

## Effect of a portable computer-based educational intervention video on the outcomes of patients undergoing percutaneous coronary intervention

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### Abstract

Percutaneous coronary intervention (PCI) is a form of interventional cardiology procedure that includes expanding a balloon in a stenotic or blocked artery. **Aim:** To assess effect of a portable computer-based educational intervention video on the outcomes of patients undergoing percutaneous coronary intervention. **Setting:** Al Orman Assiut University Hospital's cardiac catheterization unit. **Design:** A quasi-experimental was used. **Sample:** 60 patients who were admitted for the first time for percutaneous coronary intervention. Data was collected using **two tools: tool I:** patient assessment sheet **tool II** patient outcome assessment sheet. **Results:** More than half (86.4%) of patients in the study group had a higher total knowledge score level after implementing the educational intervention video, and a lower score of anxiety level in the study group after implementing the educational intervention video than control group with p value (0.004), finally about (93.3%) of subjects in the study group had mild pain level before discharge compare with control group. **Conclusion:** Using a portable computer-based educational intervention video is effective for improving patients' short-term health literacy goals, reduce pain and provide comfort. **Recommendations:** Further research focusing on the assessment of the quality of life of this group of patients

**Keywords:** Educational video -outcomes -percutaneous coronary intervention

### Introduction

Coronary artery disease (CAD) is classified as a critical illness caused by atherosclerosis which develops over time as cholesterol and connective tissue build up in the walls of blood vessels cause blood vessel narrowing. Because the myocardial, or heart muscle, does not receive enough oxygen and blood, it deteriorates, leading to tissue death in the heart (**American Heart Association, 2017**).

Percutaneous coronary intervention (PCI) is a form of interventional cardiology procedure that includes expanding a balloon in a stenotic or blocked artery and then inserting a stent. As a result, it is the most commonly used revascularization technique among cardiac patients. The procedure includes balloon angioplasty, atherectomy, and stent placement (**Aboalizm et al., 2016**). Non-pharmacological & pharmacological, interventional cardiology techniques, and surgical treatment are all options for patients with CAD (**Sharma et al., 2018**).

Despite the fact that coronary intervention surgery is a minimally invasive procedure, patients frequently experience postoperative complications such as hypotension, vasovagal reflex, severe arrhythmia, infection, injury, pain at the intravenous site or sheath insertion site harming urinary organs. Bleeding at the access site, hematoma, retroperitoneal bleeding, venous embolism, pseudo aneurysms, and arteriovenous fistula formation are all examples of vascular problems. Perforation of a transverse artery or vein causes bleeding, which necessitates a transfusion and lengthens the hospital stay (**Doll et al., 2020**).

Patients undergoing PCI have encountered an upsurge in psychological burden and deteriorated quality of life due to lack of information and education about post-discharge health management plan. Educational intervention programs are important techniques that can help individuals with heart illnesses have better health outcomes. As a result, nurses should provide pre-PCI education to patients in order to reduce their physical and emotional discomfort. The education includes information

about the procedure, preparation, close assessment, pain medication, sheath removal, problem management, patient placement, ambulation, and health education (Valaker et al., 2017).

Critical care nurses are essential in caring for PCI patients at all stages of the procedure. The patient's care begins the day he or she is admitted to the hospital for preparation, which includes taking a detailed history of cardiac and pulmonary disease, assessing the patient's physical and psychological condition, and obtaining laboratory investigations. The patient is not allowed to eat or drink after midnight and must remain nil per oral (NPO) until the procedure is completed (Vidal-Petiot et al., 2016).

During the process, the nurse's performance is focused on providing emotional support and reinforcing the procedure's explanations. Nurses observing significant variations in ECG and arterial pressure, which could be caused by medicine administration, catheter irritation, or sensitivity to the contrast dye (Hinkle and Cheever 2021).

