

Self-Care Program: Quality of Life and Satisfaction among Patients with External Skeletal Fixation

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Abstract: External skeletal fixation is a widely used orthopedic surgical procedure for the treatment of complex musculoskeletal conditions. Patients with external fixation device have limited activity of daily livings and often have negative effects on their psychological and social wellbeing. A well-structured teaching and care plan can promote maximum self-care for the patients and will decrease frustration with mobilization and problems associated with body image. **Aim:** This study aimed to evaluate the effect of self-care program on quality of life and satisfaction among patients with lower limb external skeletal fixation. **Study design:** A quasi experimental design was used to achieve the aim of the current study. **Subject:** A purposive sample of sixty adult patients was recruited for the conduction of this study. **Setting:** The study was conducted in the orthopedic departments and outpatient clinic at El-Demerdash hospital which affiliated to Ain Shams University. **Data collection tools:** 1) Patients' interviewing questionnaire, 2) patients' observational checklist for wound/pin site care, assessment of neurovascular integrity and practicing range of motion exercises, 3) RAND 36-Item Health Survey (Version 1.0) and 4) patient's satisfaction scale. **Results:** There were statistically significant differences regarding satisfactory levels of knowledge and practice among studied patients between pre and immediately post program implementation and between pre and follow up program implementation at $p < 0.001$. additionally, there were statistically significant differences regarding physical, psychological and social health related quality of life between pre and immediately post program implementation and between pre and follow up program implementation at $p < 0.05$. The results also revealed that 70% of the studied patients were satisfied with the whole program items. **Conclusion:** Consistant with study hypotheses, self-care program intervention has a positive effect on patients' knowledge, practice, physical, psychological and social health related quality of life. Furthermore, patients with skeletal external fixation are satisfied with the self-care program and its activities. **Recommendations:** Replication of the current study on a larger probability sample is recommended to achieve generalizability of the results and wider utilization of the self-care program.

Keywords: skeletal external fixation, self-care, quality of life, patients' satisfaction.

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I. Introduction

External fixation devices are used to immobilize a particular part of the body following a fracture or for bone deformity correction to allow bone healing. These devices also can be used in limb length discrepancy surgeries and, nerve and tendon repairs. They can allow the fixation and manipulation of multiple bone segments which would otherwise be very difficult. They involve the use of pins, wires and braces and are used when other options of immobilization (such as plaster casts) would be ineffective. External fixation devices include circular fixators such as halo thoracic braces, Ilizarov fixators, and unilateral fixators (different from circular fixators as they are only positioned on one side of the limb) (Singh 2016; Walker 2018).

There are many risks associated with the use of external fixation devices which include those as a result of the device itself, as well as the initial injury that requires fixation. Pin site complications rates range from 7% – 100%, with the majority of complications being infection (both pin site & osteomyelitis). Other complications include deep vein thrombosis, pulmonary embolisms, aseptic loosening fracture or non-union of existing fracture; and loss of reduction (Roberts, Panagiotidou, Sewell, Calder & Goodier, 2015). In addition to the physical problems and as a result of prolonged rehabilitation, patients with external fixation experience depression and anxiety, due to the cumbersome frame, pain, and body image changes as well as restriction in the social activities (Dheensa & Thomas, 2012). Because of the long-term immobilization involved with such a device, care of the patient with an external fixation device must include not only meticulous nursing protocol during hospitalization, but also a detailed patient teaching plan (Bader & Atiyah, 2017; Moyle, 2017).

The unique role of the nurses is to help patients and their families learn new behaviors that to have a positive impact on their health and their lives. Much of this is accomplished through patient education. As the nurse enters the patient's world, she work with the patient in mutually deciding what to teach, when to teach, and how to teach. Success in patient education is primarily achieved when patients accept responsibility for their own quality of life, actively participate in the plan of care, and are self-determined to manage health care needs at home. The process of taking responsibility for developing one's own health potential is called self-care (*Ferreira & Marais, 2012; Ahmed, 2014; Smith & Parker, 2015*). Furthermore, it is important for the nurse to share with the patients their worries and concerns regarding the long-term care of external fixation device through developing a nurse-patient relationship which is based on understanding and trust to assist the patients cope with their stress and improve their quality of lives (*Lopez & Gamba, 2013*).

According to Orem, self-care is the practice of activities that individuals perform to maintain health, life, and well-being. Orem described three categories of self-care: universal activities (to satisfy basic needs for air, water, food, elimination, activity and rest, solitude and social interaction), developmental activities, and health deviation activities. In Orem's view, the role of the nurse is to help adults continually maintain self-care to sustain life and health. When disease, injury, or disability occurs, action is necessary to adjust ways of performing universal self-care activities, to establish new methods of self-care, to modify self-image, to revise the routines of daily living, to develop a lifestyle compatible with the effects of the health deviation, and to cope with the effects of the health deviation (*Stanhope & Lancaster, 2010; Tomey & Alligood, 2010*).

