

Effect of Nursing Guidelines on Patient` Safety Regarding Surgical Positioning at Operating Room

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Abstract: Intraoperative nurses are responsible for planning and putting in practice nursing interventions that minimize or make it possible to prevent complications deriving from the anesthetic-surgical procedure, with a view to the patient's safety, comfort and individuality. The patient's surgical positioning is an important procedure in intraoperative nursing care. **Aim:** The aim of this study was to evaluate the effect of a nursing guidelines implementation on Patient`s Safety Regarding Surgical Positioning at Operating Room. **Subjects and Methods:** A quasi-experimental design study was used. **Setting:** The study was conducted at New Emergency Hospital (El Demerdash Hospital) in different departments of operating rooms and its wards. **Sample:** A convenience sample of forty (40) nurses were recruited from the previously mentioned setting and A purposive sample of (80) adult patients from both sexes to assess the physical status for them pre and post phase. **Tools of data collection:** Surgical positioning nurse`s questionnaire, Surgical positioning observational checklists and Patient assessment sheet. **Results:** The patients' safety among the group2 (post implementation of nursing guidelines) was improved. Also, there was a statistically significant difference regarding total nurses' knowledge and practice pre- and post-nursing implementation guideline. **Conclusions:** Nursing guideline was effective in improving in nurses` knowledge and practice regarding surgical positioning at operating room post phase of nursing guidelines and this is affected positively on patient's safety. **Recommendations:** It was recommended to replicate of the current study on a larger probability sample to achieve generalization of the results and wider utilization of nursing guideline.

Keywords: Nursing guideline, surgical positioning, patient' safety, operating room.

1. INTRODUCTION

Surgical positioning is the practice of placing a patient in a particular physical position during surgery. The goal in selecting and adjusting a particular surgical position is to maintain the patient's safety while allowing access to the surgical site. Often a patient must be placed in an unnatural position to gain access to the surgical site. Positioning normally occurs after the administration of anesthesia. In addition to considerations related to the location of the surgical site, the selection of a surgical position is made after considering relevant physical and physiological factors, such as body alignment, circulation, respiratory constraints, and the muscular systems to prevent stress on the patient. Physical traits of the patient must also be considered including size, age, weight, physical condition, and allergies. The type of anesthesia used also affects the decision (Wikipedia, 2017).

Factors influencing the choice, Pressure is the force put on the patient's body. Those forces can stem from the surgery itself, instruments, drills, gravity, attachments, and bandages. The duration and intensity of the pressure is inversely correlated. The longer the duration of the pressure, the less pressure the body can endure. However, the body can endure a large amount of pressure for brief periods of time. The amount of pressure on the tissue is based on the size of the area of the contact: the smaller the point of pressure, the greater effect it will have on the tissue. The position of

instruments can cause damage to the body if pressure is not relieved periodically **Swenson, (2016)**. The patient's own health is also considered. Respiratory and circulatory disorders, blood pressure, the patient's weight, old age, and body temperature may affect a patient's potential for pressure. Other forces that may damage the body are the folding of the tissue, called *shear*, friction from the tissue rubbing against other tissue, and moisture on the skin that can cause it to be more vulnerable to the other forces and factors, called maceration (**Burhan, 2011**).

Types of positions are, supine and are the most common surgical position. The patient lies with back flat on operating room bed. Trendelenburg position same as supine position but the upper torso is lowered. Reverse Trendelenburg position same as supine but upper torso is raised and legs are lowered, Fracture Table Position For hip fracture surgery. Upper torso is in supine position with unaffected leg raised. Affected leg is extended with no lower support. The leg is strapped at the ankle and there is padding in the groin to keep pressure on the leg and hip (European Medical Alliance, 2017).

Lithotomy position Used for gynecological, anal, and urological procedures. Upper torso is placed in the supine position, legs are raised and secured, and arms are extended. Fowler's position, Begins with patient in supine position. Upper torso is slowly raised to a 90 degree position. Semi-Fowlers position, Lower torso is in supine position and the upper torso is bent at a nearly 85 degree position. The patient's head is secured by a restraint. Prone position, Patient lies with stomach on the bed. Abdomen can be raised off the bed. Jackknife position, Also called the Kraske position **Kadlec Regional Medical Center, (2016)**

Patient's abdomen lies flat on the bed. The bed is scissored so the hip is lifted and the legs and head are low. Knee-chest position, Similar to the jackknife except the legs are bent at the knee at a 90 degree angle Lateral position, also called the side-lying position, it is like the jackknife except the patient is on his or her side. Other similar positions are Lateral chest and Lateral kidney, Lloyd-Davies position, It is a medical term referring to a common position for surgical procedures involving the pelvis and lower abdomen (**Sharon, 2015**)

The majority of colorectal and pelvic surgery is conducted with the patient in the Lloyd-Davis position. Kidney position, the kidney position is much like the lateral position except the patient's abdomen is placed over a lift in the operating table that bends the body to allow access to the retroperitoneal space. A kidney rest is placed under the patient at the location of the lift, Sims' position, The Sims' position is a variation of the left lateral position. The patient is usually awake and helps with the positioning. The patient will roll to his or her left side. Keeping the left leg straight, the patient will slide the left hip back and bend the right leg. This position allows access to the anus **Janette, (2017)**

