IOSR Journal of Nursing and Health Science (IOSR-JNHS)
e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 9, Issue 5 Ser. IV (Sep. – Oct. 2020), PP 01-09
www.iosrjournals.org

Effect of Educational Sessions about Early Mobilization of Critically Ill Patients on Nurses' Knowledge and Practices

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Abstract:

Background: *Early mobilization (EM) is a safe and effective intervention that can have a significant impact on functional outcomes and prevent immobility complications. Despite the growing evidence in support of the benefits of EM, many intensive care units (ICUs) are unable to effectively integrate EM into their daily practice of patient care due to many barriers including lack of nurses' knowledge and practice about the EM of critically ill patients.* ***This study aimed*** *to evaluate the effect of educational sessions on the EM of critically ill patients (CIPs) on nurses' knowledge and practices.* ***Design****: A quasi-experimental design was utilized in this study.* ***Setting****: The study was conducted in the ICUs affiliated to a University Hospital in Egypt.* ***Subjects:*** *A convenience sample of 45 nurses working at the previously mentioned setting who were involved in providing direct patients' care and had at least one year of clinical work experience in the ICU were recruited in this study.* ***Tools****: Data were collected using two tools: nurses' knowledge of EM of CIPs questionnaire and nurses' practices of EM observation checklist.* ***The results****: Statistically significant differences were noted in nurses' knowledge and practice of EM of CIPs pre and post the educational sessions. Most of the studied nurses got a satisfactory level of knowledge and practices regarding EM post the implementation of educational sessions.* ***Conclusion and Recommendations:*** *The study concludes that well-structured educational sessions on EM of CIPs can improve nurses' knowledge and practices. Hence, it is recommended to provide nurses with continuous refresher courses with continuous follow up to ensure incorporation of the EM into daily nursing practice in the ICU. There is a need for more investigations about the impact of nurses' EM education and training on CIPs' outcomes.*

Key terms: *Educational Sessions, Early Mobilization, Nurses' Knowledge, Practices, Critically Ill Patients.*

Date of Submission: 20-09-2020 Date of Acceptance: 05-10-2020

I. Introduction

Critically ill patients are prone to impairments in physical function associated with immobility which contributes to negative patient outcomes. Prolonged immobilization is independently associated with the development of a series of complications such as pressure ulcers (**Coleman et al., 2013**), pneumonia (**Brogan, Langdon, Brookes, Budgeon, & Blacker, 2014**), deep vein thrombosis (**Guo et al., 2015)**, delirium, and ICU-acquired weakness (**Hermans, & Van den Berghe, 2015**). Additionally, it may lead to the development of adverse effects such as muscle deconditioning, increased risk of hospital-acquired injuries, and increased length of hospital stay (**Beach et al., 2015; Campbell, Fisher, Anderson, & Krepel, 2015; Johnson, Petti, Olson, & Custer, 2017).** It is widely documented in the literature as a cause of increased mortality (**Chou et al., 2015; de Brito, Battistella & Guarita, 2018**). Literature supports EM as a safe and effective intervention that can significantly prevent immobility complications **(Denehy, Lanphere, & Needham, 2017).**

Early mobilization of CIPs is an evidence-based intervention designed to improve patient outcomes and enhance the quality of life after discharge from the ICU (**C. Kim, Kim, Yang, & Choi, 2019**). There is evidence that patients in the ICU who engage in EM interventions have shorter ICU and hospital stays (**Arias-Fernandez, Romero-Martin, Gomez-Salgado, & Fernandez-Garcia, 2018; Cameron et al., 2015; Tipping et al., 2017; Wang et al., 2020**), lower rates of hospital readmission and reduced mortality up to one year following critical illness (**Schober & Thornton, 2013**). Moreover, EM can reduce the incidence of ICU-acquired weakness, ventilator-associated pneumonia, deep vein thrombosis, and pressure sores **(Wang et al.,**