An informed client is more likely to collaborate with the health care team in creating a treatment regimen that minimizes or eliminates risk factors. Currently, well-written pamphlets or brochures should be shared with the client and family members, and time should be allowed during regular visits to discuss questions they may have. Client-nurse discussions should focus on explanations of pin site care, assessment of neurovascular integrity, principles of external fixation device protection, pain management strategy, using safety measures, using principles of energy conservation, drug self-administration, practice exercise, weight reduction and stress management strategies (*Bahaa, 2015*).

Care of the patient with an external fixation device may appear difficult at first due to the obstacles of the device itself and the possible severity of the wound it surrounds. A well-structured teaching and care plan followed by a great deal of consistency on the part of all involved will go far in overcoming many of the problems. In fact, if the word "challenges" is substituted for the word "problems," the first major step is taken in assuring a successful prognosis for the patient with an external fixation device. The nursing protocol improves their exercise tolerance, quality of life, ability to self-management their condition and satisfaction (*Walker, 2018*).

Quality of life is the standard of health, comfort, and happiness experienced by patients with lower limb external fixation. Thorough planning for the nursing care of such patient is essential to promote comfort, effective recovery, and rehabilitation and to prevent complications. In addition, neurologic assessment, mobilization, pain control, constipation avoidance, urinary catheterization, discharge planning and incision care (*Dheensa & Thomas, 2012*).

Patient satisfaction is the most important indicator of high-quality health care and is used for the assessment and planning of health care. Nursing care is one of the major health care services that contribute significantly to the patient healing process. Nurses have 24 hour contact with patients as well as being near to them. Patient satisfaction is often determined by the nursing care in any health setup (*Dzomeku, Ba-Etilayoo, Perekuu, & Mantey, 2013*).

Significance of the study

The group of patients with lower limb external fixation showed significantly higher levels of wound infection and tendonitis and had a greater need for additional surgeries (*Chuang, Qiang, Hongwei, Xinchun, Yuhua & Jing, 2016*). In addition, patients with external fixation always experience anxiety, depression and maladaptive coping due to, changes in body image, pain and lack in information and skills to deal with the external fixation device (*Dheensa & Thomas, 2012*). Moreover, patients with external fixation had self care deficits regarding performance of daily living activities and low satisfaction that contribute to diminished quality of life, increased morbidity and mortality post external fixation. Therefore, application of self-care program for such group of patients is thought to empower the patient and family with the needed knowledge and skills necessary for optimal safe performance, and enhancing their quality of life and satisfaction.

THE AIM OF THE STUDY:

This study aimed to evaluate the effect of self-care program on quality of life and satisfaction among patients with lower limb external skeletal fixation through the following:

1. Assess patients' level of knowledge and practice regarding external skeletal fixation pre- implementation of a self-care program.

2. Assess patients' quality of life pre- implementation of a self-care program
3. Develop and implement a self-care program for patients with external skeletal fixation based on their needs assessment.
4. Evaluate the effectiveness of self-care program on patient's level of knowledge and practice regarding external skeletal fixation post- program implementation.
5. Evaluate the effectiveness of a self-care program on patients' quality of life post- program implementation.
6. Assess patients' satisfaction with the self-care program.

THE RESEARCH HYPOTHESIS

The current study hypothesized that:

1. The patients will have an improvement regarding the level of knowledge and practice post implementation of a self-care program
2. The implementation of a self-care program has a positive effect on physical health related quality of life among patients with lower limb external skeletal fixation.
3. The implementation of a self-care program has a positive effect on psychological and social health related quality of life among patients with lower limb external skeletal fixation.
4. The implementation of a self-care program has a positive effect on patients' satisfaction.

OPERATIONAL DEFINITIONS

- **External skeletal fixation:** It refers to a surgical procedure that is performed to immobilize the lower limb using the external skeletal device.
- **Self-care program:** It refers to the basic information and self-care skills that needed for a patient with external skeletal fixation to practice pin site care, assesses the neurovascular integrity, practicing range of motion exercises and preserves physical, social and psychological aspects of quality of life.
- **Quality of life:** It refers to physical functioning, bodily pain, role limitations due to physical health problems, and role limitations due to personal or emotional problems, emotional well-being, social functioning, energy/fatigue, and general health perceptions.
- **Patients' satisfaction:** It refers to patients' satisfaction regarding theoretical content, practical skills, educational booklet, educational methods and patient's participation and autonomy.

II. Subjects & Methods

RESEARCH DESIGN:

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

A- Setting:

The study was conducted in the orthopedic departments and outpatient clinic at El-Demerdash hospital which affiliated to Ain Shams University.