Regarding nursing role for patient at operating room during surgical positioning, intra-operative nurses are responsible for planning and putting in practice nursing interventions that minimize or make it possible to prevent complications deriving from the anesthetic-surgical procedure, with a view to the patient's safety, comfort and individuality. The patient's surgical positioning is an important procedure in intraoperative nursing care. The main goal of this procedure is to promote optimal exposure of the surgical site and, at the same time, prevent complications deriving from surgical positioning. Therefore, teamwork and the use of specific positioning devices and equipment for each patient are essential (**Cristina, 2009**). Nurses share the decision on how to best position the patient to facilitate activities during anesthesia and surgery with the team (surgeon, anesthetist and nursing staff). For this purpose, the patient's anatomic and physiological alterations need to be identified, associated with the type of anesthesia, procedure type and surgical time he/she will be submitted to, so that the positioning is adequate and does not cause postoperative complications (**Dybec, Kneedler, and Pfister 2013**)

Preoperative assessment for positioning needs should be made before transferring the patient to the procedure bed. The preoperative interview should include questions to determine patient tolerance to the planned position. The OR nurse should assess both patient and intraoperative factors. Patient factors include age, body build, skin condition, nutritional status, preexisting conditions and mobility limits. Intraoperative factors include anesthetic concerns, length of the planned procedure and position required for the planned procedure (**Jones and Barelt, 2012**).

Positioning devices should be readily available, clean and in proper working order before placing the patient on the procedure bed. Properly functioning equipment and devices contribute to patient safety and help provide adequate exposure of the surgical site. Selection criteria for positioning equipment includes its availability in a variety of sizes and shapes, durability, ability to maintain normal capillary interference pressure (32 mmHg or less), resistance to moisture and microorganisms, fire resistance, non-allergenic properties, ease of use, cleaning, storage and cost-effectiveness (**Camila, 2010**).

The perioperative nurse should actively participate in monitoring patient body alignment and tissue integrity based on sound physiological principles. Use of the proper number of personnel for patient positioning decreases the risk of positioning injury. Catheters, tubes and cannulas can be accidentally pulled out if too few personnel are used. Maintaining proper body alignment and supporting the extremities also decreases the chance of injury during and after positioning, after positioning, the perioperative nurse should evaluate the patient's body alignment and tissue integrity. This evaluation should include the respiratory, circulatory, neurological, musculoskeletal and integumentary systems. Unusual findings in any of these areas can lead to lower extremity nerve injury if not corrected (**Dybec, et al., 2013**)

Policies and procedures related to positioning should be developed and reviewed annually, revised as necessary and be available in the practice setting. These policies and procedures should include, but not be limited to: assessment and evaluation criteria and documentation, anatomic and physiological considerations, safety interventions; documentation of patient position or repositioning, positioning devices and personnel positioning the patient, and positioning device care and maintenance (**Donald, 2015**).

Significance of the study

The task of positioning the patient for surgery is one of the most important tasks in which the operating room nurse participates and calls for application of the principles of anatomy and physiology and for skills in using specific pieces of equipment. All surgical positions have been potentially harmful because of their effects on respiration, circulation, peripheral nerves and the skin. Improper positioning can have a number of negative consequences, including **respiratory problems** as airway blockages and restricted rib cage and diaphragm movement. **Circulatory problems** as obstructed vessels and compromised blood flow to lower extremities, and **Pressure ulcers and other skin problems**, such as ischemia, and **Neurological problems**, including nerve damage that leads to vision loss, motor impairment or other long-term issues (**International Anesthesia Research Society, 2017**)

Aim of the study:

The aim of this study was to evaluate the effect of a nursing guidelines implementation on Patient` Safety Regarding Surgical Positioning at Operating Room. The aim of the study was achieved through the following

1. Assess the nurses` knowledge regarding surgical positioning at operating room
2. Assess the nurses` practice regarding surgical positioning at operating room
3. Assess the patient physical status pre and post guidelines
4. Evaluate the effect of nursing guidelines on patient safety

Research hypothesis:

This study was hypothesized that:

- 1) There will be a significant improvement in nurses' knowledge and practice regarding surgical positioning at operating room.
- 2) There will be a statistically significant difference between patient's safety before beginning and after implementation of nursing guidelines.

2. SUBJECTS AND METHODS

Operational definition:

Nursing Guidelines: It included specific nursing actions in a given situation to ensure consistency and quality of care. It describe nursing intervention for surgical patient perioperative care for surgical positioning on operating table in operating room for improving patient`s safety regarding different body systems (respiratory, circulatory, musculoskeletal, neuromuscular and skin condition) to prevent or minimize postoperative complications from improper surgical positioning and effect on these body systems. Guidelines describe nursing intervention which included enhancing nurses` knowledge and practice regarding the most four common surgical positioning (supine, lateral, prone and lithotomy) used in operating room.

Patients' safety: the health care providers perform correct practices that prevent harms and complications that may occurred after surgery such as circulatory, respiratory, musculoskeletal, neuromuscular and skin problems from improper surgical positioning on operating tables.

Technical Design:

The technical design includes the study design, research setting, subjects, and tools for data collection.

(A) Research design:

A quasi-experimental design study was utilized to meet the aim of the study.

(B) Research setting:

The study was conducted at New Emergency Hospital (El Demerdash Hospital) in different departments of operating rooms (general surgery, neurosurgery, urology and orthopedic surgeries) and its wards; general, neurosurgery, urology and orthopedic wards .

(C) Subjects:

A convenience sample of forty (40) nurses were recruited from the previously mentioned setting for those available 10 nurses willing to participate from each operating rooms that previously mentioned with different sexes, age, level of education and years of experience.

A purposive sample of (80) adult patients from both sexes to assess the physical status for them pre and post phase as an indicator to reflect the rate of improvement in patient safety pre and post implementation of nursing guidelines. The Sample size was estimated with STAT 10 program. The estimated required sample size was 80 patients, to achieve power of study $=1-\beta =0.90$ and Alpha $\alpha =0.5$ (sig.95%). Patients were subdivided randomly as follow: 40 patients in the pre phase (before implementation of nursing guidelines) and 40 patients post phase (after one month of implementation of nursing guidelines).

