Effect of Family Involvement in Patient Care on Preventing Intensive Care Units Acquired Weakness

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Abstract

Background: The Intensive care units acquired weakness detected in 30 to 50% of ICU patients leading to high morbidity and complication, family engaging family in early mobility process that reported benefits including reduced ICU-acquired weakness, improved functional recovery within the hospital, improved walking distance at hospital discharge and reduced hospital length of stay. **This study aimed** to Determine the effect of family involvement in patient care on preventing intensive care units acquired weakness. **Methods:** Quasi experimental research was conducted in surgical and general ICUs in the main Mansoura university and emergency hospitals, which included 60 adult newly ICU admitted patients**. Tools**: Three tools were used to collect the data of this study namely "Intensive care unit acquired weakness assessment", "Early progressive mobility protocol" and "Patients' family satisfaction with early mobility protocol involvement". **Results:** Only 6.7% of the intervention group had a weakness at the end of the study with no significant difference (0.150) was found in muscle strength from the start and end of the study. While about a third of the control group (26.7%) had a weakness at the end of the study. A statistically significant difference (0.038) in muscle strength was found between intervention and control group. Furthermore, About two-thirds (70%) of patients' family members of the intervention group were satisfied by giving them a role in participation in their patient care. **Conclusion:** Critically ill patients whose families were involved in their mobility protocol had less intensive care units acquired weakness rates than those who were not. **Recommendation:** Evaluation of muscle strength should be a routine part of ICU examination. Family centered care concept should be adopted in ICUs by allocating them in daily activities involvement with enough support and cooperation.

Keywords: Effect, family involvement, mobility, ICUAW**.**

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Introduction

In recent years, it has become increasingly obvious that we need to broaden our vision beyond our traditional multi-professional team members, various waveforms, data points, and include family input into care. Family-centered care comprises the "F" in the ABCDEF bundle, which calls for family members and surrogate decision-makers to serve as active participants in care planning and decision-making. Most experts agree that several domains of family-centered care are important: family presence in the ICU, team communication with family members, allowing family members to participate in direct care, support systems outside of the primary ICU team and

attention to the ICU environment **(Mount & Colombo, 2019).**

Family members of critical care patients themselves identify nurses as the best resource for meeting their needs. Therefore, nurses have to do their best to invest that trust, engaging family in early mobility process that reported benefits including reduced ICU-acquired weakness, improved functional recovery within the hospital, improved walking distance at hospital discharge and reduced hospital length of stay **(Hodgson CL & Tipping CJ., 2018).**

Critically ill patients face substantial morbidity and mortality rate. However, over the last few decades, decreasing mortality following critical illness has shifted the focus from short-term to long-term outcomes in intensive care unit (ICU) survivors. Despite survival among patients in the ICU has improved dramatically over the past 20 years, patients in ICU are subject to many complications associated with the advanced therapy required for their serious illnesses and survivors suffer specially from neuromuscular dysfunction and 15.2%, and anxiety disorder diagnoses are neuropsychological maladjustment **(Derde et al., 2012).**

Studies show that up to 65% of such patients have functional limitations after discharge from the hospital with neuromuscular dysfunction contributed to clinical illness that termed; Intensive care unit–acquired weakness (ICU-AW). ICUAW was detected in 30 to 50% of ICU patients and associated with difficulty in weaning from the ventilator, prolonged ICU stay, higher hospitalization charges and increases long-term morbidity and mortality **(Dres, Goligher, Heunks and Brochard, 2017).**

In the critical patient management, interventions that promote long periods of immobilization are usually performed such as the use of mechanical ventilation, administration of drugs, sedatives, analgesics, drugs to control anxiety and agitation, etc. Weakness is a common complication and is associated with a severe disability and a long rehabilitation. In this line, ICUAW is associated with joint contractures, thromboembolism, resistance to insulin, microvascular alterations, pressure ulcers, atelectasis, pneumonia, extension of the weaning period, delirium, increase costs, increased mortality, and development of disabilities **(Fan, Dowdy, & Colantuoni, 2014).**

