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**NURSING PRACTICES REGARDING PULMONARY ARTERY CATHETERS
LODGED IN WEDGE POSITION**

The University of Arizona

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NURSING PRACTICES REGARDING
PULMONARY ARTERY CATHETERS
LODGED IN WEDGE POSITION

by

Constance Jenine Wicks

A Thesis Submitted to the Faculty of the
COLLEGE OF NURSING
In Partial Fulfillment of the Requirements
For the Degree of
MASTER OF SCIENCE
In the Graduate College
THE UNIVERSITY OF ARIZONA

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APPROVAL BY THESIS DIRECTOR

This thesis has been approved on the date shown below:

Carolyn L. Murdaugh
CAROLYN L. MURDAUGH
Assistant Professor of Nursing

1/7/86
Date

DEDICATION

To my husband,

Frank,

whose continuous encouragement, support and patience
has enabled me to realize my goals.

His confidence in my abilities was my incentive to achieve.

ACKNOWLEDGMENTS

Sincere gratitude and appreciation is extended to my thesis committee: Dr. Carolyn Murdaugh, Chairperson, for her guidance and expertise, and to Dr. Joyce Verran and Dr. Ann Woodtli for their valuable suggestions and contributions. My research experience was educational, rewarding and pleasurable due to their efforts.

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ABSTRACT

An exploratory-descriptive study was conducted to describe the actions taken by professional nurses when a pulmonary artery catheter remains in wedged position, despite conventional nursing measures. The sample consisted of 147 randomly selected critical care registered nurses who were members of the American Association of Critical Care Nurses (AACN) and currently working in Coronary Care Units or combined Coronary Care/Intensive Care Units in acute care hospitals within the United States of America.

Findings revealed that although nurses predominantly rely on physicians to manipulate wedged catheters, 29 percent of the respondents indicated that they were expected to intervene when a physician was not available. The complete description of intervention protocol reported by nurses was not uniform. Notably, many respondents specified that only withdrawal of the catheter, not advancement, was the form of repositioning done by nurses when implemented.

CHAPTER I

STATEMENT OF THE PROBLEM

Introduction

The rapid advancement of medical science has continued to make new technology available to the bedside practitioner, particularly in critical care nursing. The critically ill patient now has the advantages of hemodynamic monitoring, computer-assisted electrocardiographic monitoring, infusion controllers, temporary pacemakers, intra-aortic balloon pumps and left ventricular assist devices. These highly technical instruments can expand the nurse's resources for assessment data and more accurately assist the nurse in implementing patient care. However, progress requires the nurse to continually demonstrate increased skill and knowledge to intervene in various situations, such as trouble-shooting mechanical problems.

One tool commonly used in the critical care setting is the Swan-Ganz catheter. (In this study, the terms Swan-Ganz catheter and pulmonary arterial catheter are used synonymously.) In 1970, Swan and associates initially reported the ability to catheterize the right heart using a flow-directed, balloon-tipped catheter. The Swan-Ganz catheter is now used for bedside monitoring of pulmonary

artery (PA) pressures, which reflect left ventricular function and fluid volume status (Swan, Ganz, and Forrester, 1970). A physician inserts the catheter intravenously passing it through the right side of the heart until the tip of the catheter is within the pulmonary arterial system. By positioning the catheter tip in a small branch of the pulmonary artery and inflating the balloon, a pulmonary artery "wedge" (PAW) pressure can be obtained. This wedging action interrupts communication with the right side of the heart and gives a more accurate index of left atrial and left ventricular end diastolic function (Vinsant and Spence, 1981). During diastole, the mitral valve is open, which equalizes the pressures of the left atrium and ventricle. The left ventricular pressure is reflected directly back to the pulmonary catheter in wedged position. The pulmonary systolic and diastolic pressures can be monitored continuously. Wedge pressures are assessed intermittently by slowly inflating the balloon until the contour of the waveforms changes from PA to PAW, or until the appropriate amount of air for that catheter has been instilled. The balloon is inflated for no more than 15 seconds to avoid overwedging (causing falsely high readings) and damage to the pulmonary system (Underhill, Woods, Sivarajan, and Halpenny, 1982).

Overview of the Problem

Use of the Swan-Ganz catheter includes potential risks, such as infection, embolism, pulmonary infarction or arterial rupture (Swan and Ganz, 1975). The nurse who cares for a patient with a pulmonary catheter must be able to interpret the waveforms and numerical data to intervene appropriately. For example, if the monitor displays typical right ventricular waveforms with corresponding pressures, the catheter tip may have slipped out of the PA into the right ventricle. In the right ventricle position, potential exists for ventricular arrhythmias due to irritation from the catheter. The nurse must assess the waveform, identify the incorrect position of the catheter tip and intervene appropriately, such as inflating the balloon to attempt floating the tip back into the pulmonary artery.

Pulmonary infarction can occur if the balloon is not deflated, leaving the catheter in wedge position, or if the catheter migrates into a small artery branch (Reinke et al, 1975). Several nursing measures can be implemented to intervene when a pulmonary catheter is inappropriately in wedge position. Typical nursing interventions include assuring balloon deflation, moving the patient's arm, repositioning the patient, and having the patient cough and deep breathe (Millar, Sampson and Soukup, 1985). A chest X-Ray may be needed to assess catheter tip position.

