

Effect of Nursing Guidelines Using Mobile what's App Application on Self-management of Patients Undergoing Diagnostic Cardiac Catheterization

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Abstract: Health education guidelines using mobile what's-App application considers as a health intervention method manages in increasing knowledge and subsequently enhancing self-management of patients undergoing cardiac catheterization with healthy lifestyles. This may be due to the fact that information delivered using mobile phone was attractive and could be retrieved anywhere. Additionally, patients who were once helpless could now conveniently express their concerns directly to healthcare providers through What's-app for discussion and clarification. The positive and encouraging atmosphere created in what's-app group, make patients were keen to learn new knowledge every day. **Aim:** This study aims to evaluate the effect of nursing guidelines using mobile what's app application on self-management of patients undergoing diagnostic cardiac catheterization. **Design:** A quazi experimental design was used. **Setting:** This study was conducted at cardiac catheterization unit and cardiac rehabilitation unit at Ain Shams University Hospital at Cairo in Egypt. **subjects:** A purposive subject of thirty (30) Adult patients from both gender undergoing diagnostic cardiac catheterization through using right femoral artery access site were recruited from the previously mentioned units. **Data collection tools:** (1) Patients' interviewing questionnaire, (2) Patient cardiac catheterization self-management assessment tool. (3) Nursing guidelines using mobile what's app application. **Results:** There was a statistically significance differences between pre & post health education guidelines implementation on cardiac patients' self-management. **Conclusions:** health education guidelines implementation through mobile what's-app application was helpful on the improvement of the patients' knowledge and self-management physically, socially and psychologically. **Recommendations:** Periodic in service – training advanced care programs regarding health education through using mobile what's-app application for patients undergoing diagnostic cardiac catheterization is essential for improving health outcomes of these patients.

Keywords: Cardiac Catheterization, self-management, Nursing Guidelines & What's App Application.

1. INTRODUCTION

Cardiovascular diseases (CVDs) are the most common medical conditions in developed countries. According to previous reports, 2.34% of deaths in the United States are attributed to CVDs. In fact, CVDs are among the leading causes of mortality in the world. As predicted by the American heart association, CVDs will be the main cause of mortality by 2020 (Nasiri & Barghi, 2017). According to World Health Organization (2016) Coronary artery disease (CAD) is the most common type of heart disease and has been the leading cause of death globally, it has become the heaviest burden to healthcare systems worldwide.

Coronary artery disease (CAD) is the most common and popular type of heart disease in Egypt and an important cause of disability among Egyptians (**Ibrahim, Ibrahim, Nour, & Shaheen, 2015**). Coronary artery disease (CAD) is the common term for the build-up of plaque in the heart's arteries that could lead to a heart attack. The build-up of plaque within the wall of the coronary arteries limit, decrease and sometimes completely cut off the supply of oxygen and nutrients to the heart muscle (**American Heart Association, 2017**).

Cardiac catheterization (CC) is the insertion of a catheter into a vein or artery, usually from a groin or jugular access site, which is then guided into the heart. This procedure is performed for both diagnostic and interventional purposes, despite the progressive improvement in noninvasive technique. Cardiac catheterization remains a key clinical tool for the assessment of the physiology and anatomy of the heart and its associated vasculature (**Yang, Huang, Tsia & Lou, 2015**).

Self-management of patients undergoing diagnostic cardiac catheterization refers to patients' confidence in their ability to perform certain health behaviors influences their engagement in and actual performance of those behaviors (e.g., diet regimen and practicing exercise), which in turn influence health outcomes (**Joanne, et al., 2016**). Self-management is an important component in the continuum of care for patients with cardiovascular disease, reduces mortality, morbidity, and unplanned hospital admissions in addition to improvements in physical, social and psychological well-being, and it is now recommended in cardiac international guidelines. (**Beatty, Fukuoka & Whooley, 2018**).

Mobile health (mHealth) is a rapidly growing field providing the potential to enhance patient education, prevent disease, enhance diagnostics, improve treatment, lower health care costs and increase access to health care services, and advance evidence-based research (**Doswell, et al., 2013**). For the field of nursing the potential capabilities of mHealth are not only for patient care but for delivery of nursing education to our future practicing nurses, providing a means of communication between healthcare professionals located close and at greater geographic distances, and provides access to information and personal monitoring for geographically isolated clients. Although mHealth capabilities' value appears significant for training, and practice, there remains a significant need for research and evaluation of the devices that now appearing in the health care marketplace. The National Institute of Nursing Research's strategic plan includes supporting research to develop and test the flood of health apps to assist clients in the management of their health (**Kumar, Nilsen, Pavel, & Srivastava, 2013**).

Nurses play a vital role in treatment as they are close to the patients and their families during all the process of disease. It is a matter of great importance for nurses to meet the rehabilitative care needs of patients through education, support, supervision and reinforcement. Nursing education in cardiac rehabilitation can improve health outcomes and reduce the risk of a new cardiac event. A health educational program organized by nurses for patients after a cardiac event or surgery improves patients' knowledge of their illness and awareness of behavioral changes to prevent a new event or readmission to hospital (**Kadda, Marvaki and Panagiotakos, 2012**).

Significance of the study:

Currently, cardiac catheterization has become a routine diagnostic procedure performed in many hospitals (**Yang, et al., 2015**). In Egypt according to **statistical health department at Ain Shams University hospital, 2018** more than a thousand Egyptian have diagnostic cardiac catheterization done every year. More than half of these patients have angioplasty or bypass surgery to improve blood supply to their heart.

So, self-management is often challenging due to the complexity of patients' medication regimens; the importance of self-monitoring for signs of emerging complications; and the need for lifestyle behavior changes including physical activity, healthy diet, smoking cessation, and weight loss. The effective use of patient-centered health communication technology (mHealth approach) thus represents a promising approach to extend the reach of health systems in order to provide ongoing support and may improve cardiovascular-related lifestyle behaviors and disease management and improving cardiovascular outcomes while minimizing the costs associated with clinician follow-up.

Aim of the study:

The aim of this study was to evaluate the effect of nursing guidelines using mobile what's-app application on self-management of patients undergoing diagnostic cardiac catheterization through the following:

- Assessing patients' knowledge regarding cardiac catheterization.

