their practices.

Table (1):- The subtotal mean knowledge scores of study group subjects related to management of traumatic head injury patients all through the study periods.

Knowledge	Number of items	Pre Mean ±SD	Immediately Post Mean ±SD	After 2m Mean ±SD	Significance test		
					P1	P2	P3
Airway management	5	2.200±1.049	4.480±0.762	4.160±0.955	t=12.611 P=0.001*	t=9.804 P=0.001*	t=3.466 P=0.001*
Respiratory management	9	4.580±2.129	8.500±0.677	7.700±1.606	t=13.595 P=0.001*	t=8.170 P=0.001*	t=3.300 P= 0.002*
Cardiovascular management	4	1.900±0.994	3.540±0.676	3.040±0.807	t=10.894 P=0.001*	t=-6.743 P=0.001*	t=3.629 P=0.001*
Neurological management	10	4.000±1.414	9.040±0.946	8.360±1.005	t=20.795 P=0.001*	t=-20.622 P=0.001*	t=4.116 P=0.001*
Nutritional management	4	2.200±0.808	4.560±0.704	4.280±0.948	t=14.216 P=0.001*	t=11.255 P=0.001*	t=2.714 P=0.009*
Fluid & electrolyte management	3	1.700±0.614	2.780±0.418	2.720±0.572	t=9.812 P=0.001*	t=7.887 P=0.001*	t=.685 P=0.497
Maintenance body temperature	4	2.140±0.880	3.740±0.486	3.500±0.735	t=12.522 P=0.001*	t=10.447 P=0.001*	t=2.129 P=0.038*
Control of environmental stressors	4	2.560±0.836	3.840±0.370	3.660±0.626	t=10.008 P=0.001*	t=7.662 P=0.001*	t=02.436 P=0.019*
Mobility and activity management	2	1.440±0.540	1.920±0.274	1.840±0.370	t=5.527 P=0.001*	t=4.427 P=0.001*	t=2.064 P=0.044*
Skin management	2	1.520±0.646	2.000±0.000	1.980±0.141	t=5.250 P=0.001*	t=4.809 P=0.001*	t=1.000 P=0.322
Eye management	3	1.800±0.947	2.960±0.197	2.940±0.239	t=8.586 P=0.001*	t=8.143 P=0.001*	t=.573 P=0.569
psychosocial management	1	0.720±0.453	1.000±0.000	0.980±0.141	t=4.365 P=0.001*	t= 3.775 P=0.001*	t=1 P=0.322

(**)Highly statistical significant difference (P ≤ 0.001); (*) statistically significant at (p ≤0.05)
Paired- sample t-test (P1): comparing pre and post protocol implementation
Paired- sample t-test (P2): comparing pre and immediately post (2 months) following implementation
Paired- sample t-test (P3): comparing post and following (2 months) protocol implementation

Table (2):-The subtotal mean practice scores of study group subjects regarding respiratory, cardiovascular, neurological management all through the three assessments.

Practice	Number of items	Pre Mean ±SD	Immediately Post Mean ±SD	After 2m Mean ±SD	Significance test t-test (p) value		
					P1	P2	P3
Respiratory management							
Tracheal Suctioning	26	11.30±2.39	21.94±1.67	19.68±2.17	t= 24.101 P=0.001*	t= 15.770 P=0.001*	t= 7.350 P=0.001*
Oxygen Therapy	12	8.06±1.34	11.32±.913	10.32±1.57	t= 13.192 P=0.001*	t= 7.878 P=0.001*	t= 5.337 P=0.001*
SaO2 Monitoring	10	5.34±1.04	8.96±1.49	8.42±1.35	t= 12.313 P=0.001*	t=11.128 P=0.001*	t=4.312 P=0.001*
Arterial Puncture	21	11.44±2.278	19.42±1.26	17.82±1.67	t= 21.024 P=0.001*	t= 14.070 P=0.001*	t= 6.424 P=0.001*
Cardiovascular management							
Cardiac Monitoring	13	6.74±1.35	11.14±1.27	10.54±1.16	t=20.579 P=0.001*	t=17.934 P=0.001*	t=5.250 P=0.001*
CVP Measurement	14	9.14±1.67	11.68±1.05	11.48±1.77	t= 8.71 P=0.001*	t=5.948 P=0.001*	t=1.021 P=0.312
DVT Prophylaxis	6	3.06±1.11	4.98±.820	4.40±.947	t= 8.545 P=0.001*	t= 5.835 P=0.001*	t= 3.289 P=0.002*
Neurological management	10	3.54±1.35	8.36±0.942	7.26±1.79	t=24.689 P=0.001*	t=10.963 P=0.001*	t=3.70 P=0.001*