When a catheter remains in wedge position, despite typical nursing measures, the patient is at risk for pulmonary infarction and arterial rupture (Lalli, 1978). The exact time for damage to occur due to the wedging of the catheter tip in an artery branch is not known. However, standard practice allows the nurse to institute measures to unwedge the catheter as soon as possible. If the conventional nursing measures previously described are ineffective, the catheter must be drawn back out of wedge. Institutional policies differ as to who should intervene at this stage of the problem. Some institutions allow nurses, (with competency certification and under physician order), to remove and/or withdraw the catheter. In other instances, cardiologists, alone, manipulate the catheters. Some hospitals allow only physicians to intervene, including interns and residents unfamiliar with the catheter. While manipulation of the catheter may be considered a physician's function, a physician may not always be available. The responsibility has fallen to the nurse to manipulate or remove the catheter to protect the patient, although adequate training may not have been provided. Swan-Ganz manipulation or removal also has potential complications, including chordae tendineae damage of tricuspid valve, embolus, and arrhythmias due to catheter irritation (Lalli, 1978). The nurse may be expected to wait until a physician

is available, potentially causing pulmonary tissue damage; or the nurse may have to withdraw the catheter risking complications of manipulation.

Purpose of the Study

The purpose of this study was to describe the actions taken by professional nurses when a pulmonary artery catheter remains in wedged position, despite conventional nursing measures.

Significance of Proposed Research

A letter from a critical care nurse, published in the June issue of Focus, 1984, and two responses (Focus, October, 1984) demonstrated the query: what is appropriate and standard nursing practice related to removing and/or manipulating a wedged pulmonary artery catheter? As noted in these published letters and from informal discussions with other critical care nurses, a universal protocol does not exist.

As an initial perspective, this study intended to investigate the prevalence of catheter manipulation within critical care nursing practice. From the information obtained, decisions can be made as to the need for further studies to evaluate the situation. For example; are there significant differences in outcome criteria between institutions in which nurses are expected to withdraw the

catheters and those which do not? Perhaps a standard procedure, based on clinical research, could be recommended to those institutions which do not have a physician readily available to reposition the catheter.

Summary

Due to advancing technology, the critical care nurse faces new questions concerning acceptable nursing practice for intervention in patient care. A common situation is the patient who has a Swan-Ganz catheter lodged in wedge position, despite all typical nursing measures. A variety of nursing responses are available, from calling in the physician, to removal of the catheter by a registered nurse. This study intended to survey critical care units and describe the types and frequency of interventions used in approaching the problem.

CHAPTER II

THE CONCEPTUAL FRAMEWORK

Introduction

The conceptual framework is described in this chapter (See Figure 1). The framework depicts the relationship between standards of care, institutional practice, and quality of care, or prevention of complications related to the pulmonary catheter. The construct level of the conceptual framework will first be discussed, followed by the concept and referent levels.

This study is focused at one referent in the framework. The intention is to describe the standard of nursing care that specifies the individual who is expected to intervene when a pulmonary artery catheter is lodged in wedge position.

CONSTRUCT: Standards of Care

Standards of care give the nurse direction for expected and acceptable practice. The American Association of Critical Care Nurses (AACN) defines standards of care for the critically ill as "statements of quality which serve as a model to facilitate the delivery of optimal nursing care to the critically ill." (Thierer et al, eds., 1981).

