

A STUDY TO ASSESS THE KNOWLEDGE AND PRACTICES AMONG CARDIAC NURSES ABOUT PATIENT SAFETY AFTER CARDIAC CATHETERIZATION

PROJECT REPORT

Submitted in the partial fulfillment of the requirements

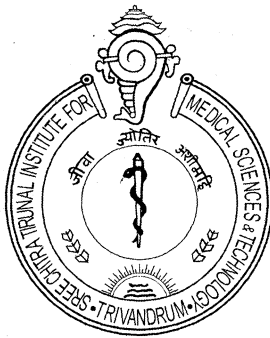
For the

Diploma in Cardiovascular and Thoracic nursing

SUBMITTED BY

ARATHY.S.R

Code No: 6210

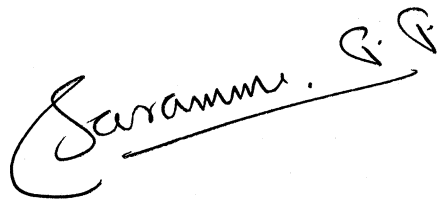


**SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL
SCIENCE AND TECHNOLOGY TRIVANDRUM, 695011**

November 2011

CERTIFICATE FROM SUPERVISORY GUIDE

This is to certify that Miss: Arathy. S. R has completed the project work on **“A study to assess the knowledge and practices among cardiac nurses about patient safety after cardiac catheterization”** at SCTIMST , Trivandrum under my supervision for the partial fulfillment for the Diploma in Cardio Vascular and Thoracic Nursing in the University of Sree Chitra Tirunal Institute for Medical Science and Technology. It is also certified that no part of this report has been included in any other thesis for procuring any other degree by the candidate.



Dr: Saramma. P. P

Senior Lecturer in Nursing

SCTIMST

Trivandrum

Trivandrum

November 2011

CERTIFICATE FROM THE CANDIDATE

This is to certify that the project on: “ A study to assess the knowledge and practices among cardiac nurses about patient safety after cardiac catheterization ”, at SCTIMST, Trivandrum is a genuine work by me, under the guidance of Dr: Saramma P.P, PhD, Senior lecturer in Nursing, SCTIMST, Trivandrum. It also certify that this work has not been presented previously to any other University for award of degree, diploma or other recognition.

Miss.Arathy.S.R
Code No: 6210
SCTIMST
Trivandrum

Trivandrum
November 2011

APPROVAL SHEET

This is to certify that Miss. Arathy.S.R , bearing code no: 6210 has been admitted to the Diploma in Cardiovascular and Thoracic nursing, in January 2011 and she has undertaken the project entitled, "A study to assess the knowledge and practices among cardiac nurses about patient safety after cardiac catheterization", in SCTIMST, Trivandrum, which is approved for the Diploma in Cardiovascular and Thoracic nursing, awarded by the Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, and is found satisfactory.

EXAMINERS

(1)

(2)

GUIDE

(1)

(2)

Thiruvananthapuram,
November 2011.

ACKNOWLEDGEMENT

First of all let me thank the God Almighty for his unending love, care and blessing especially during the tenure of this study

I take this opportunity to express my sincere thanks to Dr: Saramma P.P, Senior lecturer in nursing, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum. for the guidance, she provided for executing this study. Her advice regarding to the concept, basic guidelines and analysis of data were very much encouraging. Her contributions and suggestions have been of great help for which I am extremely grateful. With profound sentiments and gratitude the investigator acknowledge the encouragement and help received from the following persons for the completion of this study.

I am thankful to Dr. Jaganmohan Tharakan, HOD, Cardiology department for his constant support and encouragement. All the staffs and departmental head of Cardiology unit, helped me for the completion of this study at some time I am indebted to them.

Special thanks to computer division and library staff of SCTIMST for granting permission to utilize computer and library.

ARATHY.S.R

ABSTRACT

A study to assess the knowledge and practices of cardiac nurses about patient safety after cardiac catheterization.

Background: Cardiac catheterization is an invasive procedure which is used in the diagnosis and treatment of several cardiac diseases. It may lead to several major and minor complications which may contribute to morbidity and mortality. Early recognition of complications and proper care is logically tied to taking action to receive prompt treatment and thus minimizing further complications. **Objectives:** (i) To assess the knowledge level of cardiac nurses related to patient safety after cardiac catheterization. (ii) To assess the practice of cardiac nurses related to patient safety after cardiac catheterization. **Method:** A survey was conducted in 30 convenient samples with a pre-validated questionnaire and an observational tool was also used in assessing the quality of care provided. The total period of the study was from September 2011 to November 2011. The study population was staff nurses from cardiology medical intensive care unit and cardiology medical ward. **Result:** The knowledge level is higher in staff nurses who has experience more than 5 years compared to those whose years of experience is less than 5 years. On comparing these two, a significant p value of 0.015 was attained. On observing the practices; quality of care is adequate **Conclusion:** The study showed that the knowledge level increases with years of experience.

CONTENTS

Sl. No	Title	Page No
1	INTRODUCTION	1
1.1	Introduction	1
1.2	Background of study	2
1.3	Need for the study	5
1.4	Statement of problem	6
1.5	Objectives	6
1.6	Operational definition	6
1.7	Methodology	7
1.8	Delimitation	7
1.9	Organization of report	7
11	REVIEW OF LITERATURE	8
2.1	Introduction	8
2.2	Studies on nursing care and practices in patients undergone cardiac catheterization.	8
2.3	Performance evaluation of cardiac nurses.	12
2.4	Studies on detection and management of complications after cardiac catheterization	13
111	METHODOLOGY	18
3.1	Introduction	18
3.2	Research approach	18
3.3	Setting of the study	18
3.4	Study population	18
3.5	Sample and sampling technique	18
3.6	Inclusion criteria	19
3.7	Development of tool	19

3.8	Description of the tool	19
3.9	Pilot study	20
3.10	Data collection	20
3.11	Plan of analysis	20
3.12	Summary	20
1V	ANALYSIS AND INTERPRETATION	21
4.1	Introduction	21
4.2	Distribution of sample according to demographic data	21
4.3	Description of sample according to observation tool	24
4.4	Summary	27
V	SUMMARY, CONCLUSION, DISCUSSION AND RECOMMENDATION	28
5.1	Introduction	28
5.2	Summary	28
5.3	Objectives	28
5.4	Major findings of the study	29
5.5	Discussion	29
5.6	Limitations	29
5.7	Recommendations	30
5.8	Conclusions	30
V1	REFERANCE	
	Knowledge Test	

LIST OF TABLE

Table	Titles	Page No
Table 1	Complications of cardiac catheterization	4
Table 4.2a	Distribution of sample according to age	21
Table 4.2b	Distribution of sample according sex	22
Table 4.2c	Distribution of sample according to experience	23
Table 4.3a	Distribution of sample according to procedure	24
Table 4.3b	Distribution of sample according to area	25

LIST OF FIGURES

Figure	Titles	Page no
4.2a	Bar diagram of sample according to age	22
4.2b	Pie diagram according to sex	22
4.2c	Bar diagram of sample according to years of experience	23
4.3a	Bar diagram of sample according to procedure	25
4.3b	Pie diagram of sample according to area	26

LIST OF ABBREVIATIONS

Abbreviations	Expansions
CAG	Coronary angiogram
PTCA	Percutaneous transluminal coronary angioplasty
EPS	Electrophysiological study
RFA	Radio frequency ablation
PTMC	Percutaneous transluminal mitral commissurotomy
PCI	Percutaneous Intervention
CMICU	Cardiology medical intensive care unit
CMWRD	Cardiology medical ward
SCTIMST	Sree Chitira Tirunal Institute for Medical Sciences and Technology, Trivandrum

Chapter – 1

1.1 Introduction

Cardiac catheterization is a valuable diagnostic procedure which does a comprehensive examination of how the heart and its blood vessels function. One or more catheters is inserted through a peripheral blood vessel in the antecubital artery or vein or femoral artery or vein with x-ray guidance. This procedure gathers information such as adequacy of blood supply through the coronary arteries, blood pressures, blood flow throughout chambers of the heart, collection of blood samples, and x rays of the heart's ventricles or arteries.

A test that can be performed on either side of the heart, cardiac catheterization checks for different functions in both the left and right sides. When testing the heart's right side, tricuspid and pulmonary valve function are evaluated, in addition to measuring pressures of and collecting blood samples from the right atrium, ventricle, and pulmonary artery. Left-sided heart catheterization is performed by way of a catheter through an artery which tests the blood flow of the coronary arteries, function of the mitral and aortic valves, and left ventricle.

Some complications occur during the transfer of patients after cardiac catheterization or delayed or inadequately provided care.