B- Subjects:

A purposive sample of sixty adult patients was recruited for the conduction of this study from the above mentioned settings. **Inclusion Criteria:** Adult (≥ 18 -years old), patients with lower limb external skeletal fixation device, willing to participate, able to communicate and did not receive a previous educational program about the external fixation device. **Exclusion criteria:** Patients have the comorbid disease as (diabetes mellitus) and patients with a disturbed level of consciousness/ or mental disorders. Sample size: according to Statistical records of El- Demerdash Surgical Hospital 2016, the total number of patients admitted for external skeletal fixation of lower limb were 129 cases. The sample size was 60 patients, calculated by adjusting the power of the test to 80% and the confidence interval to 95% with a margin of error accepted adjusted to 5%, and The significance level at 0.05.

C-Tool of data collection:

Data were collected by using the following tools:

I- Patients' interviewing questionnaire:

It was developed by the researchers and written in a simple Arabic language after reviewing the related literature: (*Dirksen, 2011; Williams & Hopper, 2011; White, Duncan, & Baumle, 2013; Velazquez, Bell & Armstrong, 2015; Linton, 2016*). It composed of two parts.

The 1st part was concerned with studied patients' characteristics which included, age, gender, marital status, educational level, and occupation, residence, and patients' medical diagnosis.

The 2nd part was concerned with the assessment of the patients' knowledge regarding external skeletal fixation. It covered the following items, external fixation device (definition, indications, advantage and disadvantage, complications and related warning sings and symptoms), pin site care, neurovascular integrity,

principles of device protection, pain management strategies, nutrition, and range of motion and physical exercises.

Scoring system: two grades were given for the correct answer and one grade for the incorrect answer. The total level of patients' knowledge score was categorized as follows:

Satisfactory level $\geq 60\%$ Unsatisfactory level $< 60\%$.

II-Patients' observational checklist:

This tool was adopted from (*Khadka, Kisi, Raya & Shrestha, 2012; Perry, Potter & Desmarais, 2015*) to assess patients' practice and included two procedures; wound/pin site care (12 steps), assessment of neurovascular integrity (12 steps) and practicing range of motion exercises (19 steps).

Scoring system: one grade was given for each step that done correctly, zero for the step that done incorrectly or not done. The total level of patients' practice score was categorized as follows:

$\geq 70\%$ was considered the satisfactory level and $< 70\%$ was considered an unsatisfactory level.

III- RAND 36-Item Health Survey (Version 1.0):

This tool was adopted from *Ware and Sherbourne (1992)*. It was concerned with the assessment of patients' quality of life. It measures physical and mental health related quality of life and constructs according to the patient's perspective in evaluating his/her health care outcomes in order to maintain patients' functioning and well-being. It includes eight concepts: physical functioning, bodily pain, role limitations due to physical health problems, role limitations due to personal or emotional problems, emotional well-being, social functioning, energy/fatigue, and general health perceptions. It also includes a single item that provides an indication of a perceived change in health.

The scoring system: it is divided into two steps:

1-Step one: the items' values are recoded per the scoring from 0 to 100. So that a high score defines a more favorable health state (see table-1).

2- Step two: the items on the same scale are averaged together to create the 8 scale scores (see table-2).

The mean score of each item pre-post program implementation are based on the response categories (see the items responses distributed in table one).

Table-1: recording Items (step one)

Item No	response category	Scoring
1,2,20,22,34,36		
	1	100
	2	75
	3	50
	4	25
	5	0
3,4,5,6,7,8,9,10,11,12		
	1	0
	2	50
	3	100
13,14,15,16,17,18,19		
	1	0
	2	100
21,23,26,27,30		
	1	100
	2	80
	3	60
	4	40
	5	20
	6	0
24,25,28,29,31		
	1	0
	2	20
	3	40
	4	60
	5	80
	6	100
32,33,35		
	1	0
	2	25
	3	50
	4	75
	5	100

Table-2: averaging items to form scales (step two)

Scale	No of Items	Item's number in the scale
Physical functioning	10	3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Role limitations due to physical problems	4	13, 14, 15, 16
Role limitations due to emotional	3	17, 18, 19
Energy/Fatigue	4	23, 27, 29, 31
Emotional wellbeing	5	24, 25, 26, 28, 30
Social functioning	2	20, 32
Pain	2	21, 22
General health perception	5	1, 33, 34, 35, 36
Perceived change in health	1	2

IV- Patient's satisfaction scale:

It was adapted from (*Larson, Nelson, Gustafson & Batalden, 1996; Sitzia, 1999; Dzomeku, et.al., 2013*) and modified by the researchers based on reviewing the related literature (*Cardol, Hann and Jong, 2001; Mohamed, 2010; Custer, 2012; Kleefstra, 2015*). The scale was used to assess the satisfaction of patients with self-care program items, it was translated into Arabic language and back translated into English and it consisted of 57 statements which were grouped into 5 subtitles: theoretical content (4 items), practical skills (4 items), educational booklet (7 items), educational methods (10 items) and patient's participation and autonomy (32 items).

