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Physical Restraint and Maintenance of critically ill patient's safety in Intensive Care Unit: Effect of Clinical practice guidelines on nurse's practice and attitude

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Abstract: *Physical restraints are commonly used in health care settings especially in intensive care units to reduce the risk of injury and maintain patients' safety. However, there is still great augment about its benefits and risks and ethical concerns associated with its use in critical care settings.* ***Therefore, this study aimed*** *to evaluate the effect of clinical practice guidelines of physical restraint on nurse's practice, attitude and critically ill patient's safety at Intensive Care Unit in Tanta University hospital. To achieve this aim, a quasi-experimental research design (pre-posttest design) was utilized. A convenience sample of thirty critical care nurses was included, with one group before and after clinical practice guidelines. In addition, a convenience sample of sixty critically ill-restrained patients was included. Thirty patients were considered before guidelines group (group1) and another thirty were considered after clinical guidelines group (group2).*
Research hypothesis: H1: *The mean posttest practice score of nurses who are exposed to clinical practice guidelines of physical restraint will be significantly higher than their pre mean practice score.*
H2: *critical care nurses' attitude towards physical restraint will be significantly changed after clinical guidelines.*
H3: *The frequency of complications associated with physical restraint will be significantly decreased after application of clinical practice guidelines.* ***Three tools*** *were used to collect data:*
Tool I: *Nurses' structured interview questionnaire. This tool consisted of two parts.*
Part A*: Nurses' socio-demographic data.*
Part B: *Nurses' attitudes towards physical restraint.*
Tool II*: An observational checklist for nurses' practice regarding physical restraint.*
Tool III: *Clinical evaluation of critically Ill-restrained patients. This tool consisted of two parts:*
Part (A): *Bio-sociodemographic data of critically ill-restrained patient.*
Part B: *Nurses' attitudes towards physical restraint.* ***Results****: The majority (86.7%) of studied nurses had unsatisfactory practice score regarding physical restraint compared to most (76.7%) of them had satisfactory practice score after application of clinical practice guidelines. Statistical significant differences were observed among studied critical care nurses in relation to some items of their attitudes toward physical restraint before and after clinical practice guidelines with P<0.05. As well, most (73.3%) of patients before clinical practice guidelines had some associated complications compared to few proportion after clinical practice guidelines.* ***Conclusion****: The majority of studied nurses had had satisfactory practice score and there was a change in nurse's attitudes toward physical restraint after application of clinical practice guidelines. In addition, the frequency of patient's complications associated with physical restraint was decreased after application of clinical guidelines.* ***Based on findings of the study it is recommended to*** *conduct in-service training programs for nurses working in all ICUs on physical restraint use and its alternatives. The hospital should develop evidence-based written guidelines on physical restraint to be available for all nurses and physicians in order to follow.*

Key words: *Physical Restraint, Clinical Practice Guidelines, Patient's Safety, Intensive Care Unit.*

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I. Introduction:

Critically ill patients having life-threatening health problems and most of time depend on the health care providers and technology. Therefore, they are requiring continuous observation and interventions. Prevention and protecting them from harm are the nursing responsibilities. One of the most common methods used to ensure critically ill patient's safety in critical care units is physical Restraints (PR) [(1)].

About 80% of patients in Intensive Care Units (ICUs) may experience some degree of altered level of consciousness during their stay caused by pain, underlying illness, sleep deprivation, hypoxia, mechanical

ventilation, alcohol, substance withdrawal and altered cell metabolism. Critically ill Patients may attempt to remove invasive devices, therefore Physical and chemical restraints may be used to solve the problem [(2)].

Physical restraint in critical care units refers to any devices or equipment attached to patients' body to restrict their movement and physical activity [(3)]. The use of physical and chemical restraint may be seen as a simple solution to this problem, but the use of chemical restraint is associated with the risk of sedation-related psychosis. Therefore, in this critical care unit, the use of physical restraint is generally seen as a method of protecting and preventing interference in treatment. In addition, it is used to prevent the removal of invasive tubes and devices and prevent patient's falls and prevent confused patients from harming themselves [(4, 5, 6)]. It may include vests, straps, wrist ties, splints, mitts, belts, and bedside rails. On the other hand, the effectiveness of physical restraints in reducing rates of falls or preventing interference with devices that never been documented [(7)].

In Egypt, physical restraint is a more conventional practice in ICUs. There are no available guidelines or hospital polices concerning using of physical restraint. Most nursing researches in Egypt focuses on educational programs for nurses and surveying nurses' views about certain aspects of care [(1, 8)].Although physical restraint may be used to protect critically ill patients from a greater risk of harm, its uses may be associated with physical, psychological, ethical, and legal problems. Adverse outcomes associated with use of restraints include the complications of immobility, emotional disturbances, injuries, unplanned extubation and increased prevalence of posttraumatic stress symptoms in (ICUs) [(9,10)]. Ethical concerns related to patients' right of autonomy, whereas the right to a safe working environment has been raised as an ethical justification for restraining disoriented and aggressive patients [(11-13)].

Incomplete assessment of critically ill-restrained patients might reflect nurses' inadequate knowledge and training. So, the nursing education and training is essential to prepare qualified nurses to identify critically ill patients' needs in ICUs, provide proper physical restraint and appropriate health care services in the light of the best scientific evidences [(14,15)].The practice of physical restraint should be minimized and applied only if there is no other option. Physical restraint is applied in the least restrictive form with a shortest duration. Restraint devices should be used appropriately, properly, correctly and safely [(16)].

The critically ill-restrained Patients should be put under close observation and regular assessments. Their family members should be informed of the needs, risks and benefits of physical restraint before applying it. The use of restraint, indications, timing, and any adverse effects should be documented. Also, the nurse should search for viable alternatives to minimize the application of restraint and should gain updated knowledge and practice in this field of practice [(17, 18)].

According to the American College of Critical Care Medicine Task Force 2001–2002, the restrained patient must be assessed every 15 min. if agitated and every two hrs. if calm. The assessment should include the circulation of the restrained part, extremity movement and sensation. Most nurses monitored the restrained part every 8 h, and the assessment focused mainly on peripheral circulation[(19)].At the end, critical care nurses are closely contact with critically ill-restrained patients and responsible for caring them. Therefore, clinical practice guideline and instruction should be given for critical care nurses to develop a good practice in physical restraint[(16)].

Significance of the study

In Egypt, physical restraint is a more conventional and common practice in (ICUs), at Tanta University. In addition, there are no guidelines or policies for this practice. Most of the critically ill patients were restrained due to they may had disturbed level of consciousness or agitated and may remove medical tubes. On the other hand, material used for the physical restraint used in our ICUs is not available and inappropriate for good patient care. No research addressed physical restraint practices in Tanta's ICUs (Tanta University) especially in the field of medical surgical and critical care. Therefore, **the aim of this study** is to evaluate the effect of clinical practice guidelines of physical restraint on nurse's practice, attitude and critically ill patient's safety at intensive care unit in Tanta university hospital.

II. Subjects And Methods

Aim of the study:

Evaluate the effect of clinical practice guidelines of physical restraint on nurse's practice, attitude and critically ill patient's safety at Intensive Care Unit in Tanta university hospital.

Research hypothesis:

H1: The mean post test practice score of nurses who are exposed to clinical practice guidelines of physical restraint will be significantly higher than their pre mean practice score.

H2: Critical care nurses' attitude towards physical restraint will be positively changed after clinical guidelines.

H3: The frequency of complications associated with physical restraint will be significantly decreased after application of clinical practice guidelines.

