

Effect of Implementing Nursing Care Guidelines on Nurses' Knowledge for orthopedic patients undergoing External Fixation



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1.ABSTRACT

Background: Pin site infections are a major hazard of external fixation that can be extremely stressful. Nurses are vital in the prevention of pin site infections. **Aim:** to assess the effect of implementing nursing care guidelines on nurses' knowledge for orthopedic patients undergoing external fixation. **Design:** a quasi-experimental research approach was used. **Sample:** A convenient sample of 40 nurses from the orthopaedic departments of Kafrelsheikh University Hospital and a general hospital was used. **Tools:** It was a self-administered questionnaire sheet with two parts: part 1 contained demographic data of the nurses investigated, and part 2 covered nurses' knowledge of the care given to the patients with external fixation. **Results:** after the implementation of the nursing care guidelines, Nurses' knowledge increased statistically significantly ($p < 0.001$), and there was a significant association between nurses' educational level and their knowledge. ($p = 0.016$). **Conclusion:** Using the developed nursing care guidelines improved nurses' knowledge of caring for patients with external fixation. **Recommendations:** Nurses working in orthopaedic wards, particularly those who are recently employed, should be provided with up-to-date information regarding external fixations through continuing education programmes.

Keywords: external fixation, knowledge, Nursing guidelines

2.Introduction:

Every year, around 1.3 million people worldwide die in road traffic accidents (RTAs). RTAs is considered the most common causes of fractures incidence and the fifth commonest leading cause of death by the year 2030. Egypt is one of countries having the highest world's RTAs rate (**World Health Organization (WHO), 2021**). External fixation (ExFix) device has been fundamental basis for treatment of different many types of fractures which cannot be treated by traction or cast such as the management of open fracture which was considered a challenge for the orthopedic surgeon in the past. (**Bhardwaj, Singh, Kapila & Boparai, 2019**).

External fixation is increasingly being used not only in fracture treatment, but also in the repair of deformities, extremity lengthening, nonunion osteomyelitis, or tumors and prevents further soft tissue damage, allows recovery of scarred for life skin and subcutaneous tissue, allows wound management, and allows elective repair of complex fractures and periarticular injuries while having no negative effect on systemic complications in patients with multiple injuries. When it comes to patients, great quality of care (both pre- and post-

operative) and positive patient outcomes are intimately tied to proper evaluation, monitoring, and caring. In this regard, it is suggested that poor care leads to the appearance of severe complications, which would impose significant financial expenses on the society. (**El-SebaieBadr, Mohammed, EL-shenawie & Shehata, 2021**).

The usage of external fixation devices comes with a number of disadvantages. PSIs (Pin Site Infections) are one of the most prevalent complications, with rates ranging from 7% to 100%. Frame or pin/wire failure or loosening and other complications as osteomyelitis, non-union, soft-tissue impalement, neurovascular damage, compartment syndrome, and refracture around the pin are all examples of mal union. (**Morsy, Sheta & Mohamed, 2021**).

Nurses play an important role for patients undergoing an external fixation application. Before the surgery, nurses should assess the condition of patients carefully and should review the results of diagnostic tests the night before surgery; moreover, they should process the skin in the case of sterilization, remove the hair around the surgery

site, and manage the drugs before surgery as provided (Mohamed, Taha & Moghazy, 2020).

Following surgery, the nurses provide regular postoperative care as well as specific treatment for the affected side, observe vital signs, administer postoperative drugs as prescribed, elevate the limb, inspect the pin site for signs and symptoms of infection, and care for the wound, among other things. Patients are educated about the signs and symptoms of infection, the precautions needed to protect the affected limb, pin site care, activities of daily living, medications, and follow-up visits before being discharged (Khorais, Ebraheim & Barakat, 2018).

Significance of the Study

Surgical site infection rate in orthopaedic surgery and its consequences still remain a major problem. Representing a heavy psychological and financial burden (Tucci, et al., 2019). Pin tract infection is one type of surgical site infection, and it is the most prevalent complication of external fixation, accounting for 43 % of complications. The presence of pin tract infection reduces the pin-bone interface strength, which leads to subsequent pin loosening (Mohammed, 2017). Orthopedic pin site infections lead to prolonged hospital stay add to costs which may be increased to more than 300%. (Bader & Atiyah, 2017). There is a limited data available with regard to orthopedic pin site infections rate in Egypt.

