

Effect of Instructional Guidelines about Coma and Pediatric Glasgow Coma Scale on Knowledge and Skills of Pediatric Intensive Care Nurses

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Abstract: Coma is a state of prolonged unconsciousness in which the patient cannot be aroused even with painful stimuli. Coma in children is categorized into traumatic and non-traumatic (NTC). A proper neurological assessment using Pediatric Glasgow Coma Scale (PGCS) is the essential part of nursing care. Aims of the study were: to assess knowledge of PICUs nurses about coma and PGCS, to assess skills of PICUs' nurses about coma and PGCS and to assess effect of instructional guidelines about coma and PGCS on knowledge and skills of nurses. Research design a quasi-experimental research design was utilized. Setting: the current study was conducted in PICUs of 2 of Educational Pediatric Hospitals, Cairo University. Sample: a convenient sample of 50 PICUs nurses and a convenient sample of 50 preschool children with NTC were included. Tools: there were 3 tools utilized which were: 1- a structured socio-demographic questionnaire for: a- PICUs nurses and b- preschool children in PICUs. 2- a structured nurses' knowledge questionnaires. 3- An observational checklist on PGCS. Results: results of the current study revealed that the mean age of children was 3.780 ± 0.7637 years; the mean age of nurses was 23.12 ± 2.855 years. The present study indicated that nurses' knowledge about coma and PGCS in pretest was unsatisfactory but their knowledge in posttest improved after provision of instructional guidelines and there was a statistically significant difference between mean scores of nurses' knowledge in pretest and posttest. There was a statistically significant difference between mean scores of nurses' skills before and after application of instructional guidelines about coma and PGCS. *Conclusion:* There was a positive effect of instructional guidelines in improving knowledge and skills of PICUs nurses regarding coma and PGCS and achieved aims of the study. Recommendations: the current study recommended that PICUs should provide training courses for nurses about coma and application of PGCS and adequate supervision and follow up should be available by head nurses in PICUs for staff nurses during assessment of coma and application of PGCS.

Key words: Children • Pediatric Coma • PGCS • Nurses • PICU

INTRODUCTION

Consciousness is the ability to respond to sensory stimuli and have subjective experiences. Unconsciousness is inability to respond to sensory stimuli and have subjective experiences. Coma is defined as a state of prolonged unconsciousness in which the patient cannot be aroused even with painful stimuli [1]. Coma is an alteration of consciousness that represents the final pathway of various pathophysiological processes in disease states (trauma, neoplastic, seizures) ultimately leading to derangement in cerebral function manifested as decreased arousal and

awareness [2]. Coma in children is categorized into traumatic and non-traumatic (NTC) categories. NTC usually happens greater in younger than in older children [3].

NTC in childhood is an important pediatric emergency and accounts for high morbidity and mortality in pediatric age group [4]. The incidence of non-traumatic coma was five times greater in children under 16 years of age than in the general population with a notably higher incidence in the first year of life [5]. The most common causes of NTC are infections, toxins, status epilepticus, cardiac or brain abnormalities, hypoxia or ischemia and metabolic disorders [3].

Pediatric NTC coma is an important health problem making significant demands of intensive care resources. It can result from a wide variety of primary etiologies, posing a diagnostic challenge to medical staff. A better understanding of the causes and outcomes of this heterogeneous group of children will aid the design of protocols for their investigation and management [6].

The principles of management of the comatose state in children are similar to those in adults [5]. The initial treatment of these patients is generally supportive till the etiology is specified. The first objective is to minimize impaired brain perfusion that is achieved by proper oxygenation, fluid and electrolyte administration and monitoring vital signs. Following stabilizing the patient's vital signs, medications with potential toxicity should be discontinued [3].

Prognosis of coma depends principally on its causes, duration of coma and age of patients are important prognostic factors too. Children younger than 2 years old have a very poor prognosis. Lack of response to painful stimuli for 3 days indicates poor prognosis with sensitivity of 70-100% [4]. There is no doubt that prolonged coma after a hypoxic ischemic insult in childhood carries a very poor prognosis. Later onset movement disorders are often difficult to treat, although some respond to drugs. Cognitive function may recover sufficiently for children to return to their former schools, but concentration may be poor. Behavioral difficulties are very common [7].

The level of consciousness (LOC) is the sensitive and reliable indicator of the patient's neurological status. The alteration in the consciousness helps to determine if there is any damage in the nervous system that can occur even without visible damage to the patient, therefore, LOC/coma should be frequently measured. Regarding to coma assessment, assessment of child with coma can be performed through assessment of LOC which remains the earliest indicator of improvement or deterioration in neurologic status; there several scales have been devised in an attempt to standardize the description and interpretation of the degree of depressed consciousness [1]. The most common of these is GCS/PGCS. The GCS/PGCS is an internationally recognized tool which assesses the LOC of the patient [8]. PGCS consists of a three part assessment: eye opening, verbal response and motor response [1].