Inclusion criteria:

- Patients who have same age
- Patients who are newly admitted
- Time of operation is not more than 3 hours
- Normal body mass index (BMI) from 18.5 – 24.5Kg/m²

Exclusion criteria:

- Patients who have chronic illness
- Preexisting medical conditions (e.g., vascular, respiratory, circulatory, or neurological problems, immune compromise)
- Previous history of skin condition
- Elderly patient
- Patient has history of previous surgical complications

Tools for data collection:

1. Surgical positioning nurse`s questionnaire
2. Surgical positioning observational checklists
3. Patient physical assessment sheet

1-Surgical positioning nurse`s questionnaire : this tool used to assess nurses` knowledge regarding surgical positioning at operating room (pre and post implementation of nursing guidelines, it was developed by the researcher in Arabic semi structured questionnaire sheet and adapted from (**Burton, 2009; Buzzle, 2010; Barbara and Penna, 2012**)

The scoring system:

The questionnaire consisted of 65 questions (6 questions are descriptive data and 59 questions in the form of MCQ each question ranged from 1 to 4 grades according to importance and weighting of each item. One mark was given for correct answer and zero for incorrect answer. The total score of questionnaire are 65 marks.

The questionnaire consisted of 6 parts as follow:

1st part: includes the demographic characteristics of the nurses (age, gender, marital status, educational level, years of experience)

2nd part: deals with nurse's knowledge about different surgical positioning (25 marks)

3rd part: nurses knowledge about physiological changes of surgical positioning (9 marks)

4th part: nurses knowledge about complications of surgical positioning (11 marks)

5th part: nurses knowledge regarding the equipment used during surgical positioning (9 marks)

6th part: nurses` knowledge regarding their role of nurses toward surgical positioning (5 marks)

It was considered that:

Satisfactory score of knowledge $\geq 85\%$ = (55.2 marks) -

- Unsatisfactory score of knowledge $< 85\%$

2 .Surgical positioning observational checklists: this tool used to assess nurses` practice regarding surgical positioning at operating room pre and post implementation of nursing guidelines. It was adopted from (**Buzzle, 2010; Barbara and Penna, 2012; Sharon, 2014**)

The scoring system:

The checklists constructed from (4) observational checklists as follow (lithotomy position checklist- supine position checklist – prone position checklist- and lateral position checklist). The total score of observational checklists are (71 marks) as follow: 10 marks for lithotomy position, 17 marks for supine position, 19 marks for prone position, and 25 marks for lateral position

It was considered that:

- Adequate score for practice $\geq 85\%$ (60.4marks)

- In adequate score for practice $< 85\%$.

3. Patient assessment sheet: This tool used to assess physical status for patient pre and post implementation of nursing guideline by assessing any problems existing for patient due to improper positioning at operating room it was developed by the researcher based on recent literature from **Jones and Barlett, (2016)&** this tool used for different two groups of patients every group 40 patients one group (n1=40) be assessed pre implementation phase and the second group(n2= 40) post phase to evaluate the effect of nursing guidelines on patient physical status as an indicator for effective teaching and

Part I: The tool consisted of 5 items about body systems problems:

1. Assessment of the circulatory problems
2. Assessment of the respiratory problems
3. Assessment of patient skin problems especially moisture areas and sites of pressure after surgery by using **pressure ulcer grading scale** adapted from (**EPUAP/NPUAP, 2009**)
4. Assessment of patient musculoskeletal problems

5. Assessment of patient neuromuscular problems

Part II: Pain Intensity Visual Analogue Scale:

A numerical standard linear scale was scored from 0 to 10 corresponding to the degree of pain, (0) indicates no pain and (1-3) indicates mild pain, (4-6) indicates moderate pain, (7-9) indicates severe pain and (10) indicates the worst pain. This scale was quoted from **Braddom (2000)**.

Part III: Physical Outcomes Rating Scale:

- This scale includes 8 items, each item is scored in a way that the higher score indicates most positive response, it was explained as following:

*Back pain score: 0-10

*Leg pain score: 0-10

*Sensations score: 0-10

*Spinal movement score: full range=5

Limited range=0-4

*Stretch testing score: Absent=0

Depressed=2

Normal=5

*Tension sign score: +ve = 0

-ve = 5

*Muscle strength score: 0-5

* Incontinence score: Incontinent = 0

Complete control = 5

Total Score= 75

-Poor= <25

-Fair= 25 < 50

-Good= ≥ 50

Nursing guidelines:

It was designed by the researchers to improve nurses' knowledge, practice and patients' safety after surgery based on the related literature (**Burton, 2009, Buzzle, 2010, Barbara and Penna, 2012**).

A nursing guideline was revised by a group of two experts in Orthopedic and one expert in General Surgical Departments at Faculty of Medicine, Ain Shams University and four experts in Medical Surgical Nursing at Faculty of Nursing, Ain Shams University for the content validity. Based on the experts' opinion, some modifications were done, and then the final form was developed. A guideline describes nursing intervention for patient during surgical positioning on operating table for improving patient's respiratory, circulation, musculoskeletal, neuromuscular and skin conditions. A guideline describes nursing intervention which included enhancing nurses' knowledge and practice regarding: I- correct steps for putting patient in proper surgical positions in supine, lateral, prone and lithotomy. II- uses the related devices and equipment for each surgical position. III- physiological changes during each surgical position, IV- complications that occurred from improper surgical position, V- role of the nurse perioperative for patient related proper surgical position.