Then for the first 24 to 72 hours after PCI, patients are routinely maintained in a critical care unit. hemodynamic stabilization is the priority, so vital signs checked every 5 to 15 minutes, Observing the insertion site for signs of bleeding, applying a constrictive dressing to the insertion site to prevent bleeding, monitoring the cardiac monitor or assessing the apical and peripheral pulses for changes in rate and rhythm, and instructing patients not to move their legs for 6 hours to avoid bleeding, examine the patient's emotional reaction to the procedure and its results and instruct the patient to avoid coughing or straining during defecating to avoid bleeding (White et al., 2018).

Critical care nurses who care for PCI patients must educate them and assess their requirements in order to increase the quality and value of their care. Physical needs such as activities of daily living, physical preparation, general assessment, interventional techniques, investigations and treatment, post-procedural pain management, postoperative diet, complication management, procedural access site care, and self-care after discharge are

among these requirements. Psychological requirements: decreasing anxiety caused by pain. Finally, there are social needs, which include patients' social activities, employment, driving, and social support (Ali et al., 2020).

Patients should receive consistent information and good discharge instructions to be prepared for the transition of care from the hospital to home (Zhou et al., 2019). Patients have found that video-based education is easier to understand than other methods, and that it accommodates a variety of learning styles, resulting in improved learning outcomes (Dahodwala et al., 2018)

### Significant of study:

Coronary artery disease is one of the leading causes of death worldwide. Despite the widespread variety of treatment for heart disease, percutaneous coronary intervention remains the gold standard for the treatment of many types of coronary artery disease. (World Health Organization 2020) According to cardiac catheterization unit at Al Orman university hospital Statistic (2019-2020 ) more than one thousands of patients admitted annually to cardiac catheterization unit (about 75% undergoes PCI). Although PCI is a popular invasive procedure with a low complication rate, patients may be undertreated due to a lack of understanding about how to manage complications. Therefore, video-based education strategies about preparation, early detection, understanding of effective techniques.

### Aim of the study:

The aim of this study was to assessthe effect of a portable computer-based educational intervention videoon the outcomes of patients undergoespercutaneous coronary intervention.

### Hypothesis:

- **Hypothesis (1)** Patients who participated in an educational intervention video had more satisfied level of knowledge than those who did not.
- **Hypothesis (2)** Patients who participated in an educational intervention video were lesser anxiety level than those who did not.

- **Hypothesis (3)** Patients who participated in an educational intervention video were lesser pain level than those who did not.
- **Hypothesis (4)** Patients who participated in an educational intervention video had lower complications than those who did not.

## Patients and Method

### Research design:

Quasi experimental research design was utilized to conduct this study. This is an empirical study that uses a non-random assignment to estimate the causal influence of an intervention on its target population. (Craig, et al., 2017).

### Study Variables:

**Dependent variables in this study:** (outcomes) patient's knowledge, anxiety, pain level and complication.

**Independent variables:** portable computer based educational intervention video explanation

### Setting:

The study was performed in the cardiac catheterization unit at Al Orman Assuit university hospital which include 4 rooms each ones consists of 6 bed

### Sample:

A purposive sample of sixty patients of both sexes who were admitted for PCI for the first time was divided into two groups at random. Each trial and control group had a total of 30 patients.

$$n = \frac{NZ^2}{Z^2 + Ne^2}$$

$$n = \frac{1000 \times (1.96)^2 \times (0.205)^2}{(1.96)^2 \times (0.205)^2 + 1000 \times (0.05)^2} = 60$$

Where:

$Z = 1.96$ [standard scores]

$e = 0.05$ [error]

$= 0.205$ [SD]

$N = 1000$ [population]

$n = 60$ [sample]

### Exclusion criteria:-Excluded from this study patients:

Abnormal INR, abnormal renal function and hemodynamically unstable

**Tools of the study:** Two tools were used to collect data for the study after review the

local and international scientific journals (Arantes et al., 2018; Spielberg, 1983); Zsido et al., 2020; Compbell 1995; Ali et al in 2020)

**Tool 1: patient assessment sheet:** open end questions in the form of true or false, multiple-choice questions. The researcher created this tool based on national and international relevant literature reviews (Arantes et al., 2018). This tool was translated into Arabic and included two parts:

**Part I: Demographic and clinical data** as, age, sex, level of education, risk factor for coronary artery disease.

**Part (2): Patient's knowledge as regarding PCI** It consists of three basic components. There were 30 questions in total, and they were as follows:

- General information consisted of 12 questions about anatomy of heart (3 questions), coronary artery disease (3 questions) and PCI (6 questions)
- Knowledge about pre-procedure information, it consisted of 4 questions.
- Knowledge about post -procedure information of, it consisted of 14 questions.