Nurses have a unique opportunity to help patients examine their lifestyle, recognize risks and potential areas for change, advice on a focused individualized plan and facilitate the accomplishment of their goals. That cannot

be done without well qualified thoroughly knowledgeable nurses, especially in critical care settings. Nurses should have efficient assessment and evaluation skills to deal and manage their patients particularly those with disturbed LOC through the application of GCS [9]. A proper neurological assessment using PGCS is the essential part of nursing care and it is very essential for the nurse to have knowledge and skills about neurological assessment and PGCS [8].

Conceptual AI Definition of Coma: Refers to a type of coma (excluding traumatic head injury) due to one of the underlying pathology of CNS as brain infection, hypoxia, ischemia, renal failure...etc.

Operational Definition:

- NTC: in the current study will be assessed and measured by PGCS.

Significance of the Study: NTC is a common cause of morbidity and mortality in children. NTC is a common problem in pediatric practice accounting for 10-15% of all hospital admissions; it makes a heavy demand on intensive care units [4]. The neurological assessment is a key component in the care of the neurological patient. It can help the nurses to detect the presence of neurological disease or injury and monitor its progression, determine the type of care and gauge the patients' response to intervention. PGCS has become a cornerstone of the neurological assessment of patients and it has been used in a variety of clinical situations to monitor changes in neurological functions [10]. So it is very essential for the nurse to have knowledge and skills about neurological assessment and the PGCS [8].

Based upon this and in addition, that research investigator observed that nurses in PICUs assess coma and its degrees of comatose children by inaccurate way and unprofessional way and most of them think that they do not hear about PGCS, do not know how to apply it and consequently provide inappropriate nursing intervention and inaccurate recording and reporting about coma and its degree, so research investigator think that the present study should be done to improve PICUs nurses' knowledge and skills about coma and PGCS and consequently nursing care provided to comatose children in PICUs.

Aims of the Study Were:

- To assess knowledge of PICUs' nurses about coma and PGCS.

- To assess skills of PICUs nurses about coma and PGCS.
- To assess effect of instructional guidelines about coma and PGCS on knowledge and skills of pediatric intensive care nurses.
- Children with NTC as brain infection, hypoxia, ischemia, renal failure...etc
- Children are not connected with mechanical ventilator.

Subjects and Methods

Research Design: A quasi experimental research design was utilized to achieve aims of the study.

Research Hypotheses:

- Nurses who will be exposed to instructional guidelines will have mean scores of knowledge higher in posttest than mean scores of knowledge in pretest.
- Nurses who will be exposed to instructional guidelines will have mean scores of skills after applying instructional guidelines greater than mean scores of skills before instructional guidelines.
- There will be no difference between mean scores about PGCS measured by nurses and measured by research investigator after application of instructional guidelines.

Setting: The current study was conducted in PICUs of two of Educational Pediatric Hospitals in Cairo University, these PICUs provide care for all children patients from all over Egypt and free.

Subjects:

- A convenient sample of 50 PICUs' nurses was included in the study in the current study.
- A convenient sample of 50 preschool children was included into study. Determination of sample size of preschool children was calculated according to statistical procedure known as power analysis of the sample and admission rate of preschool age children into PICUs which was about 300 of preschool age children were admitted in 2014 the size of the resulted sample was 50 of preschool children.

PICUs of nurses were included in the study after fulfilling the inclusion criteria which were:

- Both male and female nurses.
- Bed side nurse
- With different years of experiences.

Preschool children were included in the study after fulfilling the inclusion criteria which were:

- Children age for 3-5 years.

1-A Structured Socio-Demographic Questionnaire:

There were three tools utilized to collect the required data for the study, the 3 tools were developed by research investigator after reviewing the related recent literature and 5 experts in pediatric medicine and pediatric nursing.

2-A Structured Nurses' Knowledge Questionnaire:

This included 2 parts as the following:

Part A- a structured socio-demographic questionnaire for children: to collect socio-demographic data of preschool children, included 4 questions, these questions were related to age, sex, residence and diagnosis? Questions were in the form of closed ended questions.

Part B -a structured socio-demographic questionnaire for nurses in PICUs: to collect socio-demographic data of nurses and included 5 questions, these questions were related to age, sex of nurses, degree of education, years of experiences and method used by nurses to assess LOC/coma. Questions were in the form of closed ended.