Research design: A quasi-experimental research design was utilized in this current study (pre-posttest design).
Setting: The study was conducted at Neurological Intensive Care Units in Tanta University Hospitals.
Variables: The independent variable is the clinical practice guidelines while the dependent variables are nurse's practices and attitudes towards practicing physical restraint and associated complications.
Subjects:

A convenience sample consisted of all (Thirty) critical care nurses working in the above-mentioned setting, who apply physical restraint to critically ill patients, were included in this study. **The inclusion criteria** were both sexes, having responsibility concerned direct patient care, having educational status at least diploma in nursing. **The exclusion criteria:** Subjects who refused voluntarily to participate in the study.

In addition, a convenience sample of sixty critically ill-patients who were restrained and divided into two equal groups. Thirty patients were considered before application of clinical guidelines (group 1), while another thirty patients were considered after application of clinical guidelines (group 2). Patients who restrained for a period less than two hours were excluded. The sample size was calculated according to critically ill patient's admission to the Neurology ICU annually and it was about 600 patients. About 300 of them were restrained annually. The sample size was 60 critically ill-restrained patients.

Tools for data collection:
Two tools were developed by the researchers after reviewing relevant literature and used to collect data related to the current study.

Tool I: Nurses' structured interview questionnaire, it consists of two parts:
Part A: **Nurses' socio-demographic data**, to assess data related to age, sex, marital status, years of experiences, level of education, Previous knowledge about physical restraint and sources of it.
Part B: nurses' attitudes towards physical restraint [(20)].This part contains items measuring critical care nurses' attitude towards the use of physical restraint (19 items). Nurses were asked to respond on a 3-point Likert Scale about whether they 'agree', 'uncertain or 'disagree'.
Scoring system: Each item was given a score of 3 for 'agree', 2 for uncertain and 1 for 'disagree' and vice versa for negatively phrased items. "High" scores reflected "positive attitudes" and "low" scores reflected "negative attitudes".

Tool II: An observational checklist for nurses' practice regarding physical restraint [(21)]. This tool was developed by the researchers and assess nurse's practice regarding physical restraint procedure. It included 26 steps divided into five domains:
1: Assessment of critically ill patients before applying restrains (3 items),
2: preparation for physical restraining (3 items),
3: procedure of physical restraint (5 items),
4: Nursing care after application of PR (13 items).
5: Documentation (2 items)

Scoring system: one score was given for "done" step and zero score was given to "not done" step. The total scores of practice observational checklist were 26. The higher scores indicated higher level of practice. They were classified as: scores <50 % were considered as unsatisfactory, scores from 50 % to <75% were considered as fair, and scores >75% were considered as satisfactory level.

Tool III: Clinical evaluation of critically Ill-restrained patients: This tool was developed by the researchers and it consisted of two parts:
Part (A): Bio-sociodemographic data of critically ill-restrained patient. This part involved data about patient's age, gender, diagnosis, Patient subjected to physical restraints, duration of physical restraints, types of physical restraint used and type of restraint material used for physical restraining.
Part (B): Critically Ill-restrained Patients' associated complications [(22)]:

This part deals with the consequences of physical restraining in the form of problems or complications such as redness, swelling, skin laceration, nerve injury, ischemic injury, bruises, limb edema, bedsores and orthostatic hypotension, incontinence and constipation.

Methods
Administrative design and ethical consideration:

An official permission was obtained from the director of Tanta University Hospital and the heads of the Neurology Intensive Care Unit departments in which the study was conducted. The aim of the research was explained to the nurses. Verbal consent was obtained from each nurse to participate in the study after clarifying the procedure of the study. Nurses were informed about their right to refuse participation and to withdraw at any time without any consequences. Confidentiality of data was ensured.

Tools validity and reliability: The content validity of the developed observational checklist tool was done by revision of five panels of experts in Medical Surgical and Critical Care Nursing department to ensure its validity. The reliability test was 0.92 for observational checklist of practice, 0.89 for clinical evaluation of critically Ill-restrained patients' sheet and was 0.90 for attitudes questionnaire by using Cronbach's alpha test.

Pilot Study: A pilot study was carried out on five critical care nurses and five patients to assess the applicability and clarity of tools. Some modifications were done and the pilot studies of patients were excluded from the actual study.

Procedure: The study was carried out through four phases (assessment, designing, implementation and evaluation phases):

1. **Assessment phase:** After finalization of the data collection tools and getting official permissions, the researchers started to recruit the samples. A sample of 60 critically ill-restrained patients was recruited according to inclusion and exclusion criteria, critically ill-restrained patients before applying clinical practice guidelines, and other 30 patients after applying clinical practice guidelines. After obtaining their consent to participate, they were assessed for complications of restraining using tool III. The studied nurses who caring for critically ill restrained patients were interviewed to assess their attitudes towards physical restraint before implementing practice clinical guidelines by using pretest questionnaire.

   The time taken was 30 min. to fill out the questionnaire. This was followed by observing their practice with restrained critically ill patients using the observation checklist tool I and II. Each nurse was observed individually before implementation of the clinical guidelines to evaluate their practices. It took an average of 15-30 minutes for each to complete. Patients were assessed for complications of restraining using tool III. Data collection for the current study was carried out in the period from December 2016 until April 2017.
2. **The designing phase**: Based on analysis of the collected data, the researchers developed a designed clinical practice guidelines and teach critical care nurses how to deal with restraint patients through 4 sessions. The objectives of designed guidelines were to improve nurses' awareness and practice regarding physical restraint. It covered assessment of patient before applying restrains, preparation for restraining, procedure, nursing care after application of PR and documentation. As well, post restraint care involves range of motion exercise, neuro-vascular check, capillary refill, hygienic care for restrained parts. Teaching methods involved questioning, small group discussion, demonstration, and re-demonstration and problem solving situations. The teaching media included illustrative pictures, videotapes and handouts.
3. **The implementation phase:** In this phase, a booklet containing the component of the clinical guidelines based on literature review and the results of pretest evaluation was prepared in Arabic language and was supplemented by photos and illustrations to help the nurses understanding of the contents. Clinical guidelines were carried out for all nurses in educational classroom in the intensive care unit. The clinical guidelines consisted of four sessions on four consecutive days for practical part and included:

Session one: Included purposes of the clinical practice guidelines, assessment of patient before applying restrains, preparation for restraining.

Session two: Included the procedure of restraint and teach the nurse how to restrain critically ill patients correctly, appropriately and without harm.

Session three: It included the post procedure care such as assessment of circulation, skin color, and sensation during restraint, range of motion exercise, renewing the order every 2 hours under physician's instruction, and documentation of restraining data in patient's file.

Session four: were used as a demonstration and re-demonstration on physical restraint procedure and how to assess restrained patients using videos and illustrative graphs. . Every session took approximately 30-45 min. The Clinical guidelines were conducted in small groups (5-7 nurses/session).

4. **The evaluation phase**: This phase was carried out after implementing the clinical practice guidelines. Each nurse was evaluated to determine the effect of the clinical practice guidelines on nurse's practice and attitude toward physical restraint using tools I part B and tool II. As for patients, the evaluation was done by comparing the assessment done after guidelines' implementation with the pre-guidelines assessment-using tool III.

Limitations of the study:

- The small sample size.
- This study was limited to the staff nurses working in previously determined settings.

Statistical analysis: The analysis was performed using statistical software SPSS version 23.

- For quantitative data, the range, mean and standard deviation were calculated.
- For qualitative data, a comparison between groups before and after intervention was done by using Chi-square test. For a comparison between two means, the independent t- test was calculated. A significance was adopted at $P<0.05$ for interpretation of results of tests of significance.