(*) statistically significant at (p ≤0.05); (**) Highly statistical significant difference (P ≤ 0.001)
Paired- sample t-test (P[1]): comparing pre and immediately post protocol implementation
Paired- sample t-test (P[2]): comparing pre and following (2 months) protocol implementation
Paired- sample t-test (P[3]): comparing post and following (2 months) protocol implementation

Table (3): Total mean scores of nurses' knowledge and practice all through the study periods

Item	pre Mean ±SD	Immediately Post Mean ±SD	After 2m Mean ±SD	P1	P2	P3
Total knowledge scores	41.50±6.67	70.96±3.16	66.26±6.20	t=29.900 0.001**	t=19.622 0.001**	t=7.778 0.001**
Total Practice score	126.14±11.44	200.20±7.25	184.02±18.34	t= 33.947 P=0.001**	t= 16.891 P=0.001**	t= 8.120 P=0.001**

Total knowledge score (77); Total Practice score (225);   P1 comparison between pre- post
P2 comparison between pre- following 2m;   P3 comparison between post- following 2m

Table (4): Relation between nurses' knowledge scores and demographic data

Item	pre Mean ±SD	P1	Immediately Post Mean ±SD	P2	After 2m Mean ±SD	P3
Age						
<30y	38.66± 5.79	t= 2.353	69.55± 3.66	t=- 2.476	63.94± 7.27	t=2.012
≥30y	43.09± 6.68	P= 0.023*	71.75± 2.57	P=0 .017*	67.53± 5.25	P=0.05*
Education						
Technical institute of nursing	35.66± 7.23	t= 1.585	68.66± 5.51	t= 1.305	61.66± 9.07	t=1.32
Diploma	41.87± 6.54	P=0 .119	71.11± 2.99	P=0.198	66.53± 6.03	P=0.193
Years of experience						
<15y	39.25± 6.47	t= 2.737	70.04±3.53	t= 2.336	64.15±7.12	t=2.735
≥15y	44.13±6.017	P=0 .009*	72.04±2.28	P=0 .024*	68.69±3.87	P=0.009*
Unit						
ICU1	42±6.39	F= .201 P=0.818	70.68±3.13	F= .952 P=0.393	66±6.54	F=1.033 P=0 .364
ICU2	40.61±7.95		70.69±3.68		65.07±6.46	
ICU3	41.12±6.08		72.37±2.19		69±4.24	

P1 comparison between pre-score in each category of demographic data
P2 comparison between post-score in each category of demographic data
P3 comparison between 2m following -score in each category of demographic data
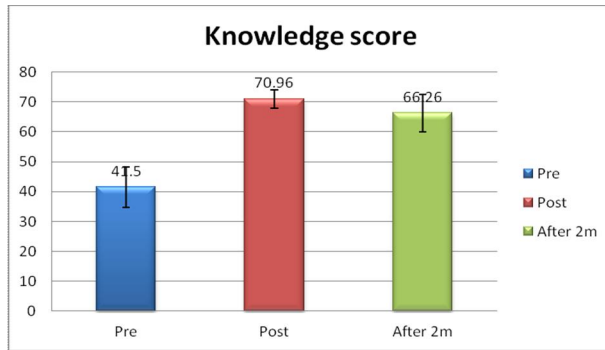
Table (5): Relation between nurses' practice scores and demographic data