3-An Observational Checklist for PGCS: To assess nurse's knowledge about coma and PGCS and included 10 questions, such as: definition, causes, importance of assessing coma, PGCS definition, components....etc. questions were in form of closed ended questions. This tool was used as pretest and posttest.

Scoring System of Nurses' Knowledge Questionnaire:

The total numbers of questions in the structured questionnaire were 10 questions, regarding knowledge's score each correct and complete answer was giving 1 score and each inaccurate and/or incorrect answer took 0 score. The total knowledge scores were 10. The scores of the items were summed up and the total divided by the number of the items.

- Nurses get scores from 0-4 were considered as having unsatisfactory knowledge
- Nurses get scores from 5-10 were considered as having satisfactory knowledge.

An observational checklist for PGCS: The observational checklist was developed based upon PGCS for children 2-6 years, which was adopted from El-Naggar [11] and

Wong and Hockenberry [1] to assess nurses' skills regarding application of PGCS by research investigator. This observational checklist was translated into Arabic to be easily understood and used by nurses. The observational checklist on PGCS includes 3 parts assessment: eye opening, verbal response and motor response.

Eye opening includes 4 items, verbal response includes 5 items and motor response includes 6 items.

Numeric values are assigned to the levels of response in each category and started from 1-4 in eye opening, from 1-5 in verbal response and from 1-6 in motor response, in each part the highest numeric value indicates best response and lowest values indicates poor response. The sum of these numeric values provides an objective measure of the patient's LOC and coma, the lower the score, the deeper the coma. A patient with an unaltered LOC would score the highest 15, a score of 7 or below is generally accepted as a definition of coma, the lowest score 3 indicates deep coma.

Scoring System of Observational Checklist on PGCS:

An observational checklist on PGCS included 3 parts; the total numbers of items in the observational checklist were 15 items. Regarding skills of the nurses in the observational checklist in each part every item done correctly and accurately was giving 1 score and each item not done/or done inaccurately was giving 0 score. Regarding to total skills' scores of the observational checklist were 15 scores, the scores of the items were summed up and the total divided by the number of the items.

- Nurses get scores from 0-8 were considered having unsatisfactory skills.
- Nurses get scores from 9-15 were considered having satisfactory skills.

Instructional Guidelines Implementation

Instructional Guidelines Outlines:

- Introduction
- Aim
- Components
- Summary

The instructional guidelines consisted of 4 sessions carried out in 2 weeks (2 sessions/ week) for every nurse, research investigator met nurses weekly on Monday and Tuesday in morning and/or after noon shift.

Implementation of instructional guidelines took about 5 months, as it started from October 2014 to end of February 2015. The instructional guidelines carried out were as following:

The First Session (30 - 45 Minutes, 1st Week): The aim of this session was to identify the research investigator with the study sample (nurses) and to explain them the purpose of instructional guidelines. Number of sessions, duration of each session, content out lines of instructional guidelines sessions, methods of teaching, time of the study and methods of evaluation were discussed to stimulate the nurses' interest and to enhance their appreciation for their role. Pretests assessment was carried out at this session, research investigator assessed nurses' knowledge about LOC, coma and PGCS by using nurses' knowledge questionnaire and assessed skills of each nurse in application of PGCS by using an observational checklist on PGCS (assessment 1). Each session was preceded by open discussion about any question and brief summary about what being discussed in the previous session. Research investigator used handouts and illustrated pictures.

The Second Session: (30-45 Minutes, 1st Week): The aim of this session was to inform the nurses with definition of, causes and management of coma, PGCS and demonstrate to nurses how to apply PGCS actually upon children and allow them to re-demonstrate application of PGCS upon children.

The Third Session: (30-45 Minutes, 2nd Week): The aims of this session were to carry out posttest and post instructional guidelines skill assessments.

The Fourth Session: (30-45 Minutes, 2nd Week): Aimed at summarizing all the information and techniques taught, answer all nurses' questions and clarify any misunderstanding.

Procedure: An official permission was obtained from the directors of both PICUs of the two Educational Pediatric Hospitals in Cairo University, after an explanation of the aims of the study. Oral and written consents were obtained from both nurses and parents of children who were included in the study after an explanation of the aims, tools, benefits and the duration of the study. First the research investigator started to collect the socio-demographic data of nurses and this took about 10-15 minutes for each nurse.

After that research investigator assessed nurses' knowledge about coma and PGCS by using nurses' knowledge questionnaire, this took about 15-20 minutes for each nurse (pretest in the first session of instructional guidelines). In the same day of first session the research investigator started to ask each nurse to assess coma and its degree by using PGCS upon her/his assigned child in PICU, during performing this assessment research investigator assessed skills of each nurse in application of PGCS by using the observational checklist about PGCS, this was considered pre instructional guidelines assessment (1) of degree of coma carried out by nurses and was being compared with what measured by research investigator upon the same child, this took about 20-30 minutes for each nurse.