Scoring system: The responses for the items were as follows: Not satisfied = 1, Somewhat Satisfied, = 2 satisfied = 3. It was considered that the higher the score the higher satisfaction level. The total level of satisfaction is considered as follows:

- Satisfied if score \geq 60 % of the total score.
- Unsatisfied if score < 60% of total score.

Self-care program for patients with lower limb external skeletal fixation device:

Based on patients' needs, the self-care program was designed by the researchers and written in simple Arabic language using illustrated pictures based on related recent literatures (*Ignatavicius & Workman, 2012; Pottage, 2012; Ahmed, 2014; Timby & Smith, 2014; Benjamain, Gabriel, Paul & Benjamain, 2015; Garrett, 2015; Margal, Glick, Benbassat & Cohen, 2015; Lewis, Dirksen, Heitkemper, Bucher and Harding, 2016; Kornah, safwat, Abdel-Aal, Seleem, Mohamed and Alshal, 2017*). It includes the following items: external fixation operation (definition, indications, types, preparation, post-operative instructions, medication, follow up), pin site care, assessment of neurovascular integrity, range of motion and physical exercises, principles of external fixation device protection, pain management strategies, using safety measures, using principles of energy conservation, drug self-administration, weight reduction, stress management strategies, overcoming negative thoughts, increasing social activities. Self-care program was revised by a group of experts for content validity. This group included 3 experts from the medical surgical nursing department, 2 experts from psychiatric/mental health nursing department, Faculty of Nursing, Ain shams university and 2 experts in orthopedic surgery specialty, Faculty of Medicine Ain Shams University. Based on the opinion of experts, some modifications were done and then the final form was developed.

Content validity and reliability:

1) Validity:

The face and content validity were ascertained by a group of 3 experts from the medical surgical nursing department, 2 experts from psychiatric/mental health nursing department, Faculty of Nursing, Ain shams university and 2 experts in orthopedic surgery specialty, Faculty of Medicine Ain Shams University. The aim was to determine relevance, clarity, completeness, simplicity, and applicability of the study tools. Expert's responses were either agreed or disagreed or agreed with modifications for the face and content validity. More than 85% of the experts were in agreement with the proposed tool and accordingly, the required modifications were done.

2) The Reliability:

Testing reliability of the proposed tools was done statistically by Cronbach Alpha test which was 0.81 for the interviewing questionnaire, 0.91 for an observational checklist of wound/pin sit care, neurovascular assessment and practicing range of motion exercises, 0.95 for RAND 36-Item Health Survey and 0.78 for patients' satisfaction scale.

Ethical considerations

The ethical considerations in this study included the following: The researchers clarified the objectives and the aim of the study to patients included in the study. The researchers maintain an anonymity and confidentiality of

patients' data. Patients were allowed to choose to participate or not and they were informed that they have the right to withdraw from the study at any time without giving any reason.

Pilot study

A pilot study was conducted on 10 % of subjects (6 patients) to test the applicability and feasibility of the study tools as well as time needed to fill these tools. Obtained results used as a guide to reconstruct the changes needed in the data collection tools and those subjects were excluded from the study sample.

Field Work:

The actual field work of this study started at the beginning of May 2017 and had been completed of January 2018. This period of time was divided into:

A. Implementation phase:

This phase started postoperatively at the orthopedic department by interviewing 60 patients who met the study criteria to explain the purpose of the study as well as taking their approval to participate in the study prior to data collection. Data collection was started and completed within 9 months including follow up phase; from May 2017 to January 2018. It was done 3 days / week (Sunday, Tuesday, and Wednesday) in orthopedic department and the orthopedic outpatient clinic. Tools of data collections were filled in by the researchers or by patients according to their level of education. Pre-assessment was conducted to determine the patients' needs regarding self-care after external skeletal fixation by using patients' interview questionnaire tool (I) part 1 and 2 which took about 15 minutes to collect data of patients' characteristics and knowledge, then, patient's practice observational checklist tool (II) was used to assess patients' practice regarding wound/pin site care, assessment of neurovascular integrity and practicing range of motion exercises which took about 30 minutes, and RAND 36-Item Health Survey tool (III) was used to assess patients' quality of life which took about 15 minutes.