Nurses' skills, attitudes, communication and continuity of care constitute the essential components of orthopedic nurse care. Due to the complicated and vital role executed by orthopedic nurses in the care of patient with external fixation, the nurse entering practice wants to learn, to perform nursing effectively and satisfactorily for themselves and for their patients. Since nursing offered to the public as help or services, nurse should attain and maintain a high level of nursing knowledge and nursing performance, in order to be effective in practice. Nurse must gain nursing knowledge before they enter practice (Mahmoud, Hassanien, Sherief & Soliman, 2016).

Despite the importance of the nursing guidelines for above reasons, there are no existing nursing guidelines for preoperative and postoperative nursing care of external fixation, all nurses didn't attend any training courses regarding external fixation and the rate of pin site infections is high in almost cases. So, there is an urgent need to conduct this study to evaluate nurses' knowledge regarding the care provided to patients pre, and post external fixation.

2.2. Aim of the Study:

The study aims to assess effect of Implementing Nursing Care Guidelines on Nurses' Knowledge for orthopedic patients undergoing External Fixation.

3.2 Research Hypothesis:

Implementation of nursing guidelines will improve nurses' knowledge regarding pre and post external fixation.

3. Subject and Method

1.3. Research design and setting

In this research, a quasi-experimental one group (time series) approach was used at the orthopaedic departments of Kafrelsheikh University Hospital. It consists of four rooms: two males and two females. its capacity 17 patients and nurse to patient ratio one to three. In Kafrelsheikh general hospital, orthopedic department consist of 4 rooms (three male and one female). Its capacity 26 patient and nurse to patient ratio one to three.

2.3. Study sample

A convenient sample of all available nurses (40 nurses) who were providing care to orthopedic patients at orthopedic departments at Kafrelsheikh University Hospital and Kafrelsheikh General Hospital accepted to participate in this study from both sexes with diverse ages, years of experiences, and different levels of education.

3.3. Tools of data collection

- I) **Self-administered questionnaire:** It was created by the researcher and written in plain Arabic after a review of the associated literature: (Dirksen, 2011; Williams and Hopper, 2011; White, Duncan, and Baumle, 2013; Velazquez, Bell, and Armstrong, 2015; Linton, 2016; Bader and Atiyah, 2017). It consists of two parts,

Part I: Consists of demographic variables consisted of (5) questions: age; gender; educational level, years of nursing experience, nursing experience in orthopaedic wards

Part II: It is concerned with assessing nurses' knowledge regarding:

- a- Fractures and consists of (6) questions; definition, causes, signs and symptoms, types, complications and treatment.
- b- External fixation which composed of (6) questions; definition, indication, contraindication, advantage, disadvantage and complication.

- c- Pre and postoperative care of patient with external fixation which composed of (12) questions; aim of preoperative, nurse role preoperative, patient education, aim of postoperative care, risk factors for acquiring pin site infection, signs of pin site infection, neurovascular disorder, importance of range of motion, nutrition, pin site care, warning signs and symptoms and discharge plan.

Scoring system: The correct answers were selected based on the literature. A score of (2) was given to the correct and complete answer, a score of (1) was given to the correct but incomplete answer, and a score of (0) was given to the wrong or when the nurse said "she does not know." Total knowledge scores were determined by summing the number of correct answers to all questions. The overall score will then be calculated out of 100. It was divided into the following categories: -

Categories of knowledge	Percentage
Poor	< 50%
Fair	50- <75%
Good	≥75%

Tools Validity and Reliability:

Validity

After the researcher developed the instruments, their component-validation was examined by a panel of five experts, two of whom were orthopedists and three of whom were medical surgical nursing, to test their content validity. Modifications on clarity, appropriateness, and completeness of the tools' content were carried out according to the experts' recommendations.

Reliability:

Cronbach's Alpha was used to assess reliability in knowledge (= 0.813) the results were rated "very good."

4.3. Pilot Study

On 10% of the participants (4 nurses), a pilot research was carried out on individuals who met the selection criteria to assess the effectiveness and simplicity of the tools, as well as the time necessary to complete these tools. Because of the limited number of nurses in the orthopaedic department and to strengthen the research findings, the pilot study's sample was used in the main research sample. The pilot research discovered that the average time required to complete the tools was between 20 -30 minutes.