In the next day (second session) research investigator provided knowledge about coma and PGCS and demonstrated to nurses actually upon children with NTC how to apply PGCS, this took about 30-45 minutes and allow to each nurse to re-demonstrate it till be able to apply it correctly on child (2-3 times re-demonstration).

After one week from pretest, research investigator carried out posttest (third session) to reassess nurses' knowledge by using the same tool in pretest; this took about 15-20 minutes and research investigator reassessed nurses skills of applying PGCS by using the observational checklist about PGCS actually upon children with NTC, this was considered post instructional guidelines assessment (2) and was compared with what measured by research investigator to the same child assigned for each nurse, this took about 15-20minutes.

In the same day and after 2 hours of the previous step research investigator reassessed nurses' skills of applying PGCS by using the observational checklist about PGCS actually upon children for each nurse and was considered post post instructional guidelines assessment (3) and was compared with what measured by research investigator and this took about 15-20 minutes. Each session included 2-3 nurses or more according to availability of their time and duties. In the next day (4th session) research investigator summarized all the information and techniques taught, answered all nurses' questions and clarified any misunderstanding and thanked nurses.

The research investigator collected the socio-demographic data about children from medical record and this took about 5-10 minutes for each child.

Pilot Study: An initial pilot study was done on 10% nurses and 10% of children to evaluate the content of tools, its objectivity and feasibility and to explain any discrepancies in the tools. The results of pilot study were included in the study.

Validity and Reliability of He Toolscontent Validity of Tools: Content validity of the tools was done by 5 experts in the field of pediatric medicine and nursing.

Reliability of Tools: Cronbach's Alpha of knowledge PGCS was very good as it was. 956.

Cronbach's Alpha of an Arabic observational checklist on PGCS was good and it was.841.

Ethical Considerations: Nurses and parents of preschool children were informed about the purpose, tools and duration of the study after explaining them the benefits of the study. Oral and written consents of parents of children were gained. The research investigator assured parents of children and nurses about confidentiality of the data gathered from them during the study. During the study the research investigator informed parents of children and nurses about their right to withdraw from the study at any time without any effect on the care provided for their children and also nurses were assured about nothing would done to them.

Statistical Analysis: Data was analyzed using SPSS statistical package version 20. Numerical data were expressed as mean \pm standard deviation. Qualitative data were expressed as frequency percentage. Chi-square test was used to examine the relation between qualitative variables; paired t test was used for comparison between means of the same group. Pearson (r) Correlation was used to test correlation between variables, P-value = 0.05 was considered significant.

RESULTS

Table 1 explains that more than two thirds of (68%) children were males and mean age of those children in the current study table 1 indicates that it was $3.78 \pm .7637$ years. The same table represents that more than two thirds of (68%) of children were from urban area. Regarding to diagnoses of children in the current study table 1 shows that the highest percentage of them (30%) was having respiratory diseases followed by the same percentage of (20%) gastro enteritis and renal failure for both of them.

Table 2 represents that more than two thirds (66%) of the nurses in the present study were males, in relation to mean age of nurses was 23.12 ± 2.855 years. Table 1 indicates that mean years of nurses' experiences was 2.68 ± 1.347 years. The same table represents that more than two thirds of (64%) nurses were having bachelor degree of nursing education. Regarding to method used in PICUs to assess coma degree of children, 60% of nurses were following routine PICUs method in assessing coma.

Table 3 indicates that the mean scores of nurses' knowledge in pretest were $4.62 \pm .923$ whereas mean scores of nurses' knowledge in posttest was $7.64 \pm .851$. There was a statistically significant difference between mean scores of nurses' knowledge between pre and posttest ($t_{\text{test}} = 16.216$, $p = 0.000$). Table 3 proved the first hypothesis of the present study.

Table 4 shows that more than half (56%) of nurses' knowledge in pretest was unsatisfactory but the picture improved after taking instructional guidelines as 90% of nurses' knowledge in posttest became satisfactory. There was a statistically significant difference between level of knowledge satisfaction of nurses in pretest and posttest ($\chi^2 = 23.926$, $p = 0.000$).

Table 5 reveals that nurses' skills improved after application of instructional guidelines about coma and PGCS in post instructional guidelines assessment (2) than in pre instructional guidelines assessment (1) as table 5 shows that nurses' scores in all items of observational checklist about PGCS were not less than 78%.