**Scoring system:** Nurses' knowledge regarding PCI included 30 questions Scores assigned to each item were between 1 and 0 points as follow; (correct=1, incorrect=0) According to range of total scores lie between 0-30. Nurses' knowledge was classified as: - Satisfactory knowledge  $\geq 70\%$  ( $> 21$  questions)- Unsatisfactory knowledge  $< 70\%$  ( $< 21$  questions)

**Second Tool: patients' outcomes assessment sheet:** This tool was developed by the researcher based on review of related literature:

**Part I: Spielberg State Trail Anxiety Inventory** developed by (Spielberger, 1983) and reused by (Zsido et al., 2020) to measure pre procedure and post procedure anxiety levels. The SAI, a subscale of the STAI, measures state anxiety. State anxiety is "characterized by subjective feelings of apprehension, nervousness, and worry". Participants were asked to answer

the 20 statements of the SAI in response to "how they feel today." The four responses for each item are "not at all," "somewhat," "moderately so," and "very much so." The total score of the SAI can range from 20 to 80. **Reliability** of STAI: alpha cronbach for shortened forms demonstrated high internal consistency reliability 0.92

**Part II: numerical pain scale** developed by **Compbell (1995)** and re-used by **Ali et al in 2020**. It was made up of a line with numbered points that ran from (0-10). No discomfort (zero), mild pain (0-less than 4), moderate pain (4-less than 7) and severe pain (7 - 10).

**Part III:** Complications related to PCI procedure which recorded once occurred.

#### **Method:**

The study was conducted on three phases (preparatory, implementation and evaluation phase)

#### **Preparatory phase:**

Preparation of the data collection tools which was developed by the researchers based on reviewing the relevant literature

Official permission was obtained from the chairman of cardiac catheterization unit at Al Orman university hospital

**Content validity:** A jury of five professionals in the domains of nursing and medicine at Assiut University Hospital assessed the study tools and made any necessary adjustments.

**A pilot study:** Prior to data collection, a pilot research was conducted with 10% of the patients in the sample to check that the study tools were clear and understandable, as well as to make any necessary revisions. This pilot sample was intended to determine how long the study tools would take to complete. The study's pilot sample was eliminated.

**Reliability** of the adapted first tool had been tested using Cronbach's coefficient alpha (0.79)

**Ethical considerations:** The ethical committee of the nursing faculty authorized the research idea. During the implementation of the research, there was no risk to the study subjects. The study followed standard clinical research ethics guidelines. Patients

gave their oral consent after being informed about the study's nature and purpose. Anonymity and confidentiality were guaranteed. Patients in the trial had the right to refuse to participate and/or withdraw from the study at any time for any reason.

#### **Field work**

Starting of data collection "February 2021" till ending the target number of sample size at December 2021

Patients' baseline vital signs for all participants were taken by the assigned nurses after 15 minutes of being in their rooms, and the readings were entered in a specified form. Participants were asked to complete the Arabic version of the Spielberger State Anxiety Inventory (SAI) after receiving standardized instructions on how to react to the SAI.. Only brief verbal instructions from nurses and a cardiologist were given to those in the control group.

Study group: pre-procedural educational interventions were given to patients individually in an approximate 45 min educational session consisting of a 30 -min educational video( **Chair et al ., 2014; Hinkle LJ and Cheever H K 2021; Haddad et al., 2018**) which covers information related to an overview of the cardiovascular system, coronary atherosclerosis, and PCI-related education, designed to familiarize patients with the events occurring before, during, and after the procedure including instructions for home care after discharge. After viewing the video, 15 -min for discussion with patients to encouraged them to ask for further information and researcher teach patient relaxation techniques to manage their anxiety. Finally, researcher provide patient or their relevant who caring for patient at home a booklet summarized the material provided within the video.