5.3. Ethical Consideration

Before collecting data, the Research Ethics Committee of Mansoura University's Faculty of Nursing obtained initial permission. In addition, official authorization was obtained from Kafrelsheikh University hospital authorities. Following that, each nurse was told of the study's goal and value. The researcher stated that participation in the research is completely voluntary, and that any nurse may withdraw from the study at any moment for any reason. Each assessment sheet will be classified for anonymity

and confidentiality, and the names of the participants will not appear on the sheets. After meeting the selection criteria and agreeing to participate in the study, the nurse was told to sign an informed written permission form.

6.3. Fieldwork: Data was collected over a four-month period, beginning in February 2021 and ending in May 2021. The investigation was carried out in four phases:

1- Preparation phase. During this phase a formal approval was taken from the hospital's administrator, nursing supervisors of the orthopedic departments. It also includes a recent review of related literature for the development of various data gathering techniques and guidelines, and teaching materials such as booklets, power point presentation, etc.....

2- Assessment phase. Once approval to carry out the intended research was given.

- a- Individual interviews with nurses were performed to discuss the nature and purpose of the study. Measures were taken to protect the subjects' ethical rights. Each interested participant completed an informed consent form. Participation was entirely voluntary, and secrecy and anonymity were guaranteed.
- b- Nurses' knowledge (pretest) were assessed using Nurses' Knowledge of External Fixation questionnaire. and the average time to fill it was estimated about 20 to 30 minutes. These pre-tests were done before developing the nursing guidelines to assess level of nurses' knowledge for caring of patients with external fixation

3- Implementation phase.

- 1- Nursing care standards were created to be participatory rather than rigid in nature, so that nurses would be guided and encouraged

to have the most up-to-date information possible in order to enhance the care offered to external fixation patients. Each nurse had three classes These classes were given in the appropriate nurses' room at the orthopaedic departments of General Hospital and Kafrelsheikh University Hospital. Each class has its own set of goals and time limits. The exact number of respondents received was decided by the availability of the nurses (their monthly schedule). The nurses were divided into eight groups by the researcher (each group contained five nurses). Each session lasted around 30-45 minutes.

- 2- The researcher delivered a summary of the whole nursing guideline made in the course of the sessions. Following that, each session received an overview of what had already been discussed.
- 3- The researchers encouraged active participation of nurses during and after the presentation by asking questions and receiving comments. Following the end of the training for all nurses, the researcher gave printed materials developed after examining pertinent literature in the form of a basic Arabic brochure to the nurses. This brochure contained all of the material presented throughout the three meetings in order to address the nurses' actual educational needs about external fixation in orthopaedic patients.

4- Evaluation phase. Evaluation phase was done once and being started after week from the implementation phase, to examine nurses' knowledge regarding external fixation using pre-post-test questionnaire. The same methods that were used in the assessment phase were utilized to examine the influence of the guidelines on nurses' knowledge (post-tests). To assess the influence of the guidelines on nurses' knowledge, the researcher compared the post-test results to the pre-test findings.

7.3. Statistical design: SPSS for Windows version 23 was used for all statistical analyses. Numbers and percentages were used to convey categorical data. For comparing variables using categorical data, the Chi-square test was performed. All continuous data were normally distributed and

reported in terms of mean standard deviation (SD). When comparing two variables with continuous data, the paired t test was utilized. To test for correlations between two variables using continuous data, the correlation co-efficient test was utilized.

4. Results:

Part1: Demographic data of the participated nurses.

Table (1): Distribution of the participated nurses according to their demographic data (n=40).

Table (1) Demonstrated that the distribution of age group was an above half (55 %) ranged from (25-30 yrs) with a mean age SD (26.5 3.05); furthermore, almost two thirds (72.5 %) of the examined nurses were females and about one third (35 %) were married. In terms of education, 57.5 % of the nurses tested had a Bachelor's degree in nursing, while 27.5 % had a Technical Institute diploma.

When it comes to years of experience in the field of orthopedics, the majority (80.0 %) had (less than 5 years) and just one-fifth (20 percent) had more than 5 years (5-10 years).

Table (2) Nursing care pre and after external fixation (67.5 %), fracture (62.5 %), and external fixation (62.5 %) had the lowest score in nurses' knowledge prior to the establishment of educational standards (57.5 %).

It is clear that after implementation of nursing care guidelines nurses' knowledge improved as (65%) of studied nurses have good knowledge compared to only (10%) before implementation of nursing care guidelines.

Table (3): This table showed the relationship between nurses' demographic features and their overall knowledge before and after nursing guidelines were applied. There were no statistically significant relationships between nurses' age, gender, or marital status and their total knowledge ($p = 0.435, 0.260, 0.866$) prior to the implementation of nursing guidelines, but There was a clinically important link between the nurses' educational and years of experience in nursing and their total knowledge ($p = 0.016, 0.020$) after the application.