2020). Early mobilization in the ICU should begin as soon as patients demonstrate physiological stability (**Conceição, Gonzáles, Figueiredo, Vieira, & Bündchen, 2017**). It involves the application of physical activities exercises that begin in bed and progress to sitting on the edge of the bed and then to ambulation to restore musculoskeletal strength and function (**Hodgson, Berney, S., Harrold, Saxena, & Bellomo, 2013**). Despite the benefits of EM, not all patients are routinely receiving these interventions during their ICU stay. This is supported by a study conducted in the United States of America and found that only 45% of ICUs report implementing EM (**Bakhru, Wiebe, McWilliams, Spuhler & Schweickert, 2015**). On the same line, a German study (**Nydahl et al., 2014**) and a Switzerland study (**Sibilla et al., 2020**) revealed that only less than one-third of ICU patients are being mobilized during their ICU stay. Previous investigations have identified multiple modifiable barriers that preclude mobility in ICUs, such as inadequate staffing, patient safety concerns, staff's limited time, inadequate mobility equipment, and lack of nurses' knowledge about the importance and techniques of EM (**Fontela, Forgiarini & Friedman, 2018; Krupp, Ehlenbach & King, 2019**). A recent study conducted by **Gilson (2019)** revealed that the most common barriers facing the nursing practice of EM in the ICUs included lack of nurses' knowledge and practices regarding EM of CIPs.

Significance of the Study

From our clinical experience and review of patients' medical records, no recorded data were found concerning the EM of CIPs in the selected ICUs. Additionally, health care providers are facing major problems related to the EM of CIPs including patient sedation, lack of teamwork, safety concerns, and limited resources and time. Furthermore, most of the nurses do not realize the importance of implementing EM practices for CIPs. This urged the need for changing the culture of care in these ICUs. Hence, it is important to enhance critical care nurses' knowledge and practices of EM. Educating and training nurses in this area will enhance their skills in using mobility protocols, and consequently improve patients' outcomes. Therefore, the present was carried out to address this issue. It was hoped that this investigation might provide evidence-based data about the effect of EM of CIPs educational sessions on nurses' knowledge and practices. Eventually, this research might generate attention and motivation for further research studies in this area.

Aim of the Study

The current study aimed to evaluate the effect of EM of CIPs educational sessions on nurses' knowledge and practices.

Research Hypothesis

Nurses' knowledge and practice mean scores will be improved post EM of CIPs educational sessions than their mean scores pre the educational sessions.

II. Method

Research Design

A quasi-experimental research design (one group of pre-test-post-test design) was used to conduct the current study. It is an empirical study used to investigate the effect of an independent variable on a dependent variable without randomization (**Nestor & Schutt, 2018**).

Setting

The study was conducted in two ICUs (Anesthesia and Neurosurgery) affiliated to a University Hospital in Egypt. These ICUs are well equipped with advanced machines, equipment, and the manpower required for patients' care. The nurse-patient ratio in the selected ICUs is nearly 1:2.

Subjects

The study included a convenience sample of 45 nurses working in the selected ICUs who were involved in providing direct patients care, had at least one year of clinical work experience in the ICU, and who accepted to take part in this investigation.

Tools of Data Collection

Data were collected using two tools:

The tool I: Nurses' Knowledge of Early Mobilization of Critically Ill Patients Questionnaire

This tool was developed by the primary investigator (PI) after reviewing recent relevant literature **(Blanchard, 2016; Brissie, 2015; Koo et al., 2016; Parry et al., 2017; Uustal, 2013).** It aimed to assess the level of nurses' knowledge about EM of CIPs. This tool was translated into the Arabic version, as it is the language of the participant nurses. It included two main parts as follows:

Part 1: 'Nurses' Personal Background Data Sheet'

This part was used to collect data about the studied nurses' age, gender, educational level, years of work experience in the ICU, working hours, and attended training programs about EM of CIPs.