Patient safety is defined as being free from accidental harm as a result of a health care encounter. It is the responsibility of the cardiac catheterization team to make that commitment to every patient and to each other. A well-functioning unit with a culture of safety, demonstrated clinical quality outcomes, and high internal/external customer satisfaction scores can avoid the risks associated with a less reliable unit.

1.2 Background

Peripheral vascular complications include hematomas, pseudoaneurysms, arteriovenous fistulae, acute arterial occlusions, cholesterol emboli, and infections that occur with an overall incidence of 1.5-9%. Major predictors of such complications following coronary interventional procedures include advanced age, repeat

percutaneous transluminal coronary angioplasty, female gender, and peripheral vascular disease. Minor predictors include level of anticoagulation, use of thrombolytic agents, elevated creatinine levels, low platelet counts, longer periods of anticoagulation, and use of increased sheath size (Nasser 1995).

. Coronary care unit is a nursing specialty that work with patient who suffer from various cardiac diseases like acute coronary syndrome ,myocardial infarction, rheumatic heart disease ,various arrhythmias, patient who had undergone various cardiac interventional procedures like coronary angiogram, percutaneous transluminal coronary angioplasty, percutaneous transluminal mitral commissurotomy, permanent pacemaker implantation, device closures ,balloon mitral valvotomy, balloon pulmonary valvotomy etc. Cardiac nurse must assess and care for patients with cardiac problems as well as patients undergone cardiac catheterizations procedures, patient for any negative signs of a change in condition, safe transport, administering medication, help with basic personal care needs ,control of bleeding, maintenance of haemostatis .This will help in minimizing the vascular complications in patient. Increased risk for vascular complications was found in patients who were older than 70 years, were female, had renal failure, underwent percutaneous intervention.(Dumont JP 2006).

The data collected from the cardiac unit of Sree Chitra Tirunal Institute of Medical Sciences and Technology, Trivandrum reveals that approximately 3800 cardiac catheterization procedures are done annually. Out of this, only 3% are done as emergency procedures, while others are done electively. The various interventional procedures done are percutaneous coronary intervention(PCI), percutaneous trans mitral commissurotomy (PTMC), cardiac catheterization study, atrial septal defect device closure(ASD DC), Ventricular septal defect device closure(VSD DC), electrophysiological study(EPS), radiofrequency ablation (RFablation), Permanent pacemaker insertion(PPI) etc.

Complications are usually temporary and may include minor infections, bleeding, abnormal heartbeats, and reaction to medications or dye. There is also a possibility that more serious but rare problems may develop during the procedure. These major cardiac catheterization complications include heart or lung problems, stroke, heart attack, or kidney failure. The frequency of haematoma was 1.3% (>10 cm) and 8.9% (>5 cm), which corresponds with reports from similar studies and

departments. The factors found to increase the risk of haematoma development can provide background for procedural changes and increase the focus on patients at increased risk in order to minimize the development of haematomas (Anderson 2005).

Table 1

The following table shows complications after cardiac catheterization.

1) Minor Complication	a) Bleeding b) Reaction to medications or dye c) Allergic skin reaction to tape, dressing, or latex d) Abnormal heartbeats e) Bruising f) Temporary pain g) Minor infections h) Nausea and vomiting
2) Major Complications	a) Serious bleeding b) Heart or lung problems, including irregular heart rhythms and lung or heart failure c) Stroke d) Heart attack e) Blood vessel, nerve, or organ damage f) Blood clots in the legs, pelvis, or lungs g) Failure of medical equipment h) Reactions to medication or dye i) Kidney failure, with possible dialysis needed - Other rare and unlikely events

Decreasing the amount of time patients are required to remain flat and supine is associated with no increase in hematoma and bleeding tendencies and is associated with a reduction in the perceptions of pain. (Fowlow B 1995).

Hemostasis and ambulation can be achieved faster with the suturing device than with manual compression, with a potential reduction in access site complications. (Gerckens U 1999). Local vascular complications may be diminished by a cautious and sensitive puncture technique with additional care in patients at higher risk for vascular complications (Heintzen M P 1998). . Requisite time in bed after percutaneous transluminal coronary angioplasty has been reduced to 4 hours at the University of Virginia Medical Center, the same time required for patients undergoing cardiac catheterization (Keeling AW 2000). Vascular access site complications may be reduced by early sheath removal, by avoiding placement of venous sheaths and by limiting heparin dosing to avoid excessive activated clotting times. (Mandak JS 1998). Angio-Seal and Prostar obtain a fast vascular access hemostasis after interventional procedures, with a low incidence of major vascular complications.(Sesana M 2000).

1.3 Need for the Study

Patient safety in minimizing complications is increasingly recognized as essential in practice of coronary care unit. Individual have right to safe and effective quality health care.

Cardiac nurses are responsible for providing patient's safety and minimizing vascular complications after cardiac catheterization procedures. They should be aware about the guidelines for providing safety for the patient. Each nurse should know the high risk patient, safe practices for handling and maintenance of homeostasis.

The investigators experience in coronary care unit in SCTIMST,TVM showed that some of the newly joined staff in cardiology department are less aware about safe practices. Hence the investigator planned to conduct a study to assess the knowledge of cardiac nurses on safety practices after cardiac catheterization procedures in cardiac unit

1.4 Statement of the problem

A study to assess the knowledge and practice among cardiac nurses about patient safety after cardiac catheterization.

1.5 Objectives

The objectives of this study are:-

1. To identify the knowledge of nurses related to patient safety after cardiac catheterization.
2. To assess the practice of cardiac nurses related to patient safety after cardiac catheterization.

1.6 Operational definition

Cardiac catheterization: It is the insertion of a catheter into a chamber or vessel of the heart. This is done for both investigational and interventional purposes. Subsets of this technique are mainly catheterization involving the catheterization of the coronary arteries, and catheterization of cardiac chambers and valves.

Cardiac nurse: cardiac nurse is a registered nurse working in CCU and cardio medical ward in SCTIMST, involved in care of patients after cardiac catheterization.

Safety: The state of being secure or safe from injury, harm, or loss; a judgment of the acceptability of risk—a measure of the probability of an adverse outcome and its severity associated with using a technology in a given situation

Knowledge: A state of awareness or understanding with conscious mind. In this study, investigator assesses the knowledge on safe practices of nurses after cardiac catheterizations.

Practice: Repeated performance or systematic exercise for the purpose of acquiring skill or proficiency .In this study, investigator assess the practice of nurses on safety after cardiac catheterization using a structured questionnaire.

Patient safety is a new healthcare discipline that emphasizes the reporting, analysis, and prevention of medical error that often leads to adverse health events. In this study, patient safety means minimizing complications in patients after cardiac catheterization.

1.7 Methodology

Descriptive survey approach was used for the study .The investigator also assess the practices of nurses in cardiac unit about safety practices after cardiac catheterizations using a checklist.

1.8 Delimitations

This study is limited to cardiac nurses working in coronary care unit and cardiology medical ward in SCTIMST, TVM.

1.9 Organization of the report

The report is divided into five chapters. The first chapter is the introduction. In this chapter, the background of the study is outlined, the subject assessing the nurse knowledge and practice about safety practices after cardiac catheterization procedures is briefed, the need and significance of research problem stressed, and problem and objectives are stated. An attempt is made to operationally define the terms, so as to clarify a brief discussion on methodology adopted for the study .The delimitations are specified.

Chapter - II

REVIEW OF LITERATURE

2.1 Introduction

Review of literature is the key step in the research process. It refers to a broad, comprehensive, in-depth, systematic and critical review of scholarly publications, unpublished scholarly print materials and audio visual materials .(Basavanthappa.Y.B2001).

A review of literature is an essential activity of scientific research projects, which provides a basis for future investigation, justify feasibility of the study, indicate, constraints of data collection and helps to relate findings from one study to another with a view to establish a comprehensive body of scientific knowledge in a professional discipline from which valid and pertinent theories may be developed.(Fay.A 1979).

The literature review relevant for the study is presented on the following sections:

2.2 Studies on the nursing care and practices in patients undergone cardiac catheterization procedures

2.3 Performance evaluation of cardiac nurses

2.4 Studies on detection and management of complications after cardiac catheterization

2.2) Studies on the nursing care and practices in patients undergone cardiac catheterization procedures.

Juran, et al (1999) conducted a study on the nursing interventions to decrease bleeding at the femoral access site after PCI. The investigators aims to measure the relationship between nursing interventions and complications at the arterial access site in patients undergoing PCI and to recommend a standard of care to minimize bleeding complications. In a descriptive, correlational 4010-patient study, nursing care interventions after coronary procedures were measured.

Observed standards of care were assessed, and regression techniques were used to evaluate nursing interventions and the effect of the interventions on bleeding at the access site after percutaneous coronary procedures. Several significant correlations between nursing interventions and the occurrences of moderate to severe bleeding at the access site were found. The most significant factors in decreasing complications at the access site were early removal of the arterial sheath, the type of pressure mechanism used to achieve arterial hemostasis, staffing allocation, and the person and method used to remove the sheath.