Intensive care unit acquired weakness (ICUAW) is associated with a multifactorial morbidity that can cause functional, physical, cognitive and/or psychological disabilities which persist even over 5 years after discharge and may last for more years in some patients, so early mobilization of patients in the ICU has become established as an evidence-based strategy to reduce the deconditioning and dysfunction so commonly seen in survivors of critical illness. **(Kress, & Hall, 2014).**

Rehabilitation and early mobilization are considered therapeutic strategies to prevent the development of ICUAW, this concept is large, complex, and interdisciplinary. Mobilization is globally defined as “the physical activity that performed with the appropriate intensity, produces physiological benefits for the body”, acting on the circulation, central and peripheral perfusion, ventilation, or state of consciousness. The term “early” refers to activities that are carried out from the initial physiological stabilization and that continue during the ICU stay **(Fernández et al., 2018).**

Early mobility presents an opportunity to not only prevent the negative outcomes associated with immobility preventing ICU-AW, but also set the stage to engage family members in their patient care supporting the concept of Patient Family-Centered Care (PFCC) into practice. PFCC is a multi-dimensional concept and a main determinant of care quality and organizations that provide PFCC, report better patient and organizational outcomes **(Berghout, Exel, Laszlo & Jane, 2015).**

Aim of the study:

The study aimed to determine the effect of family involvement in patient care on preventing intensive care units acquired weakness.

Research hypothesis:

Critically ill patients whose families are involved in their care have less intensive care units acquired weakness rates than those who are not involved.

Materials and methods

Materials

Research design:

Quasi-experimental research design was used to conduct this study.

Settings:

This study was conducted in intensive care units at the main Mansoura University and Emergency Hospitals as follows: general ICU which includes 20 beds, surgical ICU which includes 8 beds and neurological ICU which included 8 beds. These units receive patients who have a variety of disorders in the acute stage of illness.

Subjects:

A convenience sampling of 60 newly admitted critically ill adult patients for the first two weeks was included in this study as indicated by power analysis using Epi Info program (population size 75, expected frequency 50%, accepted error 5% and confidence coefficient 95%). A sample of 30 educated family members of the selected patients was included, whose hemodynamically stable patients with Glasco Coma Scale (GCS) >**9** and oxygen saturation ≥88%). With the exclusion of patients who suffered from muscle weakness on admission to the ICU as who have neurological disorders as spinal cord lesions, brain stem problems, Guillain-Barre syndrome and myasthenia gravis.

Tools of the study:

Three tools were used to collect the data of this study namely "Intensive care unit acquired weakness assessment", "Early progressive mobility protocol" and "Patients' family satisfaction with early mobility protocol involvement". This tools were used by the researcher after an extensive review of related literatures **(Hartog & Bodechtel, 2018; Hodgson & Tipping, 2016; Jolley, Bunnell & Hough, 2016; King, 2012).**

Tool I: **"Intensive care unit acquired weakness assessment"** it included two parts: **Part I:** Patients' demographic and clinical data such as age, gender, educational level, vital signs, attaching with a mechanical ventilator, APATCHI II score, blood chemistry, peripheral oxygen saturation, and administered corticosteroid drugs. **Part II:** Simplified Medical Research Council Scale that includes six items: abduction of

the arm, flexion of the forearm, extension of the wrist, flexion of the leg or hip flexion, extension of the knee and dorsal flexion of the foot.

Tool II: **"Early progressive mobility protocol"**. It consisted of three parts: **Part I:** Mobility safety screening that includes myocardial stability, oxygenation adequacy, minimal vasopressor and elevated level of consciousness. **Part II:** Progressive mobility variance: it includes four levels of gradually increasing mobility; passive range of motion exercises three times per day and sitting position 20 minutes per day, adding sitting on edge of the bed for 20 minutes per day, adding active transfer to a chair for 20 minutes per day and adding starting ambulation as marching in place and walking in halls. **Part III:** Mobility implementation tolerance screening: it indicated by hemodynamic and oxygenation stability.