| Item	Pre Mean ±SD	P1	Post Mean ±SD	P2	After 2m Mean ±SD	P3
Age						
<30y	122.72±8.77	t=1.609	196.11±6.88	t=3.271	175.39±18.48	t=2.643
≥30y	128.06±12.41	P=0.114	202.50±6.48	P=0.002*	188.88±16.63	P=0.011*
Education						
Technical institute of nursing	170±8.66	t=1.442	198.67±4.93	t=.374	176.67±21.12	t=.713
Diploma	126.72±11.42	P=0.156	200.3±7.41	P=0.710	184.49±18.31	P=0.480
Years of experience						
<15y	124.07±10.79	t=-1.396	198.07±7.31	t=2.577	179.59±18.17	t=2.075
≥15y	128.57±11.93	P=0.169	203.14±6.19	P=0.013*	190.14±17.14	P=0.043*
Unit						
ICU1	1.26.86±10.32	F=2.549 P=0.089	198.81±6.69	F=2.111 P=0.132	176.1±16.22	F=3.004 P=0.059
ICU2	129.31±13.06		201.45±4.56		190.54±17.61	
ICU3	118.38±10.41		204.57±11.32		191.44±21.75	

P1 comparison between pre-score in each category of demographic data
P2 comparison between post-score in each category of demographic data
P3 comparison between 2m following -score in each category of demographic data
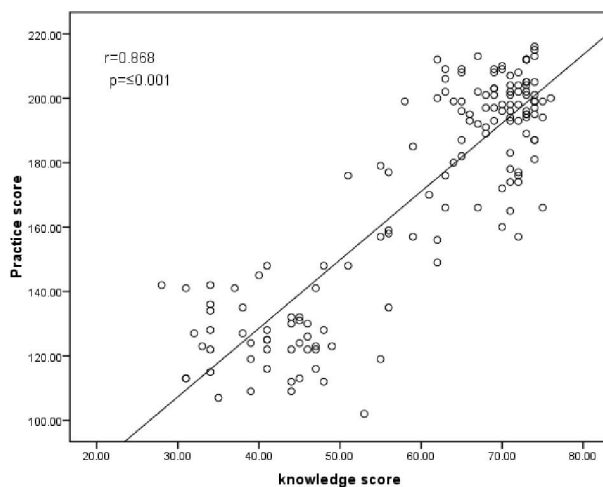
Figure (1): Distribution of nurses' regarding their total knowledge score
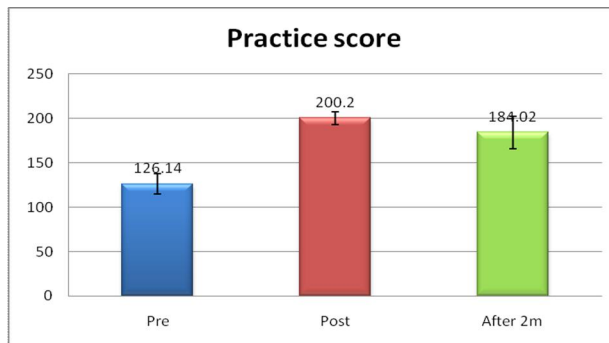
Figure (2): Distribution of nurses' regarding their total practice scores

Figure (3): Correlation between total scores of nurses' knowledge and their total practice scores all through the study periods.

Figure (3): Scatter diagram for correlation between knowledge and practice scores

4. Discussion

Research indicates that traumatic head injury (THI) is one of the major causes of disability, death and health related cost to our society. In high income countries it is the leading cause of mortality and disability among young people and globally, the incidence of THI is increasing sharply. This is mainly due to increasing use of motor vehicles in middle and low income countries. Additionally, aggressive treatment is often deployed at the ICUs without thorough assessment and consideration of the patient's wishes and with potentially negative impacts for the family Juul *et al.,* (2009), Barleycorn (2013).