Most nursing interventions aimed at decreasing bleeding at the vascular access site increase nursing workload but do not significantly affect bleeding in the groin. These results underscore the importance of continued clinical research studies to validate nursing practice on the basis of patients' outcomes.

Rolley, et al(2010) developed a study on nursing care practices following a percutaneous coronary intervention. The authors describes the practice standards and priorities of care of cardiovascular nurses in Australia and New Zealand. Item generation for the survey was informed by an integrative literature review and existing clinical guidelines. A 116-item Web-based survey was administered to cardiovascular nurses, via electronic mail lists of professional cardiovascular nursing organizations, using a secure online data collection system. Data were collected from March 2008 to March 2009. A total of 148 respondents attempted the survey, with 110 (74.3%) completing all items. All respondents were registered nurses with an average of 12.3 (SD 7.61) years of clinical experience in the cardiovascular setting. A range of practice patterns was evident in ambulation time after percutaneous coronary intervention, methods of sheath removal, pain relief, and patient positioning. Respondents consistently rated psychosocial care a power priority than other tasks and also identified a knowledge deficit in this area. The survey identified diversity of practice patterns and a range of educational needs.

Heintzen and Straur (1998) conducted a study on peripheral arterial complications after heart catheterization. The investigators find out that currently, incidences of 0.1 to 2% for significant local vascular complications after diagnostic transfemoral catheterization are reported, after interventional transfemoral treatment 0.5 to 5% and after complex procedures using large sheath sizes with

peri procedural anticoagulation up to 14%. Following transbrachial and transradial catheterization, local vascular complications at the entry site amount to 1 to 3% after diagnostic and 1 to 5% after interventional procedures. Local vascular complications may be diminished by a cautious and sensitive puncture technique with additional care in patients at higher risk for vascular complications (females, prediagnosed peripheral vascular disease, mandatory anticoagulation, necessity for large sheaths). By using smaller sized catheters and an adequate, defensive anticoagulation regimen, the rate of arterial access site complications may be reduced. The study concluded that proper methods for achievement of hemostasis as well as a close and careful observation after sheath withdrawal are required.

Nasser, et al (1995) studied on peripheral vascular complications following interventional procedures. According to the investigators, peripheral vascular complications include hematomas, pseudoaneurysms, arteriovenous fistulae, acute arterial occlusions, cholesterol emboli, and infections that occur with an overall incidence of 1.5-9%. Major predictors of such complications following coronary interventional procedures include advanced age, repeat percutaneous transluminal coronary angioplasty, female gender, and peripheral vascular disease. Minor predictors include level of anticoagulation, use of thrombolytic agents, elevated creatinine levels, low platelet counts, longer periods of anticoagulation, and use of increased sheath size. Ultrasound-guided compression repair of pseudoaneurysms and arteriovenous fistulae are discussed, as are newer methods of treatment such as hemostatic puncture closure devices. The study concluded that anticipation and early recognition of possible peripheral vascular complications in conjunction with careful attention to the optimal activated clotting time for sheath removal following coronary interventional procedures may translate into fewer vascular complications as well as into shorter and less costly hospital stays.

Best, et al (2010) conducted a prospective study of early ambulation 90 minutes post left heart catheterization using a retrospective comparison group. The investigators studied on a prospective non-concurrent design with a retrospective control. Retrospective data from the APPROACH database and chart reviews were analyzed for a period of six months for the control group on the traditional three- to four-hour ambulation protocol (n = 402). Prospective data were gathered for six months for the experimental group (n = 193). The result suggested that early

ambulation for selected patients at 90 minutes is safe and has the potential to increase both patient comfort and quality of care.

Liew R, et al (2007) developed study on how to minimize complications with a manual, nurse-led protocol for femoral sheath removal following coronary angiography. The investigators aimed to provide contemporary information on the complication rates after femoral artery sheath removal using a specific, nurse-led protocol, which is universally applicable and can be readily adopted by other units . Data were collected prospectively on patients undergoing diagnostic coronary angiography via the transfemoral route in a single centre. Sheaths were removed by trained cardiac nurses with direct application of manual pressure over the femoral artery in accordance with a specific protocol. The investigators also investigated the same endpoints in patients who received an arteriotomy closure device (ACD) during the study period. None of the 516 patients who had their femoral sheaths removed with manual compression developed a major haematoma or complication. A minor haematoma developed in 1.6% of patients. Similarly, none of the 484 patients who received an ACD developed a major haematoma and 0.8% developed a minor haematoma. Mean arterial blood pressures were higher in patients that developed a haematoma. They concluded that a manual, nurse-led system of femoral sheath removal following diagnostic coronary angiography is very safe and effective and that this remains a viable method of access site management.

2.3) Performance evaluation of cardiac nurses

Yan, et al (2011) conducted a study on continuous quality improvement of nursing care. The authors investigated the outcome of management participation in work to revise cardiac catheterization clinical pathway operating procedures. BNHI-qualified cases for Tw-DRGs 125 payment principles were recruited as study subjects to revise the cardiac catheterization clinical pathway. Researchers compared pre- and postrevision values in terms of mean medical care fees, patient volumes, healthcare quality, and length of hospital stay, as well as financial risk. Significant differences were observed in precatheterization nursing care completion rates, mean lengths of hospital stay, diagnosis numbers, surgical

treatment numbers, and numbers of complications or co-morbidities. Medical utilization was also significantly lower ($p < .05$) after revision implementation.

Schiksl SchoonhovenL, V et al (2007) studied on the performance evaluation of arterial femoral sheath removal by registered nurses after PCI. The aim of the investigators was to check if nurses' performance in 1999 and 2005 was in accordance with the protocol for arterial sheath removal and to compare both measurements to explore differences in performance over time. They trained registered nurses in sheath removal and observed them during sheath removal in elective uncomplicated PCI-patients. They developed and used a checklist, including 10 elements and 65 items. The result showed that both in 1999 ($n=43$ observations with 13 nurses) and 2005 ($n=42$ observations with 16 nurses) the norm of more than 90% for the total score was not achieved: they found 82% and 80%, respectively.

Sangkachand P,Sorosario B,Funk M(2011) studied on continuous ST segment monitoring, nurse's attitudes, practices and quality of patient care. The investigators conducted their study on 61 nurses and 202 patients with acute coronary syndrome in a cardiac intensive care unit. Baseline data on nurses' use of and attitude toward ischemia monitoring and quality of care were obtained. Education was then provided and ST-Map software was installed on all monitors. Follow-up data were obtained 4 months later. The percentage of nurses who had ever used ischemia monitoring was 13% before ST Map and 90% afterward ($P < .001$). The most common reason for not using ischemia monitoring before ST Map was inadequate knowledge (62%). The most common reason for liking ischemia monitoring after ST Map was knowing when a patient has ischemia (80%). Time to acquisition of a 12-lead electrocardiogram in response to symptoms or ST-segment changes was 5 to 15 minutes before ST Map and always less than 5 minutes afterward ($P < .001$). Time to return to the catheterization laboratory did not differ before and after ST Map. The study concluded that ST Map was associated with more frequent use of ischemia monitoring, improved attitudes of nurses toward ischemia monitoring, and shorter time to obtaining 12-lead electrocardiograms.

2.4) Studies on detection and management of complications after cardiac catheterization

Ron Waksman, et al (1995) conducted a study on predictors of groin complications after balloon and new-device coronary intervention. The investigators reviewed the clinical course of 5,042 patients who underwent percutaneous transluminal coronary angioplasty (PTCA) using balloons or new devices: (stent, laser, directional and rotational atherectomy). A vascular complication was defined as the formation of a groin hematoma, bleeding, pseudoaneurysm, fistula, or the need for surgical repair. Vascular complications occurred in 309 (6.1%) patients, and 117 (2.3%) required vascular repair; among these patients, surgery was performed for correction of an arteriovenous fistula in 12%, repair of pseudoaneurysm in 72%, repair for expanding hematoma and femoral artery lacerations in 10%, and retroperitoneal bleeding in 6%. The correlates of vascular complications were older age (66.8 vs 62.1 years; $p < 0.0001$), female gender (43% vs 26%; $p < 0.0001$), increased weight (82.1 ± 16.46 vs 78.0 ± 16.6 kg; $p < 0.001$), higher systolic blood pressure (140 ± 25 vs 134 ± 20 mm Hg; $p < 0.001$), increased heparin dose during the procedure ($14,352 \pm 3,879$ vs $13,599 \pm 3,508$ IU; $p = 0.001$), administration of heparin after the procedure (232 vs 2,985 patients; $p < 0.0001$) and intracoronary stenting (14.9% vs 3.5%; $p < 0.0001$). Fifteen patients of 214 (7.0%) who underwent stent implantation had surgical repair. The study concluded that vascular complications were not related to the size of the arterial sheath (8.11 ± 0.8 vs 8.8 ± 0.7 Fr; $p = 0.11$) and the use of devices other than stents (laser, atherectomy) did not increase the rate of vascular complications.