#### **Evaluation phase:**

- Knowledge and anxiety level for control group were measured once admitted to unit then after receiving verbal instructions from nurses and a cardiologist.
- Knowledge and anxiety level for study group were measured once admitted to after receiving video and booklet educational intervention from researcher
- pain severity for both groups is assessed post-PCI intervention twice

- complications for both groups is assessed post-PCI intervention during hospitalization till discharge .

### Statistical analysis

All data were recorded in a special chart for every patient. The collected data were coded, analyzed and tabulated .Data entry and analysis were done using SPSS 20.0 statistical software package. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations for quantitative variables. Quantitative continuous data were compared using analysis of variance test in case of comparisons between two independent groups. Using independent T-test and chi-square test to determine significant, it is considered significant when  $P \leq 0.05$  significant and non- significant when  $P > 0.05$ .

### Results:

**Table (1)** Represents personality distribution of demographic and clinical data in the both groups It was found that the mean age in study group was  $51.93 \pm 9.58$  years versus  $52.80 \pm 11.11$  years in control group with no statistical significant difference ( $p=0.748$ ). Also, more than half of gender in both groups was female with no statistical significant

difference. patients in study and control groups had primary and preparatory education (46.7& 36.7 respectively) , the most common risk factor was hypertension followed by hyperlipidemia in both groups.

**Table (2)** Represents personality distribution Patient's Knowledge in the both groups. It was found that there were statistical significant difference between both group regarding Patient's Knowledge Sub domain

**Table (3)** Represents personality distribution Patient's Knowledge in the both groups. It was found that there higher satisfactory level regarding knowledge in study group after educational intervention video.

**Table (4)** show correlations co-efficient between patient total knowledge before educational intervention video and their socio demographic data for study and control group. There were no significant correlation between both group

**Table (5)** shows personality distribution of outcomes in the control and study groups. It was found that there were statistical significant difference between both group regarding pain, anxiety. Also higher complication level among control group with significant difference between both group.

**Table (1):** Distribution of demographic and clinical data in the study and control groups

socio-demographic & clinical data	study group (n= 30)		Control group (n=30)		P-value
	No.	%	No.	%	
<b>Age: (years)</b>					0.748
Mean $\pm$ SD	51.93 $\pm$ 9.58		52.80 $\pm$ 11.11		
<b>Sex:</b>					0.500
Male	13	43.3%	12	40.0%	
Female	17	56.7%	18	60.0%	
<b>Level of education</b>					0.186
Primary/preparatory	14	46.7%	11	36.7%	
Secondary	4	13.3%	10	33.3%	
High education	12	40.0%	9	30.0%	
<b>Risk factor</b>					0.301
Hypertension	12	40.0%	11	36.7%	
Diabetes mellitus	2	6.7%	5	16.7%	
Smoker	7	23.3%	6	20.0%	
Hyperlipidemia	9	30.0%	8	26.7%	

Chi-square test& Independent samples t-test. CAD: coronary artery disease, MI: myocardial infarction. \* Significant difference at p. value<0.05

**Table (2):** Comparison between Study and control group related to Patient's Knowledge Sub domain

	Study	Control	P-value
	Mean±SD	Mean±SD	
<b>General knowledge about heart anatomy and PCI</b>			
Baseline	7.13±2.17	6.93±1.98	0.711
Post procedure	9.87±1.27	7.77±1.71	0.000*
P-value	0.000*	0.542	
<b>Knowledge about pre –procedure care information</b>			
Baseline	1.40±1.16	1.30±1.02	0.725
Post procedure	3.80±.484	3.17±1.14	0.007*
P-value	0.001*	0.001*	
<b>Knowledge about post –procedure care information</b>			
Baseline	7.13±2.60	6.20±2.44	0.158
Post procedure	10.97±2.17	8.00±1.43	0.000*
P-value	0.001*	0.057	
<b>Total Knowledge About patient information</b>			
Baseline	15.67±4.08	14.43±3.12	0.198
Post procedure	24.63±2.76	18.17±4.27	0.000*
P-value	0.000*	0.021*	