Part 2: 'Nurses' Knowledge of Early Mobilization Questionnaire'
This part covered seven main sections. It involved 48 questions (21 multiple-choice questions and 27 true/false questions) about the definition of mobility, the timing of EM, types of exercises, complications of immobility, the importance of EM, safety considerations for EM, and barriers for EM.

Scoring system: each true answer was given 1 mark. The false missed, or unknown answer was given a 0 mark. The total scoring involved two categories: satisfactory or unsatisfactory. Scores ≥75% were considered satisfactory knowledge level while scores <75% were considered unsatisfactory knowledge level. This scoring system was based upon other similar studies **(Mohmmed & Ibrahim, 2016; Tabash, Hussein, Mahmoud, El-Borgy & Abu-Hamad, 2016)**.

Tool II: "Nurses' Practices of Early Mobilization of Critically Ill Patients Observation Checklist"
This tool was developed by the PI after reviewing recent relevant literature **(Bakhru et al., 2015; Jolley, Regan-Baggs, Dickson & Hough, 2014; Koo et al., 2016; Taito, Sanui, Yasuda, Shime & Lefor, 2016).** It aimed to evaluate the level of nurses' practices of EM for CIPs. This tool involved two main parts: assessment and implementation covering 28 observational statements as follows:
Part I: Assessment: It involved five statements about how to assess CIPs before EM implementation.
Part II: Implementation: It included twenty-three observational statements about the implementation of EM for a wake and mechanically ventilated patients.
Scoring system: each 'adequately done practice' was given 1 mark. 'The false or missed practice' was given a 0 mark. The total scoring involved two categories: satisfactory or unsatisfactory. Scores ≥75% were considered satisfactory practice level while scores <75% were considered unsatisfactory practice level. This scoring system was based upon other similar studies (**Bedier, EL-Ata & Ibrahim, 2016**).

Content Validity of Tools

The tools were tested for content- related validity by a panel of 5 experts in the fields of Critical Care and Emergency Nursing, Medical-Surgical Nursing, and Anesthesia & Intensive Care Medicine. The experts revised the tools for clarity, relevancy, simplicity, and applicability. Accordingly, modifications were made.

To ensure the validity of the translation of the tool I (Early Mobilization Questionnaire), the back-translation technique was used. The tool was first translated from English into the Arabic language. Then one professional translator interpreted the Arabic version of the tool into the original language (English). This process was done by the Authorship, Translation and Publishing Department at one Egyptian University.

The Reliability of Data Collection Tools

The reliability of the tools was tested using Cronbach's Alpha test to indicate how well the items in each tool fit together conceptually. Cronbach's Alpha test result for the tool I was 0.93 and for tool II was 0.87. This indicates the reliability of the data collection tools.

Pilot Study

A pilot study was carried out on 5 nurses (10% of the total sample) to assess the feasibility, objectivity, and applicability of the tools, and to estimate the time needed to complete the questionnaire and the observation checklist. Necessary amendments were made accordingly. Nurses who took part in the pilot study were excluded from the main study.

Ethical Considerations

Ethical approval was granted from the Research Ethical Committee of the local University. An official letter to conduct the study was obtained from the hospital's administrative authority after providing details about the nature of the study. Informed consent was obtained from nurses who accepted to take part in the study. They were informed that participation in this investigation was voluntary and that they had the right to withdraw at any stage without responsibility. Anonymity and confidentiality were maintained by using codes on the data collection sheets rather than participants' names. It was emphasized to the participants that the observed practice was not a part of their performance appraisal.

Data Collection

Data were collected between May and September 2019 after obtaining official approval from the authority of the data collection setting. Data were collected in three stages:

Stage 1: Initial Assessment and Preparation of an Educational Booklet

The PI introduced herself to the eligible nurses, explained to them the details of the study, and invited them to participate in this investigation. Every participant nurse was interviewed individually by the PI to collect the background data using part I of tool I. Assessment of the nurses' knowledge regarding EM of CIPs was done using part 2 of tool I. Assessment of nurses' practices was performed using tool II. The PI prepared the EM of CIPs booklet based upon the current evidence-based mobilization practices and nurses' pre-test knowledge and practice scores.