Table 6 explains that the mean scores of nurses' skills in applying PGCS for assessing coma of children before application of instructional guidelines was 3.78 ± 3.406 while mean scores of nurses' skills after application of instructional guidelines in assessing coma of children was 12.76 ± 3.054 . There was a statistically significant difference between mean scores of nurses' skills in application of PGCS in assessing coma of children between before and after application of instructional guidelines as $t_{\text{test}} = 18.505$, $p = 0.000$. Table 5 proved the second hypothesis of the study.

Table 7 represents that highest percentage (88%) of nurses' skills of applying PGCS before application of instructional guidelines was unsatisfactory but their skills get better after application of instructional guidelines as 90% of nurses' skills in post application instructional guidelines were satisfactory. There was a statistically significant difference between level of skills satisfaction of nurses' in pre and post application instructional guidelines as $\chi^2 = 34.681$, $p = 0.000$.

Table 8 reveals that there was a statistically significant difference between mean scores of coma measured by nurses and mean scores of coma measured by research investigator ($t_{\text{test}} = 13.762$, $p = 0.000$) before providing instructional guidelines assessment (1) but there were no statistically significant differences between mean scores of coma measured by nurses and what measured by research investigator in both post instructional guidelines assessment (2) and post post instructional guidelines assessment (3) ($t_{\text{test}} = 2.632$, $t_{\text{test}} = .745$, $p = .068$, $p = .458$, respectively). It was clear that table 8 proved the 3rd hypothesis of the study.

It is obvious from table 9 there was a statistically significant difference between degree of coma when assessed by nurses and when assessed by research investigator in pre and post instructional guidelines assessment (1) as $\chi^2 = 22.148$, $p = 0.000$. But there were no statistically significant differences between degree of coma assessed by nurses and assessed by research investigator in both post instructional guidelines assessment (2) and post post instructional guidelines assessment (3) ($\chi^2 = 6.616$, $\chi^2 = 7.753$, $p = .372$, $p = .653$ respectively).

Table 10 indicates that there was a statistically significant relationship between mean scores of nurses' knowledge and mean scores of nurses' skills of applying instructional guidelines about coma and PGCS ($r = .397$, $p = .004$). While there were no statistically significant relationship between mean scores of nurses' knowledge and nurses' age, years of nurses' experiences and nurses' level of education ($r = .101$, $r = .231$, $r = .254$, $p \geq 0.05$, respectively). There were no statistically significant relationship between mean scores of nurses' skills and nurses' age, their years of experiences and their level of education ($r = .152$, $r = .007$, $r = .159$, $p \geq 0.05$, respectively).

DISCUSSION

Pediatric coma has been a nonspecific sign of many systemic illnesses. NTC is a common presentation in pediatric patients accounting for an estimated 10-15% of all hospital admissions [4]. Coma can result from traumatic and non-traumatic injuries. Though traumatic injury is prevalent, but still the management of NTC is of priority because of its diverse uncertainty of etiologies. Numerous causes (excluding head injury) for NTC are CNS infection, severe metabolic disturbances, hypoxic state, intoxication, cardiac arrest etc.

Outcomes of coma range from recovery to death. Comas can last from several days to several weeks. In more severe cases coma may last for over 5 weeks, while some have lasted as long as several years [12]. A proper neurological assessment using the PGCS is the essential part of nursing care. It is very essential for the nurse to have knowledge and skills about LOC, neurological assessment and the PGCS [8].

Results of the current study revealed that the majority of children in the present study were males. This result is in agreement with result of study done by Fouad *et al.* [6] who found in their study that majority were males and minority were females. From point of view of research investigator this result may be return to respiratory diseases are common among male children at this age group which in turn resulted in their admission to PICUs and in addition in Egypt or all Arabian areas people put more focus, attention and care on males children than females even in health and illness whereas families of females' children ask for them outpatient clinic, social medicine and popular prescription.

The mean age of children in the present study was 3.780 ± 0.7637 years. In relation to residence of children the result of current study showed that more than two thirds of children were from urban areas. Concerning to diagnoses of children diseases the majority of children in the present study suffered from respiratory diseases. This result is in congruence with what was reported by Pankaj *et al.* [4] who reported in their study that respiratory infections are one of the most common causes of NTC among children. But this result is in contradiction with what was reported by Fouad *et al.* [6] who found in their study that metabolic causes are the most common cause of NTC in pediatrics in emergency department.

It was observed from the results of the current study that highest percentage of nurses were males, their mean age was 23.12 ± 2.855 years, in addition, their mean years of experiences was 2.68 ± 1.347 years. The highest percentages of nurses were having bachelor degree in nursing. Results of the present study indicated that the majority of nurses reported that they use hospital method in assessing degree of coma as a routine care followed by their experiences in determining degree of coma of children.