III. Results

Table 1: Distribution of studied nurses according to their personal characteristics

Personal characteristics	Studied sample (n=30)	
	N	%
Sex:		
▪ Male	4	13.3
▪ Female	26	86.7
Age	**Mean ± SD 28.70±0.795**	
Level of education		
▪ Diploma secondary nursing School	6	30.0
▪ Technical institute of nursing	11	36.7
▪ Bachelor degree	10	33.3
Years of experience		
▪ < 5	15	50.0
▪ 5-< 10 years	4	13.3
▪ ≥ 10 years	11	36.7
Source of knowledge		
▪ books	17	56.7
▪ Net	4	13.3
▪ Book and net	5	16.7
▪ Book and doctors	2	6.7
▪ Book, net and doctors	2	6.7
Nurse to patient ratio		
▪ 1:2	11	36.7
▪ 1:3	19	63.3

Table (1) shows distribution of studied nurses according to their personal characteristics. It was observed that the majority (86.7%) of studied nurses were female, more than one third (36.7%) of nurses had technical institute of nursing and one third of them had bachelor degree.in addition the mean age of the studied nurses was **28.70±0.795.** Regarding years of experience, one half (50.0%) of nurses had years of experience less than 5 years and more than one third of them (36.7%) had ten years or more years of experience. Also, more than half (56.7%) of nurses had knowledge about physical restraint through books and only 6.7% of them had knowledge through book, net and doctors.

Table 2: Distribution of studied nurses according to assessment of patient before applying restraint, preparation for restraining and procedure of physical restraint domain before and after applying clinical guidelines.

Clinical Practice guidelines domain (1), (2) and (3)	The studied nurses (n = 30)								χ^2 P
	Before clinical guidelines				After clinical guidelines				
	Done		Not done		Done		Not done		
	N	%	N	%	N	%	N	%	
1. Assessment of patient before applying restrains:									
1. Indication of applying restraint	20	66.7	10	33.3	25	83.3	5	16.7	FE 0.116
2. Review physician's order for application of the restraints	3	10.0	27	90.0	22	73.3	8	26.7	**FE 0.00***
3. Asses the site of restraint	6	20.0	24	80.0	22	73.3	8	26.7	**FE 0.00***
2. preparation for restraining:									
4. preparation of equipment	19	63.3	11	36.7	25	83.3	5	16.7	FE 0.072
5. preparation of patient	11	36.7	19	63.3	26	86.7	4	13.3	**FE 0.00***
6. preparation of environment	2	6.7	28	93.3	25	83.3	5	16.7	**FE 0.00***
3. Application of physical restraint									
1. Padding bony prominences, and securing the restraint accurately	9	30.0	21	70.0	30	100.0	0	0.0	**FE 0.00***
2. didn't restrain patient while lying flat position	7	23.3	23	76.7	25	83.3	5	16.7	**FE 0.00***
3. Making sure that restraints is not over an IV line or other device	24	80.0	6	20.0	29	96.7	1	3.3	FE 0.05
4. Attaching the restraint to bed frame, not side rails	10	33.3	20	66.7	22	73.3	8	26.7	**FE 0.002***
5. Secure restraints with a quick release	24	80.0	6	20.0	26	86.7	4	13.3	FE 0.365

FE: Fisher's Exact Test * Significant at P<0.005

Table (2) Represents distribution of studied nurses according to assessment of patient before applying restraint, preparation for restraining and procedure of physical restraint domain before and after applying clinical guidelines. Regarding assessment of patient before applying restrains, it was observed that

about two third (66.7%) and only (10.0%) of critical care nurses assess the indication of applying physical restraint and review physician's order for application of the restraints respectively before application clinical guidelines compared to the majority (83.3%) and most (73.3%) of them respectively after clinical guidelines. In addition, less than one quarter (20%) of nurses asses the site of restraint before guidelines compared with (73.3%) after application of clinical guidelines with statistical significant difference where P<0.05.

As well, more than one third (36.7%) and only (6.7%) of nurses prepare critically ill patients before applying physical restraint and preparing environment respectively compared to the majority (86.7%) and (83.3%) of nurses after applying guidelines with statistical significant differences where P<0.05.

Regarding application of physical restraint, statistical significant improvement was observed after applying clinical guidelines regarding padding bony prominences, and securing the restraint accurately, didn't restrain patient while lying flat position, and attaching the restraint to bed frame, not side rails" with P<0.05.

Table 3: Distribution of studied nurses according to care and documentation after applying physical restraint.

Clinical Practice guidelines Domain (4, 5)	Studied sample (n=30)								FE P
	Before clinical guideline				After clinical guideline				
	Done		Not done		Done		Not done		
	N	%	N	%	N	%	N	%	
4.Care after PR application:									
1-Assess of proper placement of restraint	12	40.0	18	60.0	29	96.7	1	3.3	**0.00***
2- Assess of proper placement of restraint	5	16.7	25	83.3	28	93.3	2	6.7	**0.012***
3-Assess the color of the skin	8	26.7	22	73.3	26	86.7	4	13.3	**0.00***
4-Assess peripheral circulation	5	16.7	25	83.3	24	80.0	6	20.0	**0.00***
5-assess movement and sensation	2	6.7	28	93.3	29	96.7	1	3.3	**0.00***
6-inspect the skin for abrasions or skin tears	8	26.7	22	73.3	26	86.7	4	13.3	**0.00***
7-Remove restraints for 30 minutes every 2 hours	3	10.0	27	90.0	23	76.7	7	23.3	**0.00***
8- Renewing orders every 24 hours.	13	43.3	17	56.7	18	60.0	12	40.0	0.152
9-Evaluate of restrained body part every 2 hours	0	0.0	30	100.0	25	83.3	5	16.7	**0.00***
10-change position frequent	19	63.3	11	36.7	27	90.0	3	10.0	**0.015***
11-provision of adequate range of motion	11	36.7	19	63.3	29	96.7	1	3.3	**0.00***
12-tell the family the rational of restraint(s) when will be removed	3	10.0	27	90.0	26	86.7	4	13.3	**0.00***
13-When the patients does not need to be restrained, nurse make this suggestion to the doctor	0	0.0	30	100.0	24	80.0	6	20.0	**00.0***
5. Documentation:									
1- Record on the kardex the type of restraint used	0	0.0	30	100.0	24	80.0	6	20.0	**00.0***
2-Record the time, indications, and unexpected outcomes for restraining	0	0.0	30	100.0	21	70.0	9	30.0	**00.0***
Mean scores of total practice of physical restraint	**Mean ± SD 7.20±4.106**				**Mean ± SD 21.70±4.466**				**t=13.093 P=0.00***

* Significant at P<0.005

Table (3) represents distribution of studied nurses according to post care practices and documentation of physical restraint. With regard post care practice, more than one third (40.0%) of nurses assess of proper placement of restraint before clinical practice guidelines and the percentage improved to the majority (96.7%) of them after guidelines with P<0.05. Only (16.7%) of studied nurses assess condition of patient's restrained body part at least every 30 minutes and assess peripheral circulation before application of clinical guidelines compared to the majority (93.3%) and (80.0%) of them after guidelines respectively with P< 0.05. Also, less than one-third (26.7%) of nurses assess the color of the skin and-inspect the skin for abrasions or skin tears before clinical guidelines compared with (86.7%) after guidelines with P<0.05.