- Implementing nursing guidelines using what's app application.
- Evaluating the effect of nursing guidelines using mobile what's app application on self-management of patients undergoing cardiac catheterization.

Research hypothesis: The current study hypothesized that: Implementation nursing guidelines using mobile what's app application will have positive effect on self-management of patients undergoing diagnostic cardiac catheterization.

Nursing Guidelines:

it included specific nursing actions in a given situation to ensure consistency and quality of care which included enhancing patients' knowledge and practice regarding: I- cardiovascular diseases knowledge (signs and symptoms, risk factors, complications and treatment), and biomarkers (i.e. exercise workload, blood pressure, laboratory tests), II- tele-monitoring, tracking devices (i.e. in-home BP monitors, accelerometers, glucometers), III- relaxation technique, sleep and rest during the day, IV- assisted mobilization and upper and lower limb exercise, V- exercises, physical activity and weight monitors, VI-healthy diet, dietary behaviour changes and smoking cessation, VII- psychological mediators of behaviour changes, VIII- lifestyle behaviour changes and self-monitoring for signs and symptoms of disease complications and medications regimen.

Self –management:

self-monitoring for signs of emerging complications; and the need for lifestyle behavior changes including physical activity, healthy diet, smoking cessation, and weight loss after implementation of nursing guidelines using what's app application.

2. SUBJECTS AND METHODS

Study design: a quasi-experimental research design was utilized in this study.

Study setting: The study was conducted at cardiac catheterization unit and cardiac rehabilitation unit at Ain Shams University Hospital at Cairo - Egypt.

Subject: A purposive subject of thirty (30) Adult patients from both gender undergoing diagnostic cardiac catheterization through using right femoral artery access site were recruited from the cardiac catheterization unit and cardiac rehabilitation unit at Ain Shams University Hospital.

Sample size calculation:

A sample size of 30 adult patients undergoing cardiac catheterization procedure was selected to achieve the study aim with 80% power to detect a mean of period differences of 0.7 with an estimated standard deviation of differences of 3.0. and with a significance level (alpha) of 0.05 using a two-sided Wilcoxon test assuming that the actual distribution is uniform (Murphy, Myers, & Wolach, 2014).

Inclusion Criteria:

- Adult patients who undergoing diagnostic cardiac catheterization, for the first time, haemo-dynamically stable, alert and able to co-operate with training.
- Patients had what's app application on their phones or their relevants.

Exclusion criteria:

- Exclusion criteria were neoplastic disease or the presence of other disease that could contribute to exercise limitation (as cardiovascular, neuromuscular, or other respiratory diseases), patients who had other chronic diseases and recognized with psychotic confusion.

Tools for data collection: Data collection tools were developed by the researchers based on extensive review of the relevant and recent literature, it was written in Arabic and filled by the researchers; it consists of two tools:

Tool 1: Patients' interviewing questionnaire: this tool was developed by the researchers after reviewing the literature in an Arabic language and divided into four parts as follows:

Part I: Patients' demographic characteristics: it was consisted of 7 end closed questions including (age, gender, level of education, marital status, occupational status, residence & live with whom).

Part II: Patients' medical history: It was used to collect medical data of the studied patients. It was consisted of 7 MCQ questions including (body mass index, practicing exercises, smoking, family history, suffering from chronic diseases, present diagnosis & current symptoms).

Part III: Patients' knowledge regarding cardiac catheterization: this part concerned with assessment knowledge of patients regarding cardiac catheterization pre & post nursing guidelines implementation based on reviewing recent literature (Hung et al. ,2018 & Doimo et al. ,2019). It was consisted of 50 questions in the form of multiple choice questions (MCQ), and true/false questions which distributed into two section as the following:

The 1st section: it was used to assess patients' knowledge regarding cardiac catheterization; it included 15 questions which distributed into 3 items as the following: definition of cardiac catheterization (3 true/false questions), indication and contraindication for cardiac catheterization (5 MCQ questions), complications of cardiac catheterization (7 true/false questions.)

The 2nd section: it was concerned with the assessment of patients' knowledge regarding health education guidelines: it included 35 questions which distributed into 9 items as the following: medication (5 true/false questions), how to deal with side effect (3 MCQ questions), wound care (2 MCQ questions), nutrition (5 true/false questions), anxiety and stress management (5 true/false questions), motor activity and practicing exercises (4 MCQ questions), sleep & rest (4 MCQ questions), travel & work (3 MCQ questions). Follow up (4 MCQ questions)

Scoring system:

The total score of knowledge was 50 grades. Each correct answer was given one mark and the incorrect answer was given zero. Based on critical care approach. It was considered that:

- $\geq 80\%$ was satisfactory level of knowledge (≥ 40 grades correct answers).
- $< 80\%$ was unsatisfactory level of knowledge (< 40 grades correct answers).

Part IV: Patient undergoing cardiac catheterization clinical outcomes: it was designed by the researchers to assess clinical outcomes of patients pre and post (2 weeks) of cardiac catheterization based on Kaplow, Hardin & McMurry, 2016, it included the assessment the following items: vital signs: (temperature, blood pressure, respiration, pulse), O₂ saturation, ECG with exercises, cardiac enzymes and lower peripheral perfusion / cardiac catheterization site assessment.

Tool two: Patients' undergoing cardiac catheterization self-management assessment tool: cardiac self-management, defined as participants' confidence in their ability to take care of their health. This tool was designed by the researchers for assessing patients' self-management physically, socially and psychologically. It was consisted of three parts with 30 statements.

Part I: It was concerning with assessing patients self-management physically, it included 10 statements. **Part II:** It was concerning with assessing patients self-management socially it included 10 statements. **Part III:** It was concerning with assessing patients self-management psychologically it included 10 statements, based on (Hofer, Lim, Guyatt & Oldridge, 2004 ; Sarker, Ali & Whooley, 2009; Gierlaszynska, Pudlo, Jaworska, Godula, & Gasior, 2016)

Scoring system:

Each item begins with the stem, "How confident are you that you can," and assessed patients self-management physically, socially and psychologically. The responses were a 3-level Likert scale from 1 = "not at all confident", 2 = "moderately confident" to 3 = "completely confident". The self-management scores was ranged between 30 and 90 degree, with a better score indicating high self-management and low self-management was associated with worse scores.