Table (1): Distribution of the participated nurses according to their demographic data (n=40).

Data of nurses	N	%
Age		
< 25	12	30
25 – 30	22	55
> 30	6	15
Mean ± SD	26.5 ± 3.05	
Gender		
Male	11	27.5
Female	29	72.5
Marital status		
Single	26	65.0
Married	14	35.0
Educational level		
Nursing Secondary School	6	15.0
Technical institute	11	27.5
Bachelor of nursing	23	57.5
Experience in orthopedic (Years)		
< 5	32	80.0
5 - 10	8	20.0

Table 2: difference of nurse’s knowledge level before, and after implementation of nursing care guidelines (n=40).

Knowledge items	Before				After				Chi square test					
	n	%	n	%	n	%	n	%	X ²	p				
Knowledge about fractures	25	62.5	12	30.0	3	7.5	3	7.5	9	22.5	28	70.0	36.168	<0.001
Knowledge about External fixation	23	57.5	10	25	7	17.5	5	12.5	7	17.5	28	70.0	31.371	<0.001
Nursing care pre and post external fixation	27	67.5	8	20.0	5	12.5	4	10.0	10	25.0	26	65.0	31.513	<0.001
Total Knowledge Level	26	65.0	10	25.0	4	10.0	5	12.5	9	22.5	26	65.0	30.412	<0.001

Chi- square test: x²

75% is a Good score

Poor: a score of less than 50%

If the P value is less than 0.05, it is considered significant

Fair: score between 50 % to 75%

Table 3. shows the relationship between nurses' demographic characteristics and their overall knowledge before and after nursing care guidelines were applied

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Nurses' characteristics	Pre implementation of nursing care guidelines							Post implementation of nursing care guidelines							
	Poor (n=26)		Fair (n=10)		Good (n=4)		Chi square test	Poor (n=5)		Fair (n=9)		Good (n=26)		Chi square test	
n	%	n	%	n	%	X ²		p	n	%	n	%	n		%
Age															
< 25	9	34.6	3	30.0	0	0.0			1	20.0	4	44.4	7	26.9	
25 – 30	13	50.0	5	50.0	4	100.0			3	60.0	3	33.3	16	61.5	

> 30	4	15.4	2	20.0	0	0.0	3.790	0.435	1	20.0	2	22.2	3	11.5	2.472	0.650
Gender																
Male	5	19.2	4	40.0	2	50.0			1	20.0	1	11.1	9	34.6		
Female	21	80.8	6	60.0	2	50.0	2.691	0.260	4	80.0	8	88.9	17	65.4	2.014	0.365
Marital status																
Single	17	65.4	6	60.0	3	75.0			2	40.0	6	66.7	18	69.2		
Married	9	34.6	4	40.0	1	25.0	0.287	0.866	3	60.0	3	33.3	8	30.8	1.589	0.452
Educational level																
Nursing Secondary School	2	7.7	0	0.0	0	0.0			0	0.0	2	22.2	0	0.0		
Technical institute	11	42.3	0	0.0	0	0.0			3	60.0	0	0.0	8	30.8		
Bachelor of nursing	13	50.0	10	100.0	4	100.0	10.370	0.034*	2	40.0	7	77.8	18	69.2	12.098	0.016*
Experience in nursing (Years)																
< 5	22	84.6	4	40.0	0	0.0			5	100.0	9	100.0	12	46.2		
5 - 10	4	15.4	4	40.0	4	100.0			0	0.0	0	0.0	12	46.2		
11 - 15	0	0.0	2	20.0	0	0.0	19.819	<0.001*	0	0.0	0	0.0	2	7.6	11.598	0.020*
Experience in orthopedic (Years)																
< 5	22	84.6	6	60.0	4	100.0			5	100.0	9	100.0	18	69.2		
5 - 10	4	15.4	4	40.0	0	0.0	18.846	<0.001*	0	0.0	0	0.0	8	30.8	5.385	0.067

5. Discussion

Musculoskeletal injuries are common in health care settings and are an important element of the nursing profession. The nurses' main role is to help patients and their families learn new behavior that will enhance their health and quality of life. A big part of this is accomplished through patient education. When a nurse enters a patient's environment, she works with the patient to choose what to teach, when to teach, and how to educate. When patients accept responsibility for their own quality of life, actively participate in their treatment plan, and are self-determined to manage their health care requirements at home, patient education is most successful. (Khorais, Ebraheim & Barakat, 2018).