The researchers implemented the self-care program postoperatively for each patient separately or in a small group of 2-3 patients. The sessions were given according to patient's educational needs especially the practical part of pin site care, assessment of neurovascular integrity and practicing range of motion exercises. The self-care program was presented in theoretical and practical sessions, the theoretical part was conducted through lectures, and group discussion, using the poster as a media, and was taken in 2 sessions (each session about 40-60 minute). The practical part was conducted through demonstration, re-demonstration, using real materials. The practical part was taken in 3 sessions (each session about 40-60 minute), at the end, patients were informed to be in contact with the researchers by telephone for any guidance.

B. Evaluation phase: It was emphasized on:

- 1- Evaluating the effectiveness of the self-care program on patients' knowledge and practices through comparing the results pre, immediately post and follow up implementation of self-care program using a tool (I & II)
- 2- Evaluating the effectiveness of the self-care program on patients' quality of life by comparing the results pre, post-one month of program implementation and then at the time of follow up phase using a tool (III).
- 3- Evaluating the effect of the self-care program on patients' satisfaction at follow up implementation of the program using a tool (IV).

Data analysis:

The data were collected, coded and entered to a personal computer (PC), IBM compatible 2.6 GHZ. The data were analyzed with the program using the statistical package for social science (SPSS) under windows version 11.0.1. Numerical data (quantitative) were presented as mean and standard deviation (SD) values. Qualitative data were presented as frequencies (n) and percentages (%). Independent-samples t-test of significance was used when comparing between two means, pre-, immediately post and at follow-up periods. Chi-square test when applicable was used for comparisons regarding qualitative data. The significance level was set as follows: Non significant (NS) when $P>0.05$; Significant (S) when $P<0.05$ and Highly Significant (HS) when $P<0.01$.

III. Results

Table (1): Characteristics of patients under study (n= 60).

Items	No	%
Age		
20<40	47	78.3
40<60	12	20
≥60	1	1.7
Mean ± SD	30.9±8.43	
Gender		
Male	50	83.3
Female	10	16.7
Marital Status		
Married	35	58.3
Not Married	25	41.7

Education		
Not read & write	20	33.3
Basic education	14	23.3
Secondary school education	16	26.7
High education	10	16.7
Occupation		
Retired/no job/housewife	10	16.7
Sedentary work	14	23.3
Manual work	36	60.0
Residence		
Urban	40	66.7
Rural	20	33.3
Patient's medical diagnosis:		
Fracture	60	100.0
Limb lengthening	0	0.0
Angulation correction	0	0.0

Table (1) shows that the mean age of the studied patients was 30.9±8.43 and 83.3% were males. Regarding educational level, 33.3 % of patients don't read and write. Concerning marital status, it was found that 58.3% of studied patients were married. Moreover, it is observed that 60% of the patients were manual workers and 66.7% resided in rural areas. Finally, concerning medical diagnosis among studied patients, table (1) clarifies that all of the patients (100%) were diagnosed with fracture.

Table (2): Patients' satisfactory level of knowledge regarding external skeletal fixation pre, immediately post and follow up program implementation (n= 60).

Items	pre		Immediately post		Follow up		χ^2/ p value	
	No	%	No	%	No	%	Pre & Immediately post	pre & Follow up
External skeletal fixation	3	5.00	38	63.3	32	53.3	78.000**	74.595**
Pin site care	2	3.33	48	80.0	46	76.7	65.636**	46.522**
Neurovascular integrity	2	3.33	32	53.3	28	46.7	51.429**	46.939**
Principles of device protection	2	3.33	36	60.0	32	53.3	47.442****	40.0**
Pain management strategies	2	3.33	34	56.7	28	46.7	47.442**	40.0**
Nutrition	0	0.00	34	56.7	30	50.0	36.522**	28.462**
Range of motion and physical exercises	0	0.00	34	56.7	32	53.3	450433**	41.462**
Total	1	1.66	37	61.7	33	55	55.610**	48.636**
Level of significance * = p <0.05 ** = p <0.001 *** = p 0. 000 Satisfactory level \geq 60 %								

Table 2 illustrates the satisfactory level of knowledge among studied patients. There were statistically significant differences regarding all items of knowledge between pre and immediately post program implementation and between pre and follow up program implementation at $p < 0.001$.

Table (3): Patients' satisfactory level of practice regarding external skeletal fixation pre, immediately post and follow up program implementation (n= 60).

