

NURSES' ATTITUDES TOWARD THE USE OF COMPUTERS
IN NURSING PRACTICE

by

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submitted to Salisbury State University
in conformity with the requirements for the degree of
Master of Science in Nursing
Salisbury, Maryland

1989

ABSTRACT

The use of computers in nursing practice is creating significant economic, political and social change within the nursing profession. Nurses' attitudes toward computers and their use in nursing practice will influence the nurses' ability to actively participate in and fully integrate this change. The purpose of this study was to describe the attitudes of nurses toward the use of computers in nursing practice and to examine the association of these attitudes with demographic variables of: age; position; degree in nursing; degree in fields other than nursing; years of experience in nursing; years employed at the study hospital; previous education in the use of computers and computer use variables of ownership of a home computer and regularity of its use.

A conceptual model, the Change Model of the Use of Computers in Nursing Practice, based on Lewin's (1947) theory of social was developed by the researcher to identify driving and resisting forces involved in the process of the utilization of computers in nursing.

A descriptive-correlational design was utilized for the present study. A random sample of 85 registered and licensed practical nurses employed at a 383 bed acute care regional medical center was used. The majority of

the sample were white, female staff registered nurses working in full-time positions.

A questionnaire to measure nurses' attitudes toward the use of computers in nursing practice and a demographic tool developed by the researcher were used to collect data. The Computers in Nursing Practice Questionnaire (CNPQ) is a 33 item self-report instrument which was developed from a thorough review of the literature. Internal consistency was determined utilizing the Cronbach's alpha to be 0.849. Test-retest reliability was 0.8839.

Nurses' overall attitudes toward computers were positive. Those variables found to be significantly associated with overall attitudes were age (negative association), degree in nursing, and ownership and regular use of a computer.

A factor analysis of the CNPQ resulted in the identification of ten factors. Factors and demographic and computer use variables which were found to be significantly associated are: Documentation of Patient Care (I) and the Human-machine Relationship (II) with nursing degree and regularity of use of home computer; Costing Nursing Care (III) with age (-), nursing degree, years employed in nursing (-), years employed at study hospital (-), and regularity of use of home computer; Effect on Time Available for Direct Care (IV) and age

(-); Necessary Tool for Nursing Practice (V) with regularity of use of home computer; Ethical Concerns (VI) with nursing degree and years employed in nursing (-); Knowledge of Computers (VII) with nursing degree; Belief in Ability to Manage Computers (VIII) with age (-), position, nursing degree, degree in another discipline, years employed at study hospital, ownership of a home computer and regularity of its use; and finally, Need for Nurses to be Computer Literate (IX) with nursing degree and computer course in nursing school.

Multiple regression analysis indicated that sixteen percent of the variance in the overall attitudes score was explained by these variables: degree in nursing, regular use of a home computer and years employed in nursing at PGHMC, with the years in education in nursing as the most significant explanatory variable.

Descriptive information indicated that a major concern was the protection of privacy and / or confidentiality of patient information.

ACKNOWLEDGMENTS

I wish to thank the faculty members of Salisbury State University who assisted in the development of this thesis: Dr. Karin Johnson, Associate Professor and Chairperson of the Graduate Nursing Program, Dr. Homer Austin, Professor of mathematical Sciences. I would particularly like to thank Dr. Johnson, my advisor, for her guidance and gentle nudging when needed. Her respect for my experience, knowledge and independence as a nursing professional was appreciated. I wish to acknowledge and express my gratitude to Dr. Austin and Dr. Janice Rushton for their assistance with the statistical analysis.

Finally, I would like to thank Betty Collins, my nursing supervisor, for being flexible with my work schedule and seeking financial support from the agency where I work.

TABLE OF CONTENTS

	<u>PAGE</u>
ABSTRACT	ii
ACKNOWLEDGMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES	x
LIST OF FIGURES	xi
CHAPTER 1: INTRODUCTION	1
CHAPTER 2: REVIEW OF THE LITERATURE	7
Introduction	7
Early Research - 1960's	8
Research of the 1970's	15
Research of the 1980's	22
Attitudes and Knowledge	24
Evaluation of Effects of Use of Computers in Nursing Practice	40
Cognitive Style, Social Influence and Attitudes	43
Attitudes and the Use of Computers in Support of Patient Care	51
Summary	55
CHAPTER 3: METHODOLOGY	57
Introduction	57
Theoretical Base	57
Constancy and Resistance to Change	58
Social Fields	59

Social States As Quasi-Stationary Processes	60
Change of Force Fields	60
Changing As Three Steps	62
Model of Planned Change for the Introduction of the Use of Computers in Nursing Practice	62
Purpose of This Study	63
Research Questions	65
Hypotheses	66
Study Variables	67
Definition of Variables	68
Study Design	70
Study Population and Sample	70
Instrumentation	71
Computers in Nursing Practice Questionnaire	71
Validity	72
Reliability	73
Demographic Instrument	73
Data Collection	74
Data Analysis	76
Limitations of Study	76
Chapter 4: DATA ANALYSIS	77
Introduction	77
Reliability of Study Instrument	78
Computers in Nursing Practice Questionnaire	78