Regarding the age of studied nurses, according to the study's conclusions, the most of the nurses investigated are in their third decade of life. The same results reported by Radhi & Tawfiq, (2016), who mentioned in their study in Baghdad that the majority of their studied samples within the same age group. It is also supported by Hassan, Mohamed, Farouk and Ghanem, (2014) They found out that majority of the nurses they investigated were in the age group.

The findings of the present study were in disagreement with Elsharkawy, (2016), who found

in his study that about half of nurses in orthopedic department within age group fourth decade. In my opinion this result might be because the younger nurses provided the actual care, while the older ones played the role of supervision.

According to the current study's findings regarding gender, more than two-thirds of the participants in the study were females. In my opinion, this result might be because the high ratio of female to male nurses in Egypt is still reported in many studies since the admission of male students in nursing schools only dates less than two decades so that the nursing workforce is still more feminine.

This finding is in agreement with Mohamed, Taha & Moghazy ,(2020) they revealed that all their studied subjects in orthopedic wards were females. But, this result is in disagreement with Bader & Atiyah, (2017) Who mentioned in their study that a large proportion of sample were orthopedic male nurses.

Regarding to educational level this study showed that the more than half of nurses had bachelor degree in nursing. This result might be due to the orthopedic settings needed highly qualified and practitioner nurses to be able to deal with different cases pre and post-operative and Kafrelsheikh University Hospital had preferred in the last years to employ the nurses who hold a Bachelor in nursing rather than a Diploma. This

finding is consistent with **Radhi & Tawfiq, (2016)**, who found that the majority of nurses had bachelor degree in nursing science, while this result is in disagreement with **Bader & Atiyah, (2017)** who mentioned in his study that the majority of nurses were diploma degree.

Concerning nurses' experience years in orthopedic ward, the majority of nurses had from one to five years of experience in orthopedic ward. this is in agreement with **Radhi & Tawfiq, (2016)** who reported that years of experience in orthopedic ward for the majority of his sample was one to five years. but this result is in disagreement with **Elsharkawy, (2016)**, who noted that the most of nurses had equal or more than ten years of experience. In my opinion, this result might be because Kafrelsheikh University Hospital is new, and most of the existing nursing staff are newly appointed

In regard to the total knowledge scores of the investigated nurses prior to the implementation of guidelines, the current study found that more than two-thirds of the studied nurses had low total knowledge concerning orthopedic external fixation. This finding was in the same regard with **Mohamady, Taha and Moghazy (2020)**, who reported in their study that, nearly two thirds of the studied nurses were having unsatisfactory total knowledge about orthopedic external fixation.

Also, the current study was supported by the study of **Bader and Atiyah (2017)**, who reported in their study that nurses' knowledge regarding orthopedic external fixation was poor among the nurses under the study. On the other hand, this results are in disagreement with **Hassan, Mohamed, Farouk and Ghanem (2014)**, They stated in their survey that more than two-thirds of nurses had a high level of knowledge of external fixation.

Following the application of the nursing care guidelines, majority of nurses had an excellent level of knowledge in all examined categories. showing a great improvement in nurses' knowledge. This demonstrated that the nursing care guidelines had a strong beneficial impact on nurses' knowledge, and that nurses were able to acquire and enrich their knowledge. This result was similar with the findings of a study done by **Konda (2020)**, who found in his study that the majority of his researched nurses had enough knowledge of external fixation after providing the information booklet.

Also, the current study was supported by the study of **Ahmed & El-kady, (2015)** who

reported in their study after implementation of the designed educational program regarding external fixation, more than half of his studied nurses gain satisfactory level of knowledge. This improvement might be due to the fact that a large number of nurses have a strong desire to learn skills and knowledge.

6. Conclusion

- 1- Prior to implementing the nurse care guidelines, total nurses' knowledge of the care given to patients with external fixation was inadequate.
- 2- Following the implementation of nursing care guidelines, they were able to more effectively increase their knowledge, resulting in an improvement in the quality of nursing care.

7. Recommendations

It was suggested, based on the study's findings:

1. Periodic in-service training courses should be provided to the orthopedic nurses with emphasizing on the weak points to increase their knowledge and practice.
2. Providing the orthopedic nurses with needed magazines and educational booklets in the field of Orthopedic to encourage continuous education.
3. To accomplish generalization, the study should be replicated on a large sample size.

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