The educational booklet included ten sessions covering the theoretical and practical components of EM of CIPs. The booklet was written in a simple Arabic language with different illustrated colored pictures to enhance the learning process and facilitate nurses' understanding of the presented material. The booklet was reviewed by faculty staff members from the Critical Care & Emergency Nursing Department, Faculty of Nursing, and recommended changes were made accordingly.

Stage 2: Implementation of the Educational Sessions

During this stage, the PI organized and implemented the EM educational sessions in ICUs. Three sessions were given every week during morning and afternoon shifts at the nurse station in the ICU. The studied nurses were divided into groups. Each group included 3-5 nurses according to their availability. Each participant nurse was given a copy of the colored educational booklet in the first session for guidance, motivation, and revision. Many teaching media were used, such as PowerPoint presentations, figures, papers and pens, and illustrated videos. By the end of the last session, the PI expressed her appreciation and gratitude to the nurses who put time and effort in participating in the study.

Stage 3: Evaluation of Participants' Knowledge and Practices

At this stage, nurses' knowledge and practices were evaluated one month after the implementation of the educational sessions. The knowledge was evaluated using part 2 of tool I and the practices of EM of CIPs were evaluated using tool II. A comparison between nurses' scores pre and post the educational sessions was done.

Data Analysis

Data were analyzed using the Statically Package for Social Sciences version 22 (SPSS, Inc., Chicago, IL, USA). The *p*-value of < 0.05 indicates a significant result. Numbers and percentages were used for describing and summarizing qualitative data. While the arithmetic means and standard deviation (SD) was used as a measure of central tendency and dispersion respectively for the normally distributed quantitative data. Chi-square test (χ^2), Pearson Correlation Coefficient(r), Point bi-serial correlation coefficient (rpb), and Paired t-test (t) were used to estimate the statistical significance between the study's variables.

III. Results

Table 1 illustrated that more than two-thirds of the studied nurses were females and were between 20 and less than 30 years old with a mean age of 29.9 ± 6.30. Nearly half of them were working in the neurosurgery ICU and had a bachelor's degree in nursing. Besides, most of them had from 1 to less than 5 years of work experience with the mean years of experience of 5.5 ± 6.8. The data also showed that all the studied nurses (100%) didn't attend any training programs, workshops, or conferences related to EM of CIPs.

Table 1: Studied Nurses' Personal Background Data

Variables	No (45)	%
Gender		
Male	13	28.9
Female	32	71.1
Age nurses (years)		
20- < 30	39	86.7
30- < 40	6	13.3
Mean ± SD = 29.9 ± 6.30		
Working Place		
Anesthesia ICU	22	48.9
Neurosurgery ICU	23	51.1
Educational level		
Secondary Nursing School	6	13.3
Technical Nursing Institute	15	33.3
BSc Nurse	22	48.9
Postgraduates study	2	4.4

Years of work experience in ICU		
1<5	35	77.8
5<10	5	11.1
> 10	5	11.1
Mean ±SD 5.5 ± 6.8		
Attended training programs		
Yes	--	--
No	45	100

Table 2 showed that after the implementation of the educational sessions, most of the studied nurses had a satisfactory level of knowledge about the definition of EM (75.56%), complications of immobility (73. 33%), and the vast majority were aware of the importance of EM (93.33%). However, as regards to the timing of EM, only 33.33% of the studied nurses had a satisfactory level of knowledge regarding this issue and less than half of them had satisfactory knowledge about the types of exercises (46.67%), safety measures for EM (46.67%) and barriers for EM (48.89%). A significant difference was noted between the studied nurses' knowledge pre and post the educational sessions (p = <0.000). Nurses' knowledge had significantly improved after the implementation of the educational sessions as 77.78% had a satisfactory level of knowledge regarding EM.