Head trauma nursing management protocol aims to improve quality of life for THI patients. Continuity of care, continuous monitoring of THI patients are the cornerstone of protocol process. Additionally, maintenance of physiological values associated with secondary brain injury such as blood pressure, ICP, CPP, oxygen saturation, body temperature, and addressing psychosocial needs are the main parameters that must be improved for THI patients. Through theses process and parameters the protocol may reduce utilization of ICUs burdensome, and costly interventions McNett *et al.,* (2010).

Moreover, nursing care for THI patients is more necessary in the ICUs that affects on THI patients outcome. Therefore, ever more important that trained nurses to be equipped with the appropriate knowledge and support to meet the unique needs of each patient competently Carter & Cumming (2014). The researcher observed that the nurses had lack of knowledge regarding nursing care of THI patients. So, appropriate preparation of nurses is a vital component in providing quality care to THI patients and their families Choudhary (2009).

The present study findings are discussed in reference to the aims and research hypotheses of the study. Regarding to subjects socio-demographic characteristics, all nurses were females and two thirds of the studied subjects, had 30 years old and more with the mean age 32.22 ± 5.29. regarding their years of experience, more than half of the studied subjects had 15 or more years of experience. Finally, the majority of the studied subjects were having diploma degree. It may be due to the majority of Egyptian nurses were graduate of secondary nursing schools Gaumer *et al.,* (2008).

This socio-demographic findings were consistent with Refai (2012[)] in an published doctorate thesis entitled, a study to evaluate the impact of a designed teaching protocol about advanced cardiac life support on critical care nurses' knowledge and practices at Benha University Hospital, Cairo, Egypt, the study revealed that the majority of nurses were in the age group (25–30 years old). Also, the majority of studied nurses had secondary diploma degree. Finally, study findings indicated that the most of studied nurses units had not trained.

Impact of the protocol on nurses' knowledge

regarding head trauma nursing management at Emergency University Hospital.

To fulfill the aim of this study, two hypothesis were formulated and tested. Findings of this study supported the two started hypothesis. For the first hypothesis in which the knowledge scores of the studied subjects related to head trauma nursing management at ICUs post a designed protocol improved significantly especially in the immediate post test.

An obvious improvement in nurses knowledge scores were documented post protocol implementation as compared to their pre protocol with highly significant statistically differences. This improvement might be related to the fact that majority of them are secondary school nurse, not receiving any previous training about head trauma nursing management. In addition to, the highly expressed need of nurses to learn more about head trauma nursing management.

This finding agrees with Taha (2004) who was studying the impact of a training program provided for nurses working with the comatosed patients in the critical care units, Zagazig university hospitals. His sample constitutes 36 nurses working in I.C.U, neurological and emergency medical units. The study reports an improvement in nurses knowledge scores after implementation of the program with a highly significant statistical differences.

In the current study, it was obvious that nurses' had inadequate knowledge about assessment and management of THI patients at ICUs. Considering; it was found that none of the nurse had adequate knowledge about head trauma nursing management in pre protocol. This revealed that nurses' knowledge about head trauma nursing management in the ICUs was low and not satisfactory, especially in subjects related to assessment and management of neurological system. From my opinion, the reduction of nurses' knowledge may be due to lack of updating knowledge and overloaded area of working.

This result was consistent with the findings of the assessment done by Choudhary (2009) for 40 nurses are working in the neuro- surgery I.C.U. in a selected hospital at Bangalore and have experience minimum 5 years. He found that level of knowledge of staff nurses were relatively low. Further, study was conducted by Said (2009) to assess nurses' knowledge and skills for patients with head injury at Benha University Hospital, Cairo, Egypt. The study reflected that nurses had poor knowledge about concept of head injury; 57% and 38% of nurses had poor knowledge about structure of the head and incidence respectively. On the same side Said (2009) reported that the majority of nurses had poor knowledge regarding the care of patients with head injury.