The total score of cardiac patient self-management was 90 grades. It was considered that:

- Not at all confident (≤ 30 degree) indicating low self-management
- Moderately confident (more 30 to 60 degree) indicating moderate self-management
- Completely confident (more 60 to 90 degrees) indicating high self-management

Nursing Guidelines:

- It was designed by the researchers to improve self-management of patients undergoing diagnostic cardiac catheterization based on the related literature (LeMone, Burke, Gerene Bauldoff, & Gubrud, 2014; American Association of Cardiovascular and Pulmonary Rehabilitation, 2016; American Heart Association, 2017).

This group assisted in answering the questions of each Nursing guidelines was revised by a group of three experts in Cardiology department at Faculty of Medicine, Ain Shams University and four experts in Medical surgical nursing at Faculty of Nursing, Ain Shams University for the content validity. Based on the experts' opinion, some modifications were done, and then the final form was developed. It included: I- cardiovascular diseases knowledge (signs and symptoms, risk factors, complications and treatment), and biomarkers (i.e. exercise workload, blood pressure, laboratory tests), II- tele-monitoring, tracking devices (i.e. in-home BP monitors, accelerometers, glucometers), III- relaxation technique, sleep and rest during the day, IV- assisted mobilization and upper and lower limb exercise, V- exercises, physical activity and weight monitors, VI- healthy diet, dietary behaviour changes and smoking cessation, VII- psychological mediators of behaviour changes, VIII- lifestyle behaviour changes and self-monitoring for signs and symptoms of disease complications and medications regimen.

II- Operational design:

The operational design includes: preparatory phase, pilot study, content validity, the content reliability of the developed tools and fieldwork.

(1) Preparatory phase:

It included reviewing of related literature of different studies related to the research questions, and theoretical knowledge of its various aspects of the problem using textbooks, evidence-based articles and internet. This served in developing the data collection tools.

(2) Validity and reliability:

Testing validity by using face and content validity. Face validity aimed at inspecting the tools for clarity, relevance comprehensiveness, simplicity and applicability; minor modifications were done. Testing content validity to ensure that an assessment tool produces stable and consistent result overtimes. The validity was done by 5 experts (one professor and two assistant professors in nursing, one cardiologist and one anesthetist). **Tools reliability:** Alpha Cronbach test was used to measure the internal consistency of tools (reliability of the used tools). These showed good reliability scores for the following tools: (patients' knowledge assessment tool = 0.893 and self- management assessment tool = 0,840).

(3) Pilot study: A pilot study were carried out on 10% of the total number of the study sample to test the applicability, clarity and efficacy of the tools and time needed to fulfill the tool, then the tool were modified according to the results of the pilot study. Those patients included in the pilot study were excluded from the study.

(4) Field Work:

The application of nursing guidelines unitizing mobile what's-app application for patients undergoing cardiac catheterization was conducted through four phases: Assessment, planning, implementation, and evaluation phase.

1) Assessment phase

- After reviewing the literature and preparing the study tools by the researchers, an official permit was obtained from the Faculty of Nursing ethical and research committee, Ain Shams University and from cardiac catheterization unit and cardiac rehabilitation unit administrative authority at Ain Shams University Hospital which is affiliated to Ain Shams University.
- The data was collected; 2 days / week at morning and afternoon shift within 6 months started from July until December 2018. All patients who were present in cardiac catheterization unit and cardiac rehabilitation unit during the period of data collection and met the criteria of subjects' selection were included in the study after obtaining their informed consent.

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- The nursing guidelines implementation through utilizing mobile what's-app application was designed by the researchers. Goals, learning activity, teaching methods and media (photo/video sharing services and network sites) were prepared.
- The total subject consisted of 30 adult patients undergoing diagnostic cardiac catheterization was included in the study and data collection is started by each patient was interviewed individually.
- On admission the researchers built a therapeutic communication with the patient to get co-operation after explanation of the purpose of the study.
- The data were be collected twice pre-cardiac catheterization (at catheterization unit and post two week from procedure date (at rehabilitation unit) through using two tool patients' interviewing questionnaire and self- management assessment tool.
- The patients' knowledge was assessed by the researchers for non-educated patients while educated Patients took the knowledge assessment tool and answered it by themselves, it took about 45- 60 minutes to be fulfilled. It was filled 2 times pre the health educational guidelines implementation and post of the health educational guidelines implementation (post cardiac catheterization 2 week) before rehabilitation phase to ensure the maximal realistic assessment of the patients' knowledge and self-management and minimize the possibility of bias. The time allowed for filling the cardiac self-management assessment tool took about one hour.

1-Planning phase:**Nursing guidelines utilizing mobile what's app Application:**

- The nursing guidelines were designed based on analysis of the actual patients' needs in pre assessment by using the pre constructed tools. The content was written in simple Arabic language and consistent with the related literatures. Moreover, met patients' needs and their level of understanding.
- A group was established trough mobile what's app application and its name (happy heart). All the sample of the study was added to happy heart group. The objective of this group was explained to give proper health education to patients undergoing cardiac catheterization, including information regarding medication, follow up, Motor activity, exercise, sleep and rest and travel & work) based on (LeMone, Burke, Gerene Bauldoff, & Gubrud, 2014; American Association of Cardiovascular and Pulmonary Rehabilitation, 2016; American Heart Association ,2017).
- This group assisted in answering the questions of each patient from the medical side by medical researcher as well as providing efficient nursing advice by the rest of the researchers' team.