Practical skills	pre		Immediately post		Follow up		χ^2/ p value	
	No	%	No	%	No	%	Pre & Immediately post	pre & Follow up
Wound/pin site care	0	0.00	28	46.7	25	41.7	61.575**	44.692**
Neurovascular integrity assessment	0	0.00	25	41.7	23	38.3	56.547**	53.343**
Practicing range of motion exercises.	0	0.00	34	56.7	28	46.7	47.442**	36.522**
Total	0	0.00	27	45	24	40	57.231**	55.232**
Level of significance * = p <0.05 ** = p <0.001 *** = p 0. 000 \geq 70 % was considered the satisfactory level								

As observed in **table 3**, no one (0 %) of the patients under study had a satisfactory level of total practice pre program implementation. In contrast, 45% and 40% of studied patients had satisfactory level of total practice immediately post- and follow up program implementation respectively. Also, table (3) shows that there were

statistically significant differences between pre and immediately post, and between pre and follow up program implementation regarding the total satisfactory level of practice ($\chi^2= 57.231$ & 55.232 respectively at $p < 0.001$).

Table (4): Physical health related quality of life as perceived by studied patients pre, post-one month and at follow up program implementation (n= 60).

Items	pre		Post-1mon.		Follow up		T test/p value	
	Mean	SD	Mean	SD	Mean	SD	Pre & post-1mon.	pre & Follow up
Physical functioning	1.2	0.55	2.98	1.14	2.78	1.11	3.98*	3.044*
Role limitations due to physical problems	0.54	0.22	1.77	1.01	1.77	1.032	3.11*	3.22*
Energy/fatigue	1.1	0.33	3.90	1.13	4.22	0.99	3.63*	3.812*
Pain	1.3	0.42	3.98	1.24	3.87	1.22	3.44*	3.23*
Level of significance * = $p < 0.05$ ** = $p < 0.001$ *** = $p < 0.000$								

Table 4 clarifies the physical health related quality of life among the studied subjects. Generally, there were statistically significant differences regarding physical functioning, role limitations due to physical problems, energy, and pain mean score between pre and post-1 month program implementation ($t = 3.98, 3.11, 3.63$ & 3.44 respectively and $p < 0.001$), and between pre and follow up program implementation ($t = 3.044, 3.22^*, 3.812$ & 3.23 respectively and $p < 0.05$).

Table (5): Psychological and social health related quality of life as perceived by studied patients pre, post-one month and at follow up program implementation (n= 60).

Items	pre		Post-1mon.		Follow up		T test/p value	
	Mean	SD	Mean	SD	Mean	SD	Pre & post-1mon.	pre & Follow up
Role limitations due to emotional problems	1.4	0.55	3.74	1.11	4.1	1.74	4.044*	3.68*
Emotional well-being	1.3	0.71	3.21	1.23	3.99	1.23	3.22*	3.01*
Social functioning	1.1	0.33	3.22	0.99	3.90	1.13	3.812*	3.43*
Level of significance * = $p < 0.05$ ** = $p < 0.001$ *** = $p < 0.000$								

Regarding psychological and social health related quality of life as observed in table 5, there were statistically significant differences among studied patients regarding total mean scores of psychological and social health related quality of life between pre and post-1 month program implementation and between pre and follow up program implementation at $p < 0.05$.

Table (6): Health related quality of life regarding overall rating general health and health change as perceived by studied patients pre, post-one month and at follow up program implementation (n= 60).

Items	pre		Post-1mon.		Follow up		T test/p value	
	Mean	SD	Mean	SD	Mean	SD	Pre & post-1mon.	pre & Follow up
General health perception	1.71	0.55	4.54	1.13	4.3	1.81	4.22*	3.98*
Perceived change in health	1.52	0.71	4.21	1.08	4.1	1.65	4.35*	3.21*
Total	1.241	0.485	3.506	1.13	3.67	1.323	3.756*	3.401*
Level of significance * = $p < 0.05$ ** = $p < 0.001$ *** = $p < 0.000$								

According to the results that presented in **Table 6** regarding the overall rating of general health and health change among the studied subjects, there were statistically significant differences regarding the overall rating of general health and health change between pre and post-1 month program implementation and between pre and follow up program implementation at $p < 0.05$.

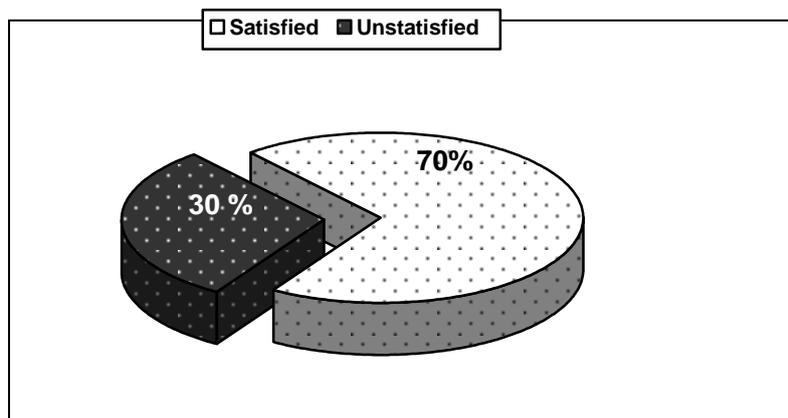
Table (7): Satisfaction with self-care program among studied patients at follow up program implementation (n= 60)