2-Operational Design:

A. Preparatory phase:

It included reviewing of the most recent literature and different studies related to patient safety during surgical positioning at operating room and the theoretical knowledge of various aspects of care using books, articles, periodicals, internet and magazines to develop tools for data collection.

B. Tools validity and reliability:

The content and face validity was ascertained for layout, consistency, and scoring system by a group of 7 experts including three professors of Medical Surgical Nursing department, two professors of general surgery department and two professors of neurosurgery department. The content validity of the tools was tested regarding to the knowledge accuracy, relevance and comprehensiveness.

Test - retest: the tools were tested for reliability on a sample of 10 subjects; the results revealed that all items were significant. And has a correlation coefficient above the significance level $r = 0.8$.

C. Pilot study:

A pilot study was carried out on 5 of nurses and 8 of patients had previous inclusion criteria, in the previous mentioned setting to test the clarity and applicability of the tools in this study before performing the actual study. Subjects included in the pilot study were included in the sample, there was no modifications needed.

D. Field work:

The study was started at January to Jun 2017. It was divided into 4 phases: assessment, planning, implementation and evaluation (post phase after one month). After the official permission was taken from the study setting the researchers visit the operation departments to identify the patients' flow rate and wards set up and appropriate time for data collection determined according to free time for the patient and basic activities and routine care in the ward.

- The researchers specify Monday, Tuesday and Wednesday of every week from 9 am - 12 pm.

Assessment phase:

-Assessment was done through filling the interview questionnaire sheets and assesses using the previously mentioned tools, from the nurses and patients after explaining the purpose of the study and formal consent to be involved in the study was taken.

- The researchers have referred to the predetermined research study setting and selected the samples based on the previous inclusion and exclusion criteria to assess patients' complications after surgery for two groups of patients group1(pre) before implementation of nursing guidelines and group2 (post) after implementation of nursing guidelines.

- Planning phase:

During this phase, the data obtained in the assessment phase were analyzed to identify the educational needs of the nurses in order to develop a nursing guidelines tailored to these needs. The main objective of guidelines was to enable the nurses involved in the care of patients during surgical positioning on operating table to perform this clinical skill with confidence, whilst reducing the risks to the patient through improving their knowledge and practice. The guideline covers the core elements of technique of different surgical positions inside operating room. The educational guidelines were prepared based on the determined nurses' needs using the related literatures **Mendonça and Galvão (2010)**, **Shoemaker and Stoessel, (2011)**, **John and Mark, (2018)**, **Hagan, and Gottumukkala (2019)**, it included knowledge about different surgical positioning, physiological changes of surgical positioning, complications of surgical positioning, the equipment needed for every position, role of the nurse toward surgical positioning. The teaching media was prepared which included; Booklet, posters and pictures added to that related videos. Its content validity was tested through experts' opinions.

Implementation phase:

- At the first meeting of the nurses which involved assessment of nurses' demographic characteristics, nurses' knowledge and practice about different surgical positioning (supine, lateral, prone and lithotomy). Filling the tools were took about (30-40) minutes for questionnaire and observation checklist were took about (45-60) minutes in different operating rooms.
- The Patients who met the study criteria and had no any risk factors as mentioned in inclusion and exclusion criteria were included in the study after explaining the purpose of the study and obtaining a verbal consent. First, the researchers

greeted the patients, introduced themselves and explained the aim of the study. The researchers assessed those patient (group1) after 24 hours of surgery in their wards by patient physical assessment sheet that include (body systems complications, the researchers measured blood pressure and pulse blood refill in lower extremities to detect the circulatory problems. The researchers could detect the circulatory problems by chest sound and inspect the chest symmetrically and the skin by inspection through using the scale. Also the researchers assessed pain by pain severity scale and physical outcomes scale {through muscle strength test to test muscle weakness, reflex test by jerk reflex, tension test by straight leg raising or femoral stretch, sensation by pin-prick test and spinal movement by spinal flexion and extension}), before implementation of nursing guidelines.

- The study subjects were divided into small groups; the group comprised of 4 to 5 nurses for each educational session.
- The researchers demonstrated the component of the educational guidelines to the nurses through theoretical and practical session 30-40 minutes for each; the total was 5 sessions for each nurses` group.
- The handout was distributed to all nurses included in the program in the first day of starting guidelines implementation.

Evaluation phase:

The evaluation phase was done after one month of implementation of nursing guidelines, nurses' questionnaire and observation checklist were again asked and observed to be completed with different surgical positioning. Patient assessment sheet was done for group2 (post implementation of nursing guidelines) after 24hours of surgery to be completed the body systems complications, pain severity scale and physical outcomes scale (included the same items previously mentioned with G1 (pre implementation of nursing guidelines). The evaluation phase was emphasized on estimating the effect of nursing guidelines intervention on patients' safety regarding surgical positioning on operating table through comparing the two groups pre and post implementation of nursing guidelines and improving the nurses' knowledge and their practice.

IV. Administrative Design:

An official permission was obtained from the Director of New Emergency Hospital affiliated to Ain Shams University and the Head of Operating Room Departments in which the study was conducted. Meeting and discussions were held between the researches and nursing administrative personnel to make them aware about the aims and objectives, as well as to get better cooperation during the implementation phase. It was important to have their full support, especially to encourage nurses and patients to participate positively in the study.

Ethical considerations:

The aim of the research was explained to the participants. Verbal consent was obtained from each nurse and patient to participate in the study, after clarifying the procedures of the study. Participants were informed about their right to refuse participation and to withdraw at any time without any consequences. Confidentiality of data was ensured.