3- Implementation phase:

- The nursing guidelines includes the following knowledge concerning patients undergoing cardiac catheterization (definition of cardiac catheterization, indications of cardiac catheterization, precautions to avoid complications, information regarding medication, follow up, Motor activity, exercise, sleep and rest and travel & work) in the form of educational video and posters through "happy heart" what's app group.
- It was difficult to gather all the patients at one time, so health education guidelines was sent individually when adding new patients and also sometimes patients sending their questions privately because, they don't like to share health problem with others. All patients were given equal chances to understand the educational guidelines content to ensure exposure of all patients to the same learning experience, each patient received the same educational guidelines content and using the same teaching methods and media.
- The researchers were on touch with non-educated patients through their relatives who are able to use the social media (mobile what's-app). Also, sometimes the researchers conducted telephone follow-up interviews with participants (or their proxy) to ask about self-management and health status.

4- Evaluation phase:

- Effect of nursing guidelines on the studied patients was evaluated by researchers for comparing the change in patients' knowledge, clinical outcomes (vital signs, O₂ saturations and ECG with exercises and laboratory results from hospital

patients sheets and lower peripheral perfusion) and self-management (physically, socially and psychologically) pre and post 2 weeks of the nursing guidelines implementation by using the same tools.

III- Administrative design:

An official letter from the faculty of nursing at Ain Shams University to the director of Ain Shams University Hospital for permission to carry out the study was obtained from the director of setting after explanation of the purpose of the study.

Ethical consideration:

The research approval was obtained from scientific research ethics committee in the faculty of nursing at Ain Shams University before starting the study. The researcher clarified the objective and aim of the study to the subjects included in the study. The researcher assured maintaining anonymity and confidentiality of the subject data. Subjects were informed that they can choose to participate or not participate in the study and that they have the right to withdraw from the study at any time without giving any reason. Values, culture and beliefs were respected.

IV- Statistical design:

Data were extracted from the interview questionnaire and computerized in Microsoft Excel 2010. Data analyzed was done using a software package, while statistical analysis was done using the statistical package for social sciences (SPSS). Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables and means and standard deviations for quantitative variables. The statistical analysis was done using percentage, range, and Chi-square (X^2).

3. RESULTS

Table (1) showed that, 66.7% of the studied patients their age were less than 60 years and coming from the urban area. According to gender 60% of them were males. Concerning level of education 63.3% of them educated. As regards occupational status among of the studied patients represented 76.7 % not working and 96.7% of them live with their family.

Table (2) showed that 53.3 % of the studied had obesity and 76.7% didn't practice exercises. Regarding smoking it was found 26.7% smokers. As well as, 60% of them had no family history of coronary heart disease. Also all of them 100% suffer from chronic diseases. Concerning present diagnosis 43.3% had narrowing in Coronary arteries.

Comparison between patients' level of knowledge regarding cardiac catheterization pre and post health education guidelines implementation through whats'app application was clear in **table (3)**. This table shows that there was statically significant improvement in knowledge from unsatisfactory to satisfactory post health education guidelines implementation as follow as $P \leq 0.001^{**}$

Comparison between satisfactory level of total knowledge of the studied patients ' pre and post health education guidelines **Figure (1)** revealed that there was statistically significant improvement regarding total knowledge of patients post health education guidelines implementation .

Data in **table (4)** illustrated that there was statistically significant improvement regarding patients' clinical outcomes (Pulse, Mean Arterial Pressure, O_2 saturation) while there is no statistically significant improvement regarding (Temperature & Respiration). As well as, regarding lower peripheral Perfusion outcomes there was statistically significant improvement concerning (right foot Color, right foot warmth, numbness & swelling) while there is no statistically significant improvement regarding (pain).

Data in **table (5)** revealed that there was statistically significant improvement in patients' self-management physically post health education nursing guidelines implementation compared with pre nursing guidelines implementation.

Concerning patients' self-management socially, data in **table (6)** showed that there was statistically significant improvement post nursing guidelines implementation compared to pre nursing guidelines implementation.

Data in **table (7)** revealed that there was statistically significant improvement in patients' self-management socially post nursing guidelines implementation compared to pre nursing guidelines implementation.

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Comparison between total self-management of studied patients undergoing cardiac catheterization **figure (2)** showed that there was statistically significant improvement regarding total of patients' self-management post nursing guidelines implementation.

Table 1: Frequency and percentage distribution of the study subjects according to their demographic characteristics (N=30)

Demographical characteristics	N	%
Age		
30 ≤ 40	15	50.0
41 ≤ 50	5	16.7
51 ≥ 60 years	10	33.3
Mean ±SD	45.37 ± 2.76	
Gender		
Male	18	60.0
Female	12	40.0
Level of education		
Not educated	11	36.7
Educated	19	63.3
Marital Status		
Married	21	70.0
Unmarried	9	30.0
Occupational status		
Work	7	23.3
Not working	23	76.7
Place of residence		
Urban	20	66.7
Rural	10	33.3
With who you live		
Alone	1	3.3
With family	29	96.7

Table 2: Frequency and percentage distribution of the studied sample according to their medical data (N=30)

Medical Data	N	%
Body mass index		
Underweight	0.0	0.0
Healthy weight	14	46.7
Obese	16	53.3
Mean ±SD	21.9±6.12	
practice exercises		
Yes	7	23.3
No	23	76.7
smoking		
Yes	8	26.7
No	22	73.3
Family history of coronary heart disease		
Present	12	40.0
Absent	18	60.0

Past medical history (Suffering from chronic diseases)		
No	0.0	00.0
Yes (If the answer is yes, what is it)	30	100.0
Diabetes mellitus	12	40.0
Hypertension	11	36.7
Thyroid disorders	1	3.8
Others	6	31.6
Present medical history (Chief complain)		
Chest pain	30	100.0
Dyspnea	12	40.0
Edema in lower extremities	14	46.7
Arrhythmia	30	100.0
the current symptoms that suffer from it		
Fatigue	13	43.3
Anxiety	9	30.0
Sleep disorders	6	20.0
Loss of appetite	2	6.7

Table 3: Comparison between patients’ knowledge regarding cardiac catheterization pre and post nursing guidelines implementation (N=30).