Tool III: **"Patients' family satisfaction assessment".** Which was used to assess the satisfaction of the patient's family participation in their patient's early mobility protocol implementation and consisted of five questions which rated by using three points likert scale as: dissatisfied, borderline (neutral) and satisfied.

Methods

• Approval from the ethical committee, faculty of nursing, Alexandria University was obtained.

• Permission to conduct the study was obtained from the administrative authorities of the previously mentioned settings after an explanation of the aim of the study.

• Informed consent was obtained from patients and families. It included the aim of the study, potential benefits, risks, discomforts and the right to refuse to participate in the study.

• The tool of this study was developed by the researchers after reviewing related literature. Tool II (Part II) (Progressive mobility variance) was translated into Arabic language.

• Content validity of the tools was done by five experts in the field of the study and necessary modifications were done.

• Reliability of the tools was done using Cronbach's alpha test with a 0.74 result.

• A pilot study was carried out on 6 patients (10% of the total subjects) to assess the clarity and applicability of the research tool and necessary modifications were done.

Data collection:

A convenient sample of 60 newly admitted critically ill adult patients were included in this study considering the exclusion criteria.

Patients were divided into two equal groups: 30 subjects for each, the control group (group A): this group received routine nursing care by assigned nurses. The study group (group B): family of this group was involved in their patients' care.

For both groups: patients' demographic and clinical data as vital signs, blood chemistry, Attaching with a mechanical ventilator or not, any organ failure presence, APATCHI II score, administered corticosteroid or vasopressor drug were obtained using part I of tool I. Muscle strength assessment and monitoring of critically ill patients

indicators of ICUAW was obtained using Simplified Medical Research Council Scale that assess muscle strength in both right and left limbs (part II of tool I). The data were taken on admission and after two weeks from ICU admission date.

For control group: routine nursing care has been applied by assigned intensive care nurses.

For study group: the researchers administered to patients' family members an educational session on progressive mobility based on reviewing recent literature, explaining goals, contents, and expected outcomes.

The researchers met patients' family members in groups. Each group contained three patients' family members of the session that took about 30 minutes.

The session included a simple booklet and videos, illustrated progressive mobility variance which patients' family members should have to give to their patients using part II from tool II. Progressive mobility variance included four levels; firstly, the level I that included performing passive range of motion exercise for patients' upper and lower limbs three times per day and putting them in sitting position 20 minutes once per day. Secondly, transferring to Level II by adding sitting on edge of bed for 20 minutes once per day to level I movements. Thirdly, Level III that should have the active transfer of the patient to a chair for 20 minutes once per day to reach finally level IV that allow patient to start ambulation (marching in place and walking in the halls)

The researchers demonstrated that four levels of movements to the patients' family members following by demonstration by them to evaluate their comprehension of the progressive mobility variance.

The researchers ensured tolerance of the patients to start the mobility variance and moving from level to the next one and safety of the patients by monitoring heart rate, respiratory rate, mean arterial pressure and oxygen saturation (by using part I and part III from tool II) for continuous two weeks.

Applying the progressive mobility to patients was started by the families for two weeks.

For both groups; the researchers assessed muscle strength and monitored patients' indicators of ICUAW using part II of tool I at the end of the two weeks.

For family members: the researchers assessed their satisfaction with participation in their patients' care (using tool III).

The collected data were analyzed using the appropriate statistical test to compare between control and study groups**.**

Ethical considerations:

Informed consent was obtained from patients and their families. It included the aim of the study, potential benefits, risks and discomforts from participation and the right to refuse to participate in the study and the right to withdraw from the study at any time was emphasized.

Privacy and confidentiality of the collected data were maintained during the implementation of the study.

Statistical analysis:

Collected data were coded, computed and statistically analyzed using statistical package of social sciences (SPSS), version 20. Reliability of the tool was determined by Cronbach alpha. Data were presented as percentages and mean ± SD. Chi square (□2) was used for comparison of categorical variables, and was replaced by Mont Carlo Exact test if the expected value of any cell was less than 5. Student's t test was used for comparison of continuous quantitative variables (two different groups). For variables which were not normally distributed, Median was used as a central tendency measures. The difference was considered significant at $P \leq 0.05$.