Statistical significant differences were observed before and after clinical guidelines regarding" Evaluate of restrained body part every 2 hours", "change position frequent", and "provision of adequate range of motion" where P<0.05.Also, the minority (10.0%) of nurses remove restraint for 30 minutes every 2 hours and tell the family when the restraint will be removed with P<0.05.In relation to documentation, none of nurses in studied ICU before clinical guidelines record the type of physical restraint used, the time, indications, and unexpected outcomes in patient's file and the majority (80.0%) and most (70.0%) of them documented these practices after guidelines. In addition, the total mean score of practice was (7.20±4.106) before clinical guidelines and reached to (21.70±4.466) after guidelines.

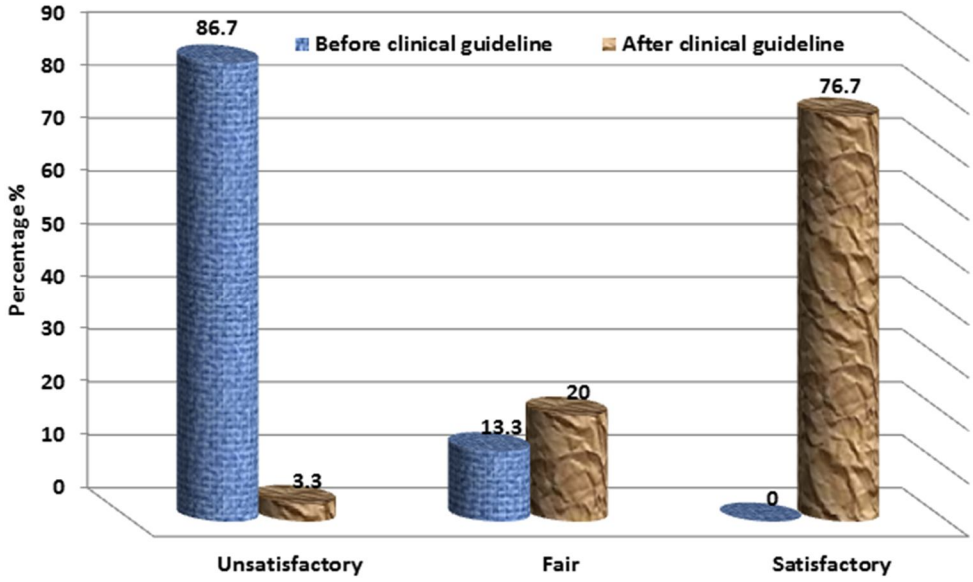

Fig (1): Distribution of studied nurses according to total practice level

Fig (1) shows distribution of studied nurses in relation to total practices level of physical restraint before and after clinical guidelines. It was found that the majority (86.7%) of studied nurses had unsatisfactory practice score regarding physical restraint compared to most (76.7%) of them had satisfactory practice score after application of clinical guidelines. Also, statistical significant different was observed with P=0.00.

Table 4: Distribution of studied nurses in relation to their attitudes toward physical restraint before and after clinical guidelines.

Nurses attitudes toward physical restraint	The studied nurses (n=30)												χ^2 P
	Before clinical Guideline n=(30)						After clinical Guideline n=(30)						
	agree		uncertain		disagree		agree		uncertain		disagree		
	N	%	N	%	N	%	N	%	N	%	N	%	
1. patient's sedation can be reduced more safely by using physical restraint	20	66.7	4	13.3	6	20.0	10	33.3	3	10.0	17	56.7	**8.73 0.01***
2. tell the family that restraining is a part of care	6	20.0	9	30.0	15	50.0	22	73.3	8	26.7	0	0.0	**24.20 0.00***
3. I feel bad if the patient gets upset after restraints are applied	17	56.7	6	20.0	7	23.3	19	63.3	5	16.7	6	20.0	**12.35 0.00***
4. I feel that nurses have the right to refuse to place of restraints.	5	16.7	8	26.7	17	56.7	7	23.3	15	50.0	8	26.7	**5.70 0.05***
5. I feel guilty when place a patient in restraint	19	63.3	6	20.0	5	16.7	21	70.0	7	23.3	2	6.7	1.463 0.48
6. The use of physical restraint allows for other duties to be completed	19	63.3	7	23.3	4	13.3	24	80.0	6	20.0	0	0.0	4.65 0.09
7. I feel that family members have the right to refuse the use of restraints	2	6.7	11	36.7	17	56.7	5	16.7	9	30.0	16	53.3	1.51 0.46
8. Medical staff suggest the use of restraint than nursing staff	8	26.7	7	23.3	15	50.0	19	63.3	8	26.7	3	10.0	2.81 0.24
9. I feel embarrassed when the family enters the room of a patient who is restrained and they have not been notified.	16	53.3	6	20.0	8	26.7	7	23.3	5	16.7	18	60.0	**7.45 0.02***
10. Physical restraint is prescribed and applied unnecessarily	16	53.3	4	13.3	10	33.3	19	63.3	2	6.7	9	30.0	0.97 0.61
11. Use physical restraint with physician's order	2	6.7	8	26.7	20	66.7	22	73.3	7	23.3	1	3.3	0.49 0.78
12. Physical restraint is used more when there's shortage in staff number	16	53.3	1	3.3	13	43.3	6	20.0	2	6.7	22	73.3	**7.19 0.02***
13. Physical restraint is sometime applied without prescription	20	66.7	7	23.3	3	10.0	15	50.0	10	33.3	5	16.7	1.74 0.41
14. Do not believe in use of	2	6.7	9	30.0	19	63.3	4	13.3	11	36.7	15	50.0	1.33

physical restraints													0.51
15. Physical restraints are not suitable for patients' rights	12	40.0	8	26.7	10	33.3	17	56.7	9	30.0	4	13.3	3.49 0.17
16. Physical restraint causes patient to be in hospital for long period	6	20.0	6	20.0	18	60.0	17	56.7	8	26.7	5	16.7	**12.89** **0.002***
17. Physical restraints prevent falling from hospital beds	20	66.7	0	0.0	10	33.3	20	66.7	6	20.0	4	13.3	3.63 0.16
18. Before using restraints, alternative methods should be tried	6	20.0	6	20.0	18	60.0	23	76.7	6	20.0	1	3.3	**25.17** **0.00***

* Significant at P<0.005

Table (4) represents distribution of studied nurses in relation to their attitudes toward physical restraint before and after clinical guidelines. In this table, statistical significant differences were observed among studied nurses in relation to their attitudes toward physical restraint before and after clinical guidelines regarding some items of Likert scale such as " patient's sedation can be reduced more safely by using physical restraint", "tell the family that restraining their patient is a part of care" "I feel bad if the patient gets more upset after restraints are applied" and" I feel embarrassed when the family enters the room of a patient who is restrained and they have not been notified with P<0.05. Also, about two third (63.3%) and majority (80.0%) of nurses before and after application of guidelines respectively agree that the use of physical restraint allows for other duties to be completed. In addition, about half (50.0%) and two third (63.3%) of nurses before and after guidelines respectively agree that medical staff suggest the use of restraint than the nursing staff. However, most (73.3%)of studied nurses after clinical guideline was disagree that physical restraint is used more when there's shortage in staff number and more than half (56.7%) and most (76.7%) of them after guidelines agree that physical restraints causes patient's to stay in hospital for long period and before using restrains alternative methods should be tried respectively with P<0.05.

Table (5): Comparison between nurses' age and their mean scores of physical restraint practice domains before and after applying clinical guideline.