Patients’ knowledge regarding cardiac catheterization	Pre				Post				Chi-square	
	Satisfactory		unsatisfactory		satisfactory		unsatisfactory		X ²	P-value
	N	%	N	%	N	%	N	%		
Knowledge regarding cardiac catheterization include :										
Definition of cardiac catheterization	9	30.0	21	70.0	30	100.0	0	0.0	32.308	<0.001**
Indications of cardiac catheterization	8	26.7	22	73.3	21	70.0	9	30.0	11.279	<0.001**
Complications of cardiac catheterization	5	16.7	25	83.3	27	90.0	3	10.0	32.411	<0.001**
Knowledge regarding health education nursing guidelines include:										
Medications	9	30.0	21	70.0	24	80.0	6	20.0	15.152	<0.001**
How to deal with side effect	11	36.7	19	63.3	23	76.7	7	23.3	9.774	0.002*
Wound care	11	36.7	19	63.3	27	90.0	3	10.0	18.373	<0.001**
Nutrition	4	13.3	26	86.7	22	73.3	8	26.7	21.991	<0.001**
Anxiety	8	26.7	22	73.3	21	70.0	9	30.0	11.279	<0.001**
Motor activity & practicing exercises	4	13.3	26	86.7	20	66.7	10	33.3	17.778	<0.001**
Rest & sleep	4	13.3	26	86.7	25	83.3	5	16.7	29.433	<0.001**
Travel & work	6	20.0	24	80.0	20	66.7	10	33.3	13.303	<0.001**
Follow up	7	23.3	23	76.7	18	60.0	12	40.0	8.297	0.004*

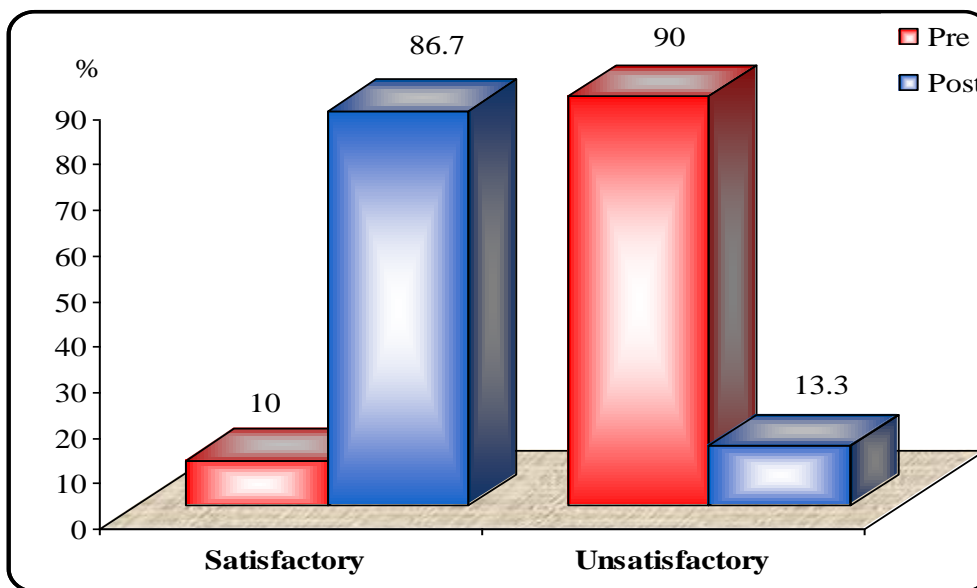


Figure (1): Satisfactory level of total knowledge among studied patients regarding cardiac catheterization pre and post nursing guidelines implementation (N=30).

Table (4): Frequency and percentages distribution of clinical outcomes of studied patients undergoing cardiac catheterization pre and post nursing guidelines implementation (N=30).

Items	Pre				Post				Chi-square	
	Yes		No		Yes		No		X ²	P-value
	N	%	N	%	N	%	N	%		
The following items (within normal range)										
Temperature	30	100.0	0	0.0	30	100.0	0	0.0	-	-
Pulse	22	73.3	8	26.7	30	100.0	0	0.0	9.231	0.002*
Respiration	30	100.0	0	0.0	30	100.0	0	0.0	-	-
Mean Arterial Pressure (MAP)	26	86.7	4	13.3	30	100.0	0	0.0	4.286	0.038*
O2 saturation	22	73.3	8	26.7	30	100.0	0	0.0	9.231	0.002*
ECG with exercises	7	23.3	23	76.7	18	60.0	12	40.0	8.297	0.004*
Cardiac enzymes	11	36.7	19	63.3	23	76.7	7	23.3	9.774	0.002*
Lower peripheral Perfusion / cardiac catheterization site assessment										
Right foot Color										
Blue or pallor	8	26.7	-	-	0	0.0	-	-	9.231	0.002*
Pink	22	73.3	-	-	30	100.0	0	0.0		
Right foot warmth										
Warm	20	66.7	-	-	27	90.0	-	-	4.812	0.028*
Cold	10	33.3	-	-	3	10.0	-	-		
Numbness										
Absent	16	53.3	-	-	26	86.7	-	-	7.937	0.005*
Present	14	46.7	-	-	4	13.3	-	-		
Swelling										
Absent	20	66.7	-	-	27	90.0	-	-	4.812	0.028*
Present	10	33.3	-	-	3	10.0	-	-		
Pain										
Absent	19	63.3	-	-	25	83.3	-	-	3.068	0.080
Present	11	36.7	-	-	5	16.7	-	-		

Table (5): Frequency and percentages distribution of total physically self-management of studied patients undergoing cardiac catheterization