The demographic profiles of the studied subjects

mentioned that the majority of them were diploma holders. The students are exposed to critical care nursing branch, but they are not prepared or knowledgeable enough to provide high level of care. Meherali et al., (2011) reported that the reason of low level of nurses' knowledge could be the lack of integration of learned concepts in the clinical setting. This problem of theory practice gap or lack of clinical integration is not a new problem. Thus, nurses need to be prepared specifically according to the type of patients they will be required to care.

From the analysis of mean scores of nurses' knowledge about head trauma nursing management, the researcher found a highly statistical significant difference in total and subtotal scores of knowledge among pre- protocol, immediately post and two months following protocol implementation. This improvement means that the protocol had a positive impact on nurses' knowledge about head trauma nursing management in the intensive care units. From the statistical analysis, it was clear that the significant was between pre protocol and the immediately post protocol knowledge scores.

In a study carried out in the USA that aimed to evaluate the effect of an educational intervention on nursing staff knowledge, confidence, and practice in the care of children with mild traumatic brain injury. A 25 trauma core nurses were assessed and then reassessed 1 month post intervention. The results revealed that mean scores of nurses' knowledge before completing the educational module was 33.6%; but after the educational program, the mean scores increased to become 95% and79.2% respectively Cook et al., (2013). This in the same line of the current study findings.

Various authors and experts have described certain principles of knowledge retention. A principle being identified that knowledge retention generally falls to 75–89% of its original level after a relatively short 2–3 weeks time Bruno et al., (2007). On the other hand, findings of the current study reported a gradual decrement in nurses knowledge by time over two months post protocol implementation. In this respect Mansour (2014) emphasized the result reporting a decline with limited value in nurses knowledge level after 2 months period, than immediately after the program implementation.

In contradiction to this study Shahin et al., (2012) who reported that there was no significant difference between mean post test scores of knowledge and 1 month or 2 months follow up mean scores. Improvements of nurses' knowledge about enteral nutrition was sustainable and maintained for two months.

Impact of the protocol on nurses' practices regarding head trauma nursing management at

Emergency University Hospital.

This part is specified to verify the second research hypothesis which assumed that "nurses' practices regarding head trauma nursing management will be improved after implementing of the protocol".

From the analysis of mean scores of study subjects practices regarding head trauma nursing management, the researcher found a highly statistical significant difference in total and subtotal of practice among pre- protocol, immediately post, and two months following the protocol implementation. This indicates a positive impact of the protocol to improve nurses' practices regarding head trauma nursing management.

The researcher used statistical tests to identify the direction of differences in practice scores, it was clear that the significant difference was between the pre and all post protocol scores. The improvement of nurses' practices as a result of implementing an training protocol was well recognized and supported by many researchers around the world.

Moreover, the current study revealed unsatisfactory nursing practices regarding head trauma nursing management in the intended ICUs. This may be due to shortage of nursing staff to provide high quality nursing care for traumatic head injury patients. The ratio of nurses to patients in the intended ICUs was 1:2 for all three shifts. The nursing practice was based primarily on individual past experience and tradition, with senior nurses teaching procedures to the junior nurses. Evidence-based nursing practice was not the standard for care. In addition to absence of training courses, or workshops regarding head trauma nursing management.

In a comparative study conducted at the Intensive Care Unit at Tanta Emergency Hospital by Ghoneim *et al.,* (2012), the study aimed to evaluate the impact of implementing nursing care protocol on moderate head injured patient's outcome, the results indicates that the implementing nursing care protocol for moderate head injured patients associated with polytrauma had best effect on minimize the incidence of all systemic complications, decrease morbidity as well as mortality rate.

In another study done by Ali *et al.,* (2010), the aim to develop, implement and evaluate an educational training program for newly graduate nursery school teachers about first aid of some emergency situations occurring to preschooler. The results revealed that highly significant improvement of practice of the studied group in the post test in comparison to pre test practice increased, on the average, from 0-10% to 80-95% in first aid of wound, fractures, epileptic convulsions, fainting, epistaxis, suffocation and burn.