Physical restraint practice domains	**Age Mean ±SD**							
	Before clinical guideline			**t**	**After clinical guideline**			**t**
	< 20 years	**20-<30**	**≥ 30**	**P**	**< 20 years**	**20-<30**	**≥ 30**	**P**
1-Assessment of patient before applying restrains	1.00±0.00	0.75±0.463	1.47±0.69	**4.12** **0.02***	1.33±1.155	1.36±0.641	1.58±0.69	2.16 0.13
2-preparation for restraining	0.00±0.00	1.16±0.765	1.25±1.389	2.15 0.13	3.00±0.000	2.47±0.841	2.38±0.916	0.64 0.53
3-Procedure	2.00±0.000	1.63±1.061	2.63±0.831	**3.99** **0.03***	3.67±2.309	3.53±0.697	3.63±0.518	1.14 0.23
4-Care after applying PR	0.00±0.00	2.74±2.377	3.25±3.495	1.73 0.19	8.67±5.774	11.21±2.463	11.25±2.315	1.11 0.34
5-Documentation	0.00±0.00	0.00±0.00	0.00±0.00	-	1.33±1.155	1.63±0.597	1.63±0.744	0.27 0.78
Total Physical restraint mean score	**3.00±0.00**	**6.88±4.998**	**15.00±3.712**	**6.12** **0.03***	**17.00±10.392**	**21.75±3.284**	**22.42±3.421**	2.04 0.14

* Significant at P<0.005

Table (5) shows comparison between nurses' age and their mean scores of Physical restraint practice domains before and after applying clinical guideline. In this table, the mean score of nurses practice of patient's assessment before applying restrains among nurses' age of 30 years or more was **(1.47±0.69)** before clinical guidelines. In addition, the mean score of nurses' practice regarding procedure of physical restraint before clinical guidelines was(**2.63±0.83)**nurses' age of 30 years or more where it was **(2.00±0.00)** and **(1.63±1.06**) among nurses 'age of <20 years and 20 -< 30 years respectively. In addition, the mean score of practice regarding care after applying physical restraint care before applying guidelines was(**3.25±3.49**) among nurses' age of 30years and more. Also, the total mean score of practicing physical restraint was increased among nurses with 30years or more before guidelines to be **(15.00±3.71**) and it was **(22.42±3.42)** after clinical guidelines at the same level of age compared with mean scores at other level of age. After clinical guidelines, no significant differences were observed regarding Physical restraint practice domains and nurses' age.

Table (6): Comparison between nurses' years of experiences and their mean scores of Physical restraint practice domains before and after clinical guideline

Physical restraint practice domains	Years of experiences Mean ±SD							
	Before clinical guideline			t P	After clinical guideline			t P
	<5 years	5-<10	≥ 10		<5 years	5-<10	≥ 10	
1-Assessment of patient before applying restrains	1.27±0.704	1.50±0.577	1.09±0.701	0.55 0.58	2.27±0.961	2.50±0.577	2.18±0.751	0.20 0.81
2-preparation for restraining	0.80±0.676	1.00±1.155	1.45±1.214	1.47 0.24	2.67±0.617	2.00±1.414	2.45±0.820	1.07 0.35
3-Procedure	2.20±0.561	3.00±0.816	2.18±1.328	1.27 0.29	4.00±1.309	4.75±0.500	4.73±0.467	2.02 0.15
4-Care after applying PR	1.60±2.131	2.50±1.732	4.00±3.194	2.83 0.07	11.00±3.024	8.75±3.304	11.73±2.102	1.71 0.19
5-Documentation	0.00±0.00	0.00±0.00	0.00±0.00	-	1.67±0.724	1.25±0.500	1.64±0.674	0.61 0.55
Total Physical restraint mean score	**5.87±2.924**	**8.00±3.559**	**8.73±5.255**	1.70 0.20	**21.60±5.262**	**19.25±4.113**	**22.73±3.228**	0.89 0.42

Table (6) represents comparison between nurses' years of experiences and their mean scores of Physical restraint practice domains before and after clinical guideline. In this table, the mean score of nurses practice of patient's assessment before applying physical restraint and the procedure domain were increased among nurses with 5-10 years of experience before clinical practice guidelines (**1.50±0.57)** and **(3.00±0.81**) respectively and was increased after guidelines at the same years of experience to be (**2.50±0.57**) and **(4.75±0.50**) respectively.

On the other hand, the mean scores of "preparation for restraining" and "care after applying PR" was increased among nurses with more than 10 years of experience before clinical guidelines (**1.45±1.21)** and **(4.00±3.19**) respectively. In addition, it was (**2.45±0.82)** and (**11.73±2.10**) respectively, among studied nurses with the same level of years of experience after application of clinical practice guidelines. Moreover, the total mean scores of physical restraint practice were increased before and after guidelines among studied nurses with more than 10 years of experiences. No significant differences were observed regarding years of experiences and mean scores of all domains of physical restraint practice.

Table (7): Comparison between nurses' educational level and their mean scores of Physical restraint practice domains before and after clinical guideline

Physical restraint practice domains	Level of education Mean ±SD							
	Before clinical guideline			t P	After clinical guideline			t P
	Diploma	Technical institute of nursing	Bachelor degree		Diploma	Technical institute of nursing	Bachelor degree	
1-Assessment of patient before applying restrains	0.78±0.441	1.27±0.786	1.60±0.516	**4.30 0.02***	1.67±0.866	2.36±0.809	2.70±0.483	**4.813 0.01***
2-preparation for restraining	0.67±1.323	1.00±0.667	1.45±0.820	1.714 0.199	2.44±0.882	2.36±0.924	2.70±0.675	0.45 0.64
3-Procedure	1.67±1.00	2.10±0.5683	3.00±0.775	**7.509 0.003***	4.00±1.581	4.91±0.302	4.10±0.738	2.69 0.08
4-Care after applying PR	1.33±2.646	2.00±2.261	4.18±2.523	**3.714 0.038***	10.11±3.689	10.90±2.378	11.73±2.412	0.80 0.45
5-Documentation	0.00±0.00	0.00±0.00	0.00±0.00	-	1.44±0.882	1.55±0.688	1.80±0.422	0.70 0.50
Total Physical restraint mean score	**4.44±3.779**	**6.70±2.983**	**9.91±3.780**	**6.068 0.007***	**19.67±6.205**	**22.20±2.936**	**22.91±3.700**	1.44 0.25

* Significant at P<0.005

Table (7): Comparison between nurses' educational level and their mean scores of Physical restraint practice domains before and after clinical guideline. In this table it was observed that the mean score of nurses practice concerning" assessment of patient before applying restrains", "preparation for restraining", procedure and "post-practice care" domains were increased among studied nurses with bachelor degree and reached to(1.60±0.51), (1.45±0.82), (3.00±0.77) and (4.18±2.52) respectively than other levels of education before application of clinical guidelines. On the other hand, no statistical significant differences were observed

after guidelines in relation to preparation for restraining, procedure, and post-practice care and documentation domains. Moreover a statistical significant difference was observed only after guidelines regarding assessment of patient before applying restrains with P<0.05. Also, significant difference was observed among all nurses before clinical guidelines regarding total mean score of practice with P<0.05.