The results of the current study are in accordance with Teles *et al.* [8] and Bagi [13] who reported that the majority of their study subjects have been males and in the age range of 20 to 25 years. Regarding nurses' degree of education, the results of current study are in agreement with Jaddoua *et al.* [9] as they found in their study that the majority of the nurses were nursing institute graduates. But the results of the current study do not

match with results found by Hussein [14] and Meherali *et al.* [15] who found in their studies that majority of nurses were females and having diploma degree in nursing, the majority of nurses completed their diploma recently and majority of the nurses acquire their knowledge of taking care of critically ill patients from their basic educational programs, or from hospital policies and procedures.

From point of view of research investigator the majority of nurses' were males nurses, this may be due to increasing joining of male students into nursing education/ curriculum after secondary schools and the majority of nurses were having bachelor degree in nursing, this because PICUs in the current study were chosen to be settings for collecting required are critical areas and require specialized professional and highly educated nurses which require bachelor nurses are being hire or work in PICUs.

Results of the current study presented that nurses' knowledge about coma and PGCS in pretest was unsatisfactory but their knowledge was improved after provision of instructional guidelines in posttest and there was a statistically significant difference between mean scores' knowledge in pretest and posttest.

The result of current study is in congruence with what was reported by Teles *et al.* [8] and Bagi [13] as the findings of their studies revealed that during pretest, the majority of the staff nurses had average knowledge regarding the use of GCS in neurological assessment of patients and minority of them had poor knowledge. After the administration of self-instructional module in posttest the majority of the staff nurses had good knowledge and minority of them had average knowledge. The results of the present study are in the same line with what was reported by Jaddoua *et al.* [9] as they found in their study that all nurses' have almost inadequate knowledge concerning application GCS. In addition, Meherali *et al.* [15] found in their study that the educational intervention significantly improved the knowledge level of the nurses regarding evidence based guidelines for Ventilator Associated Pneumonia prevention (VAP).

Unsatisfactory nurses' knowledge about coma and PGCS from point of view of research investigator may be return to that the majority of nurses their level of education only diploma in addition and though, the students are exposed to pediatric critical care nursing in their studying curriculum, but they are not prepared or knowledgeable enough to provide care for children in PICUs. besides that lack of training educational programs for staff nurses about appropriate care for PICUs patients in general and PGCS specifically, its benefits and applicability and also reflects the lack of responsibility of

nursing director and management staff in providing such training programs for staff nurses in PICUs. Regarding to increasing nurses' knowledge in posttest, this reflects nurses' readiness and interest toward increase their knowledge and consequently improve care provided to PICUs children. This proved the positive effect of instructional guidelines upon nurses as increased their knowledge and achieved aim of current study.

Results of the current study indicated that there was a statistically significant difference in nurses' skills regarding application of PGCS before and after application of instructional guidelines. This result is in congruence with what found by Mattar, *et al.*, [16] as they reported in their study that a new staff nurses' knowledge and performance about GCS were insufficient and even old staff nurses are also unaware of protocols that guide in the performance of a GCS assessment and an education session had significant effect on the overall GCS," which significantly improved the performance of the educated group.

This result is in the same line with result of a study done by Loni [17] who found in his study that many nurses having many difficulties while practicing and using GCS in assessment of unconscious patients and many studies reveled that teaching program and instruction improves the knowledge and practices. In addition, the result of current study is supported by Shoqirat [18] who reported that in his study that many staff nurses are not well versed and thorough about the neurological assessment using the GCS. Had not been confident in practical use of the GCS, they would want to improve their practical skills and his study has concluded that a short training course would be needed to make sure that nurses are able to use the GCS effectively while minimizing errors for improving the care of the patients in the critical care units.

The result of the present study is in agreement with a result of a study carried out by Rullis and Thornley [19] as they found in their study that because the registered nurses did not routinely assess patients using the GCS in the non-neurological areas, a lack of skill refinement led to a knowledge and practice deficit. Incomplete skill development meant that the participants did not feel confident in using the GCS to assess patients with neurological dysfunction. In fact, participants were confused regarding the use of the GCS and this affected how they made clinical decisions. This was significant because timely identification of neurological deterioration was crucial to patient survival and recommendations for practice include more attention to skill development and importantly opportunities for training, refinement and reinforcement of the GCS.

Results of a study carried out by Chan and Matter [20] supported the results of present study as they reported in their study that by accurately assessing a patient's conscious level, the nurse is able to detect neurological changes in order to improve survival outcomes and minimize long-term sequelae. However, problems are encountered when using the GCS to assess a patient's conscious level. Findings may be used for management to improve support of nurses to ensure accurately assessing patient's conscious level. Management should formulate strategies to encourage nurses to resolve actual problems following training or mentoring and to increase the depth and breadth of nurses' knowledge and skills to perform the conscious level assessment using the GCS.