Table 2: Differences between the Studied Nurses' Knowledge Level Pre and Post the Educational Sessions

Items	Pre-Sessions Satisfactory		Post-Sessions Satisfactory		χ^2	*P*-value
	No	%	No	%		
Definition of early mobilization	7	15.56	34	75.56	32.66	0.000
Timing of early mobilization	3	6.67	15	33.33	10.00	0.075
Types of exercises	0	0.00	21	46.67	27.39	0.000
Complications of immobility	1	2.22	33	73.33	48.40	0.000
Importance of early mobilization	1	2.22	42	93.33	74.86	0.000
Safety considerations for early mobilization	5	11.11	21	46.67	13.85	0.017
Barriers for early mobilization	0	0.00	22	48.89	29.12	0.000
Total	0	0.00	35	77.78	57.27	0.000

Table 3 illustrated that after the implementation of the educational sessions, more than half of the nurses had satisfactory practices level regarding assessment and implementation of EM for awake patients (57.78% & 68.89% respectively). While the majority (80%) demonstrated a satisfactory EM practice for unconscious patients. This table portrays that the practices of studied nurses were improved significantly post the educational sessions where p-value <0.000 and 60% had a satisfactory EM practice level.

Table 3: The Difference between Studied Nurses' Practices of Assessment and Implementation of Early Mobilization Pre and Post the Educational Sessions

Items	Pre-Sessions Satisfactory		Post-Sessions Satisfactory		χ^2	*P*-value
	No	%	No	%		
Assessment of early mobilization	0	0.00	26	57.78	36.56	0.000
Implementation of early mobilization for awake patients	0	0.00	31	68.89	47.29	0.000
Implementation of early mobilization for unconscious patients	0	0.00	36	80.00	60.00	0.000
Total	0	0.00	27	60.00	38.57	0.000

Table 4 showed a statistically significant difference between the total nurses' knowledge mean scores and total nurses' practices mean score pre and post the educational sessions (p =<0.000). The total nurses' knowledge and practices mean scores were higher post-educational sessions than pre-education (37.91±3.92 & 20.89 ± 3.47 respectively).

Table 4: Differences between the Total Nurses' Knowledge and Practices Mean Scores Pre and Post the Educational Sessions

Items	Pre-Sessions	Post-Sessions	*T*	*P*-value
	Mean ± SD	Mean ± SD		
Nurses' knowledge mean scores	28.18±10.40	37.91±3.92	9.08	0.000
Nurses' practices mean scores	1.07± 0.72	20.89 ± 3.47	46.19	0.000

t: Paired t-test

Table 5 illustrated that there was no significant statistical relationship between nurses' baseline knowledge scores and their personal data including the gender, age, and working place (p = 0.083, 0.553 & 0.057 respectively). Also, there was no significant statistical relationship between nurses' baseline practice scores and their personal data including the gender, age, and working place (p = 0.129, 0.514 & 0.096 respectively). However, a statistically significant positive relationship was noted between nurses' baseline knowledge scores and their educational level (p <0.000). Besides, a statistically significant positive relationship was noted between nurses' baseline knowledge scores and their years of work experience in the ICU (p <0.000).

A statistically significant positive relationship was noted between nurses' baseline practice scores and their educational level (p <0.000). Additionally, a statistically significant positive relationship was noted between nurses' baseline practice scores and their years of work experience in the ICU (p <0.000).

Table 5: The Relationship between Studied Nurses' Baseline Total Knowledge and Practices Scores, and their Personal Background Data Pre the Educational Sessions

Nurses' Personal Background Data	Baseline Knowledge Score		Baseline Practices Score	
	Correlation coefficient	*P*-value	Correlation coefficient	*P*-value
Gender	r_{pb} = 0.863	0.083	r_{pb} = 0.137	0.129
Age in years	r_{pb} = 1.000	0.553	r_{pb} = 0.615	0.514
Working place	r_{pb} = 0.836	0.057	r_{pb} = 0.514	0.096
Educational level	r = 0.920	0.000	r = 0.791	0.000
Years of work experience in ICU	r = 0.643	0.000	r = 0.656	0.000

r_{pb} = Point bi-serial correlation coefficient **r=Pearson Correlation Coefficient**

Table 6 revealed a positive significant statistical correlation between nurses' total scores of knowledge and practices pre and post the educational sessions (P = 0.001& 0.000 respectively).