Patients' self-management	Pre						Post						Chi-square	
	Not all confidant		Moderately confidant		Completely confidant		Not all confidant		Moderately confidant		Completely confidant		X ²	P-value
	N	%	N	%	N	%	N	%	N	%	N	%		
Physical self-management (how confidant are you that can)														
Take a shower alone.	21	70.0	9	30.0	0.0	0.00	3	10.0	6	20.0	21	70.0	24.300	<0.001**
Go to the bathroom alone.	9	30.0	9	30.0	12	40.0	0	0.00	8	26.7	22	73.3	17.510	<0.001**
Changing clothes alone	6	20.0	9	30.0	15	50.0	0	0.00	10	33.3	20	66.7	22.591	<0.001**
Mobility and movement at home alone.	16	53.3	10	33.3	4	13.3	1	3.3	12	40.0	17	56.7	21.465	<0.001**
Walking half hour daily.	19	63.3	9	30.0	2	6.7	3	10.0	10	33.3	17	56.7	19.431	<0.001**
Ability to ascending stairs	19	63.3	10	33.3	1	3.3	3	10.0	9	30.0	18	60.0	20.322	<0.001**
Ability to descending stairs	19	63.3	10	33.3	1	3.3	3	10.0	13	43.3	14	46.7	23.294	<0.001**
Ability to do shopping	20	66.7	9	30.0	1	3.3	2	6.7	12	40.0	16	53.3	25.995	<0.001**
Lifting or carrying light things	12	40.0	13	43.3	5	16.7	0	0.00	8	26.7	22	73.3	23.894	<0.001**
Works that require bending and kneeling, such as doing home activities	15	50.0	10	33.3	5	16.7	0	0.00	6	20.0	24	80.0	26.305	<0.001**
Total physical self-management	Pre						post						X²	P-value
	N		%		N		%		N		%			
Not all confidant (low self-management)	14		46.7		5		16.7		9.4				<0.001**	
Moderately confidant (moderate self-management)	13		43.3		7		23.3		11.3				<0.001**	
Completely confidant (high self-management)	3		10.0		18		60.0		17.4				<0.001**	

Table 6: Frequency and percentages distribution of social self-management of studied patients undergoing cardiac catheterization

Patients' social self-management	Pre						Post						Chi-square	
	Not all confidant		Moderately confidant		Completely confidant		Not all confidant		Moderately confidant		Completely confidant		X ²	P-value
	N	%	N	%	N	%	N	%	N	%	N	%		
Social self-management(how confidant are you that can)														
having meaning or purpose for life	17	56.7	6	20.0	7	23.3	0	0.0	7	23.3	23	76.7	21.132	<0.001**
Making satisfactory relations with family or friends	19	63.3	6	20.0	5	16.7	2	6.7	11	36.7	17	56.7	21.273	<0.001**
Practicing recreational activities.	18	60.0	8	26.7	4	13.3	0	0.0	4	13.3	26	86.7	22.439	<0.001**

Caring about activities that affect others	13	43.3	15	50.0	2	6.7	0	0.0	15	50.0	15	50.0	22.941	<0.001**
ability to adapt with environment around me	17	56.7	7	23.3	6	20.0	0	0.0	6	20.0	24	80.0	20.583	<0.001**
Feeling with physical security	21	70.0	9	30.0	0	0.0	2	6.7	8	26.7	20	66.7	27.868	<0.001**
Adjustment to my health now	24	80.0	6	20.0	0	0.0	4	13.3	8	26.7	18	60.0	28.286	<0.001**
work increase my self-confidence	19	63.3	10	33.3	1	3.3	3	10.0	9	30.0	18	60.0	20.322	<0.001**
participation in community activities	19	63.3	10	33.3	1	3.3	3	10.0	13	43.3	14	46.7	23.294	<0.001**
Ability to achieve my goals.	20	66.7	9	30.0	1	3.3	2	6.7	12	40.0	16	53.3	25.995	<0.001**
Total social self-management	Pre				Post				X²	P-value				
	N		%		N		%							
Not all confidant (low self-management)	9		30.0		6		20.0		8.3	<0.001**				
Moderately confidant (moderate self-management)	11		36.7		6		20.0		13.3	<0.001**				
Completely confidant (high self-management)	10		33.3		18		60.0		15.4	<0.001**				

Table 7: Frequency and percentages distribution of psychological self-management of studied patients undergoing cardiac catheterization

Patients' psychological self-management	Pre						Post						Chi-square	
	Not all confidant		Moderately confidant		Completely confidant		Not all confidant		Moderately confidant		Completely confidant		X ²	P-value
	N	%	N	%	N	%	N	%	N	%	N	%		
psychological self-management														
Having important role in life.	16	53.3	10	33.3	4	13.3	1	3.3	12	40.0	17	56.7	21.465	<0.001**
Ability to commit to follow-up.	19	63.3	9	30.0	2	6.7	3	10.0	10	33.3	17	56.7	19.431	<0.001**
Practicing some activities (as prayer, and reading,) to relax.	17	56.7	6	20.0	7	23.3	0	0.0	7	23.3	23	76.7	21.132	<0.001**
Ability to deal with current health conditions.	19	63.3	6	20.0	5	16.7	2	6.7	11	36.7	17	56.7	21.273	<0.001**
Feeling satisfaction with my personal life	21	70.0	9	30.0	0	0.0	2	6.7	8	26.7	20	66.7	27.868	<0.001**
Felling with comfort	19	63.3	6	20.0	0	0.0	2	6.7	11	36.7	17	56.7	21.273	<0.001**
Having willing to heal.	24	80.0	6	20.0	0	0.0	4	13.3	8	26.7	18	60.0	28.286	<0.001**
Having psychosocial support from others	19	63.3	10	33.3	1	3.3	3	10.0	9	30.0	18	60.0	20.322	<0.001**
Felling confidence to about future health condition	16	53.3	10	33.3	4	13.3	1	3.3	12	40.0	17	56.7	21.465	<0.001**
Having no sleep disturbances	12	40.0	9	30.0	9	30.0	0	0.0	8	26.7	22	73.3	17.510	<0.001**
Having energy in dealing with others.	18	60.0	8	26.7	4	13.3	0	0.0	4	13.3	26	86.7	22.439	<0.001**

Total psychological self-management	Pre		post		X ²	P-value
	N	%	N	%		
Not all confident (low self-management)	8	26.7	7	23.3	8.2	<0.001**
Moderately confident (moderate self-management)	12	40.0	8	26.7	13.1	<0.001**
Completely confident (high self-management)	10	33.3	15	50.0	17.3	<0.001**