Independent samples t-test\*\*Significant difference at p. value<0.01

**Table (3):** Distribution of patient total knowledge for study and control group before and after intervention

	Study		Control		P. value
	No	%	No	%	
<b>Baseline Total Knowledge</b>					
Satisfactory	6	20.0	3	10.0	0.236
Unsatisfactory	24	80.0	27	90.0	
<b>Total Knowledge after intervention</b>					
Satisfactory	26	86.7	9	30.0	0.000*
Unsatisfactory	4	13.3	21	70.0	

- Chi-square test

\*\*Significant difference at p. value<0.01

**Table (4):** Correlations co-efficient between patient total knowledge before educational intervention video and their socio demographic data for study and control group

Correlations	Total Knowledge about patient information		
		Control	Study
Age	R	0.342	0.063
	P	0.065	0.740
Gender	R	0.342	0.016
	P	0.065	0.934
Level of education	R	-0.234	-0.119
	P	0.567	0.532

\*\* Statistically Significant Correlations P. value <0.01

**Table (5):** Distribution of outcomes in the control and study groups after intervention

	study group (n= 30)		Control group (n=30)		P-value
	No.	%	No.	%	
<b>Pain severity after procedure</b>					
Mild	0	0.0%	1	3.3%	0.002*
Moderate	24	80.0%	17	56.7%	
Severe	6	20.0%	12	40.0%	
<b>Pain intensity before discharge</b>					
Mild	28	93.3%	13	43.3%	

	study group (n= 30)		Control group (n=30)		P-value
	No.	%	No.	%	
Moderate	2	6.7%	16	53.3%	0.000*
Severe	0	0.0%	1	3.3%	
<b>Complications</b>					
No complications	23	76.7%	11	36.7%	0.026*
postoperative hypotension	3	10.0%	4	13.3%	
severe arrhythmia	0	0.0%	1	3.3%	
Vasovagal reaction	0	0.0%	5	16.7%	
harming urinary organs	0	0.0%	1	3.3%	
Bleeding at the access site	1	3.3%	2	6.7%	
Hematoma	3	10.0%	6	20.0%	
<b>Anxiety level (STAI) baseline</b>	42.33 ± 6.51		45.56 ± 9.27		0.354
<b>Anxiety level (STAI) after procedure</b>	39.33 ± 6.51		43.56 ± 9.27		0.004*

Chi-square test& Independent samples t-test. \* Statistical significant difference (p<0.05)STAI State Trail Anxiety Inventory

## Discussion:

Percutaneous coronary intervention is the gold standard treatment for patients with coronary artery disease which consider the leading cause of death globally. It can result in a number of complications, which must be diagnosed and treated following PCI, healthcare providers pay special attention to their patients, keeping in mind the possibility of consequences. On the other hand, differentiated care from the multidisciplinary team, was required Pre-PCI particularly from nurses, who are responsible for preparing the patient and providing advise; nurses are closer to the patients at this time(**Buzatto, and Zanei 2010**).

Regarding socio-demographic data, the present study claimed that the average age of patients in study and control groups was (51.93± 9.5852.80± 11.1 respectively), and majority of study sample in both group were female. Also, more of patients in both groups had education level less than secondary. This identical with findings **Ayasrah and Ahmad (2016)**. In the study about " Educational Video Intervention Effects on Per-procedural Anxiety Levels Among Cardiac Catheterization Patients" reported that more than half of the patients had less than the second secondary level of education

But the finding in the present study not identical with (**Harkness, 2003**) when evaluated the effect of early education on patient anxiety while waiting for elective cardiac catheterization. Who reported that bulk of study sample were male

Regarding risk factor for coronary artery disease. In the present study, the most prominent risk factors were hypertension followed by hyperlipidemia in both groups. Which is supported by **Gallagher et al., 2010** in the study about" Pre-procedural concerns and anxiety assessment in patients undergoing coronary angiography and percutaneous coronary interventions." Who reported that hypertension was the most common risk factor among study subjects. This contradicts **Mosch et al., (2017)**, who found diabetic mellitus (DM) to be the most important risk factor for atherosclerosis-related cardiovascular illnesses.