Dumont CJ, Keeling AW, Bourguignon C, Sarembock IJ, Turner M (2006) conducted a study on predictors of vascular complications post diagnostic cardiac catheterization and percutaneous coronary interventions. The investigators describes a retrospective, descriptive, and correlational study of 11,119 patients who underwent cardiac catheterization and/or percutaneous intervention, with femoral artery access, in the years 2001 to 2003. The study concluded that increased risk for vascular complications was found in patients who were older than 70 years, were female, had renal failure, underwent percutaneous intervention, and had a venous sheath.

Best DG, Pike R, Grainger P, Eastwood CA, Carroll K (2010) conducted a prospective study of early ambulation 90 minutes post-left heart catheterization using a retrospective comparison group. The investigators aims to determine safety of ambulating patients at 90 minutes post-LHC sheath removal compared to the current practice of ambulation at three to four hours post-sheath removal. The study was a prospective non-concurrent design with a retrospective control. Retrospective data from the APPROACH database and chart reviews were analyzed for a period of six months for the control group on the traditional three- to four-hour ambulation protocol (n = 402). Prospective data were gathered for six months for the experimental group (n = 193). The study concluded that early ambulation for selected patients at 90 minutes is safe and has the potential to increase both patient comfort and quality of care.

Eidt et al, (1999) conducted a study on surgical complications from hemostatic puncture closure devices. A retrospective, single-center, nonrandomized observational study was made of all vascular complications following femoral cardiac catheterization by the investigators. An immediate mechanical failure of the device was experienced in 34 (8%) patients. Surgical repair was required in 1.6% (7 of 425) of patients following Angio-Seal versus 0.3% (5 of 1662) following routine manual compression (P = 0.004). In 5 patients, the device caused either complete occlusion or stenosis of the femoral artery. The polymer anchor embolized in 1 patient and was retrieved with a balloon catheter at surgery. The study concluded that during the first year of utilization of a percutaneous hemostatic closure device following cardiac catheterization, we observed a marked increase in arterial occlusive complications requiring surgical repair.

U Gerckens, N Cattelaens, E G Lampe, E Grube (1999) conducted a study on management of arterial puncture site after catheterization procedures: evaluating a suture-mediated closure device. The investigators aims to overcome the challenge associated with achievement in hemostasis after a catheterization procedure, a suture-based closure device was compared with manual compression in a 600-patient randomized trial. The major study end points included the incidence of vascular complications and the time to ambulation after the procedure. The study included diagnostic or interventional procedures. The suture-mediated closure was performed immediately after the procedure independent of the anticoagulation level, whereas

manual compression was performed per hospital protocol with sheath removal relying on normalization of patient's anticoagulation status. A significant reduction in time to achieve hemostasis (7.8 4.8 vs 19.6 13.2 minutes, $p < 0.0001$) and time to ambulation (4.5 6.5 vs 17.8 5 hours, $p < 0.0001$) was associated with use of the suture-mediated closure device. The incidence of vascular complications was similar in the overall population (5.7% for suturing device vs 11.3% for compression) or in the interventional patient subset (8.4% for suturing device vs 9.6% for compression). There was a significant reduction in the incidence of vascular complications in the diagnostic procedure subset (4.4% for suturing device vs 12.1% for compression, $p < 0.05$). The study concluded that the use of a suture-mediated closure device represents a safe alternative to manual compression.

Duffin, et al (2001) conducted a study on femoral arterial puncture management after percutaneous coronary procedures: a comparison of clinical outcomes and patient satisfaction between manual compression and two different vascular closure devices. The investigators compared Perclose and Angio-Seal, two devices and tested them in reference to standard MC for safety, effectiveness and patient preference. Prospective demographic, peri-procedural, and late follow-up data for 1,500 patients undergoing percutaneous coronary procedures were collected from patients receiving femoral artery closure by MC ($n = 469$), Perclose ($n = 492$), or Angio-Seal ($n = 539$). Peri-procedural, post-procedural, and post-hospitalization endpoints were: 1) safety of closure method; 2) efficacy of closure method; and 3) patient satisfaction. Patients treated with Angio-Seal experienced shorter times to hemostasis ($p < 0.0001$, diagnostic and interventional) and ambulation (diagnostic, $p = 0.05$; interventional, $p < 0.0001$) than those treated with Perclose. Those treated with Perclose experienced greater access site complications (Perclose vs. Angio-Seal, $p = 0.008$; Perclose vs. MC, $p = 0.06$). Patients treated with Angio-Seal reported greater overall satisfaction, better wound healing and lower discomfort (each vs. Perclose or vs. MC, all $p < \text{or} = 0.0001$). For diagnostic cath only, median post-procedural length of stay was reduced by Angio-Seal (Angio-Seal vs. MC, $p < 0.0001$; Angio-Seal vs. Perclose, $p = 0.009$). The study concluded that no indifference was seen in length of stay for interventional cases.

Filis K, et al (2007) conducted a study on management of early and late detected vascular complications following femoral arterial puncture for cardiac

catheterization. The investigators evaluated on evaluated when and whether conservative, urgent surgical, or elective surgical treatment is appropriate. A retrospective analysis was made of 45 consecutive iatrogenic vascular trauma patients, among 10,450 cardiac diagnostic or therapeutic catheterizations. Patients' demographics, type of catheterization, time from catheterization to initial diagnosis, the type of complication (thrombosis, infection, bleeding, pseudoaneurysm, etc.), time from presentation of the complication to definite treatment, diagnostic imaging and decision making, the surgical or conservative management, the length of stay and the clinical outcome were determined and analyzed. The investigators identified and treated 30 early and 15 late (after patient's discharge) arterial complications: 18 pseudoaneurysms, 6 bleedings, 9 hematomas, 5 deep vein thromboses, 3 arteriovenous fistulas, 2 arterial embolisms and 2 arterial thromboses. Eight patients underwent emergency surgical repair, three elective surgical repair and 31 were managed conservatively. The study concluded that bleeding and acute leg ischemia were the most frequent indication for emergency surgical treatment, whereas the majority of pseudoaneurysms, fistulas and vein thrombosis were successfully treated conservatively.

Chapter - 3

METHODOLOGY

3.1 Introduction

This chapter contains research approach, study design, the sampling technique, development and description of the tool, pilot study, data collection and plan of analysis.

3.2 Research approach

Descriptive survey approach was used in this study

3.3 Setting of the study

The study was conducted in cardiac medical intensive care units and cardiac medical wards of Sree Chitra Tirunal Institute For Medical Science And Technology, Thiruvananthapuram.

3.4 Study population

Populations of the study are the staff nurses in cardiac medical ICU and cardiology wards of SCTIMST, those who are caring the patients after cardiac catheterization.

3.5 Sample and sampling technique

Convenient sampling is done for this study; 30 samples collected. The pilot study was done in 5 staff nurses. The total period of study is one month from October to November 2011.

3.7 Inclusion criteria

Staff nurses who are receiving the patients after cardiac catheterization and those who are willing to participate are included in the study.

3.8 Development of the tool

Self-prepared structured questionnaire and observation tool was developed to assess the knowledge and practice of cardiac nurses who are working in cardiac medical ICU and cardiac medical ward. In SCTIMST Trivandrum .Several journals and textbooks helped to develop the tool and experts in SCTIMST Trivandrum approved it. The self-prepared questions contain 10 questions regarding several aspects of preventing complications after cardiac catheterization, after care, blood investigations, physical activity etc. An observational tool was made to assess the practice.

3.9 Description of the tool

The tool used in this study contains the following parts:

First the questionnaire contains

- ❖ Demographic data
- ❖ Questions about the development of complications after cardiac catheterization

Second the Observation tool contains

- ❖ Demographic data
- ❖ Nursing care after cardiac catheterization

3.10 Pilot study

Pilot study was conducted on the month of October 2011 after obtaining permission from the authorities of hospital management. The study was conducted in 5 cardiac nurses both male and female between the age group 26 to 55 years of age with a self-prepared questionnaire and observation tool. After pilot study

assessment has been done after making necessary corrections in the questionnaire.

3.11 Data collection procedure

Formal permission obtained from the authorities for the collection of data. The period of data collection was from September to October 2011. The data was collected from the cardiac medical intensive care units and cardiac medical wards of SCTIMST Trivandrum. The investigator first introduced her and explained the need and purpose of the study, the knowledge level and practice assessed after obtaining permission from the cardiac nurses.

3.12 Plan of analysis

The investigator developed the plan of analysis after the pilot study. The data obtained from the samples was analyzed by using descriptive statistics.