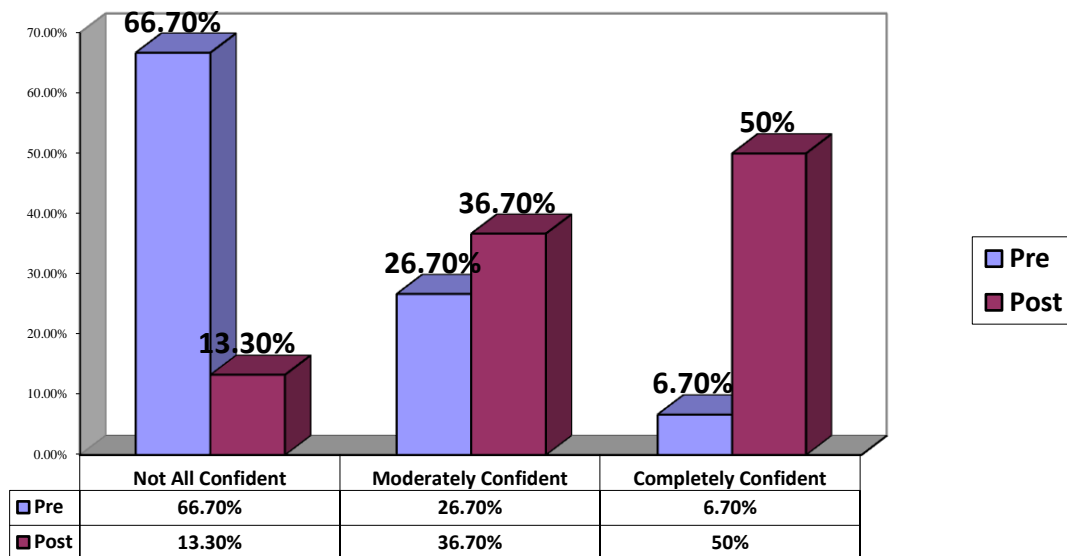


Figure 2: Comparison between total self-management of studied patients undergoing cardiac catheterization

4. DISCUSSION

Several organizations including the **The American Association of Cardiovascular and Pulmonary Rehabilitation, (2016)**, and the **American Heart Association (2017)**, agree that a comprehensive cardiac rehabilitation program should contain specific core components. These components should optimize cardiovascular risk reduction, reduce disability, encourage active and healthy lifestyle changes, and help maintain those healthy habits after rehabilitation is complete. Cardiac rehabilitation programs through communication technology should focus on: (Patient assessment nutritional counseling, Weight management, Blood pressure management, Diabetes management, Tobacco cessation, psychosocial management, physical activity counseling & exercise training).

In the current study, it was detected that demographic characteristics of the studied patients, shows that, about two thirds of the studied patients their age was less than 60 years with mean age of them 45.37 ± 2.76 and coming from the urban area. It can be examined by increased incidence of cardiac diseases and recurrent exposure to life stressors in younger adults which is a critical indicator for cardiac diseases among patients in urban area rather than rural area. These results were in agreement with **Youssef (2014)** who mentioned that, the mean age of the patients undergoing DCC in his study was 43.48 ± 13.24 in the study that titled "Effect of educational program on quality of life of patients with cardiac catheterization". According to gender, the current study revealed that less than two third of the studied patients were males. This finding might be due to that heart diseases are more prevalent in males than the females, as well as men are significantly more likely to more stress from heavy physical activities and more limited ways to express emotional stress in the workplace than women. The finding was supported by a **Hung, et al., (2018)** who were noticed that less than to third 64.9% of the participants were men, significantly higher than female in their study titled "The effect of mobile messaging apps on cardiac patient knowledge of coronary artery disease risk factors and adherence to a healthy lifestyle".

Concerning marital status, the results showed that, two thirds of the studied patients were married; this might reflect that married people were liable to cardiac diseases more than singles because they always facing psychological stress of their

social role. This result is congruent with **Mohamed & Mohamed (2014)** they mentioned that the majority of their study subjects were married in the study entitled "Impact of Nursing teaching protocol on reduction of complications for patients undergoing cardiac catheterization".

Concerning level of education the present study was found that less than of two thirds of the studied patients educated. This finding in the same line with **Spertus & Jones, (2015)** who were found that most of the participants had reached a secondary educational level 45.7% (n = 43), 34.0% (n = 32) with primary educational level, 9.6% (n = 9) had tertiary level, while the rest had no schooling in their study entitled "Development and validation of a short version of the Kansas City Cardiomyopathy Questionnaire".

As regards occupational status among of the studied patients represented about three quarter not working and majority of them live with their family. These findings might be interpreted as these patients had little activities that might be due to cardiac diseases that affect the health condition but the majority of them had a social support because they live with their family. This result in contrast, **Santarpino, et al., (2015)** study demonstrated that majority of the participants were either employed 53.2% (n = 50) or retired 42.6% (n = 40). Only 4.3% (n = 4) of them were unemployed. And more than half of the participants were married (66%, n = 62), 17.0% (n = 16) were widowed and 8.5% were single and divorced, respectively in their study that titled "Outcome in patients having salvage coronary artery bypass grafting".

In terms of medical data, the present study showed that more than half of the studied had obesity and more than two thirds didn't practice exercises. These findings might be attributed to the effect of obesity and no exercises on cardiovascular health conditions. This finding in the same line with **Dalal, Doherty and Taylor (2015)** who mentioned that the prevalence of obesity in those attending cardiac rehabilitation in the US has increased in the past two decades, with >40% having a body mass index >30 and 80% with a body mass index >25, in their study titled "Cardiac rehabilitation".

Regarding smoking, the current study results were found that less than one third were smokers. This finding supported by **Messner and Bernhard, (2014)** who mentioned that the smoking plays a strong role not only in CVD initiation but also significantly contributes to and causes disease progression and fatal cardiovascular outcomes. The key processes in smoking-induced atherogenesis initiation are endothelial dysfunction and damage, increase in and oxidation of proatherogenic lipids, as well as decrease of high-density lipoprotein, induction of inflammation, and the shift toward a procoagulant state in the circulation. Current data clearly show that also secondhand smoking can trigger life-threatening conditions

The results revealed that less than two third of them had no family history of coronary heart disease. Also all of them suffer from chronic diseases and had Chest pain and Arrhythmia. Concerning present diagnosis 43.3% had narrowing in Coronary arteries. These findings might be interpreted as; the accompanied chronic disease which is one of risk factors for cardiovascular-related illnesses and might enhance the complications. According **Sommer, (2018)** who mentioned that family history (FH) is one of the key components of a comprehensive health history of any patient because it is strongly associated with several aspects of our health. Not only a simple, readily obtainable view into our genetic heritage, FH is also a hallmark of family behaviors and shared family environment associated with health and disease. In cardiovascular disease (CVD) it has been long known that traditional risk factors, such as high low-density lipoprotein cholesterol levels and hypertension, have strong genetic determinants, but other known behavioral risk factors, such as smoking and unhealthy diet, also cluster in families in his study which titled "Family History of Cardiovascular Disease: How Detailed Should It Be?". And regarding **Hinkle & Cheever (2014)** who reported that, the most common co-morbid conditions among cardiac catheterization patients were congestive heart failure, myocardial infarction, diabetes and hypertension in their study entitled "Impact of permanent pacemaker implantation on clinical outcome among patients undergoing transcatheter aortic valve implantation".