Regarding the knowledge, there was a highly statistically significant difference between the study and control groups regarding patients knowledge about PCI procedure and majority of subjects in the study group had a satisfactory level of total knowledge than that in the control group.

The current study's findings were in line with those of **Dahodwala et al (2018)**. Who was the author of the paper "The impact of video-based instructional interventions on patient outcomes in hospital settings". They reported that applying an education intervention had a positive significant impact on increasing the level of patient's knowledge. Moreover, **Lee, et al., 2020** who investigate the impact of video-based information delivery via a smart pad on patients undergoing bone marrow biopsies. Claimed that there is statistically significant difference between experimental group and control group regarding patient's knowledge. Also, **Sharma**

**et al., 2018** in the study about "Effectiveness of percutaneous coronary intervention care program on selected variables among patients undergoing percutaneous coronary intervention" reported that improving knowledge regarding coronary artery disease as well as significant increase in satisfaction level among patients undergoing PCI in the experimental group than the control group.

Regarding outcomes, the present study show that there were statistical significant difference between both group regarding pain. and higher complication level among control group and hematoma was the most common complication. The researcher guesses that occurrence of hematoma linked to a variety of factors, including the use of too much heparin during the procedure, the patient's early activity, the lack of time and strength of the pressure dressing in the puncture position

The current study in the line with **Sharma et al., 2018** in the study about "Effectiveness of percutaneous coronary intervention care program on selected variables among patients undergoing percutaneous coronary intervention" reported that significant decrease observed in state anxiety, pain level among patients undergoing PCI in the experimental group than the control group.

Which matched with findings reported by **Abd-allah et al., 2021** that Implementing nursing recommendations reduces insertion site problems such as hematomas and improves pain levels significantly. Also **Wang et al., 2021** reported that control group had higher level of complications and the most prominent complication were vasovagal reflex and uroschesis.

In terms of anxiety, the current study found that the study group had lower levels of anxiety than the control group. Reduced anxiety in the study group was linked to higher-quality information and more material being provided through educational videos and booklets that make information clear and easy to understand. In addition to relaxing techniques.

Which consistent with (**Harkness, 2003**) who evaluated the effect of early education on patient anxiety while waiting for elective

cardiac catheterization. He reported that Patients who received the early education intervention had a 23% reduction in perceived anxiety. Also, **Dahodwala et al (2018)**. Who did the research on "The Impact of Video-Based Educational Interventions on Patient Outcomes in Hospital Settings" They reported that applying education intervention had a positive significant influence on lowering the level of patient anxiety. Moreover, Patient education has been found to reduce cardiac mortality, improve anxiety and quality of life, improve compliance, and increase satisfaction in patients undergoing percutaneous balloon valvuloplasty (**Verma et al., 2018**).

But not in the line with **Lee, et al., 2020** investigate the impact of video-based information delivery via a smart pad on patients undergoing bone marrow biopsies. claimed that there is no statistically significant difference between experimental group and control group regarding anxiety level,

### Conclusion

Based on the results of this study, it could be concluded that The findings show that using a portable computer-based educational intervention is more effective for improving patients' short-term health literacy goals, reduce pain, provide comfort and reduce anxiety level.

### Recommendations

- Patients awaiting a pci treatment should receive well-structured education programs as part of daily care.
- Future research studies focusing on the assessment of the quality of life of this group of patients.
- For individuals with hearing or vision impairments, additional educational modalities must be implemented and tested.
- Evaluating the nurse-led video-based educational intervention's long-term consequences

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