3.13 Summary

This chapter contains research approach, settings, population, sample and sampling technique, development and description of the tool, data collection and plan of analysis.

Chapter - 4

ANALYSIS AND INTERPRETATION

4.1 Introduction

Analysis is the categorizing, ordering, manipulating and summarizing the data to an intelligible and interpretable form so that the research problem can be studied and tested including relationship between variables. Interpretation refers to the process of making sense of the results and examining the implications of the findings within a broad context.

4.2 Distribution of samples according to demographic data

4.2 Description of samples according to observation tool

Section A

4.2a Distribution of samples according to age.

Table 4.2a shows distribution of samples according to age

Age	Frequency	Percentage
20-29	16	53.5
30-39	6	20
40-49	4	13.3
50-59	4	13.3
Total	30	100

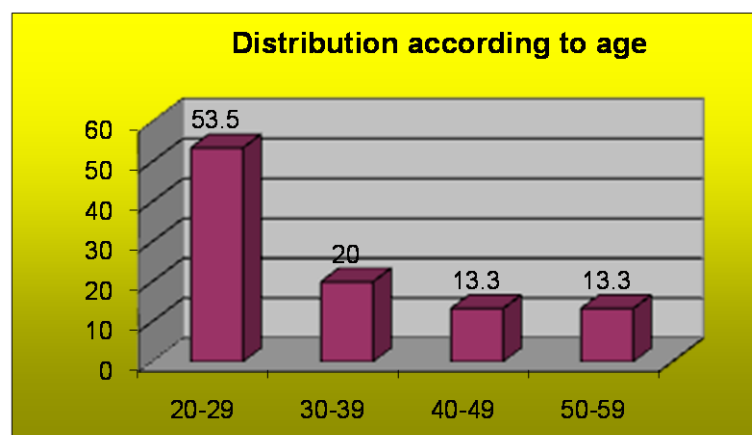
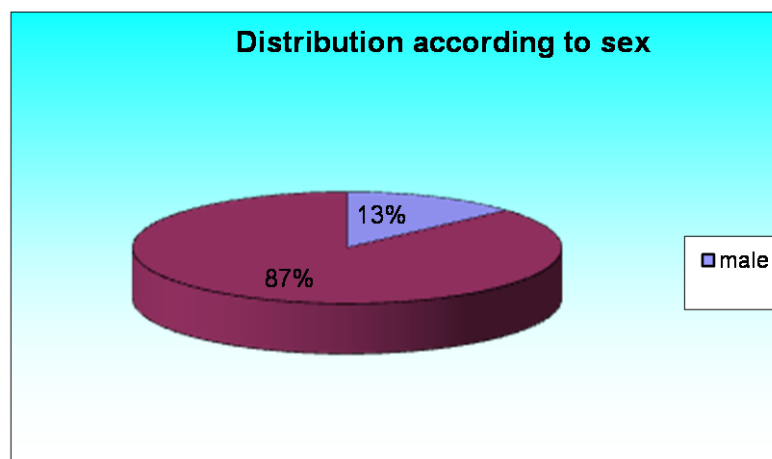


Figure4.2a shows distribution of sample according to age.

Table 4.2b shows distribution of samples according to sex

Sex	Frequency	Percentage
Male	4	13.3
Female	26	86.6
Total	30	100

Figure 4.2b shows distribution of sample according to sex in a pie diagram



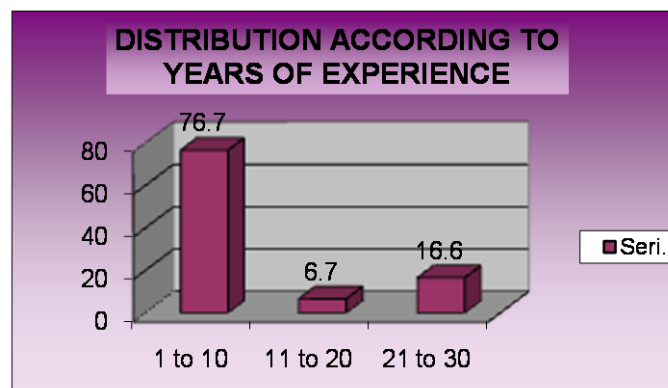
The analysis shows, the mean age of female is 7.8 and the standard deviation is 1.47 where as mean age of males is 7 and the standard deviation is 1.2. On assessing the knowledge from these two, we have got a p value of 0.11, which is not significant. From this we can infer that there is not much relation between sex and knowledge level.

Table 4.2c shows distribution of sample according to experience

Years of experience	Frequency	Percentage
1-10	23	76.7
11-20	2	6.7
21-30	5	16.6
Total	30	100

The table explains that the sample from which data collected includes 23 staff nurses having 1 to 10 years of experience, 2 staff nurses of experience between 11 to 20 years, 5 of them of 21 to 30 years of experience.

Figure 4.2c shows distribution of samples according to experience in bar diagram.



On analyzing the data it is found out that samples with less than 5 years of experience have got a mean of 6.8 and a standard deviation of 1.22. The samples with age more than 5 years has got a mean of 8.8 and a standard deviation of 1.32. The p value attained on analyzing these two is 0.015, which is significant. From this we can infer that knowledge level is more in those whose experience is more than 5 years.

Above 5 years experience : -The experience knowledge level range from 5 to 10 with a median of 8 and a mode of 9.

Below 5 years experience : -The experience knowledge level range from 4 to 9 with a median of 7 and a mode of 7.

Section B

4.3 Description of samples according to observation tool.

The Observation study was done in 14 staff nurses and 30 patients

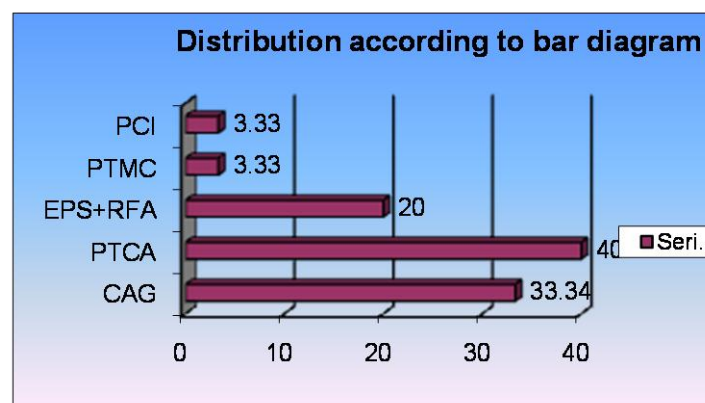
.

Table 4.3a shows distribution of samples according to the procedure.

Name of the procedure	Frequency	Percentage
CAG	10	33.34
PTCA	12	40
EPS+RFA	6	20
PTMC	1	3.33
PCI	1	3.33
Total	30	100

The table explains that the data collected from the samples include 10 patients who had undergone CAG,12 patients who have undergone PTCA,6 of them EPS+RFA,1 PTMC,1 PCI .Thus total 30 patients who had undergone various cardiac catheterization procedures.

Figure 4.3a shows the distribution of samples according to the procedure in a bar diagram



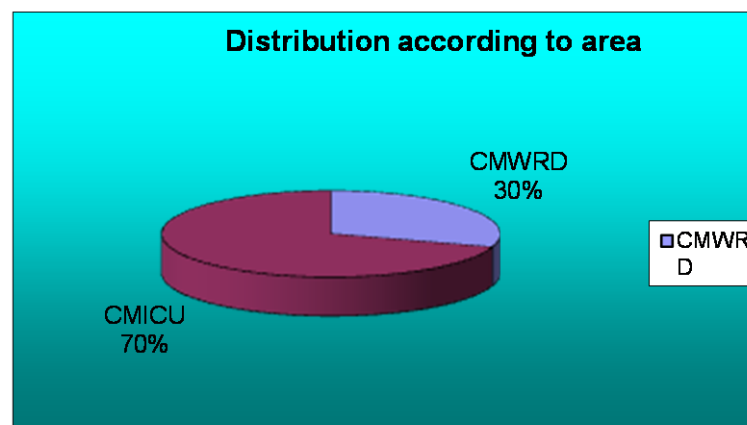
Majority (40%) of the patients underwent PTCA according to the data. All the patients were transported to ward or ICU in trolley. Out of 30 patients only one patient had a radial puncture for cardiac catheterization, the remaining had femoral site.

Table 4.3b shows distribution of samples according to area.

Area	Frequency	Percentage
CMWRD	9	30
CMICU	21	70
Total	30	100

We obtained the data of 9 patients from cardiology medical ward and 21 patients from cardiology medical ICU.

Figure 4.3b shows distribution of samples according to area.



Majority of the patient were shifted to CMICU(70%) after the procedure.