3-A statistical design:

Statistical methods for data analysis

All Data were collected, tabulated and subjected to statistical analysis. Statistical analysis is performed by SPSS in general (version 17), also Microsoft office Excel is used for data handling and graphical presentation. **Quantitative variables** are described by the Mean, Standard Deviation (SD) and the Range (Maximum – Minimum). Qualitative categorical variables are described by proportions and Percentages. Paired sample t test are used for testing Pre –post measurements within the same group. Comparison of the mean changes (Post—Pre) between groups is performed using independent samples t test. For categorical variables Chi squared test is used and Fisher exact test in case of small number per cell. Pearson correlation coefficient is used for quantitative variables. Significance level is considered at $P < 0.05$ (S); while for $P < 0.01$ is considered highly significant (HS). Two Tailed tests are assumed throughout the analysis for all statistical tests.

3. RESULTS

Table (1): Number and percentage distribution of nurses according to their demographic characteristics under study (n=40)

Demographic characteristics of nurses	No.	%
Age (years)		
20- <25	4	10%
25- <30	16	40%
≥30	20	50%
Mean ±SD	26.33±4.16	
Gender		
Female	37	92.5%
Male	3	7.5%
Level of education		
Diploma nursing	11	27.5%
Technical institute	25	62.5%
Bachelor degree	4	10%
Marital status		
Married	15	37.5%
Not married	25	62.5%
Experience		
≤5	8	20%
5-10	24	60%
>10	8	20%
Mean ± SD	3.67±2.11	

Table (1) shows that, (50%) of the study nurses their age 30 years or above, (92.5%) of them were female, (62.5%) of the nurses were had technical institute, and not married. Regarding their years of experience, (60%) of the study nurses their years of experience were 5-10 years.

Table (2): Demographic Characteristics of Patients under Study (n=80)

Demographic characteristics of patients	No.=40 (pre phase)	%	No.=40 (post phase)	%	X ² P value
Age (years)					
20- <30	14	35	11	27.5	2.81 NS
30- <40	8	20	10	25	
40 < 50	18	45	19	47.5	
Mean±SD	38.55±12.14		35.52±12.78		
Gender					
Male	21	52.5	17	42.5	4.6 NS
Female	19	47.5	23	57.5	
Level of education					
Read and write	8	72.5	7	17.5	0.82 NS
Technician	29		27		
Highly education	3		6		
		7.5		15	
Surgical positions					
Supine	28	70	29	72.5	2.19 NS
Lateral	5	12.5	4	10	
Prone	5	12.5	3	7.5	
Lithotomy	2	5	4	10	

Time of operation					
- < one hour	7	17.5	5	12.5	
- 1- < 2 hours	10	25	9	22.5	
- 2- ≤ 3 hours	23	57.5	26	65	
					0.94 NS

NS (P>0.05)

Table (2) shows that, there was no significant difference regarding patients' demographic characteristics (age, gender, level of education, surgical operations and time of operation) $X^2=2.81(P>0.05)$, $X^2=4.6 (P>0.05)$, $X^2=0.82 (P>0.05)$, $X^2=2.19 (P>0.05)$ and $X^2=0.94 (P>0.05)$ respectively for two groups (pre implantation phase and post implementation).

Table (3): Presentation of studied nurses' satisfactory knowledge pre / post implementation of nursing guidelines (n=40).

Nurses` knowledge	Satisfactory Knowledge				Chi-square test	
	Pre		Post		x2	p-value
	No.	%	No.	%		
-Knowledge of nurses about different surgical positioning	0	0.0%	10	25%	9.257	0.002*
-Knowledge about physiological changes of surgical positioning	0	0.0%	24	60%	31.488	<0.001**
-Knowledge about complications of surgical positioning	0	0.0%	19	47.5%	23.364	<0.001**
-Knowledge about equipment used during surgical positioning	4	10%	40	100%	61.689	<0.001**
-Knowledge of nurses about role of nurses toward surgical positioning	12	30%	40	100%	40.055	<0.001**
Total Knowledge ≥80%	0	0.0%	25	62.5%	16.082	<0.001**

*p<0.05 statistically significant,** p<0.001 highly statistically significant

Table (3) showed that, there were highly statistically significant differences regarding nurses knowledge about surgical positioning pre and post nursing guidelines in which (p <0.001). Also there was statistically significant difference regarding knowledge about different surgical positioning (p <0.05).

Table (4): Presentation of studied nurses' satisfactory practice pre / post implementation of nursing guidelines (n=40).

Nurses 'Practice	Satisfactory Practice				Chi-square test	
	Pre		Post		x2	p-value
	No.	%	No.	%		
Supine position	5	12.5%	35	87.5%	42.050	<0.001**
Prone position	0	0.0%	14	35%	14.643	<0.001**
lithotomy position	0	0.0%	4	10.0%	2.368	0.124
Lateral position	4	10%	36	90%	48.050	<0.001**
Total Practice ≥85%	5	12.5%	35	87.5%	58.717	<0.001**

*P> 0.05 non-significant, **p<0.001 highly statistically significant

Table (4) revealed that, there were highly statistically significant differences regarding nurses' practice about surgical positioning pre and post nursing guidelines in which (p< 0.001) except lithotomy position there was no statistically significant difference (p>0.05)

Table (5): Assessment of patient physical status problems pre and post implementation of nursing guidelines for patients under the study (n=80)