Regarding Comparison between patients' level of knowledge regarding cardiac catheterization pre and post nursing guidelines implementation through whats'app application, the current study findings revealed that there was statistically significant improvement in patients' knowledge after implementation of nursing guidelines compared to the pretest. This finding might be attributed to the effect of the provision of educational content through whats'app application with clear and simple written information which given to them. In addition to the curiosity of the studied patients to know how to deal with their diagnosis. This finding was supported by a study that used health education and counselling as health education intervention (**Mosca, Christian, Mochari-Greenberger, Kligfield, & Smith, 2010**). Mobile apps as health

intervention methods had been proven by many studies to significantly improve participant knowledge and reduce readmission to hospitals due to increase in awareness of heart disease (Beatty, Fukuoka, & Whooley, 2013; Widmer, Allison, Lerman, & Lerman, 2014). In addition, Forman et al. (2014) also mentioned that mobile technology helped to make health education intervention more feasible in their study entitled "Utility and efficacy of a smartphone application to enhance the learning and behavior goals of traditional cardiac rehabilitation: A feasibility study".

In relation to comparison between satisfactory level of total knowledge of the studied patients' pre and post health education guidelines, this study reveals that there was statistically significant improvement regarding total knowledge of patients post health education guidelines implementation through what's app application. This finding is in the same line with Hung, et al., (2018) who were found that the effect of health education intervention effectively increased participant knowledge of CAD risk factors.

The current study findings illustrate that there was statistically significant improvement regarding patients' clinical outcomes (Pulse, Mean Arterial Pressure, O₂ saturation, ECG with exercises and cardiac enzymes), while there is no statistically significant improvement regarding (Temperature & Respiration). As well as, regarding lower peripheral Perfusion outcomes there was statistically significant improvement concerning (Right foot Color, Right foot warmth, Numbness & swelling) while there is no statistically significant improvement regarding (pain). These findings might be as a result of continuous demonstration, re demonstration, follow up and practical content by using a variety ways as video and photos through what's app application which were given to the studied patients with the continuous explanations, reinforcement and feedback. The more often the learners hear and see the materials, the greater the chance that the material will be retained. But the pain is subjectivity and each patient had a different tolerance of pain. This finding is in the same line with Doimo et al., (2019) who reveal the positive effects of ambulatory CR (cardiac rehabilitation) program in improving clinical outcomes and highlights the importance of a spread use of CR in order to reduce cardiovascular hospitalizations and cardiovascular mortality during a long-term follow-up in their study titled "Impact of ambulatory cardiac rehabilitation on cardiovascular outcomes: a long-term follow-up study".

In term of self-management of studied patients undergoing cardiac catheterization, the current study reveals that there was statistically significant improvement in all items of patients' self-management physically, psychologically and socially. These findings can be explained as after exposing to nursing guidelines, their self-care knowledge and practice improved and affect positively on physically, psychologically and socially conditions and can explained that the effect of what's app application in which the interpersonal communication through group discussion on what's group which made patients ventilate and share their feelings, stressors, questions and wellbeing that help them in coping and adaptation with the new modifications. This result supported with Dorri, Esfahan, sedeh, (2016) who noticed that documented benefits of cardiac rehabilitation are improved cardiovascular capacity, improved mood and prevention of psychological complications, return to productive normal social life, modification of risk factors and secondary preventive effects. Cardiac rehabilitation has also been associated with reduced demand for health services and fewer clinical events in their study entitled "Effect of cardiac rehabilitation on physical and mental health components: a randomized controlled clinical trial". Also Varnfield, Karunanithi & Lee (2014) showed that using a mobile app as part of a home CR program increased uptake, adherence, and completion rates compared to traditional center-based CR, while producing similar improvements in exercise capacity. This suggests that mobile apps have the potential to extend effective CVD secondary prevention programs to more people (i.e. difficulty with access to health programs, living in rural areas) and promote long-term engagement in their study titled "Smartphone-based home care model improved use of cardiac rehabilitation in postmyocardial infarction patients: results from a randomized controlled trial".

In relation to total self-management of studied patients undergoing cardiac catheterization, the result showed that there was statistically significant improvement regarding total of patients' self-management post nursing guidelines implementation using communication technology "what's app application".

5. CONCLUSION

Based on the findings of this study, the following can be concluded:

Based on the findings of the current study, it can be concluded that there was statically significant improvement in patients' knowledge from unsatisfactory to satisfactory level post health education guidelines implementation through

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using mobile what's-App application. Also, there was statistically significant improvement in all items self-management physically, psychologically and socially for patients undergoing cardiac catheterization. Mobile health provides an exciting opportunity to improve chronic disease management because mobile phones are so commonly used, widely accepted, easily accessible, and affordable.

6. RECOMMENDATIONS

The following recommendations are formulated based on the results of the study:

- Further research is proposed use of a longitudinal study to examine the long-term effects of mobile interventions.
- The study should be replicated on large sample and different hospitals setting in order to generalize the results.
- Periodic in service – training advanced care programs regarding application of mobile what's-App for patients undergoing cardiac catheterization and for nurses working in this area is very effective to provide accurate information.
- The researchers recommended that, health care agency should be unitizing new technology as mobile what's-app in order to ensure providing accurate health care of patients and minimize work load.

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