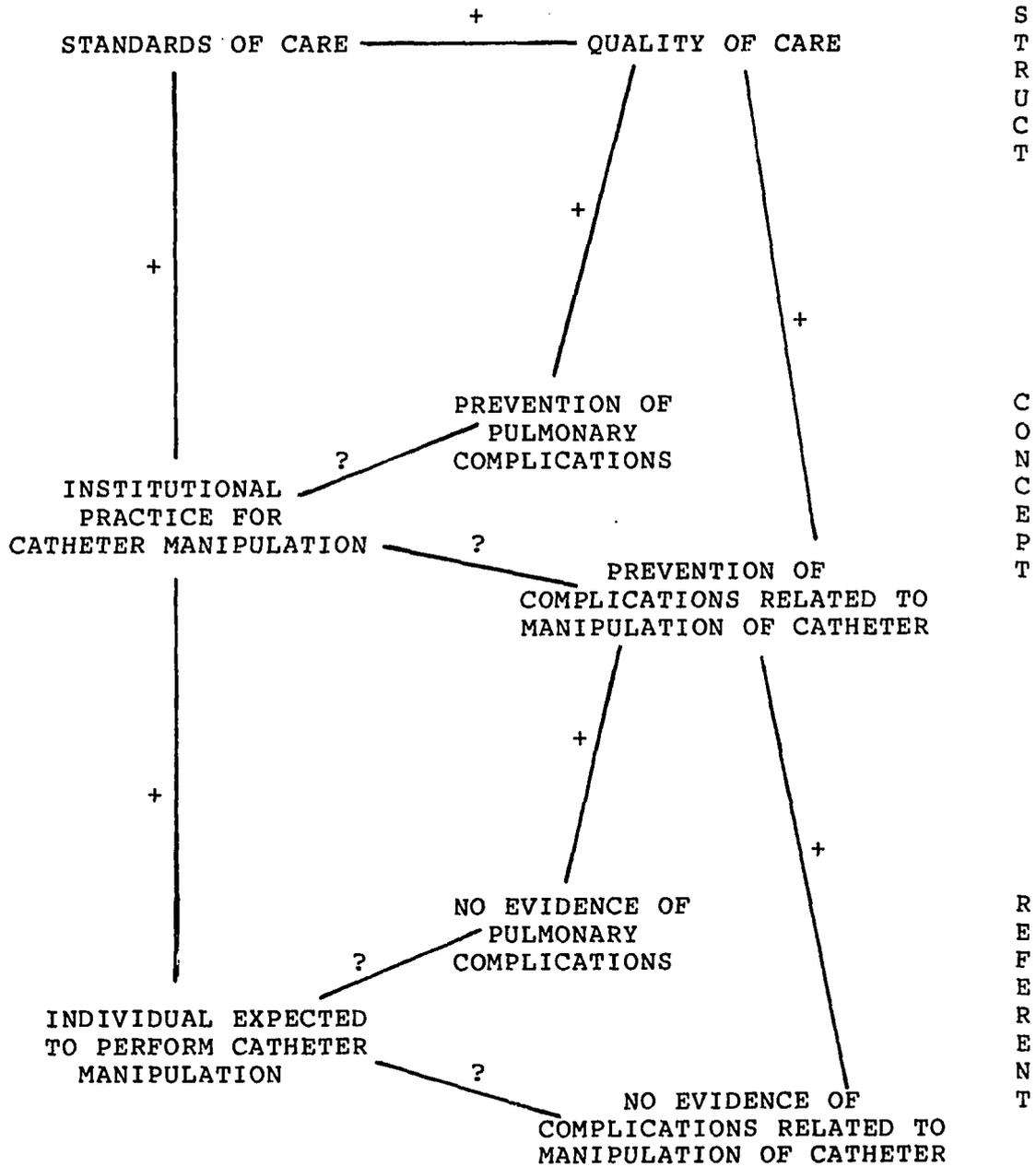


Figure 1. Conceptual Framework.

There are three common approaches to establishment of standards; structure, process and outcome (Stevens, 1980). Structure includes those standards specified in the formulation of the organization, such as policies, goals, and objectives. Activities involving the actual delivery of care are classified as process standards. Outcome standards reflect the patient's response to the care delivered.

CONSTRUCT: Quality of Care

Quality of care can be viewed from the perspective of the worth of the care given, was there any benefit? The evaluation of quality of care rendered by nurses is dependent on a set of standards against which the actual care delivered or outcome produced can be judged (Glennin, 1980). The caregivers need to be educated about the standards so that they will have a better understanding of their performance expectations. For example, with foley catheter insertion, the process standard must be learned and implemented by the nurse before the outcome standard of no urinary tract infection can be evaluated.

Bloch (1975) observed studies of nursing processes usually focused on care given by nurses or the care received by patients. She saw the need for studies which would more appropriately evaluate the patient outcome related to nursing process. Given et al (1979) conducted a study which examined the relationship of process to outcome. One

hundred three uncontrolled hypertensive patients were followed over a five month period. The data were collected through chart audits and standardized telephone interviews. Specific criteria for process and outcome were determined. The investigators found the independent process variables (diagnostic approach, therapeutic approach, and patient compliance) were significantly related to the dependent outcome variables (functional status, clinical health status, perception of health care and knowledge and understanding of disease and therapy). This study showed that an outcome, defining quality of care, is related to a specific standard of care.

Nichols, Barstow and Cooper (1983), examined the relationship between the incidence of phlebitis (quality of care) and the frequency of changing intravenous (IV) tubing and site (standard of care). One hundred and thirty patients from three hospital units were assigned to three treatment groups (tubing changed every 24 hours with site changed every 48 hours, tubing every 24 and site every 72 or tubing every 48 and site every 72 hours). All IVs were started according to a standardized protocol. Phlebitis was measured by assessing pain, erythema and temperature at the IV site. Statistically significant differences were not found between the groups. However, a trend was noted toward decreased rates of phlebitis with more frequent tubing

changes. Comparison of more distinct groups, such as tubing and site changed every 24 hours versus every 48 versus every 72, or just examining tubing change, may have given more clear differences between groups. Replication of this study was recommended by the authors, using a larger population, different setting, and other time intervals. Although significant differences were not shown between groups, the investigators made an attempt to evaluate a quality outcome related to a standard of care. A revised methodology may produce clearer evidence.

Powaser (1976) evaluated the effectiveness of hourly cuff deflation in minimizing tracheal damage. Although the practice had been advocated, little work had been done to determine its effectiveness, due in part to the difficulty in controlling variables in the clinical setting. The study was conducted over 72 hours, using mechanically ventilated, anesthetized dogs. Three groups of dogs received either hourly 5 minute cuff deflation, a continuous air leak or continuous cuff inflation. The continuous air leak group had significantly less tracheal damage than the other two groups. The hourly cuff deflation group, however, was not found to be significantly different than the group with continuous cuff inflation. Quality of care was shown to be influenced by a defined standard of care. The standard, however, needs to be based on clinical evidence.

CONCEPT: Institutional Practice
for Catheter Manipulation

According to Ramey (1972), standards usually become established by authority, custom or general consent. Optimally, standards of nursing practice or care must be based on sound scientific data, with the best interest of the patient as the objective. However, many conventional medical and nursing practices do not have rationale for their standard, except for tradition.

When a wedged pulmonary catheter is unresponsive to typical nursing measures, directions given to professional nurses for intervention vary depending on the institution. Conventional nursing standard interventions include assuring balloon deflation, moving the patient's arm, repositioning the patient, and having the patient cough and deep breathe (Millar, et al, 1985). If the measures are ineffective the nurse is expected to seek appropriate action to have the catheter released from wedge position as soon as possible.

CONCEPT: Prevention of Pulmonary Complications

Pulmonary arterial wave forms must be continuously monitored, to assess proper position of the catheter tip. If the Swan-Ganz catheter remains in wedge position, pulmonary infarction due to pulmonary ischemia can occur (Reinke, Higgins and Atkin, 1975) (Foote, Schabel and Hodges, 1974). "The length of time the catheter is

tolerated in wedge position is individually determined." (Vinsant and Spence, 1981, p.260). However, it should remain in the wedge position for as short amount of time as possible. Swan and Ganz (1975) recommend that when assessing wedge pressure, the catheter must not remain in wedge position for more than one or two minutes. A chest X-ray can verify the catheter tip position. If the catheter tip lies peripherally, it needs to be withdrawn an appropriate distance so the tip lies within the main pulmonary artery or one of its branches (Swan and Ganz, 1975).