Results

Table (I) shows percentage distribution of demographic characteristics of the studied groups. It was found that the majority (about 70%) of the studied groups were in the age group of 40 years to 60 years old while no significance difference between male and female. Concerning their educations, more than third of them were illiterate (36.7%). Generally there was no significance difference between two studied groups in their demographic characteristics.

Table (II) shows the percentage distribution of vital signs of the studied patients groups. It was found that more than half of the intervention and control groups' temperature (56.7% and 63.3%, respectively) was less than 37 and about a third of them (33.3 %, and 26.7%) was feverish, with no significant difference between the two groups.

Table (III) shows the percentage distribution of clinical data of the studied groups. It was found that more than a third of the intervention and control group (33.3% and 36.7%, respectively) were attached to a mechanical ventilator, about half had organ failure most of them had a respiratory failure. On the other hand, more than half (56.7 % and 53.3%) of the studied groups' APATCHI II score was < 25.0, and more than third (33.3 % and 36.7%) were septic. It revealed no significant difference between the two groups.

Table (IV) shows no significant differences in blood chemistry among the two studied groups.

Table (V) shows that only 6.7% of the intervention group had a weakness at the end of the study with no significant difference (0.150) was found in muscle strength from the start and end of the study.

Table (VI) shows that more than a quarter of the control group (26.7%) had a weakness at the end of the study. Furthermore, a highly significant difference (0.001) was found in muscle strength from the start and end of the study.

Table (VII) shows that only two patients (6.7%) of the intervention group experienced weakness at the end of the study. While more than a quarter of the control group (26.7%) experienced weakness at the end of the study, which presented by a statistically significant difference (0.038) in muscle strength between intervention and control group.

Table (VIII) shows that about two-thirds (70%) of patients' family of the intervention group were satisfied by giving them a role in participation in their patient care, and clarity and feasibility of participation steps information. On the other hand, more than a third of them (40%) were dissatisfied with the

cooperation of ICU nurses with patient's family. Generally, the majority of patients' family, more than two third (76.7%) were satisfied by their participation in mobility protocol.

Table (I): Distribution of the studied groups according to their demographic characteristics.

Characteristics	Intervention group (30)		Control group (30)		Significance test
	No	%	No	%	
Age (years)	9	30.0	7	23.3	□2=1.849
20-<40	21	70.0	23	76.6	Pmc =0.611
40-60					
Gender	15	50.0	14	46.7	□2=0.067
Males	15	50.0	16	53.3	P=0.796
Females					
Education	11	36.7	10	33.3	□2=2.341,
Illiterate	19	63.3	20	66.6	Pmc = 0.539
Educated					

Pmc: Mont Carlo exact test; □2: Chi square test; p: significant < 0.05

Table (II): Distribution of the studied groups according to their vital signs.

Vital signs	Intervention group (30)		Control group (30)		Significance test
	No	**%**	**No**	**%**	
Temperature (°C)	17	56.7	19	63.3	□2=0.333,
Decreased (35.8 –37.0)	3	10.0	3	10.0	Pmc = 0.929
Normal (37.1 – 37.5)	10	33.3	8	26.7	
Increased (37.6 – 38.2)					
Heart rate (beat/min)	2	6.6	4	13.3	□2=0.850,
Decreased (58 – 59)	18	60	15	50.0	P= 0.654
Normal (60 – 100)	10	33.3	11	36.7	
Increased (112 – 120)					
Respiratory rate	5	16.7	6	20	□2=0.786,
(cycle/min)	17	56.6	18	60	Pmc =0.702
Decreased (11 – 12)	8	26.7	6	20	
Normal (12 – 20)					
Increased (21 – 30)					
Mean arterial pressure	8	26.7	10	33.3	□2=3.162,
(mmHg)	18	60	17	56.6	Pmc =0.295
Decreased (50– 64)	4	13.3	3	10.0	
Normal (65 – 110)					
Increased (111 – 120)					
Oxygen saturation (%)	9	30	11	36.7	□2=1.491,
Decreased (73 – 94)	21	70	19	63.3	P 0.475
Normal (95 – 100)					

Pmc: Mont Carlo exact test; □2: Chi square test; p: significant < 0.05

Table (III): Distribution of the studied groups according to their clinical data.