Patient physical assessment	Pre (n1= 40)		Post (n2=40)		Chi-square test	
	No.	%	No.	%	x2	p-value
1-Circulatory problems						
(A)hypotension	28	70	16	40.0	6.084	0.014*
(B)compromised blood flow to lower extremities	25	62.5	19	47.5	0.818	0.366
2-Respiratory problems						
(A)Air way blockage	10	25	0	0.0	9.257	0.002*
(B)Restricted rib cage	26	65	13	32.5	9.800	0.002*
3-Skin problems						
(A)Moisture lesions	27	67.5	13	32.5	9.776	0.004*
(B)Pressure ulcers (grade I)	27	67.5	14	35	6.084	0.014*
4-Musculoskeletal problems						
(A) muscle weakness	32	80	13	32.5	16.364	<0.001**
(B)Back problems	30	75	13	32.5	16.364	<0.001**
5-Neuromuscular problems						
(A)Numbness	29	72.5	9	22.5	20.05	<0.001**
(B)cramping and pain	33	82.5	12	30	16.364	<0.001**
Range	4-5		2-4		(t-test)	<0.001
Mean ±SD	4.63±0.49		2.78±0.66			

*P<0.005 (statistical significant), **P<0.001 (high significant)

Table (5): this table showed that, there were statistically significant changes between two groups (G1 and G2) pre and post implementation of nursing guidelines regarding body systems (circulatory, respiratory, skin, musculoskeletal and neuromuscular) problems during assessment of patients' physical status. There mean scores for two groups (G1 and G2) pre and post implementation of guidelines regarding patients problems after surgery, (4.63±0.49 and 2.78±0.66) respectively.

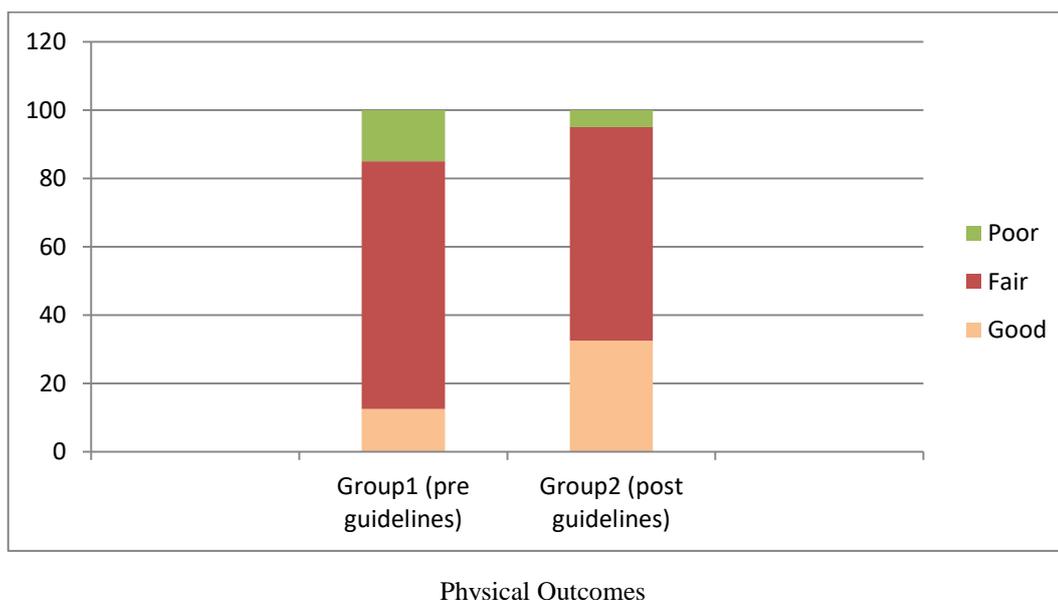


Fig. (1)Total physical outcomes between the Group1 & Group2 subject's pre and post implementation of nursing guidelines

This figure showed that there was significant difference (P<0.05) between group 1 and group 2 pre and post implementation of nursing guidelines regarding total physical outcomes.

Table (6): Relation between nurses' unsatisfactory and satisfactory knowledge and patient physical problems post implementation of nursing guidelines (n=40).

Patient physical problems (post phase)	Total nurses' knowledge (post phase)				Chi-square test	
	Unsatisfied(n= 15)		Satisfied(n= 25)		x ²	p-value
	No.	%	No.	%		
1-Circulatory problems						
(A)hypotension						
No	2	13.3	22	88	4.600	0.046*
Yes	13	86.7	3	12		
(B)compromised blood flow to lower extremities					1.504	0.220
No	6	40	15	60		
Yes	9	60	10	40		
2-Respiratory problems						
(A)Air way blockage					0.941	0.342
No	15	100	25	100		
Yes	0	0	0	0		
(B)Restricted rib cage					4.372	0.042*
No	7	46.6	20	80		
Yes	8	53.4	5	20		
3-Skin problems						
(A)Moisture lesions					0.372	0.543
No	11	73.3	16	64		
Yes	4	26.7	9	36		
(B)Pressure ulcers (grade I)					7.111	0.008*
No	12	80	14	56		
Yes	3	20	11	44		
4-Musculoskeletal problems						
(A) muscle weakness					0.372	0.543
No	11	73.3	16	64		
Yes	4	26.7	9	36		
(B)Back problems					5.361	0.032*
No	8	53.4	19	76		
Yes	7	46.6	6	24		
5-Neuromuscular problems						
(A)Numbness					1.615	0.204
No	10	66.6	21	84		
Yes	5	33.4	4	16		
(B)cramping and pain					0.362	0.502
No	12	80	16	64		
Yes	3	20	9	36		
Mean ±SD	2.88±0.60		2.30±0.74		(t-test) 1.720	0.020*

*P<0.005 (statistical significant).

Table (6) showed that, there is a positive relation between nurses' unsatisfactory and satisfactory knowledge and patient physical problems post implementation of nursing guidelines regarding hypotension, restricted rib cage, pressure ulcer (grade I) and back problems (P- value 0.046, 0.042, 0.008 and 0.032) respectively. Also there were statistical significant differences between total nurses' knowledge (satisfied and unsatisfied) post implementation of nursing guidelines and obvious improvement of patients problems, the mean score was (t-test 1.720 and P-value 0.020).