Items	Unsatisfied		Somewhat satisfied		Satisfied	
	No	%	No	%	No	%
Theoretical content	3	5.0	15	25.0	42	70.0
Practical skills	4	6.7	18	30	38	63.33
Educational Booklet	2	3.33	16	26.7	42	70.0
Educational methods	3	5.0	15	25.0	42	70.0

Patient's participation & autonomy	2	3.33	19	31.67	39	65.0
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Concerning the patients' satisfaction with the self-care program, **table (7)** shows that 70% of the studied patients were satisfied with the theoretical content, educational booklet, and educational methods. Additionally, 63.33% and 65% of the studied patients were satisfied with practical skills as well as their active participation and sense of autonomy respectively.

Figure (1): Total satisfaction with self-care program among studied patients at follow up program implementation (n= 60).



Satisfied if score $\geq 60\%$

Unsatisfied if score $< 60\%$

Concerning the patients' satisfaction with the self-care program, **figure (1)** illustrates that 70% of the studied patients were satisfied while 30% of them were unsatisfied.

IV. Discussion

External skeletal fixator is an important aspect of complex fracture management. External fixation is used for limb reconstruction and deformity correction. The external fixator can be in place for many months and patients will need to adapt to the device and demonstrate an understanding of the principles of pin site care. Psychosocial issues also need to be considered. Furthermore, Patients always struggle to cope with the external fixator device and need holistic assessment and support to improve their quality of life (*Ma, Deng, Pu, Cheng, Kan & Yusufu, 2016; Walker, 2018*). So that a well-structured teaching and care plan can promote maximum self-care for the patients with external fixation devices and will decrease frustration with mobilization and problems associated with body image (*Sydney hospital network, 2017*). The current study was designed aiming to evaluate the effect of self-care program on health related quality of life and satisfaction among patients with lower limb external skeletal fixation.

As regards to the demographic characteristics among studied patients, the current study shows that the mean age of the patients was (30.9±8.43). This may be due to that patients under study had a higher incidence of fracture due to accidents. This finding was supported by *Egol, Koval and Zuckerman (2012)* who stated that a higher incidence of fracture related to trauma, occurs at the young age. This finding is not in agreement with a study done by *Mohamed, Saeed, Durrani, Abdul Satar and Arif (2015)* entitled: "Outcome of ilizarov fixator in tibial non-union" who stated that the mean age of the patients with external fixation was (40±13.89). Regarding the gender, most of the studied patients were males. In the researchers' point of view, this is because most of the studied patients were at a young age that culturally has more access to be out of homes and are more engaged in high risky behaviors. This finding was supported by *Moneur (2013)* who confirmed that a higher incidence of fracture among males than females.

In relation to educational level, the current study illustrated that about one third of the studied patients didn't read and write, while the other two thirds of them had a different level of education. This may be due to that the study was conducted in the governmental hospital which accommodates many numbers of patients with low socioeconomic levels. As regards to occupation, the results of the present study showed that more than half of the studied patients were manual workers. This may explain the physical effort and the nature of the work which lead them to be more liable to accidents and trauma. This result was incongruent with *Wong, Chan and Chair (2010)* who found that 96% of patients with external fixation devices have basic and secondary educational levels.

The result shows that there were statistically significant differences among studied patients throughout the implementation of the self-care program in the three phases of the study (pre, immediately post and follow

up program implementation) regarding their satisfactory knowledge about external fixation device, pin site care, neurovascular integrity, principles of device protection, pain management strategies, nutrition, and range of motion and physical exercises. This reflects the positive effect of the program on improving patients' level of knowledge. This finding agrees with **Matt-Hensrud, Severson, Hansen and Holland (2015)** in a study entitled "A discharge planning program in orthopaedics: experiences in implementation and evaluation" who stated that there was a statistical significance change in patients' knowledge three months following participation in discharge planning education. Another study conducted by **Ahmed and Abd-El mohsen (2018)** supported the current finding and asserted that orthopedic patients in the experimental group had improvement in their knowledge after the structured education at the time of discharge compared to the control group.

Concerning the satisfactory level of practice among studied patients, it was noticed that no one of patients under study had satisfactory level of self-care practices regarding the wound/pin site care, the neurovascular integrity assessment, and practicing range of motion exercises at pre program implementation with significant improvement can be observed at immediately post and follow up program implementation. This result can reflect the effectiveness of the self-care program on improvement of self-care practices of studied patients. On the other hand, most of the studied patients had limited educational level which in turn finds some difficulties to looking for and understand the management protocol so that they are willing to enhance their knowledge and skills to maintain a healthy quality of life. This finding agrees with a study done by **Brereton (2016)** entitled "Pin site care the rate of local infection" who confirmed that patients with external fixation improved their skills regarding pin site care after education.