Table 6: Correlation between the Studied Nurses' Total Scores of Knowledge and Practices Pre and Post the Educational Sessions

Items	Knowledge	Practices	R	*P*-value
	Mean ± SD	Mean ± SD		
Total scores pre-sessions	28.18±10.40	1.07± 0.72	0.906	0.001
Total scores post-sessions	37.91±3.92	20.89 ± 3.47	0.846	0.000

IV. Discussion

Despite the growing evidence in support of the EM of CIPs, many ICUs did not yet integrate EM into their daily practice of patient care. The literature supports EM as a safe and effective intervention that can have a significant impact on functional outcomes **(Denehy et al., 2017; Hodgson et al., 2013**). The discussion of the results of the current study focuses upon the interpretation of the findings related to the studied nurses' characteristics, and the effect of the EM of CIPs educational sessions on nurses' knowledge and practices.

Regarding the studied nurses' personal data, the results of the current study revealed that more than two -thirds of the studied nurses were females and were between 20 and less than 30 years old. This was expected as females who join nursing careers are usually outnumber males in Egypt. These findings are in an agreement with **Kim et al. (2019)** who investigated the educational needs of nurses about EM of CIPs and found that most of the studied sample were females. Another study investigated nurses' knowledge and attitude regarding the EM of post-operative patients and reported that all participant nurses were females, and the mean of their ages was 31.36 ± 30.00 (**Mary, Afzal, Sehar & Gilani, 2018**). Concerning the educational level, the current study illustrated that nearly half of the nurses had a bachelor's degree in nursing. This may be because there is a

national trend to appoint newly bachelor-nursing graduates in ICUs to improve the quality of care delivery to CIPs. Indeed, nurses who work in ICUs should be well prepared and highly qualified to be able to provide the best care for CIPs to improve outcomes. This finding is in harmony with another similar study which reported that more than half of the studied sample had a bachelor's degree in nursing **(Mahran, Abdelrahman & Abo-Elmagd, 2019)**.

Concerning participant nurses' years of work experience in ICU, our results indicated that more than two-thirds of them had from 1 to less than 5 years of work experience with the mean years of experience of 5.5 ± 6.8. This finding goes in the same line with **Kim et al. (2019)** study's results. The current findings revealed that all the studied nurses didn't receive any education or training about EM. This finding is in harmony with the results of **Mahran et al. (2019).** This finding may be attributed to the lack of in-service education and training for nurses in the study settings. Inadequate nurses' training could be due to organizational factors such as unavailable of training funds and shortage in nursing staff which hinders their attendance of training programs outside the hospital. Health care institutions must allocate funds for nurses' in-service training to enhance their knowledge and skills, and consequently improve the quality of care they deliver. Education and training of critical care nurses on the EM were also emphasized by some authors **(Messer, Comer & Forst, 2015; Middleton, 2019)**.

Nurses' knowledge constitutes the fundamental basis of their technical skills (**Yue**, **Zhang, Zhang & Jin, 2017**). The ability of nurses to think critically stems from the knowledge they acquire through education and training in clinical settings. The most problem facing nursing practice is the disconnection between education and training on EM and implemented practices due to many barriers such as lack of nurses' knowledge of EM in the ICU (**Gilson, 2019**)**.** The current study findings revealed that all the studied nurses had unsatisfactory knowledge levels about EM pre the educational sessions. This could be likely due to nurses' inadequate awareness about the importance of EM and its effect on CIPs' recovery and outcomes. Unsatisfactory nurses' knowledge about the EM highlighted the need for continuous in-service education and training for nurses in the studied ICUs. A significant improvement in nurses' knowledge regarding the EM of CIPs was noted post the educational sessions. This was expected as the education changes knowledge, skills, and attitude. This finding is harmonious with other studies that reported a significant improvement in nurses' knowledge after the EM educational intervention (**Chatterley, 2017; Mary et al., 2018; Messer et al., 2015**).