On receiving the patient after procedure both in ICU and ward puncture site assessment and distal pulse checked to all patients. But frequency of assessing puncture site and checking distal pulse varied. This is because (1) patients with low risk are shifted to ward,(2) in ward as the staff to patient ratio is more , they are not able to assess them frequently. But it does not lead to any complications in any of

the patients. In ICU cardiac monitoring was done continuously to patients were as in ward only vital signs checked and charted. Communication with the patient was done effectively in both ward and ICU. Patients who had undergone PTCA were given iv fluids until sheath removal is over and for others fluid administered once they had taken orally well. No patients had any episodes of vasovagal attacks or any untoward symptoms. Two patients did not pass urine in 8 hours, for them, bladder palpations and intervention given. Both of them had adequate urine output after the nursing intervention. All patients had taken food without any untoward symptoms, intake output chart maintained, documentation done and seen by relatives .For patient who had undergone PTCA, sheath removal was done without any complication and compression given effectively until bleeding stopped.

According to the observational tool, there is no development of complications due to poor nursing care both in ward as well as ICU.

SUMMARY

This Chapter dealt with the objectives in which the data were analyzed, distribution of samples according to the demographic variables such as age, experience and distribution of sample according to knowledge level. On analyzing the data, the p value attained is 0.015, which is significant. The study concluded that the knowledge level is higher in those with experience more than 5 years.

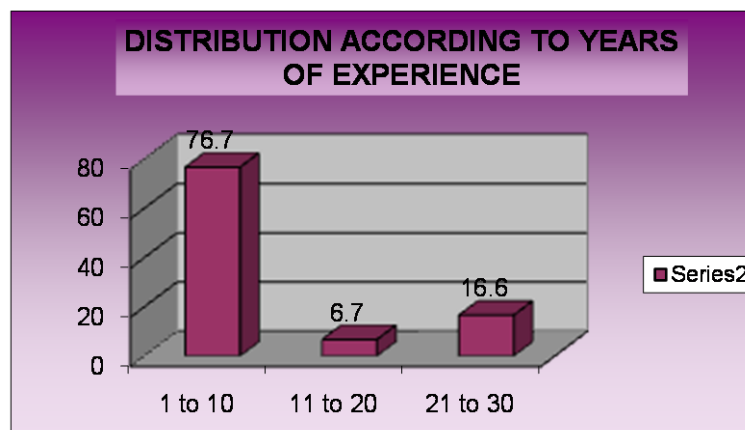
The analysis shows, the mean age of female is 7.8 and the standard deviation is 1.47 where as mean age of males is 7 and the standard deviation is 1.2. On assessing the knowledge from these two, we have got a p value of 0.11, which is not significant. From this we can infer that there is not much relation between sex and knowledge level.

Table 4.2c shows distribution of sample according to experience

Years of experience	Frequency	Percentage
1-10	23	76.7
11-20	2	6.7
21-30	5	16.6
Total	30	100

The table explains that the sample from which data collected includes 23 staff nurses having 1 to 10 years of experience, 2 staff nurses of experience between 11 to 20 years, 5 of them of 21 to 30 years of experience.

Figure 4.2c shows distribution of samples according to experience in bar diagram.



On analyzing the data it is found out that samples with less than 5 years of experience have got a mean of 6.8 and a standard deviation of 1.22. The samples with age more than 5 years has got a mean of 8.8 and a standard deviation of 1.32. The p value attained on analyzing these two is 0.015, which is significant. From this we can infer that knowledge level is more in those whose experience is more than 5 years.

Above 5 years experience : -The experience knowledge level range from 5 to 10 with a median of 8 and a mode of 9.

Below 5 years experience : -The experience knowledge level range from 4 to 9 with a median of 7 and a mode of 7.

Section B

4.3 Description of samples according to observation tool.

The Observation study was done in 14 staff nurses and 30 patients

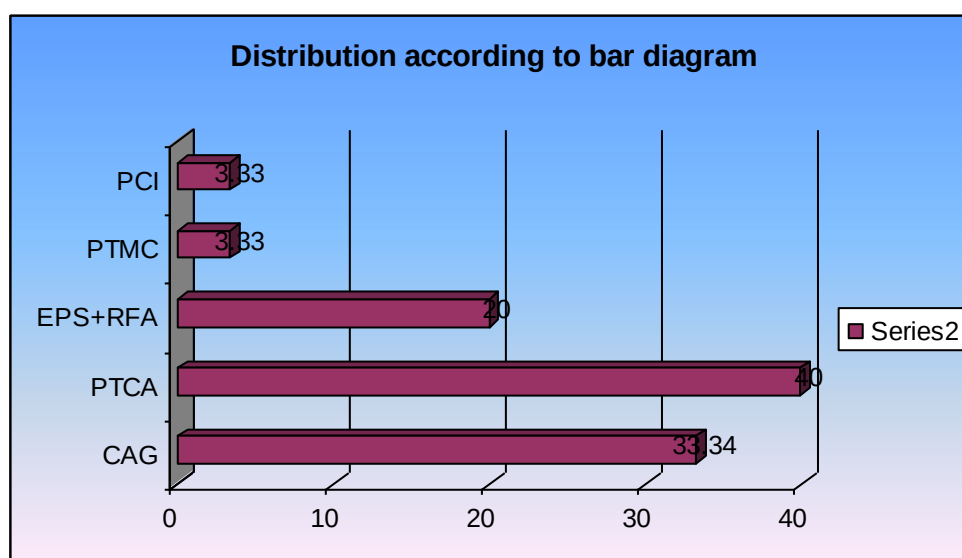
.

Table 4.3a shows distribution of samples according to the procedure.

Name of the procedure	Frequency	Percentage
CAG	10	33.34
PTCA	12	40
EPS+RFA	6	20
PTMC	1	3.33
PCI	1	3.33
Total	30	100

The table explains that the data collected from the samples include 10 patients who had undergone CAG, 12 patients who have undergone PTCA, 6 of them EPS+RFA, 1 PTMC, 1 PCI. Thus total 30 patients who had undergone various cardiac catheterization procedures.

Figure 4.3a shows the distribution of samples according to the procedure in a bar diagram



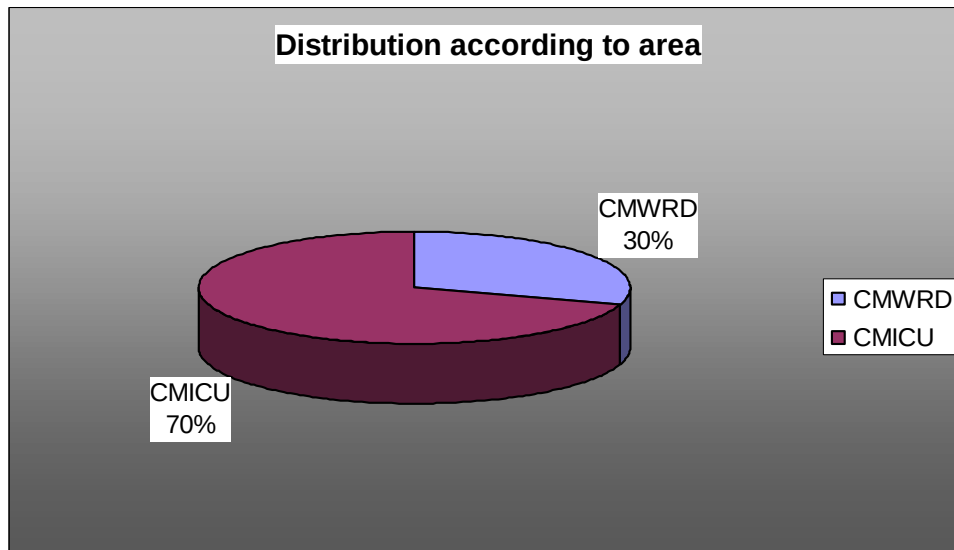
Majority (40%) of the patients underwent PTCA according to the data. All the patients were transported to ward or ICU in trolley. Out of 30 patients only one patient had a radial puncture for cardiac catheterization, the remaining had femoral site.

Table 4.3b shows distribution of samples according to area.

Area	Frequency	Percentage
CMWRD	9	30
CMICU	21	70
Total	30	100

We obtained the data of 9 patients from cardiology medical ward and 21 patients from cardiology medical ICU.

Figure 4.3b shows distribution of samples according to area.



Majority of the patient were shifted to CMICU(70%) after the procedure.

On receiving the patient after procedure both in ICU and ward puncture site assessment and distal pulse checked to all patients. But frequency of assessing puncture site and checking distal pulse varied. This is because (1) patients with low risk are shifted to ward,(2) in ward as the staff to patient ratio is more , they are not able to assess them frequently. But it does not lead to any complications in any of the patients. In ICU cardiac monitoring was done continuously to patients were as in ward only vital signs checked and charted. Communication with the patient was done effectively in both ward and ICU. Patients who had undergone PTCA were given iv fluids until sheath removal is over and for others fluid administered once they had taken orally well. No patients had any episodes of vasovagal attacks or any untoward symptoms. Two patients did not pass urine in 8 hours, for them,bladder palpations and intervention given. Both of them had adequate urine output after the nursing intervention. All patients had taken food without any untoward symptoms, intake output chart maintained, documentation done and seen by relatives .For patient who had undergone PTCA, sheath removal was done without any complication and compression given effectively until bleeding stopped.