From point of view of research investigator this indicates to readiness of nurses to learn more and more and their interest in learning new skills for improving their skills regarding care of patients and also reflects the positive effect of instructional guidelines in improving skills of PICUs nurses regarding application of PGCS.

The results of present study indicated that there was a statistically significant difference between mean scores of coma measured by nurses and mean scores of coma measured by research investigator before providing instructional guidelines assessment (1), but there were no statistically significant differences between mean scores of coma measured by nurses and what measured by research investigator in both post instructional guidelines assessment (2) and post post instructional guidelines assessment (3). From point of view of research investigator this reflects the success of instructional guidelines in enhancing skills of nurses in application of PGCS and also reflects the extent of readiness of nurses to gain knowledge and skills to improve their skills in PICUs.

The results of present study revealed that there was a statistically significant relation between mean scores of nurses' knowledge scores and mean scores of nurses' skills scores about coma and PGCS upon children with NTC. The results of the current study are in accordance with what was found by Teles *et al.* [8] and Jaddoua *et al.* [9] who found in their studies that there was a positive relationship between nurses' knowledge scores and skills scores in PICUs.

From point of view of research investigator this indicates to the connection between well comprehended information and its application clinically as if nurses have knowledge and this knowledge well understood, nurses are being able to apply it as possible and vice versa.

CONCLUSIONS

In the light of the present study, it can be concluded that most of PICUs nurses' have unsatisfactory knowledge and skills before application of instructional guidelines, but most of PICUs nurses became having satisfactory knowledge and skills after the application of instructional guidelines. The current study concluded that there were statistically significant differences between mean scores of pretest and posttest regarding nurses' knowledge and there were statistically differences between mean scores of skills before and after application of instructional guidelines upon children with NTC in PICUs. This proved the hypotheses and achieved aims of the present study.

Recommendations: In the light of the findings of the present study, the following recommendations were suggested:

Nurses:

- PICUs should provide training courses for nurses about coma and application of PGCS.

- Provision of periodic workshops and seminars for PICUs nurses about assessment of coma and application of PGCS.
- Adequate supervision and follow up should be available by head nurses in PICUs for staff nurses during assessment of coma and application of PGCS.
- A designed protocol about coma and PGCS should be provided to all PICUs nurses and being a routine for nurses to apply PGCS as a neurological assessment.
- Availability of application/use of PGCS on CD to be available in PICUs for nurses at any time to revise their knowledge and for newly registered nurses.

Research:

- Educational program should be provided to all PICUs nurses to increase and update their knowledge and skills concerning PGCS.
- Replication of such study on a larger sample of nurses and different settings and different age group to be able to generalize the results of current study.

Table 1: Frequency Distribution of Socio-Demographic Characteristics of Studied Children (No =50).

Item	No	%
Sex:		
Male	34	68.0
Female	16	32.0
Age:		
X ± SD	3.780	±.7637
Residence:		
Urban	34	68.0
Rural	16	32.0
Diagnosis of children diseases		
Gastro enteritis	10	20
Heart failure	9	18
Respiratory diseases	15	30
Multiple system failure	4	8
Chest infection	2	4
Renal failure	10	20

Table 2: Frequency Distribution of Staff Nurses Socio-Demographic Characteristics of Nurses (No =50)

Item	No	%
Sex:		
Male	33	66
Female	17	34
Nurses' Age:		
X ± SD	23.12	±2.855
Years of experiences:		
X ± SD	2.68±	1.347
Degree of education:		
1-Diploma	10	20
2- Associate degree of nursing	8	16
3-Bachleor	32	64
Method used in PICU assessing coma:		
1-Hospital method	30	60
2-Experieces	11	22
3-It is not nurses' job	9	18

Table 3: Mean Differences between Pre and Posttest Scores Regarding Nurses' Knowledge about Coma and PGCS (No =50)

Item	X ± SD	t.test	p-value
Mean scores of knowledge (Pretest)	4.62±.923	16.216	.000*
Mean scores of knowledge (Posttest)	7.64±.851		

*Significant at $p \leq 0.05$

Table 4: Comparison between Level of Satisfaction of Nurses' Knowledge before and after Instructional Guidelines about Coma and PGCS (No =50).

item	Unsatisfactory		Satisfactory		χ^2 23.926	p-value .000*
	No	%	No	%		
Nurses' knowledge Pretest	28	56	22	44		
Nurses' knowledge Posttest	5	10	45	90		

*Significant at $p \leq 0.05$

Table 5: Frequency and Percentage Distribution of Nurses' skills before and after Application of Instructional Guidelines about Coma and PGCS (No =50).