Table (8): Distribution of studied critically ill-patients according to bio-socio demographic characteristics before and after clinical guidelines

Patient's characteristics	The studied patients (n=60)				
	Group 1 (n=30)		Group 2 (n=30)		χ^2 P
	N	%	N	%	
Sex:					
▪ Male	20	66.7	21	70.0	0.77
▪ Female	10	33.3	9	30.0	0.781
Age	Mean ± SD 56.39±2.84		Mean ± SD 57.87±1.755		F=2.957 P=0.091
Diagnosis					
Patient subjected to physical restraints					
▪ agitated	15	50.0	11	36.7	1.115 0.573
▪ unconscious	14	46.7	18	60.0	
▪ Patients who receive sedation	1	3.3	1	3.3	
Duration of physical restraint evaluation					
▪ 2 hours	0	0.0	10	33.3	
▪ 4hours	0	0.0	16	53.3	**56.267**
▪ 8 hours	2	6.7	14	46.7	**0.00***
▪ depend on patient condition	28	90.0	0	0.0	
Physical restraint is released:					
▪ Every 2 hrs.	0	0.0	16	53.3	
▪ Every 4 hrs.	0	0.0	10	33.3	**52.502**
▪ Every 8 hrs.	0	0.0	4	13.4	**0.00***
▪ Not released	13	43.3	0	0.0	
▪ Very 24 hrs.	17	56.7	0	0.0	
# **Types of physical restraints**					
▪ wrist restraint	30	100.0	30	100.0	
▪ upper limb restraint	22	73.3	25	83.3	**3.21**
▪ lower limb restraint	14	46.7	22	73.3	**0.035***
▪ abdominal restraint	9	30.0	5	16.7	
Types of material used for physical restraint					
▪ Roll of gauze	24	80.0	2	6.7	**5.16**
▪ special restraints	0	0.0	3	10.0	**0.00***
▪ gauze and dressing	6	20.0	25	83.3	

Group 1: Before guideline group Group 2: After guideline group
More than one answer was chosen. * Significant at P<0.005

Table (8) shows distribution of studied critically ill-patients according to bio-sociodemographic characteristics before and after clinical guidelines. In relation to sex, about two third (66.7%) and (70%) of studied patients before and after clinical guidelines were male respectively. Also, the mean ages of studied patients before and after guidelines were (56.39±2.84) and (57.87±1.75) respectively. Also, half (50.0%) and (60.0%) of Patients subjected to PR were agitated and unconscious before and after guidelines respectively. With regard duration of PR, the majority (90.0%) of physically restrained patient duration depend on patients conditions before clinical practice guidelines. While more than half (53.3%) of them restrained for duration of 4 hours and near to half (46.7%) of the sample restrained for a duration of eight hours after clinical practice guidelines.

Regarding the duration of Physical restraint release, more than half (56.7%) of studied patients were released from it every 24 hours. While after application of clinical guidelines, about one half (53.3%) and more than one third (33.3%) of patients were released every 2 and 4 hours, respectively. As regard types of physical restraints, all (100.0%) patients before and after application of clinical guidelines used wrist restraints and less than one third (30.0%) of them used abdominal restraint before guidelines compared only to (16.7%) after clinical guidelines with P<0.05. Regarding types of material used, the majority (80.0%) of critically ill patients restrained with roll of gauze only compared with (83.3%) of them after clinical guidelines restrained with gauze and dressing with P<0.05.

Fig. (2): Distribution of studied critically ill patient according to their diagnosis

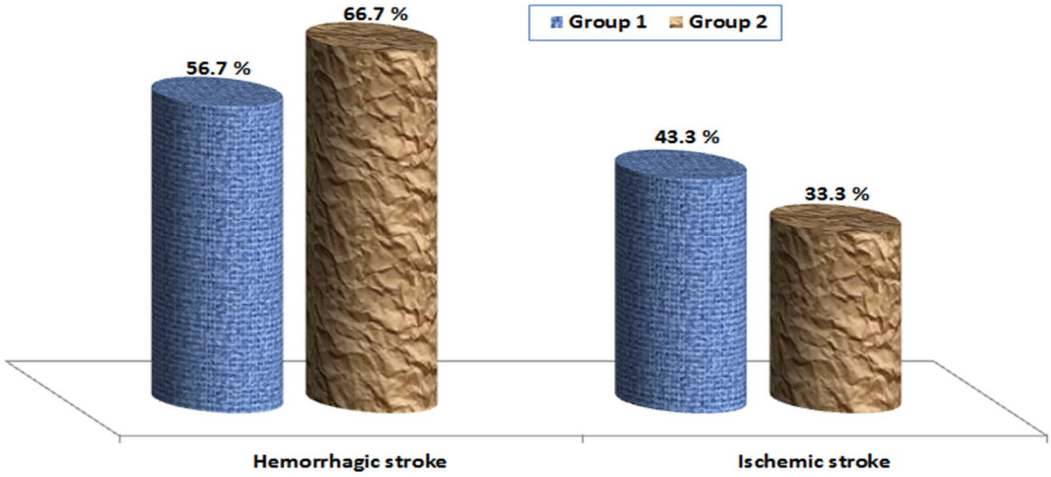

Fig. (2) Shows distribution of studied critically ill patient according to their diagnosis. In this figure, more than half (56.7%) and two third (66.7%) of studied patients diagnosed as hemorrhagic stroke before and after clinical guidelines.

Table (9): Distribution of the studied critically ill patients according to presence of complications from physical restraints

Complications of physical restraints	The studied patients (n=60)				χ^2	P
	Group 1 (n=30)		Group 2 (n=30)			
	N	%	N	%		
1. Bruises	22	73.3	3	10.0	**FE**	**0.00***
2. Redness	19	63.3	3	10.0	**FE**	**0.00***
3. Swelling	17	56.7	0	0.0	**FE**	**0.00***
4. Nerve injury	0	0.0	0	0.0	-	-
5. Ischemia	0	0.0	0	0.0	-	-
6. Skin laceration	5	16.7	0	0.0	**FE**	**0.02***
7. Limb edema	6	20.0	0	0.0	**FE**	**0.02***
8. Bed sores	5	16.7	0	0.0	**FE**	**0.02***
9. Orthostatic hypotension	1	3.3	0	0.0	FE	1.00
10. Restricted circulation	1	3.3	0	0.0	FE	1.00
11. Incontinence	22	73.3	5	16.7	**FE**	**0.03***
12. Constipation	19	63.3	0	0.0	**FE**	**0.00***
13. Unplanned extubation of connected tubes/lines	17	56.7	0	0.0	**FE**	**0.00***

Group 1: Before guideline group Group 2:After guideline group
More than one answer was chosen. * Significant at P<0.005

Table (11) shows presence of complications of physical restraints before and after clinical guidelines.in this table, It was found that most (73.3%) of patients before clinical guidelines had bruises and incontinence compared to only (10.0%) and (16.7%) after guidelines with statistical significant differences where P<0.05. Also, near two third (63.3%) of patients before clinical guidelines had complications of redness and constipation and the percentage decreased after guidelines to (10.0%) with P<0.05. In addition, more than half (56.7%) of patients had swelling and unplanned extubation of connected tubes and lines respectively before guidelines and the percentage decreased to (0.0%).Only (16.7%) of patients had skin laceration and bedsores before clinical guidelines and the percentage reached to (0.0%) after guidelines with P<0.05. Moreover (20%) of them had limb edema before guidelines with P<0.05.

IV. Discussion:

Critical Care Unit is one of the specialized sections of nursing care. Critically ill patients are cared for their life-threatening conditions. One of the nursing care services in ICU is the appropriate use of physical restraint for prevention of harms for critical ill patients. Use of physical restraint is a common clinical practice in Intensive Care Units (ICU). Use of physical restraint is usually associated with many adverse effects. In addition, it raises many ethical and practical concerns [(23)].Therefore, teaching clinical guidelines about physical restraint are as necessary for the critical care nurses in clinical practice.