Variables		Intervention group (30)		Control group (30)		Significance test
		No	%	No	%	
Attaching with mechanical ventilator	Yes	10	33.3	11	36.7	□2=0.073, P= 0.787
	No	20	66.7	19	63.3	
Sepsis	Yes	10	33.3	11	36.7	□2=0.073, P=0.787
	No	20	66.7	19	63.3	
Organ Failure	Yes	13	43.3	14	46.7	□2=0.067, P=0.795
	No	17	56.7	16	53.3	
Corticosteroid drugs administration	Yes	18	60.0	14	46.7	□2=1.071, P=0.301
	No	12	40.0	16	53.3	
Vasopressor drugs administration	Yes	5	16.7	4	13.3	□2=0.131, Pmc = 0.718
	No	25	83.3	26	86.7	
APACHI II score	Mean ± SD	31.67±9.59		32.23±9.86		□2=0.097, P= 0.953

Pmc: Mont Carlo exact test; □2: Chi square test; p: significant < 0.05

Table (IV): Distribution of the studied groups according to their blood chemistry.

Blood chemistry (Mean ± SD)	Intervention group (30)	Control group (30)	test t (p)
Sodium	138.00 ± 3.62	134.60 ± 6.55	2.513 (0.015)
Potassium	4.00 ± 0.61	3.98 ± 0.65	0.123 (0.903)
Creatinine	1.35 ± 1.03	1.17 ± 0.91	0.723 (0.473)
Albumin	3.76 ± 0.67	3.86 ± 0.70	0.581 (0.564)
Glucose	139.57 ±57.01	142.53 ± 66.2	0.185 (0.854)
Hemoglobin	11.72 ± 0.94	11.47 ± 1.40	0.806 (0.423)
Hematocrit	38.10 ± 4.04	37.31 ± 3.32	2.269(<0.211)
Bicarbonate (HCO3)	24.03 ± 2.03	23.53 ± 1.78	1.017 (0.314)
White blood counts	5.18 ± 1.65	5.58 ± 1.85	0.890 (0.377)

t: Student t-test; p: significant < 0.05

Table (V): Comparing muscle strength among intervention group throughout two phases of the study.

Muscle strength according to SMRC scale		**Intervention group**		**Significance test**
At the Start of the study (30)			**At the end of the study (30)**	
	No	%	No	%	
Right limbs muscles	0	0.0	0	0.0	□2=2.070,
Sever weakness	0	0.0	2	6.7	Pmc = 0.150
Slight weakness	30	100.0	28	93.3	
Normal strength					
Left limbs muscles	0	0.0	1	3.3	□2=3.160,
Sever weakness	0	0.0	2	6.7	Pmc = 0.206
Slight weakness	30	100.0	27	90.0	
Normal strength					
Total score of right and left limbs muscle strength	30	100.0	28	93.3	□2=2.070,
	0	0.0	2	6.7	Pmc = 0.150
Normal (28-36)					
Weakness (0-27)					

Pmc =: Mont Carlo exact test; □2: Chi square test; SMRC: Simplified Medical Research Council Scale

Table (VI): Comparing muscle strength among control group throughout two phases of the study.

Muscle strength according to SMRC scale		**Control group patients**		**Significance test**
At the start of the study (30)			**At the end of the study (30)**	
	No	%	No	%	
Right limbs muscles			3	10.0	□2=9.230,
Sever weakness	0	0.0	5	16.7	Pmc = 0.001
Slight weakness	0	0.0	22	73.3	
Normal strength	30	100.0			
Left limbs muscles	0	0.0	5	16.7	□2=15.000,
Sever weakness	0	0.0	7	23.3	Pmc <0.001
Slight weakness	30	100.0	18	60.0	
Normal strength					
Total score of right and left limbs muscle strength					
Normal (28-36)	30	100.0	22	73.3	□2=9.230,
Weakness (0-27)	0	0.0	8	26.7	Pmc = 0.001