The current study findings depicted that most of the studied nurses had an unsatisfactory level of practice pre the educational sessions. This could be due to the lack of in-service training programs for nurses, increased nurses' workload in the ICU, and the absence of the EM protocol to guide nursing practice in the study settings. A significant improvement in nurses' practices of the EM of CIPs was noted post the educational sessions. This improvement could be attributed to the content and process of the educational sessions, which met the individualized needs of the studied nurses. This finding was supported by the results of other studies that reported improvement in nurses' practices post the EM educational program (**Jones et al. 2020; Chong, 2017).**

A statistically significant difference was noted between the total nurses' knowledge and practices mean scores pre and post the educational sessions. As the total nurses' knowledge and practice mean scores were higher post educational sessions than pre-education. This reflects the willingness of the studied nurses to develop their knowledge and skills in their practice. It also reflects the positive effect of the educational sessions on nurses' knowledge and practices. These results are supported by the findings of **Messer et al. (2015**).

The findings of the current study showed no significant statistical relationship between nurses' baseline knowledge scores, and their gender, age, and working place. This finding is inconsistent with the finding of a study conducted by **Qutub, Matani, and Farooqi (2018)** who found a significant association between the studied participants' age and gender, and their knowledge level. Additionally, there was no significant statistical relationship between nurses' practice baseline scores and their gender, age, and working place. This finding was supported by the results of another investigation which revealed no association between nurses' demographic data and their EM practices **(Chong, 2017).**

However, a statistically significant positive relationship was noted between nurses' baseline knowledge scores and their educational level. This finding is contradicted with other studies that reported no relationship between educational level and the participants' knowledge level (**Sepulveda-Pacsi, Soderman, & Kertesz, 2016; Qutub et al. 2018)**. Moreover, a statistically significant positive relationship was noted between nurses' baseline practice scores and their years of work experience. This finding is consistent with other studies (**Sepulveda-Pacsi, et al. 2016; Qutub et al. 2018).** Furthermore, a statistically significant positive relationship was noted between nurses' practice scores, and their educational level and years of work experience in the ICU. This finding is contrasted with the finding of **Chong** (**2017**).

The findings of the current study revealed a positive significant statistical correlation between the nurses' total scores of knowledge and the nurses' total scores of practices pre and post the educational sessions. This result is consistent with the findings of other research studies **(M. Ahmed, Ahmed, Mohammed & Mahgoub,**

2020; H. Ali & Ali, 2019). Nurses' knowledge is usually delivered into their clinical practice. Hence, if nurses are aware of the best evidence for patient care, this will improve their performance and consequently the quality of care they provide and patient outcome. Therefore, continuous education, training, and refresher courses for critical care nurses are emphasized to ensure high-quality patient care in ICUs.

Overall, the current study findings showed the positive effect of the EM educational sessions on nurses' knowledge and practices of the EM of CIPs. These findings support the research hypothesis of the study.

V. Conclusion and Recommendations

The EM of CIPs' educational sessions improved nurses' knowledge and practices. Therefore, critical care nurses should periodically attend in-service training programs and refreshers EM training to maintain their knowledge and competency. Our findings highlighted the need for future studies to investigate the effect of the EM of CIPs educational sessions for nurses on patient outcomes.

Limitations

Generalizability of the research findings is limited due to the small sample size and the collection of data from two ICUs in one Egyptian teaching hospital. Besides, the place of the educational sessions was not the ideal place for education. Another limitation was related to the unavailability of the kinetic beds that are used for kinetic rotational therapy which might affect nurses' training on how to use this type of therapy.

Acknowledgment

We are very thankful to the critical care nurses who accepted to participate in this investigation.

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