Normal pulmonary arteries are relatively thin structures of limited tensile strength and rupture of these thin vessels by an inflated balloon is certainly possible (Swan and Ganz, 1975). In fact, a fatal pulmonary hemorrhage was reported as a complication of use of a flow-directed, balloon-tipped catheter in a patient receiving anticoagulant therapy (Golden et al, 1973). The hazards of arterial rupture are probably greater in those patients who are receiving anticoagulation therapy and those in whom serious pulmonary hypertension coexists (Swan and Ganz, 1975).

CONCEPT: Prevention of Complications Related to Manipulation of the Catheter

Pulmonary catheter manipulation or removal also has potential complications, including chordae tendineae damage of tricuspid valve, embolus, and arrhythmias due to catheter

irritation to the myocardium (Lalli, 1978). Optimally, manipulation or removal of the Swan-Ganz catheter must be limited to those who are adequately trained in the catheter function and potential complications. Lalli (1978) suggests a slight amount of air needs to be instilled into the balloon to prevent tissue damage if the catheter is to be removed.

One referent of the conceptual framework corresponds to the purpose of this study. Specifically, the investigator is interested in the standard nursing care that describes who is to intervene when a pulmonary artery catheter is lodged in wedge position. This study will not address the other components of the referent level, as presently, no evidence shows that complications resulting from catheter manipulation are related to the individual performing the task.

REFERENT: Individual Expected to Perform
Manipulation of the Catheter

Institutions vary as to the guidelines or policies directing who is to manipulate the catheter when lodged in wedge position. Some hospitals expect only physicians to manipulate the wedged catheter, others certify nurses for this procedure. However, when a physician is not available, the nurse may be expected to release the catheter from wedge (to protect the patient), even though she/he may not

have been adequately trained. No studies have documented any relationship between the skill level of the individual and complications associated with manipulation of the catheter. Therefore, current standard care practice needs to be studied.

REFERENT: No Evidence of Pulmonary Complications

As previously explained, if the catheter is allowed to remain in wedge position, complications of pulmonary infarction or rupture could occur. Symptoms indicative of pulmonary infarction include chest pain with dyspnea, tachypnea, hemoptysis, tachycardia, and chest pain with hypertension or hypotension (Johanson et al, 1981). Depending on the size of the infarct area, abnormal findings may be seen on a chest X-ray (Foote et al, 1974) and hypoxemia may be evident on an arterial blood gas report. Chest pain, hemoptysis, hypotension, cardiovascular collapse, and respiratory distress will be seen with arterial rupture (Johanson et al, 1981). Consolidation may be seen on a chest X-ray.

REFERENT: No Evidence of Complications
Related to Manipulation of Catheter

Possible complications related to manipulation of the catheter include arrhythmias, emboli, and damage to tricuspid valve. Arrhythmias, particularly ventricular in origin, are related to catheter irritation to myocardium due

to manipulation. Thrombi formed on the catheter may be released as emboli. Symptoms of pulmonary emboli may be seen; severe substernal pain, dyspnea, tachypnea, diaphoresis, cyanosis, pallor, tachycardia, hypotension, hemoptysis, anxiety, diminished breath sounds, and arrhythmias (Johanson, et al, 1981). The patient may exhibit a new systolic murmur if the tricuspid valve is damaged and possibly signs of right sided heart failure (increased jugular venous distention, increased right atrial pressure, and eventually peripheral edema).

Research Question

What is the action taken by professional nurses when a pulmonary artery catheter remains inappropriately in wedge position, despite conventional nursing measures? The terms in the research question are defined as follows:

Action - The intervention used by the nurse to have the catheter repositioned when typical nursing measures are unsuccessful.

Professional nurses - Registered nurses employed in settings which monitor pulmonary artery pressures.

Pulmonary artery catheter - A flow-directed, balloon-tipped catheter inserted transvenously through the right side of the heart into the pulmonary arterial vasculature for pressure measurement.

Inappropriate wedge position - The pulmonary catheter has

independently migrated to a small branch of the arterial system and is not amenable to conventional nursing measures.

Conventional nursing measures - Those actions that are expected to be immediately instituted by the nurse as standard practice. For inappropriate wedging, these measures include;

- assuring balloon deflation
- moving the patient's arm
- repositioning the patient, turning
- having the patient cough and deep breathe.

Summary

Pulmonary artery catheters have been found to damage the pulmonary vasculature if they remain in wedge position for extended amounts of time. When a catheter is inappropriately in wedge position, probably due to catheter migration, the nurse intervenes with typical measures. However, these methods may be ineffective. In which case, the catheter must be manipulated out of the wedge position. Depending on the institution, the responsibility for releasing the catheter from wedge position may fall to a nurse or a physician, with or without training.

Quality of care has a relationship with the standard of practice that is set. To provide quality care to the client, the standard of practice must direct that the catheter be withdrawn from wedged position in the shortest amount of time possible, preventing pulmonary vascular damage. In addition, the individual expected to adjust the

catheter needs to be qualified in the appropriate skills to prevent complications related to manipulation.

CHAPTER III

METHODOLOGY

Introduction

The intent of this study was to survey critical care units and describe the current practices of professional nurses when wedged pulmonary artery catheters are unresponsive to typical nursing measures. This chapter describes the methods used to obtain the data.