Comparison of the physical health related quality of life among studied subjects. There were statistically significant differences in the physical functioning, physical limitations due to physical problems, feeling of fatigue and pain. It means that patients with external fixation become more powerful in dealing with their physical limitations and methods of overcoming pain and fatigue after the program. These findings agreed with **Nunez, Nunez, Segur, Macule, Quinto and Hernandez (2006); Wong et. al. (2010)** who found that improvements in pain and physical functional capacity after the application of the health education among patients with musculoskeletal problems. Also, the current results were supported by **Gay, Chabaud, Guilley and Coudeyre (2016)** who reported in an article entitled "Educating patients about the benefits of physical activity and exercise for their hip and knee osteoarthritis." that self-care management education leads to better treatment adherence, reduction in pain, and better management of the disease and improved quality of life.

Concerning the psychological and social health related quality of life among studied subjects. There were statistically significant differences among studies patients between pre and post-one month program implementation as well as pre and follow up program implementation. At pre program implementation phase, the subjects under study achieved low mean scores regarding role limitations due to psychological problems, emotional wellbeing, and social functioning. This may be due to a decrease in physical functioning, pain sensation at the pin site and the changes in body image that affect the patients' psychological and social functioning. In addition, most of the studied patients were young agers that the body image is a main concern for them. Harmonious with these illustrations, **Dheensa and Thomas (2012)** who investigated the relationship between coping, quality of life and depression/anxiety in patients with external fixation devices and clarified that patient with external fixation who experienced maladaptive coping have poorer psychological and social quality of life. While, after the self-care program, there were understandable improvements among studied subjects as regards to psychological and social functioning. Similar to this finding, **Anthony and Hudson-Barr (2010)** who reported that structured education at the time of discharge lowered patients' depression level six months post discharge.

Also, the current study findings was supported by **Modin, Ramos and Sternberg (2009)** in a study entitled: "Postoperative impact of daily life after primary treatment of proximal/distal tibia fracture with Ilizarov external fixation" who stated that the clear information given to patients prior to discharge had a positive impact on improving social activities and relationships. Another study conducted by **Ekeberg and Diane (2016)** entitled: "Promoting a Positive Attitude in Patients Undergoing Limb Lengthening" who concluded that a positive psychological responses to a patient with external skeletal fixation can be attained after health educational intervention.

It can be obvious from the study results that there were statistically significant improvement in the overall rating general health and positive health changes as perceived by the studied subjects. This result is in agreement with the results of **Williams and Griffiths (2004)** in a study entitled "The effectiveness of pin site care for patients with external fixation" who reported that educating patients with external fixation has a positive effect in improving patients' outcomes and overall health.

Pertaining the satisfaction with the self-care program from the subjects' perspectives in the current study, most of the studied subjects were satisfied with the educational program and its activities, such as knowledge and skills needed for the care of external fixation device, the educational booklet, educational methods, and patient's autonomy regarding his/her decision making and involvement in the self-care program.

This study was similar to the studies of *Barkadale and Backer (2010)*; *Awad and Chung (2010)*; *Ahmed and Abd-El Mohsen (2018)* who mentioned that the implementation of a structured educational program increased the patients' satisfaction level.

To sum up the discussion of the current study, the study results documented that, the studied patients showed better improvement of the knowledge, self-care practices, physical, psychological and social Health Related Quality of Life at immediately post and follow up program implementation as compared to pre-program implementation. In addition to that, most of the patients under study were satisfied with self care program which support completely the study hypothesis.

V. Conclusion

Congruent with study hypotheses, self-care program intervention has a positive effect on patients' knowledge, self-care practices in addition to physical, psychological and social health related quality of life. Furthermore, most of the patients under study were satisfied with the self-care program and its activities.

Recommendations

The results of this study projected the following recommendations:

1. Self-care programs and continuous health education are necessary to improve patients' quality of life and satisfaction.
2. The educational intervention and patient's psychosocial support should be included in routine nursing care as a protocol before and after external skeletal fixation surgery and at the time of follow up phase.
3. Further researches are recommended periodically to be carried out on new approaches in the area of management of patients with external skeletal fixation and evaluate its effect on patients' quality of life.
4. Replication of the current study on a larger probability sample is recommended to achieve generalizability of the results and wider utilization of the self care program.
5. Studying factors affecting patients' satisfaction with the therapeutic regimen post external skeletal fixation surgery.
6. Follow up care for patients with external skeletal fixation through phone calls, and clinical visits that would help to pinpoint patients' self-care needs and meet it.

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