Regarding socio-demographic characteristics of the studied critical care nurses, the present study revealed that, the majority of the sample was female and their ages ranged from 20-30 years. In addition, half of them had years of experience less than five and about one third had bachelor degree. These results were in the agreement with **Younis G and Ahmed S (2015)[24]** Who stated in their study that the majority of their sample was female and their ages ranged from 20-30 years and had years of experience from one to four years.

Regarding nurse to patient's ratio, the findings of the present study found that about two third of nurses had a ratio of 1:3 patients. The number of restrained patients increased with the decrease in the number of nurses. This may be interpreted, as there is a shortage of nursing staff in ICUs of Tanta University, which increase nurses 'work overload, so they use physical restraints. This result was in line with **Al-Khaled T et al. (2011)** [1] they indicated that staffing patterns have been cited as a factor that influences the use of physical restraint. Also, **Zolot (2016)** [25] documented that the presence of adequate number of registered nurses on the unit appears to decrease restraint use.

In relation to sources of nurses' knowledge about physical restraint, this result showed that more than half of nurses had knowledge about restraint through books. This mean that no training was carried out regarding physical restraint in Tanta' ICUs because nurses and physicians have no concern about this procedure. In agreement with this, **Cannon et al., (2001) [26]** and **Hafez E, (2011)** [27] found in their studies that most of critical care nurses did not receive any special education or training about physical restraint. On the other hand, **Taha** and **Ali z, (2013)[16]** reported that few nurses having information about physical restraining through training, whereas most of the sample reported practice as a source of their information.

Concerning clinical practice regarding physical restraint of critically ill patients, the results revealed that the nurse's mean score of patient's assessment before applying restraint was inadequate before applying clinical guidelines and was increased after guidelines. This may be attributed to the lack of nurses training about physical restraint, the lack of written policies in ICUs about guiding physical restraining and inadequate supervision. In addition, this result indicated that the majority of nurses did not review physician's order for application of the physical restraints. This due to the absence of written medical order and physicians has no concern about this procedure.

While, after clinical guidelines the majority of nurses review physician's order regarding this practice. This result was supported by **Azab and Negm, (2013)**[19] who stated that a small proportion of the respondent nurses use physical restraint with a physician's order. Similar, finding was reported by **De Jonghe et al. (2013)**[28]who found that PR was started and removed without written medical orders. In addition, two third of studied nurses review the indication of applying restraint. Similarly, **Lai's (2007)** [29] study showed that regardless nurse' attitudes towards the use of physical restraints, they review the indication of applying restraint and apply restraints in order to prevent treatment disruption, stop self-injury, and prevent falls.

Regarding preparation for restraining, near two third of the studied nurses prepare the needed equipment before implementation of clinical guidelines. On the other hand, about two third of them did not prepare the patient. Also, the majority of nurses didn't assess of proper placement of restraint, didn't renewing orders every 24 hours, didn't provide adequate range of motion, assess the color of the skin, assess peripheral circulation, assess movement and sensation, and didn't remove restraints for 30 minutes every 2 hours. Incomplete assessment of the restrained patient's extremity might reflect nurses' inadequate knowledge and training on caring for physically restrained patients and shortage of nursing staff. In addition, the majority of nurses did not assess the site of physical restraint.

While after application of clinical guidelines, the majority of nurses did theses intervention appropriately. This interpreted as the contents of these guidelines stressed on patient's care before, during and after application of physical restraint. Similarly, **East Cheshire NHS Trust (2009)** [30] emphasized the importance of continuous reassessment of restraint sites. In addition, according to the American College of Critical Care Medicine Task Force 2001–2002, the restrained patient must be assessed every 15 min if agitated and every 2 hrs. if calm **(Maccioli et al., 2003)[18]**. Also, this results was constant with **Freeman S et al (2016)[31]** and **Akansel N, (2007)[32]**, they demonstrated in their studies that the physical restraint assessment should include the circulation of the restrained part, extremity movement and sensation and reported that most nurses monitored the restrained part every 8 h, and the assessment focused on peripheral circulation.

Concerning documentation, the results of this study revealed that all studied nurses reported that the type of restraint used , time, indication and expected outcome not documented and record on the kardex and medical record of patients before clinical. This may be attributed to their belief that restraining procedure is not ethically accepted, so they do not document any data related to this procedure. Moreover, they may not consider restraining as an important procedure that requires documentation. This results was in accordance with **Choi E (2003)** [33] who stated that in his study about Physical restraint use in a Korean ICU" that nurse's records in a patient's chart rarely mentioned the restraint use. In addition, **by Kandeel et al (2013)**[8] reported in a study that was carried out in Egypt that majority of nurses did 'not documented the purpose of physical restraints in patient's medical records. On the other hand, **Agens (2010)**[34] stated that the implementation of restraints should

be documented and the time for restraint should be minimal, and assessments should be frequent for their effectiveness and complications.

Furthermore, the current result demonstrated that the nurses' total mean practice score were unsatisfactory and inadequate before applying clinical guidelines. It is clear that such low standard of performance in physical restraints practice, is due to some factors such as is no physician order that the nurse can follow ,lack of cooperation between nurse and physician or lack of physicians' knowledge regarding their role in participating in the decision of restraining a patient. On the other hand, the total mean score of physical restraint practice was improved significantly after application of clinical guidelines among nurses regardless their personal characteristic. In this respect, **Huang et al. (2009)** [(35)] found a significant improvement in nurses', attitudes, and self-reported practices related to physical restraint use after completion of a short-term in-service education program.

Regarding attitudes of nurses toward physical restraint, the findings of the current study showed that two third of the sample agreed that patient's sedation can be reduced more safely by using physical restraint, in this respect **Esmaeili R et al. (2007)**[(22)] reported that the majority of nurses reported sedatives as alternatives to physical restraints. In addition, they agreed, "The use of physical restraint allows for other duties to be completed. Similarly, **Akansel N, (2007)** [(32)] showed that most of the nurses believed that restraint allow health practitioners to work safely.

Also, they agreed that Physical restraint is sometime applied without prescription and Physical restraint is used more when there is shortage in staff number and Physical restraint is prescribed and applied unnecessarily. Also, more than half of nurses agreed with the statement "I feel bad if the patient gets more upset after restraints are applied and physical restraints prevent falling from hospital beds.

On the other hand, about half of nurses disagreed with this statement "tell the family that restraining their patient is a part of care" and I feel that nurses have the right to refuse to place patient in restraints"," I feel that family members have the right to refuse the use of restraints. In this regard, **Azab S and Negm (2013)** [**(19)**] and **Hine K. (2007)**[(36)] Showed in their study that most of the respondent nurses believed that if they were the patients, they should have the right to refuse or resist the placing of restraints and disagreed that family members have the right to refuse the use of restraints.

Also the current finding reveled that, nurses disagreed about these sentences " Medical staff suggest the use of restraint than the nursing staff"" I do not believe in the use of physical restraints with patients in ICU" and" Before using restrains alternative methods should be tried before PR", before application of clinical guidelines. Also, these results reported that these negative attitudes were changed after application of practical guidelines. In this respect, **Ralph M** and **Gabriele M, (2013)** [(37)]**, Kong** and **Evans, (2012)**[(38)] and **Nay and Koch (2006)**[(39)] illustrated in their studies that nurses used physical restraints often as a first choice without considering potential alternative measures.

While, this result was congruent with **Azab and Negm, (2013)**[**(19)**] and **Suen et al, (2006)**[(40)] who stated that the respondent nursing staff in their study reported attempts of several alternative methods before applying PR should be done. Also, two third of nurse disagreed to apply physical restraint with physician's order. This may be interpreted that this procedure considered the responsibility of nurse as she stay long time beside the patients. This was in lines with **De Jonghe et al. (2013)** [(28)] and **Choi and Song, (2003)** [(33)] they found that, the majority of restraint applications was usually started and removed without physicians orders.