Research Design

The study used an exploratory-descriptive design. The literature promotes early efforts to retract the catheter from wedge position to prevent pulmonary complications. However, the individual responsible for actually manipulating the catheter lodged in wedge position has not been clearly defined. The various approaches used by critical care nurses are described, in addition to the frequency distribution amongst national hospitals.

Study Sample and Setting

The sample consisted of registered nurses who were members of the American Association of Critical Care Nurses (AACN) and currently working in Coronary Care Units or combined Coronary Care/Intensive Care Units in acute care

hospitals within the United States of America. Two hundred nurses were randomly selected from AACN national membership, and asked to participate. One hundred forty-seven responded to the questionnaire and one Tucson subject was eliminated. With 146 eligible participants, the response rate was 73 percent.

Pilot Study

Ten critical care nurses who are members of AACN and currently working in the Tucson area were asked to participate in a pilot study to test the survey instrument. Tucson nurses were then excluded from the sample. One Tucson nurse was randomly selected and responded; that questionnaire was eliminated in the calculation of results. It was realized that by eliminating this group, local standards were not included. The purpose of the pilot study was to evaluate the questionnaire for clarity and detect any problems prior to the national survey. The questionnaire format was altered from their input.

Protection of Human Rights

The study was reviewed and approved by the University of Arizona College of Nursing Human Subjects Committee (See Appendix A). Participation was voluntary. There were no known risks to the subjects. A written disclaimer was included with the questionnaire, assuring the

subject of confidentiality. AACN's policy states that names and addresses of their members will not be shared with outside parties to preserve members' anonymity. The materials were therefore sent to a local mailing service which conducted the actual distribution of the questionnaires.

Data Collection Procedures

A structured questionnaire (See Appendix B) was mailed to the selected sample, along with a disclaimer letter (See Appendix C) requesting participation, and a stamped, addressed, return envelope. The questionnaire asked the nurse's intervention when a pulmonary artery catheter is lodged in wedge position, despite typical nursing measures. In this question, an unstructured category was included to elicit interventions not proposed in the selection given. Demographic information was also obtained: size, type and location of hospital, and age, experience and educational background of subject. Each question was limited to a specific selection of responses, except for the question regarding the individual expected to manipulate the catheter. A post card reminder was sent to the subjects approximately three weeks after the initial mailing, again through the mailing service.

Analysis of the Data

The purpose of this study was to describe the actions taken by professional nurses throughout the country when a pulmonary artery catheter remains in wedge position, despite conventional nursing measures. The responses to the questionnaire provided demographic information on the subjects and the hospitals in which they work. In addition, a survey of the individuals expected to manipulate the wedged catheter in these institutions was obtained. This nominal data was organized into frequency distributions for the individual expected to manipulate the catheter, with descriptions of the hospitals. Any other interventions described outside the selection given for the question regarding the nursing interventions were summarized and noted within the report of the study.

Assumptions

The following assumptions were made:

1. Various health professionals are expected to withdraw a wedged pulmonary catheter.
2. Manipulating the pulmonary catheter out of wedge position is a nursing responsibility in some institutions.
3. Evaluating the current practices by critical care nurses will provide information useful for further investigations.

Summary

In summary, an exploratory-descriptive study was used to survey critical care nurses through a mailed structured questionnaire. This chapter explains the study sample, setting, protection of human rights, data collection procedure, assumptions and limitations. The current nursing practices to intervene when a catheter is lodged in wedge position was evaluated, in order to obtain information useful towards establishment of a standard of practice.

CHAPTER IV

PRESENTATION AND ANALYSIS OF THE DATA

Introduction

Results of analysis of the data as well as a description of the sample are included in this chapter. Any missing data is identified on each respectable table.

Characteristics of the Sample

The sample consisted of 146, randomly selected professional nurses, who were members of AACN and working in critical care units within the United States of America. The ages of the nurses ranged from 23 to 63 years. The mean age was 34.4 years (standard deviation 8.2 years). These nurses had acquired experience in nursing from 1 to 34 years, with experience in critical care between 1 to 23 years (See table 1). Eighty-three percent of the respondents were employed in nursing full time.

Thirty-seven percent of the participants originally had a bachelor of science in nursing as their basic nursing education. At the time of the study, 51 percent had attained a bachelor of science or greater degree in nursing.

Information on the type of hospital in which these nurses were employed was obtained (See tables 2, 3 and 4).

Table 1. Years of experience in Nursing and in Critical Care
(N = 146)

	EXPERIENCE IN NURSING (years)	EXPERIENCE IN CRITICAL CARE (years)
RANGE:	1 to 34	1 to 23
MEAN:	11.6	7.8
STANDARD DEVIATION:	7.6	4.5

Table 2. Type of hospital in which the respondent primarily employed.

(FREQUENCIES) (N = 146)

TYPE	N	PERCENT
COMMUNITY (NON-PROFIT)	81	55
COMMUNITY (FOR-PROFIT)	29	20
UNIVERSITY AFFILIATED	17	12
GOVERNMENTAL	14	10
OTHER	5	3
TOTAL	146	100

Table 3. Size of hospital in which respondent
primarily employed.

(FREQUENCIES) (N = 143, 3 CASES MISSING DATA)

SIZE (beds)	N	PERCENT
LESS THAN 100	20	14
100 - 199	29	20
200 - 299	31	22
300 - 399	26	18
GREATER THAN 400	37	26
TOTAL	143	100

Table 4. Geographic location of hospital in which respondent primarily employed.