Pmc: Mont Carlo exact test; □2: Chi square test; SMRC: Simplified Medical Research Council Scale

Table (VII): Comparison between the intervention and the control groups regarding to the muscle strength

Muscle strength according to SMRC scale	Intervention group (30)		Control group (30)		Significance test
	No	%	No	%	
Right limbs muscles					
Sever weakness	0	0.0	3	10.0	χ^2=5.010,
Slight weakness	2	6.7	5	16.7	Pmc = 0.082
Normal strength	28	93.3	22	73.3	
Left limbs muscles			5	16.7	χ^2= 7.240,
Sever weakness	1	3.3	7	23.3	Pmc = 0.026
Slight weakness	2	6.7	18	60.0	
Normal strength	27	90.0			
Total score of right and left limbs muscle strength	28	93.3	22	3.3	χ^2=4.320,
Normal (28-36)	2	6.7	8	26.7	P= 0.038
Weakness (0-27)					

Pmc: Mont Carlo exact test; χ^2: Chi square test; p: significant < 0.05; SMRC: Simplified Medical Research Council scale.

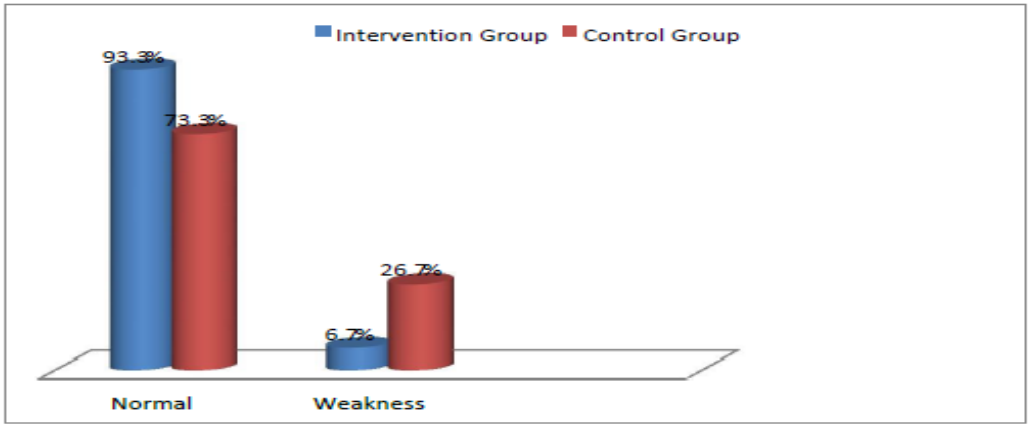

Figure (1): Percentage of muscle strength at the end of the study in both groups.

Table (VIII): Satisfaction of family with participating in their patients' mobility protocol in the intervention group.

Items of satisfaction	**Intervention group family (30)**					
Dissatisfied		**Border line**		**Satisfied**		
	No	%	No	%	No	%
1.Giving the patient's family a role in participation in their patient care	4	13.3	5	16.7	21	70.0
2.Clarity and feasibility of participation steps information	4	13.3	5	16.7	21	70.0
3.Overcoming the barriers faced patient's family during the participation	4	13.3	10	33.3	16	53.3
4.Cooperation of ICU nurses with patient's family	12	40	9	30	9	30
5.Interest to repeat the participation experience in further patient care activities	7	23.3	5	16.7	18	60.0
Total satisfaction level	**1**	**3.3**	**6**	**20.0**	**23**	**76.7**