Item	Pre instructional guidelines	Post instructional guidelines							
		No		Yes		No		Yes	
		No	%	No	%	No	%	No	%
Eye opening	-goes around child and observe if child opens eye spontaneously	20	40	30	60	0	0	50	100
	-calls and commands child and observes if child opens the eyes	45	90	5	10	0	0	50	100
	-apply pressure on the limb/nipple and observe child response to pain	40	80	10	20	8	16	42	84
	- apply pressure on the supraorbital area and observe child response	47	94	3	6	11	22	39	78
Motor response	-gives child simple commands and observes if child responds	50	100	0	0	0	0	50	100
	-gives painful stimuli and observes if child uses arm and attempt to remove stimuli/pressure.	45	90	5	10	0	0	50	100
	-observes if child's arm withdraws to pain	37	74	13	26	4	8	46	92
	- observes if there is flexion of arm to the body in response to pain	50	100	0	0	6	12	44	88
	-observes if there is flexion of arm away from body in response to pain	50	100	0	0	7	14	43	86
Verbal response	- observes that child is flaccid and no response to pain	50	100	0	0	7	14	43	86
	-talk with child and observes if the child is oriented or not	30	60	20	40	0	0	50	100
	-observe if child is not oriented and confused and talks inappropriate and understandable words.	50	100	0	0	7	14	43	86
	-observe if child always cries, moan,....	10	20	40	80	9	18	41	82
	-observe if child is grunting and no speech	50	100	0	0	6	12	44	88
	- observe if there is no verbalization of any type	50	100	0	0	11	22	39	78

Table 6: Comparison between Mean Scores of Nurses' Skills before and after Application of Instructional Guidelines about Coma and PGCS (No =50)

Item	X ± SD	t.test	p-value
Mean scores of Nurses' skills:	3.78±3.406	18.505	.000*
Pre instructional guidelines (assessment 1)			
Mean scores of Nurses' skills:	12.76±3.054		
Post instructional guidelines (assessment 2)			

*Significant at $P \leq 0.05$

Table 7: Frequency Distribution of Level of Satisfaction of Nurses' Skills before and after Application of Instructional Guidelines about Coma and PGCS (No =50)

item	Unsatisfactory		Satisfactory		χ^2 34.681	p-value .000*
	No	%	No	%		
Nurses' skills :	44	88	6	12		
Pre instructional guidelines (assessment 1)						
Nurses' skills:	5	10	45	90		
Post instructional guidelines (assessment 2)						

*Significant at $p \leq 0.05$

Table 8: Comparison between Total Mean Scores of Skills between Nurses and Research Investigator before and after Application of Instructional Guidelines about Coma and PGCS (No =50)

Item	Nurses X ± SD	Research investigator X ± SD	t.test	p-value
Mean scores of coma:	3.71±3.410	12.76±3.086	13.762	.000*
Pre instructional guidelines (assessment 1)				
Mean scores of coma :	10.12±2.685	12.63±3.026	2.632	.068
Post instructional guidelines (assessment 2)				
Mean scores of coma	12.04±2.941	12.49±3.063	.745	.458
Post post instructional guidelines (assessment 3)				

*Significant at $p \leq 0.05$

Table 9: Comparison between Frequency Distribution of Degree of Coma between Nurses and Research Investigator before and after Application of Instructional Guidelines about Coma and PGCS (No =50)

Item	No coma		Moderate coma		Severe coma		x2	p-value
	No	%	No	%	No	%		
Pre instructional guidelines (assessment 1)							22.148	.000*
1-Nurses' assessment	23	46	15	30	12	24		
2-Research investigator assessment	0	0	33	66	17	34		
Post instructional guidelines (assessment 2)								
1-Nurses' assessment	36	72	9	18	5	10	6.616	.372
2-Research investigator assessment	32	64	7	14	11	22		
Post Post instructional guidelines (assessment3)								
1-Nurses' assessment	32	64	9	18	9	18	7.753	.653
2-Research investigator assessment	35	70	9	18	6	12		

*Significant at $p \leq 0.05$

Table 10: Correlation Relationship between Mean Score of Nurses' Knowledge, Mean Score Skills and Socio-Demographic Variables (No =50)

Item	Total nurses' skills	Age	Years of experiences	Level of education
Total mean score of nurses' knowledge	r=.397 p=.004*	r=.101 p=.486	r =.231 P=.107	r=.254 P=.988
Total mean score of nurses' skills	-	r=.152 p=.293	r=.007 P=.962	r=.159 P=.281

*Significant at $p \leq 0.05$

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