(FREQUENCIES) (N = 145, 1 CASE MISSING DATA)

LOCATION	N	PERCENT
NORTHEAST UNITED STATES	44	30
NORTHWEST UNITED STATES	2	1
SOUTHEAST UNITED STATES	35	24
SOUTHWEST UNITED STATES	26	18
MIDWEST UNITED STATES	37	26
OUTSIDE CONTINENTAL UNITED STATES	1	1
TOTAL	145	100

The predominant type of hospital included in the survey was a community hospital, either non-profit or for profit (75 percent). Twelve percent were affiliated with a university and 10 percent were governmental organizations. There were a few employment situations which were not within any of the mentioned categories, and these were selected in an "other" category (three percent).

Size of the hospital in which the respondent was primarily employed ranged from less than 100 beds to greater than 400 beds. Fourteen percent of the nurses were from hospitals of less than 100 beds, 20 percent from hospitals of 100 - 199 beds, and 22 percent with 200 - 299 beds. Another 18 percent worked in institutions of 300 - 399 beds and 26 percent had greater than 400 beds in their hospitals.

Reflecting the population dispersion of the United States, most of the respondent were from hospitals located in the eastern and midwestern parts of the country (30 percent Northeast, 24 percent Southeast and 26 percent Midwest). Eighteen percent were from the Southwest and only one percent from both the Northwest and outside the continental states.

Results of the Study

Of the 146 nurses who participated in the study, only three indicated that they were not currently using pulmonary artery catheters at the hospitals in which they

were working. The 143 nurses using the catheters responded to the question; what is the nursing action on your unit if a pulmonary artery catheter is still lodged in wedge position, despite typical nursing measures (that is; assuring balloon deflation, repositioning patient and having patient cough, having chest x-ray verified for catheter malposition)? The respondents were directed to choose one or more of the selections given, with a request to explain further if the "other" category was selected.

The responses were grouped into three main categories of action; 1) a physician only is contacted to manipulate the catheter, 2) a nurse intervenes to manipulate the catheter, and 3) a physician or a nurse manipulates the catheter. The majority of the respondents (71 percent) related that physicians (including residents, interns and fellows) were the only ones who actually manipulated a pulmonary artery catheter lodged in wedge position. Only two percent of the nurses indicated that nurses were primarily expected to intervene. In 27 percent of the hospitals, there was a sharing of the responsibility for releasing the catheter from inappropriate wedge. Typically nurses stated that a physician was to intervene, however when not available, nurses were expected to reposition the catheter. Twenty-two respondents clarified that "repositioning" in these situations was limited to "pulling back"

on the catheter, but not advancement. Of the total 42 respondents who indicated that intervention by nurses was occurring, 26 stated that the nurses were given special training to reposition the catheter. The only other measure mentioned by nurses to dislodge a wedged catheter was gently flushing the distal port of the catheter (five respondents).

In situations where a nurse was expected to reposition the catheter, no other description besides withdrawal was included in the responses. The extent of withdrawal ranged from a few centimeters to pulling the catheter tip all the way back to the right atrium or just until appropriate pulmonary artery waveforms were seen. Fifteen respondents mentioned the need for a doctor's order to perform repositioning. Seven nurses specifically stated they were "covered" by hospital policy and four admitted they "did it anyway after all other options were exhausted", to protect the patient. Interestingly, only one nurse added that it was against their state nurse practice act for nurses to manipulate catheters which extended beyond the right atrium, yet, two other nurses from the same state did not eliminate intervention by nurses.

Frequency distributions of the three main categories of actions related to the respondents' type, size and location of hospital in which primarily employed were done. The following paragraphs describe the distributions.

Type of Hospital

Predominantly, the respondents were from community hospitals and this is reflected in this distribution table (See Table 5). Physicians were indicated as the responsible person in each of the five types of hospitals. Community hospitals (non-profit) were the only type which had nurses as the ones expected to intervene initially. Governmental or university affiliated hospitals had few respondents who indicated physicians or nurses as the ones to intervene.

Size of Hospital

The hospital policies which require intervention by physicians were fairly well distributed, except in the hospitals less than 100 beds, where physician intervention was lower. Of those that indicated physicians or nurses, the largest number of respondents were from hospitals greater than 400 beds, and the second highest in the smallest hospitals. The three respondents who indicated that nurses alone were expected to intervene, were from three different size hospitals (See Table 6).

Location of Hospital

The location of hospitals which expected physicians only to intervene reflects the distribution of all the respondents (See Table 7). Three different areas of the country represented those hospitals where nurses alone are

Table 5. Type of hospital with three main
response categories.

(FREQUENCY DISTRIBUTIONS) (N = 143)

TYPE OF HOSPITAL	PHYSICIANS ONLY	NURSES ONLY	PHYSICIANS OR NURSES	TOTAL N
COMMUNITY (NON-PROFIT)	54	3	21	78
COMMUNITY (FOR-PROFIT)	18	0	11	29
UNIVERSITY AFFILIATED	12	0	5	17
GOVERNMENTAL	12	0	2	14
OTHER	5	0	0	5
TOTAL	101	3	39	143
PERCENT	71	2	27	100

Table 6. Size of hospitals with three main
response categories.

(FREQUENCY DISTRIBUTIONS)
(N = 140, 3 CASES MISSING DATA)

SIZE OF HOSPITAL (beds)	PHYSICIANS ONLY	NURSES ONLY	PHYSICIANS OR NURSES	TOTAL N
LESS THAN 100	9	1	8	18
100 - 199	23	0	6	29
200 - 299	23	1	7	31
300 - 399	21	0	5	26
GREATER THAN 400	22	1	13	36
TOTAL N	98	3	39	140
PERCENT	70	2	28	100

Table 7. Location of hospital with three main
response categories.