As for comparison between nurse's age and their mean scores of Physical restraint practice domain, the results of current study found that with increasing the age of nurses, the level of performance regarding the domains of physical restraint increased. This is because the increasing nurses' age may increase level of experiences in ICUs. This was in line with **McMillan's study (2004)**[(41)] which concluded that professionals and mature age nurses have more experience and tend to make better adjustment compared with younger ones.

In relation to years of experiences, the results of the current study illustrated that there was a significant relationship between the total mean score of practice and critical care nurses' years of experience. This means that the level of nursing practice towards physical restraint was increased among nurses who had years of experience more than ten years. This result was supported by **Al-Khaled et al., (2011)**[(1)] they found that nurses with higher years of experience are performing the procedure of restraining better than others. Similarly **Gillis, (1997)**[(42)] reported that day-to-day activities increase nurses' experience and improve their practice while applying restraining. On the other hand, **Hamers et al. (2009)**[(43)] studied the attitudes of nursing staff towards restraint use in nursing home residents and individual characteristics of nursing staff. They found that, more experienced nursing staff had a more negative attitude and performance regarding restraints than other nursing staff.

Concerning level of education and the total score of physical restraints practice, the findings of this study revealed that the total mean score of nurses' practice regarding application of physical restraint was increased significantly among critical care nurses with bachelor degree compared with other level of educations. This may be due to the fact that nurses who had bachelor degree received knowledge and training on restraining

while they were undergraduate. While, nurses graduated from the secondary nursing school did not receive any training about physical restraining. This was agreed with **Al-Khaled et al., (2011)** [(1)]. On the other hand, this finding was in disagreement with **Hantikainen** and **Kappeli, (2000)**[(44)] who reported no differences in the score of physical restraint practice between qualified and unqualified nurses.

Concerning Patient's biosocio-demographic characteristic, the present study showed that most of critically ill patients were male, with the mean ages **56.39±2.84** and **57.87±1.75**. This may be aging is one of the main factors causing patients 'agitation and putting them into the risk of pulling the life support devices and catheters and harming themselves. This finding was in line with **Al-Khaled et al., (2011)**[(1)] they found that most of the restrained patients were aged between 45-75 years old, and the mean age was 59 years old. Also, this finding was supported by **Martin (2005)** [**(9)**] who found that advanced age is associated with the use of physical restraints.

In addition, most of the sample had hemorrhagic stroke. This result was in accordance with **EsmaeiliRet al, (2007)** [(22)] and **Kim and Park, (2010)**[(45)] they found that the rate of physically restrained patients was higher in the neurology ICUs than in the other ICUs. Also, **Al-Khaled et al., (2011)** [(1)] showed in their result about" Nurses' related factors influencing the use of physical restraint in critical care units" that about third of the studied restrained patients had neurological disorders.

In addition, half of Patient subjected to physical restraint before guidelines were agitated, while most of patient subjected to physical restraints were unconscious. This may be attributed to the altered level of consciousness associated with their neurological disorders. Also, agitation predisposes patients to physical restraint. This result was in agreement with the findings of the study by **Gonzalez et al. (2004)** [(46)].

Regarding duration of physical restraint, the majority of patients before clinical guidelines were restrained depend on patient condition. Moreover, more than half of critically ill patients after guidelines were restrainedfor a period of 4hours. Also, more than half of patients before guidelines released restraint every 24 hours. In this regard **Maccioli et al, (2003)**[(18)]reported in their study that according to the recommendations of the American College of Critical Care Medicine "orders for restraining therapy should be limited in duration to a 24 h period and the potential to discontinue or reduce physical restraining should be considered every 8 hrs". On the other hand, this result was congruent with **Kandeel et al (2013)** [(8)]who reported in their study that the duration of physical restraint was between 3 and 4 days.

Regarding types of physical restraint and material used for this procedure, the results showed that all of critically ill patients admitted to neurological unit used wrist restraint. Also, more than one type of restraint was used and most of them were restrained with upper and lower limb restraints. This could be attributed to the heavy workload of nurses with their shortage in ICU and due to nurse to patient's ratio (1:3). This result was supported **by Kandeel et al (2013)**[(8)], **Akansel (2007)**[(32)] and **Turgay et al., (2009)**[(47)]They reported in their studies that the most commonly used type of physical restraint involved restraining the upper and the lower limbs, followed by bilateral wrist restraints. Other studies done by **Martin & Marthisen (2005)** [(9)] **Hurlock-Chorosteckiet al., (2006)** [(48)] and **Benbenbishty et al., (2010)** [(49)] they reported that a wrist restraint is the most preferable restraining method in ICUS. This finding was congruent with the results of the current study, whereby the most common types of restraints used were body vest and upper limb restraints.

In addition, most of critically ill patients were restrained with roll of gauze only and few percentages of them restrained with gauze and dressing before clinical guidelines. In this study absence of policy and regulations for restraint use in the studied ICUs, make nurses used the available resources. Nurses wrap the dressing pads around the wrist or ankle then tie it with a roll of gauze and may use roll of gauze only .This may be due to lack of physical restraint products because they are considered to be expensive. This result was supported by **Kandeel et al., (2013)** [(8)] who stated that special physical restraint material considered being expensive.

In relation to the presence of complications from physical restraints, the findings of the present study represents that most of critically ill patients had bruises, redness and constipation. In addition, more than half of them had swelling and unplanned extubation of connected tubes and lines before applying clinical guidelines. In this respect, **Birkett et al., (2005)** [(50)] and **Chang et al., (2008)** [(51)] reported a high incidence of self-extubation when patients were restrained. Similarly, **Mion et al., (2007)** [(52)] found that more than one third of studied patients removed medical devices while they were physically restrained. Also few proportions of patients had skin laceration, bedsores, orthostatic hypotension, limb edema and restricted circulation before giving clinical guidelines. These results were in accordance with **Kim and Park, (2010)**[(53)] and **Demir, (2007)**[(54)] they illustrated that the most and common reported restrained site complications were redness, bruises and edema. While after applying clinical guidelines, a few percentages of patients had bruises, redness and incontinence. This may interpreted as positive effect of clinical practice guidelines that given by the researches for nurses. This result was in the agreement with **Kimet al., (2008)**[(55)] who reported a significant decreased the incidence of physical injury and self-removal of devices and tubes after introducing an educational program for nurses on the procedure of physical restraint.

Conclusion:

It can be concluded that nurses' practice and attitude towards physical restraint improved significantly after clinical guidelines. In addition, older nurses and those with higher qualification and years of experience have better practice than others do. Lack of adequate practice and negative attitudes on the use of physical restraints has led to the poor performance of nurses and inability to care ICU Patients appropriately. Therefore, training nurses to have practical instructions on effective use of physical restraint and educating alternative methods is very important to maintain patient's safety in all ICUs at Tanta University Hospital (Egypt).

V. Recommendations:

- There should be a continuous educational/ training program about physical restraint for updating the knowledge and skills of nurses working in all ICUs at Tanta University in other areas of health care setting.
- Establish written updated clinical guidelines about physical restraint in all ICUs to ensure critically ill patient's safety.
- Enhancing collaboration between nurses and physician and offering appropriate counseling should also be emphasized.
- Further studies have to be conducted on another area of health care settings to assess nurse knowledge and performance towards physical restraint and investigate the barriers that affect its use.

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