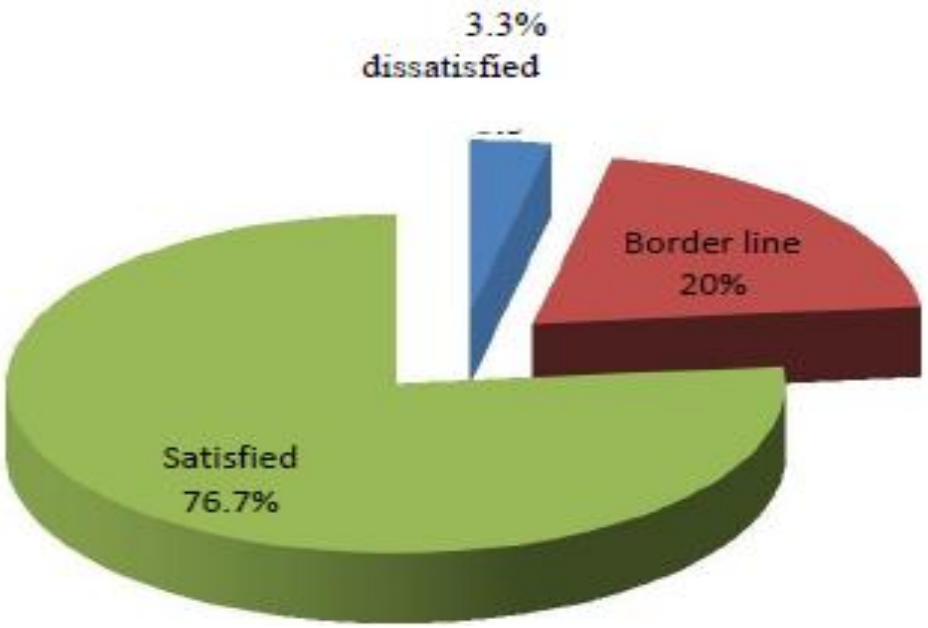

Figure (2): Satisfaction score level in intervention group family

Discussion

Mobilizing the critically ill patient to preventing ICUAW requires an integrated approach. Evidences support the union of family participation and early mobility into standard nursing practice. Patient family-centered care (PFCC) is a main determinant of care quality, research has shown that PFCC is a multi-dimensional concept, and organizations that provide PFCC well report better patient and organizational outcomes**.** In response to these, the current study was conducted to determine the effect of family involvement in patient care on preventing intensive care units acquired weakness.

The present study shows that most of the studied groups were in the age group of 40 years to 60 years old. These findings are supported by **Fuchs, et al (2012)** who considered advanced age a significant independent risk factor for mortality due to the highly proportion of various preexisting comorbidities that considered the primary reason for ICU admission. Concerning the studied patients' educations, this study shows that more than third of them were illiterate. These findings are agreed by **Geense, et al (2020)** who found that patients with a poor pre-ICU health status were more likely to be low educated, living in a healthcare facility and suffering from a chronic condition. This finding may be due to their decreased general health awareness and delay in decision making by patients in presentation to hospital which deteriorate their case indicating ICU admission.

Concerning clinical data of the two studied groups, the current study result revealed that more than a third of them were attached to a mechanical ventilator. This may be due to existence of organ failure in about half of them especially a respiratory failure. This finding was in agreement with **Wunsch, et al (2013)** who stated that; three out of ten ICU beds were filled at any time with mechanically ventilated patients.

Moreover, sepsis is found in more than third of the studied groups. This finding may be due to non-compliance of health care providers with standard precautions of infection control. This result is in the line with **SepNet Critical Care Trials Group, (2016)** who reported that a total of 11,883 patients from 133 ICUs in 95 German hospitals were included in the study, 1503 (12.6 %) of them were diagnosed with severe sepsis or septic shock. In 860 cases (57.2 %) the infections were of nosocomial origin and related to factors such as advanced age, immunosuppression and multidrug-resistant infections.

Critically ill patients in the ICU can developing some form of neuromuscular dysfunction. In the present study regarding muscle strength of the studied groups, more than a quarter of control group exhibited a muscle weakness with a highly significant difference in muscle strength at the end of the study. This result is agreed with **Piva, et al (2019) and Nicola, & Rik, (2015)** who revealed that ICUAW is detected in 30 to 50% of ICU patients that can be due to the use of neuromuscular blocking agents for long periods of time, the use of some antibiotics, electrolyte abnormalities, and prolonged immobilization are common in the ICU. Similarly, **Vanhorebeek, et al (2020)** reported that a prevalence of 43% of ICU patients exhibited muscle weakness.