(FREQUENCY DISTRIBUTIONS)
(N = 142, 1 CASE MISSING DATA)

LOCATION OF HOSPITAL	PHYSICIANS ONLY	NURSES ONLY	PHYSICIANS OR NURSES	TOTAL N
NORTHEAST UNITED STATES	34	0	9	43
NORTHWEST UNITED STATES	1	1	0	2
SOUTHEAST UNITED STATES	25	1	9	35
SOUTHWEST UNITED STATES	19	0	7	26
MIDWEST UNITED STATES	20	1	14	35
OUTSIDE CONTINENTAL UNITED STATES	1	0	0	1
TOTAL N	100	3	39	142
PERCENT	71	2	27	100

expected to intervene. Hospitals in which physicians or nurses were indicated were highest in the midwest.

Summary

A national study of the actions taken by professional nurses when a pulmonary artery catheter remains in wedged position despite typical nursing measures was conducted through a mailed structured questionnaire. One hundred and forty-seven nurses responded with 143 specifically eligible to participate. The characteristics of the sample have been described in this chapter.

Predominantly, nurses related their action was to contact a physician who would be expected to manipulate the catheter. Few hospitals expected nurses alone to intervene directly in the situation. A moderate number of participants indicated that although physicians were expected to reposition the catheters, nurses had to intervene when physicians not available.

Frequency distributions of main responses associated with type, size and location of the hospitals were reported. Additional comments from participants were included.

CHAPTER V

CONCLUSIONS AND IMPLICATIONS

Introduction

In the final chapter, the results of the data analysis are discussed. Conclusions drawn from the results are presented along with implications for nursing practice. Limitations of the study and recommendations for further nursing research are suggested.

Conclusions

The intent of this study was to survey professional nurses in critical care and describe the current practices when wedged pulmonary artery catheters are unresponsive to typical nursing measures. Although nurses responded that their predominant action was to contact a physician to reposition the catheter, 29 percent did consider it within a nursing practice under certain circumstances. In particular, as many of the respondents described, if a physician was not available, the nurse was directed to withdraw the catheter out of wedge position. Some of the participants indicated ambiguity as to the appropriateness of the nurse manipulating the catheter. For example, "Nursing staff are allowed to reposition the catheter with

doctor's order (hospital policy). Some nurses refuse to do this - others reposition catheter."

The limitation of "withdrawing catheter only, never advancing" was a common response by those who described repositioning by nurses. This perspective reflects the nurses' intention to protect the patient, as shared by one nurse; "our philosophy is that the risk of pulmonary infarct is greater than the risk of RN withdrawing the pulmonary artery catheter slightly".

From the frequency distributions of the three most typical nursing actions with the type, size and location of the hospitals a few observations can be made. The intervention by 1) nurses alone and 2) physician or nurse were expected less frequently in governmental or university affiliated hospitals. These institutions would more likely have interns/residents available through teaching programs. The hospitals of less than 100 beds less frequently expected intervention by the physicians alone, probably due to the lack of readily available physicians. As one nurse described; "my hospital has no interns/residents and the Emergency Room physician has no idea regarding pulmonary artery lines". The location of the hospitals frequency distribution did not reflect an association of a particular type of action with a specific area of the country.

Implications for Nursing Practice

In hospitals where physicians are readily available to intervene in the problem of a catheter lodged in wedge position, nurses are not faced with the dilemma of acting outside acceptable nursing practice, or risking harm to the patient if they do not intervene. Directives based on current nursing actions with wedged catheters can only be suggested at this time due to the lack of conformity in approach to the problem nationally and the absence of clinical evidence. If an institution identifies a need to establish a nursing intervention which would protect the patient in the event that a physician is unavailable, these considerations need to be included:

1. Nurse practice acts within the state must be investigated for any recommendations of standard practice for catheter manipulation.

2. Hospital policy must specify who is qualified to reposition the catheter and under what circumstances.

3. Procedures need to address proper methods to identify and alleviate lodged pulmonary catheters.

4. Nurses must be adequately trained in assessment and manipulation of a wedged catheter, including evaluation of possible complications after catheter repositioned.

5. Determine the expectation within that hospital

as to whether notification of the physician needs to precede manipulation of the catheter by the nursing staff.

Hopefully these suggestions will be helpful to those nurses faced with the responsibility of repositioning the catheter in the absence of a physician. Notably, respondents specifically described withdrawal of the catheter as the type of repositioning done by nurses, avoiding advancement of catheter. This author intends to publish these results in one of the American Association of Critical Care Nurses's organizational journals (Heart and Lung or Focus).

Limitations

The following limitations were recognized:

1. All the subjects were members of one specific professional critical care nurse organization. Potentially these subjects may have responded differently from nurses who do not belong to such organizations.
2. Since the subjects were selected randomly and questionnaires distributed through a mailing service, the investigator does not know the geographic location of nurses who did not respond.
3. The responses of these particular nurses may not represent other nurses in the same critical care unit or the unit expectation.

Recommendations

Recommendations for further nursing research include:

1. Replication of the study with critical care nurses not limited to the those members of one organization.
2. Design study to promote participation of nurses from all areas of the country.
3. Evaluate clinical situations of wedged pulmonary catheters to determine if nursing intervention is safe and beneficial for the patient.