According to the observational tool, there is no development of complications due to poor nursing care both in ward as well as ICU.

SUMMARY

This Chapter dealt with the objectives in which the data were analyzed, distribution of samples according to the demographic variables such as age, experience and distribution of sample according to knowledge level. On analyzing the data, the p value attained is 0.015, which is significant. The study concluded that the knowledge level is higher in those with experience more than 5 years.

Chapter – V

SUMMARY, CONCLUSION, DISCUSSION, LIMITATIONS, RECOMMENDATIONS, CONCLUSION.

5.1 Introduction

This chapter gives a brief account of the preset study including conclusions drawn from the findings and possible applications of the result; recommendation for future research and suggestions for improving the present study is also included.

5.2 Summary

The study was conducted in cardiology medical ICU and cardiology medical wards of Sree Chitra Institute for Medical Sciences and Technology. Study populations consist of 30 cardiac nurses and observational samples of 30 patients in CMICU and CMWRD. A survey including questionnaire was conducted in cardiac nurses to assess the knowledge level and an observational study was conducted in 30 convenient samples. The questionnaire consists of 10 questions based on the occurrence of complications after cardiac catheterization. The observational tool included 30 observations.

5.3 Objectives

The specific objective of the study was:-

1. To identify the knowledge of nurses related to patient safety after cardiac catheterization.
2. To assess the practice of cardiac nurses related to patient safety after cardiac catheterization.

The data were analyzed using appropriate statistical test and by p values assess the effectiveness of the intervention.

5.4 Major findings of the study

On analyzing the data it is found out that samples with less than 5 years of experience have got a mean knowledge of 6.8 and a standard deviation of 1.22. The

samples with age more than 5 years has got a mean knowledge of 8.8 and a standard deviation of 1.32. The p value attained on analyzing these two is 0.015, which is significant. From this we can infer that knowledge level is more in those whose experience is more than 5 years. According to the observational tool, there is no development of complications due to poor nursing care both in ward as well as ICU.

5.5 Discussion

Out of 30 subjects, staff nurses with experience of more than 5 years has more knowledge level than those whose experience level is less than 5 years. On assessing the practice level, there is no significant difference in giving care to the patients. On comparing with earlier studies, the development of complications in patients after cardiac catheterization depends to an extent on the basis of nursing care given.

5.6 Limitations

- Study was limited to the SCTIMST, Trivandrum.
- Cardiac nurses who are not willing to participate in this study are not included.
- The study was limited only in cardiac nurses of CMICU and CMWARD.
- The sample size was limited to 30 in each group.

5.7 Recommendations

- The study can be done using large samples
- The study can be done in other ICUs and wards.

5.8 Conclusion

In this study conducted among cardiac nurses at SCTIMST, the development of complications in patients after cardiac catheterization is minimal. This is due to adequate knowledge of staff nurses and comprehensive nursing care.

REFERENCE

1. Anderson K, Bregendahl M, Kaestel H, Skriver M, Ravkilde J. Haematoma after coronary angiography and percutaneous coronary intervention via the femoral artery frequency and risk factors. *Eur J Cardiovasc Nurs.* 2005;4:123-127.
2. Barkman A, Lunse CP. The effect of early ambulation on patient comfort and delayed bleeding after cardiac angiogram: a pilot study. *Heart Lung.* 1994;23:112-117.
3. Best DG, Pike R, Grainger P, East wood CA, Carroll K. A Prospective study of early ambulation 90 minutes post left heart catheterization using a retrospective comparison group. *Can J Cardiovasc Nurs.* 2010;20(4):15-20.
4. . Dangas G, Mehran R, Kokolis S, et al. Vascular complications after percutaneous coronary interventions following hemostasis with manual compression versus arteriotomy closure devices. *J Am Coll Cardiol.* 2001;38:638-641
5. Duffin DC, Muhlestein JB, Allison SB, et al. Femoral arterial puncture management after percutaneous coronary procedures: a comparison of clinical outcomes and patient satisfaction between manual compression and two different vascular closure devices. *J Invasive Cardiol.* 2001;13:354-362.
6. Dumont JP, Keeling AW, Bourguignon C, Sarembock IJ, Turner M. Predictors of vascular complications post diagnostic cardiac catheterization and percutaneous coronary interventions. *Dimens Crit Care Nurs.* 2006;25(3):137-142.
7. Eggebrecht H, Haude M, vonBirgelen C, et al. Early clinical experience with the 6 french AngioSeal device: immediate closure of femoral

puncture sites after diagnostic and interventional coronary procedures. Catheter Cardiovasc Interv. 2001;53:437-442.

8. Eidt JF, Habibipour S, Saucedo JF, et al. Surgical complications from hemostatic puncture closure devices. Am J Surg. 1999;178:511-516.
9. Fowlow B, Price P, Fung T. Ambulation after sheath removal: a comparison of 6 and 8 hours of bed rest after sheath removal in patients following a PTCA procedure. Heart Lung. 1995;24:28-37.
10. Gerckens U, Cattelaens N, Lampe E, Grube E. Management of arterial puncture site after catheterization procedures: evaluating a suture mediated closure device. Am J Cardiol. 1999;83:1658-1663.
11. Harper JP. Post diagnostic cardiac catheterization ;development and evaluation of an evidence based standard of care. J nurses Staff Dev. Nov-Dec 2007;23(6):271-76
12. Herntzen M P, Straure BE. Peripheral arterial complications after heart catheterization. Herz .1998;23(1):4-20.
13. Jackson JL, Meyer GS, Pettit T. Complications from cardiac catheterization: analysis of a military database. Mil Med. 2000;165:298-301.
14. Juran NB et al. Nursing interventions to decrease bleeding at the femoral access site after percutaneous coronary intervention. SANDBAG Nursing Coordinators. Standards of Angioplasty Nursing Techniques to Diminish Bleeding around the Groin. Am J Crit care. Sep 1999;8(5):303-13.
15. Keeling AW, Fisher CA, Haugh KH, Powers ER, Turner MS. Reducing time in bed after percutaneous transluminal coronary angioplasty (TIBS III). Am J Crit Care. 2000;9:185-187.

16. Keeling AW, Knight E, Taylor V, Nordt LA. Post cardiac catheterization time-in bed study: enhancing patient comfort through nursing research. *Appl Nurs Res.* 1994;7:14-17.
17. Keeling AW, Taylor V, Nordt LA, Powers ER. Reducing time in bed after cardiac catheterization (TIBS II). *Am J Crit Care.* 1996;5:277-281.
18. Kelm M, Perings SM, Jax T, et al. Incidence and clinical outcome of iatrogenic femoral arteriovenous fistulas. *J Am Coll Cardiol.* 2002;40:291-297.
19. Liew R et al .Very low complication rate with a manual,nurse-led protocol for sheath removal following coronary angiography.*Eur J Cardio vasc Nurs.*Dec 2007;6(4):303-307.
20. Logemann T, Leutmer P, Kaliebe J, Olson K, Murdock DK. Two versus six hours of bed rest following left-sided cardiac catheterization and a meta-analysis of early ambulation trials. *Am J Cardiol.* 1999;84:486-488.
21. Mah J, Smith H, Jensen L. Evaluation of 3-hour ambulation post cardiac catheterization. *Can J Cardiovasc Nurs.* 1999;10:23-30.
22. . Mandak JS, Blankenship JC, Gardner LH, et al. Modifiable risk factors for vascular access site complications in the IMPACT II trial of angioplasty with versus without eptifibatide. *J Am Coll Cardiol.* 1998;31:1518-1524.
23. Moscucci M, Mansour K, Kent KC, et al. Peripheral vascular complications of directional coronary atherectomy and stenting: predictors, management, and outcome. *Am J Cardiol.* 1994;74:448-453.
24. Muller DWM, Shamir KJ, Ellis SG, Topol EJ. Peripheral vascular complications after conventional and complex percutaneous coronary interventional procedures. *Am J Cardiol.* 1992;69:63-68.