Consequently, it is crucial to adopting preventive measures to overcome ICUAW occurrence with its detrimental outcomes. In the present study, an early progressive mobility

protocol was applied to the intervention group with participation of their family. As a result, at the end of the study, the intervention group exhibited less muscle weakness than the control group with statistically significant difference. This result can be related to the effect of mobility protocol especially with the family involvement that encourage and support their patients which enhanced their cooperation. This finding is supported by **Chawla and Todi, (2020)** who stated that early mobility interventions which included passive and active range of motion activities reduced and prevented the ICUAW.

Similarly, **Hermans, & Berge,)2015)** revealed that early mobility improved the different ICUAW complications as increased MV time, days in the ICU, incidence of ICU delirium, risk of aspiration, elevated mortality rate, and long term disability. **El biaa, et al (2015)** illustrated that after application of an early exercise program on post coronary artery bypass graft patients, most of them experienced high insulin sensitivity, low incidence of pulmonary complications (atelectasis & hypoxia), delirium, pain and lower length of ICU stay.

On the other hand, **Fernández, et al (2018)** demonstrated that early rehabilitation had no significant effect on the length of stay and number of cases of ICUAW. **Lad, et al (2020)** reported that early mobilization may appear promising as it has been shown to decrease the incidence of ICUAW and improve mobility compared to standard of care or no early rehabilitation. Even though, the evidence supporting mobilization to improve function in those with ICUAW remains poor compared to long-term outcomes.

In the present study, mobility safety and mobility implementation tolerance screening were used to ensure the patient readiness and tolerance during implementing the progressive mobility protocol steps safely. It is supported by **Dinglas, et al (2014)** who found the safety consideration as a major barrier to implementation of early mobility in clinical practice, and the program which included safety guidelines, increased mobilization rate in the ICU. Similarly, Nydahl**, et al (2017)** reported that rehabilitation has a low risk of potential adverse events and exert a positive effect safely on hospital outcomes specially, for patients who require MV.

Conclusion:

Intensive Care Unit Acquired Weakness (ICUAW) can be experienced in critically ill patients after two weeks from ICU admission. Critically ill patients whose families were involved in their mobility protocol have less intensive care units acquired weakness rates than those who were not. The majority of patients' family members who involved in mobility protocol to their patients were satisfied with the participation experience in their patient care, showing interest to generalize that in other patient care procedures

Recommendations:

In this study, it can be recommended that:

For practice:

• Evaluation of muscle strength should be a routine part of ICU examination.

• Family centered care concept should be adopted in ICUs by allocating

them in daily activities involvement with enough support and cooperation.

For education:

• Incorporate early mobility protocols and family centered care concept in undergraduate nursing curriculum.

• In-service educational programs and workshops should be conducted to raise nurses awareness regarding the positive

outcome of family involvement in their patient care.

• Continuous ICU staff development courses to enhance principles and implementation of nurse and family-led mobility protocols.

For administration:

• Developing a policy that adopt mobility protocols with family centered care based approach, supporting the ICU staff to be able to cooperate and implement that policy.

• Preparing a suitable rest room for ICU patients' family to facilitate their involvement in patients' care.

• Ensuring adherence of the ICU staff to the needed educational training with suitable needed supplies and time.

For research:

• Further research is necessary to establish more solid evidences on the effectiveness of the rehabilitation and early mobilization interventions.

• Developing family and nurses-led mobility protocol with more effective and efficient evidenced based models.

• Specifying a program suitable and tailored to mechanically ventilators patient mobilization.

• The study should be replicated on different larger samples size in order to generalize the results. • Difficultly of teaching the mobility protocol to the patients' family took a long time more than the expected time table with some barriers of their adherence with the needed steps and some delays in presence time in the ICU.

• Work overload of the ICU nurses conflicting with their cooperation with the family.

• Mechanically ventilated patients could not able to perform all mobility protocol levels completely and easily, that directed us to recommend specific program tailored to ventilated patients only suitable to their disabilities of movement.

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