Summary

This study described the current actions taken by professional nurses when a pulmonary artery catheter remains in wedged position, despite conventional nursing measures. Although most nurses related that physicians are contacted to manipulate the catheter, many nurses must intervene in the situation when physicians are not available at their hospitals. Within the responses there was evidence of uncertainty as to the appropriateness and course of these actions by some nurses, while others had developed specific policies and procedures to direct nurses in those situations. The description of intervention by nurses for wedged catheters was not uniform. However, based on the participants' responses, some considerations were suggested to assist those organizations that may be searching for some

direction when nurses are expected to reposition catheters. No clinical evidence is currently available to support the reported nursing interventions. One recommendation of this study is that nursing research be conducted to evaluate the safety and benefit of nurses repositioning the catheter in the absence of the physician. Hopefully a standard of practice can be developed based on clinical evidence. Limitations of the study were recognized and recommendations for further research suggested.

APPENDIX A

HUMAN SUBJECTS APPROVAL



THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

COLLEGE OF NURSING

MEMORANDUM

TO: Constance J. Wicks
Graduate Student
College of Nursing

FROM: Ada Sue Hinshaw, PhD, RN ^{ASN} Katherine Young, PhD, RN
Director of Research Chairman, Research Committee

DATE: September 9, 1985

RE: Human Subjects Review: Nursing Practices Regarding Pulmonary
Artery Catheters Lodged in Wedged Position

Your project has been reviewed and approved as exempt from University review by the College of Nursing Ethical Review Subcommittee of the Research Committee and the Director of Research. A consent form with subject signature is not required for projects exempt from full University review. Please use only a disclaimer format for subjects to read before giving their oral consent to the research. The Human Subjects Project Approval Form is filed in the office of the Director of Research if you need access to it.

We wish you a valuable and stimulating experience with your research.

ASH/fp

APPENDIX B

QUESTIONNAIRE

NURSING PRACTICES REGARDING
PULMONARY ARTERY CATHETERS
LODGED IN WEDGE POSITION

QUESTIONNAIRE

PLEASE WRITE IN THE APPROXIMATE NUMBER OF YEARS FOR THE
FIRST THREE QUESTIONS.

- I.) Your age: _____ years.
- II.) Experience in nursing: _____ years.
- III.) Experience in critical care nursing: _____ years.

SELECT ONE RESPONSE FOR EACH OF THE FOLLOWING QUESTIONS.
WRITE SELECTION NUMBER ON BLANK SPACE TO THE RIGHT OF THE QUESTION.

- IV.) Basic education in Nursing: _____ (.IV)
1.) Diploma
2.) Associate degree
3.) Baccalaureate or higher degree
4.) LPN/LVN
- V.) Highest nursing degree held: _____ (.V)
1.) Diploma
2.) Associate degree
3.) Baccalaureate degree
4.) Masters degree
5.) Doctorate degree
- VI.) Employed in nursing: _____ (.VI)
1.) Full Time
2.) Part Time
3.) Not Employed
- VII.) Type of hospital in which you are primarily employed: _____ (.VII)
1.) Community Hospital (Non-profit)
2.) Community Hospital (For profit)
3.) University affiliated Hospital
4.) Governmental Hospital
(County, State, Federal, Military)
5.) Other

(GO ON TO OTHER SIDE)

VIII.) Size of hospital in which you are primarily employed: _____ (.VI)

- 1.) Less than 100 beds
- 2.) 100 - 199 beds
- 3.) 200 - 299 beds
- 4.) 300 - 399 beds
- 5.) greater than 400 beds

IX.) Geographic location of hospital: _____ (.IX)

- 1.) Northeast United States
- 2.) Northwest United States
- 3.) Southeast United States
- 4.) Southwest United States
- 5.) Midwest United States
- 6.) Outside Continental United States

X.) Are pulmonary artery catheters utilized in your critical care unit? _____ (.X)

- 1.) Yes
- 2.) No

**IF YOU ANSWERED "YES" TO QUESTION # X, PLEASE ANSWER QUESTION # XI. .
YOU MAY HAVE MORE THAN ONE ANSWER FOR QUESTION # XI, CHECK THE
ONE/ONES THAT APPLY.**

XI.) What is the nursing action on your unit if a pulmonary artery catheter is still lodged in wedge position, despite typical nursing measures (that is; assuring balloon deflation, repositioning patient and having patient cough, having chest X-Ray verified for catheter malposition)?

- 1.) Contact specific physician to reposition the catheter (Attending, Cardiologist, etc) _____ (.1)
- 2.) Contact any available physician within hospital to reposition the catheter (Intern, Resident, E.R. physician, any other physician) _____ (.2)
- 3.) Contact specific R.N. who has received special training to reposition catheter. _____ (.3)
- 4.) Have any available staff R.N. reposition the catheter. _____ (.4)
- 5.) Other (please, briefly describe) _____ (.5)

APPENDIX C

DISCLAIMER

NURSING PRACTICES REGARDING
PULMONARY ARTERY CATHETERS
LODGED IN WEDGE POSITION

QUESTIONNAIRE DISCLAIMER

The purpose of this study is to describe the actions taken by professional nurses, when a pulmonary artery catheter remains in wedge position, despite conventional nursing measures. You are requested to voluntarily complete the questionnaire, which asks about yourself, your hospital and pulmonary artery catheters. The time needed to answer the questions is less than fifteen minutes.

By responding to the questionnaire, you will be giving your consent to participate in the study. Your name is not on the questionnaire and only the investigator and her thesis committee will have access to your responses. You may choose not to answer some or all of the questions, if you so desire. Whatever you decide, you will not be affected in any way. You are free to withdraw from the study at any time. If you have any questions, please write to me at the address below. There are no known risks to this study.

Please place the completed questionnaire into the enclosed stamped, self-addressed envelope and return to the investigator.

Investigator:

Constance Wicks, RN, BSN, CCRN
Graduate Student
University of Arizona
College of Nursing
Tucson, Arizona 85720

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