In accordance with that, Refaey (2012)

conducted study to evaluate the Impact of a designed teaching protocol about advanced cardiac life support (ACLS) on critical care nurse's knowledge and practices at Benha University Hospital, Cairo, Egypt. The design of the study was pre-test/post-test. ACLS practices (cardiopulmonary resuscitation, defibrillation, emergency medication, ECG monitor, oxygenation, suctioning, ETT intubation, and CVP) before and after the deigned teaching protocol was compared by guided observational checklist. From these observations, ACLS compliance increased significantly at *p*-values of <0.005 after conducting the teaching protocol on ACLS. However, a slight declinment occurred after three months of protocol implementation.

Nursing practice is increasingly influenced by evidence-based standards, and nurses are expected to be knowledgeable about research findings and clinical guidelines affecting the nurses' area of clinical expertise. However, marked gaps still remain between best evidence and nursing practice. Ludwick *et al.* (2010) reported that only 27% of nurses were aware of evidence based guidelines for managing physiological parameters in traumatic brain injury patients. Further, a recent survey of 413 trauma centers in the United States indicated that 66% of trauma centers are compliant with brain trauma foundation guideline Hesdorffer & Ghajar (2008). The finding that nurses in our study were not aware of these guidelines therefore indicates that ICU nurses still lack knowledge and practices of evidence-based guidelines for prevention of secondary brain injury in traumatic head injury patients.

Mock (2004) stated that health professionals at all levels should have the skills to deal with trauma. There are national and local courses that nurses can attend; however, Tippett (2004) found that three months after attending the advanced trauma nursing course, emergency nurses' knowledge was not statistically significant from pre-course levels, suggesting skill retention is poor. This confirmed by Barker's (2003) who viewed that training should not finish on completion of the course but that ongoing training in practice is required.

The correlation between nurses' total knowledge score and total practice score.

Findings of the present study reported that there is a positive correlation between nurses knowledge and practice. This agree with Shahin *et al.,* (2012); Mohammed & Taha (2014) who stated that a highly statistical significant correlation between participants' scores of knowledge and practice in pre-program, post program, 1 month and 2 months following the instructional program. This strong correlation between nurses' knowledge and practice is highly expectable; however, the effective establishment of head trauma

management is often hindered by lack of knowledge, basic knowledge about head trauma management is essential for nursing practice.

This result was congruent with a recent study which was about " mild traumatic brain injury: a Survey of perceived knowledge and learning preferences of Military and Civilian nurses ". The study found that head trauma management are directly influenced by nurses. Therefore, CCNs should be provided with the knowledge, skills, and abilities to care for this important segment of the neuroscience patient population to achieve the best practice and optimal outcomes for traumatic head injury patients Watts *et al.,* (2011).

Conclusion

The findings of this study show that there is lack in nurses' knowledge and practices regarding head trauma management in the intensive care units. There was a lack of educational materials, policies and protocol about head trauma nursing management in the intensive care units. Therefore it was imperative to establish a written updated protocol of head trauma management to ensure enough knowledge and safe nursing practice.

Recommendations

Based on the results of the present study the following recommendations are suggested:-

1. Designing an educational handout about head trauma nursing management must be provided to nurses to be used as a reference guide in their practice.

2. Head trauma nursing management protocol could be applied in clinical practice as a routine of unit care.

3. Creating head trauma nursing management algorithm to be applied in clinical practice.

4. Improve and update nurses knowledge and skills about head trauma nursing management through attending national and international conferences and workshops.

5. Developing system of periodical nurses evaluation to determine strategies for updating their knowledge and enhancing their practice.

Further Research:

▪ Similar study is recommended to include large sample size in other hospitals which provide care for traumatic head injury patients to confirm these findings .

▪ More research is needed to evaluate the effectiveness of early intensive therapy intervention on functional outcomes in traumatic head injury during the acute hospitalization.

▪ Further research is recommended to evaluate which teaching method and curriculum

content are most effective to educate nurses caring for traumatic head injury patients and to identify barriers to incorporating this knowledge in practice.

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