Table (7): Relation between nurses unsatisfactory and satisfactory practice and patient physical problems post implementation of nursing guidelines (n=40).

Patient physical problems (post phase)	Total nurses' practice (post phase)				Chi-square test	
	Unsatisfied(n= 5)		Satisfied(n= 35)		x ²	p-value
	No.	%	No.	%		
1-Circulatory problems						
(A)hypotension						
No	2	40	22	62.8	0.952	0.329
Yes	3	60	13	37.2		
(B)compromised blood flow to lower extremities						
No	0	0.0	21	60	5.191	0.021*
Yes	5	100	14	40		
2-Respiratory problems						
(A)Air way blockage						
No	5	100	35	100	0.941	0.342
Yes	0	0.0	0	0.0		
(B)Restricted rib cage						
No	3	60	24	68.6	0.147	0.702
Yes	2	40	11	31.4		
3-Skin problems						
(A)Moisture lesions						
No	3	60	24	68.6	0.147	0.702
Yes	2	40	11	31.4		
(B)Pressure ulcers (grade I)						
No	1	20	25	71.4	3.81	0.049*
Yes	4	80	10	28.6		
4-Musculoskeletal problems						
(A) muscle weakness						
No	3	60	24	68.6	0.147	0.702
Yes	2	40	11	31.4		
(B)Back problems						
No	3	60	24	68.6	0.147	0.702
Yes	2	40	11	31.4		
5-Neuromuscular problems						
(A)Numbness						
No	3	60	28	80	1.004	0.316
Yes	2	40	7	20		
(B)cramping and pain						
No	3	60	25	71.4	3.81	0.049*
Yes	2	40	10	28.6		
Mean ±SD	2.80±0.45		2.57±0.69		(t-test) 3.008	0.013*

*P<0.005 (statistical significant).

Table (7) showed that, there is a positive relation between nurses' unsatisfactory and satisfactory practice and patient physical problems post implementation of nursing guidelines regarding compromised blood flow to lower extremities, pressure ulcer (grade I) and cramping and pain (P- value 0.021, 0.042,0.049 and 0.049) respectively. Also there were statistical significant differences between total nurses' practice (satisfied and unsatisfied) post implementation of nursing guidelines and obvious improvement of patients problems, the mean score was (t-test 3.008 and P-value 0.013).

4. DISCUSSION

Positioning patient safety for surgical procedures is a routine intraoperative nursing responsibility, and facilitating positive patient outcome is an expected standard of professional care. The safe positioning of patient for surgical procedures requires the cooperation of all surgical team members. Nurses implement appropriate perioperative nursing actions throughout all phases of patient's surgical experience to prevent and minimize potential complications related to surgical positioning (**Kutteruf, Wells and Stephens, 2018**)

The finding of the current study showed that, regarding demographic characteristics of the study nurses, one half of the study nurses their age 30 years or above, the majority of them were female, more than one half of the nurses were had technical institute, and not married. Regarding their years of experience, more than half of the study nurses their years of experience were between 5-10 years of experience.

Regarding patients' demographic characteristics there was no significant difference regarding (age, gender, level of education and time of operation) between two groups under study G1 and G2 (pre and post implementation of nursing guidelines). The most of them were put in a supine position because this is the most position used on operating table.

There were no national researches with the same line in relation with title of the present study. Approximately all of the international researches about assessment of complications and problems from improper surgical positioning in operating rooms.

The current study showed that, there was obvious improvement in nurses' knowledge regarding surgical positioning for patient at operating room in which highly statistically significant differences found pre and post nursing guidelines, and this indicator to reflect positive effect of guidelines and this could be attributed to the clarity of guidelines, use of simple language and nurse's interest to acquire knowledge about the guidelines.

Other studies performed by **Kitlen and woodfen, (2018)** in their research study titled " Use of a Novel Memory Aid to Educate Perioperative Team Members on Proper Patient Positioning Technique" who reported similar results that, a lack of knowledge of proper positioning practices can result in serious patient injury, such as permanent paralysis, blindness, tissue necrosis, burns, bone fracture, and even death.

The results of this study revealed that, there were great improvement in nurse's practice regarding supine, lateral, prone position in which highly statistically significant differences found pre and post phase of guidelines except for lithotomy position, and this results is agreed with **OR Today (2016)**, in this research study titled " Continuing Education: Avoiding Lower Extremity Positioning Injuries in OR" which stated that positioning a patient into the lithotomy position requires two people moving the legs simultaneously, and this explained that there was shortage in staff members at operating room to perform proper and correct technique.

This result is not agreed with study performed by **Erik, Kathrine, and Mette, (2015)** who stated that positioning of the patient was found to be particularly difficult for the prone, lithotomy and lateral positions. Also stated that, lack of positioning practice and competences and equipment can complicate positioning

The result of the study showed that, there was statistically significant difference post implementation of guidelines with obvious improvement of patients' conditions regarding circulatory problems as hypotension and cold extremities, this could be attributed to good nursing assessment for tissue perfusion and preexisting vascular disease and keeping patients warm by using light blanket perioperative. Other studies performed by **Srensen, Kusk, and Gronkjaer, (2015)** reported similar results that who stated that improper positioning can help a number of negative consequences as circulatory problems (obstructed vessels and compromised blood flow to lower extremities. This is in agreement with **Hershey, Valenciano and Bookbinder (2017)**, who stated that perioperative staff members need to minimize the risks associated with hypothermia and their study findings validate perioperative nurses' standard intervention of using warmed thermal blankets and hospital bed-spreads as a cost effective, safe, efficient method of increasing patients' body temperatures of comfort levels, in their research study titled " Comparison of the rewarming in post-anesthesia care unit" .