25. Nasser TK, Mohler ER 3rd, Wilensky RL, Hathaway DR. Peripheral vascular complications following coronary interventional procedures, Clin Cardiol. Nov 1995;18(11):609-14.
26. Oweida SW, Roubin GS, Smith RB, Salam AA. Post catheterization vascular complications associated with percutaneous transluminal coronary angioplasty. J Vasc Surg. 1990;12:310-315.
27. Pracyk JB, Wall TC, Longabaugh JP, et al. A randomized trial of vascular hemostasis techniques to reduce femoral vascular complications after coronary intervention. Am J Cardiol. 1998;81:970-976
28. Roebuck A, Jessop S, Turner R, Caplin JL. The safety of two-hour versus four-hour bed rest after elective 6-french femoral cardiac catheterization. Coron Health Care. 2000;4:169-173.
29. Rolley JX, Salmonson Y, Dennison CR, Davidson PM. Nursing care practices following a percutaneous coronary intervention: results of a survey of Australian and New Zealand Cardiovascular Nurses. J Cardiovasc Nurs. Jan-Feb 2010;25(1):75-89.
30. Sangkachand P, Sorosario B, Funk M. Continuous ST segment monitoring; nurse's attitudes, practices and quality of patient care. Am J Crit care. May 2011;20(3):226-37.
31. Schiks I, Schoonhoven L, Verheugt F, Aengevaeren W, van Achterberg T. Performance Evaluation of arterial femoral by registered nurses after PCI. Eur J Cardio vasc Nurs. Sep 2007;6(3):172-77.
32. Searle MM, Hoff L. Bed rest after elective cardiac catheterization. Prof Nurse. 2000;15:588-591.
33. Sesana M, Vaghetti M, Albiero R, et al. Effectiveness and complications of vascular access closure devices after interventional procedures. J Invasive Cardiol. 2000;12:395-399.

34. Shiow-Lan Wang, Nancy S. Redeker, Abel E. Moreyra and Marie R. Diamond. Comparison of Comfort and Local Complications After Cardiac Catheterization. *Clin Nurs Res* Feb 2001;10(1);29-39.
35. Sola R, Pastore GM, Stein B. Early ambulation after diagnostic cardiac catheterization: a 4 french study. *J Invasive Cardiol*. 2001;13:75-78.
36. Tavris DR, Gallauresi B, Rich S, Bell C. Relative risks of reported serious injury and death associated with hemostasis devices by gender. *Pharmacoepidemiol Drug Saf*. 2003;12:237-241.
37. Thore V, Berder V, Houplon P, Preiss JP, Selton-Suty C, Juilliere Y. Role of manual compression time and bed rest duration on the occurrence of femoral bleeding complications after sheath retrieval following 4 Fr. left-sided cardiac catheterization. *J Interv Cardiol*. 2001;14:7-10.
38. Vlastic W, Almond D, Massel D. Reducing bed rest following arterial puncture for coronary interventional procedures: impact on vascular complications: the BAC Trial. *J Invasive Cardiol*. 2001;13:788-792.
39. Waksman R, King SB, Douglas JS, et al. Predictors of groin complications after balloon and new-device coronary intervention. *Am J Cardiol*. 1995;75:886-889.
40. Warren BS, Warren SG, Miller SD. Predictors of complications and learning curve using the AngioSeal closure device following interventional and diagnostic catheterization. *Catheter Cardiovasc Interv*. 1999;48:162-166.
41. Wiley JM, White CJ, Uretsky FF. Noncoronary complications of coronary intervention. *Catheter Cardiovasc Interv*. 2002;57:257-265.
42. Yan, Yu-Hua Chen, Yi Kung, Chih-Ming, Peng, Li-Jung. Continuous Quality Improvement Of Nursing care: Case study of a clinical pathway revision for cardiac catheterization. *Journal of Nursing Research*. Sept 2011 (19)(3):181-89.

APPENDIX

KNOWLEDGE ASSESSMENT OF CARDIAC NURSES IN PROVIDING SAFETY TO PATIENTS AFTER CARDIAC CATHETERIZATION

SOCIODEMOGRAPHIC DATA

Age:- years

Sex:-M...F

Qualification:-....GNM....B. Sc (N)....M. Sc (N)

Additional Qualification, if any:....

Place of work: CMICU/CMWRD

Total years of experience:

Signature of the staff nurse:

Note: Place a tick (✓) mark on the most appropriate answer. Total ten questions.

I) What are the local complications occurring in patients after cardiac catheterization? Mark all that apply.

- 1) Hematoma 2) AV fistula 3) Thrombus formation 4) Stroke 5) Renal failure
- 6) AORTIC dissection.

II) How will you detect pseudoaneurysm after cardiac catheterization?

- 1) Pain at the puncture site 2) Severe bleeding from the puncture site 3) Pulsatile swelling and bruit 4) Fever

III) When should you check the serum creatine level of patients after cardiac catheterization?

- 1) Immediately after the procedure
- 2) One day after the procedure
- 3) One week after the procedure
- 4) No need to check

IV) What is the complication of delayed sheath removal?

- 1) Bleeding
- 2) Thrombus formation
- 3) Air embolism
- 4) Tachypnoea

V) Development of contrast-induced nephropathy occurs

- 1) One week after the procedure
- 2) 5 days after the procedure
- 3) 2-3 days after the procedure
- 4) On the day of procedure

VI) Who is at risk for developing renal failure after cardiac catheterization?

- 1) Young adults
- 2) Hypertensive patients
- 3) Elderly
- 4) Dislipidemia

VII) What is the sign of thrombus formation after cardiac catheterization?

- 1) Absence of distal pulse
- 2) Pain at the puncture site
- 3) Swelling at the puncture site

VIII) How should the patient's affected extremity to be kept immobilized after cardiac catheterization?

- 1) 1-3 hours
- 2) 4-6 hours
- 3) 6-8 hours
- 4) Above 8 hours

IX) Who is at risk for developing pulmonary edema after cardiac catheterization?

- 1) LV failure
- 2) RV failure
- 3) AORTIC Regurgitation
- 4) Pulmonary AV fistula

X) When you detect a hematoma at the puncture site after cardiac catheterization, you should not

1) Elevate the bruised extremity 2) Apply ice 3) Lower the bruised limb 4) Apply pressure bandage.

Answer Key

(I)1, 2,3 (ii) 3 (iii) 2 (iv) 2 (v) 3 (vi) 3 (vii) 1 (viii) 3 (ix) 1 (x) 3

**OBSERVATION TOOL FOR ASSESSING THE PRACTICES AMONG
CARDIAC NURSES IN PROVIDING SAFETY TO PATIENTS AFTER
CARDIAC CATHETERIZATION**

Name of the staff nurse:

Area: CMICU/CMWRD

Date:

Name of the patient:

Age:-....☐ years

Diagnosis:

Sex:-...☐M....F

Procedure Done:

		Safe	Unsafe
1)Mode of transport from cathlab to CMICU/CMWRD	1)Trolley 2) Any Other		
2)Puncture site	1)Radial 2) Femoral		
3) Transfer to bed	1) By self 2) Immobilizing the affected limb 3) By transfer sheet		
4) Checking distal pulse	1) Both dorsalis pedis and posterior tibialis 2) Only dorsalis pedis 3) Not checked		
5) Frequency of checking pulse	1) Every hour 2) Every 2 hours 3) Every 4 hours 4) Once a shift		

	5) Not checked		
6) Assessing the puncture site	1) Assessed 2) Not assessed		
7) Frequency of assessing the puncture site	1) Every hour 2) Every 2 hours 3) Every 4 hours 4) Once a shift		
8) Communicated to the patient	1) Yes 2) NO		
9) Connected to cardiac monitor	1) Yes 2) No		
10) Checked for	1) ECG 2) Heart rate 3) SPO2 4) Respiratory rate 5) Temperature		
11) Immobilizing the affected limb	1) 1-3 hours 2) 4-6 hours 3) 6-8 hours 4) Above 8 hours		
12) Administering IV fluids	1) Till the patient takes orally well 2) Till the sheath is removed in case of PTCA 3) For the next 24 hours		
13) Checking ACT in case of PTCA	1) Immediately after		

	receiving the patient 2) After 1 hour 3) Immediately and after 4 hours 4) Not checked		
14) Compression given to puncture site after sheath removal till bleeding stops	1) Yes 2) No		
15) Immobilizing the affected limb after sheath removal	1) 2 hours 2) 4 hours 3) More than 6 hours		
16) Checked for untoward symptoms	1) Yes 2) No		
17) Development of symptoms	1) Nausea 2) Vomiting 3) Pulmonary edema 4) Hypo tension 5) Bradycardia		
18) Any episodes of vasovagal attacks	1) Yes 2) No		
19) Intake output chart maintained	1) Yes 2) No		
20) Urine output In 8 hours	1) Passed 2) Not passed		
21) If urine not passed, bladder palpable	1) Yes 2) No		
22) If urine not passed, intervention done	1) Hot water bag applied 2) Foley's catheterization done		

23) Administered fluid and soft diet	1)Yes 2)No		
24) Checked for untoward symptoms	1) Yes 2) No		
25) Due medicines given	1) Yes 2) No		
26) Ambulation done in 8 hours	1) Yes 2) No		
27) Seen by relatives	1) Yes 2) No		