Regarding patients' conditions related to respiratory problems, the results also showed that, there was statistically significant difference post implementation of guidelines with obvious improvement, two thirds of the study sample had respiratory problems (restricted rib cage) pre phase and more than half of them only post phase especially with prone and

lateral position because restricted rib cage can occur. This may be due to the nurses' commitment and continuous correct performance and positive effect of nursing guidelines on patient's physical status. These findings were supported with **Craig (2016)**, who stated that, the postoperative pulmonary complications are not restricted to patients with preexisting pulmonary diseases, they often occur otherwise normal patients. These are attributed to the complication events to which patient are exposed in the perioperative period including the surgical procedure itself, anesthesia and immobilization in the supine position and may control these problems by coordinated all perioperative members team.

Concerning skin problems that were occurred after surgeries, the results of the study revealed that, there was statistically significant difference post implementation of guidelines in the group2 (post phase) in comparing with group1 (pre phase). Two thirds of the study sample were had skin problems (develop the first degree of pressure sore and moisture lesions area from pooling of solution from skin preparation under the patient) pre phase while one third of them only post phase, this occurred with time of operation more than 2 hours. This could be attributed from good preoperative nursing assessment and removing excess of the preparation solution. These results are similar to study done by **(Rimi, and Emeka, (2010))** who stated that pressure ulcers are the most common type of patient positioning injury in entitled research "the importance of correct patient positioning in theatres and implications of mal- positioning".

Also, these results are similar to study done by **Judith, (2011)** who indicates that many postoperative pressure ulcers are OR-induced. The incidence of pressure ulcers occurring as a result of surgery may be as high as 66% (in elderly patients with femoral neck fractures), with most being Stage I and fewer than 10% being Stage II or higher

The results of the current study showed that, three quarters of the study sample were had musculoskeletal problems (muscle weakness, back problems, lumbo-sacral pain and hip pain) pre phase while after phase one third of them only, this may be due to good and correct nurses' performance; put a pillow or pad under the sacral area in supine or in lithotomy positions and two nurses elevating or lowering the patient's legs simultaneously during lithotomy position. Also three quarters of the study sample were had neuromuscular problems tingling, numbness, and cramping and pain. These results agreed with **Jones and Barlett, (2012)** complications of improper positioning include postoperative musculoskeletal pain, joint dislocation, nerve damage and skin problems.

Concerning physical clinical assessment of patients under study using the Physical Outcome Rating Scale, the results revealed that, there was a statistically significant improvement of the group2 (post implementation of nursing guidelines) as compared to the group1 (pre implementation of nursing guidelines) this may be due to conveys the role of implementation of the nursing guidelines in the improvement of physical clinical outcomes.

Physical outcomes that indicated significant better improvement of the (group1) as compared to the (group2) one in the present study, at post implementation phase of nursing guidelines, included leg pain, severity and duration of back pain, back muscle spasm, numbness in leg, spinal flexion and knee-Jerk reflex. This was in accordance with the findings of **Chui, Murkin, Posner and Domino, (2018)** about the importance of nurses' role in putting the patient on operating table by proper way in surgical positioning, which had a positive effect on improvement of postoperative of physical outcomes

The findings of the study showed that, there were positive relation between total nurses satisfactory level of knowledge and patient physical assessment (no problems) post implementation phase of guidelines regarding obstructed blood flow, redness area, pressure ulcer, deformities in which there were statistically significant difference found and this results is agreed with **(Craig, 2016)** who stated that, the need for increased education and reinforcing knowledge for preoperative nurses facilitate proper patient positioning for surgery and prevent incidence of patient problems after operation.

Also the study showed that, there were positive relation between total nurses satisfactory level of practice and patient physical assessment(no problems) post implementation phase of guidelines regarding compromised blood flow to lower extremities, air way blockage, redness area, pressure ulcer, deformities in which there were statistically significant difference found pre and post phase.

All preoperative team members are responsible for the safe positioning of surgical patients. Circulating nurses coordinate the positioning of patients during intraoperative periods of care. Skilled perioperative nursing interventions afford patients' safe and comfortable positioning during surgery, ensure optimal exposure of surging sites, and prevent postoperative complications (e.g., pressure injuries, neuropathies, cardiovascular and respiratory compromises).

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Perioperative nurses should have a working knowledge of anatomy and physiology, patients' risk factors, injury mechanisms, potential complications and positioning of devices before placing patient in the required perioperative positions.

Finally, the results of this study support the hypothesis that the nursing guidelines has a positive effect on nurses' performance and a positive improvement of patients' safety and decreasing of postoperative patients' complications.

5. CONCLUSION

Based on the result of the present study, it can be concluded that there were highly statistically significant improvement in nurses' knowledge and practice regarding surgical positioning at operating room post phase of nursing guidelines and this is affected positively on patient's safety.

6. RECOMMENDATIONS

The main recommendations can be summarized as follow:

1. Continuous training and education for perioperative nurses and OR team to increased their knowledge and practice regarding safe surgical position.
2. Further studies should be performed to ensuring a safe and comfortable environment for every surgical patient
3. Nursing guidelines must be available at all surgical operating rooms.
4. Developing perioperative assessment tool for patient to plan the necessary precautions and prevent positioning-related injuries.
5. Devices and equipment to support the patients in different surgical positioning should be available.
6. Further studies should be performed in different settings, on a larger sample for wider utilization of the nursing guidelines and achieve generalization of the results.

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