Sample Characteristics	78
Correlation of Independent Variables with Attitudes	87
Identification of Factors in the CNPQ	89
Associations of Selected Independent Variables and the Factors	92
Relationship Between Predictor Variables and the Total Attitude Scores	94
Descriptive Data	94
Ethical Dilemmas	94
Satisfaction with Training and Functioning of Computerized Patient Care System at PGHMC (PCS)	97
Computer Education Desired	98
Summary	98
CHAPTER 5: SUMMARY AND CONCLUSIONS	101
Introduction	101
Overall Attitude Toward Computers	102
Relationship of Age, Nurses' Attitudes, and Factors From the CNPQ	103
Relationship of Degree in Nursing, Nurses' Attitudes and CNPQ Factors	104
Relation of Ownership and Regular Use of a Computer with Nurses' Attitudes and with CNPQ Factors	105
Relationship of Position with CNPQ Factors	106

Relationship of Degree in Another Discipline with CNPQ Factors	107
Relationship of Years Employed in Nursing with CNPQ Factors	107
Relationship of Computer Course in Nursing Curriculum and CNPQ Factors	108
Variance in Attitudes	109
Descriptive Data	110
Uses in Nursing Practice	110
Ethical Concerns	111
Satisfaction with Training, Support and Functioning of PCS at PGHMC	112
Educational Needs Perceived by Nurses	113
Limitations	114
Conclusions and Implications for Nursing	114
Recommendations for Further Study	117
APPENDIX I: COMPUTERS IN NURSING PRACTICE QUESTIONNAIRE	119
APPENDIX II: DEMOGRAPHIC INSTRUMENT	123
APPENDIX III: SUPPORTING LETTER	125
APPENDIX IV: HUMAN VOLUNTEERS COMMITTEE LETTER	126
APPENDIX V: DISCLOSURE LETTER	127
APPENDIX VI: SECOND LETTER TO PARTICIPANTS	128
REFERENCES	129
CURRICULUM VITAE	132

LIST OF TABLES

TABLE NUMBER	TITLE	PAGE
1.	Subject Responses	80
2.	Characteristics of the Sample	81
3.	Spearman Correlation Coefficients of Independent Variables and Total Attitude Scores	88
4.	Correlation of Independent Variables and Factors I to X	91
5.	Multiple Regression of Predictor Variables and Total Attitudes Score	95

LIST OF FIGURES

FIGURE NUMBER	TITLE	PAGE
1.	Model of Lewin's (1947) Change Theory	61
2.	Change Model of the Use of Computer in Nursing Practice	64

Chapter 1

Introduction

Changes in society affect the discipline of nursing, nursing education and nursing research. According to Naisbitt (1982), society is moving rapidly from an industrial society to an information society. The strategic resource in this new society is information. To manage information, sophisticated new technologies have been developed. The computer is one technological advance that is creating significant economic, political and social changes within our society; and therefore, the nursing profession.

Paralleling the information explosion are increasing demands of health care organizations for accountability, productivity and documentation. The greatest impetus for developing Nursing Information Systems (NIS) came as a result of the Social Security Act of 1965 which initiated Medicare and Medicaid coverage. Nurses were required to provide data needed for reimbursement and to substantiate the care delivered (Carlsen, 1981). Documentation demands associated with accreditation, quality assurance, and evaluation purposes have increased and will continue to be important in the future. Other accountability demands are legal and financial (Happ, 1986). At the

same time, the nation is in the mist of a severe nursing shortage. One of the recommendations of the federal Commission on Nursings' final report on the nursing shortage was that "computers and other labor-saving technologies should be applied to support nursing" (News Brief, 1989, p. 278).

As computer technology has become more affordable, computerized medical, nursing and hospital information systems are being purchased and implemented in more health care organizations than ever before. In a major evaluation study of the Technicon Hospital Information System (HIS) at the National Institute of Health, McNeely (1984), found that the most frequent users of the system were nurses. Therefore, nurses are in a position to significantly influence the future in terms of effective and humanistic utilization of computers. Unfortunately, when nurses' attitudes have been compared to those of other health professionals, the majority of these studies revealed that nurses were found to have less favorable attitudes than other professionals toward computer systems (Melhorn, Legler & Clark, 1979; Reznikoff, Holland, Stroebel & Ericson, 1967; Rosenberg, Reznikoff & Stroebel, 1967; Startzman & Robinson, 1972; Thies, 1975).

There is a sparsity of research in the humanistic and ethical concerns of nurses concerning the use of

computers in nursing practice. Startzman and Robinson (1972) first identified the need to further explore humanistic concerns associated with the use of computers in nursing. Walker (1981) conducted a study to determine educational needs of professional nurses regarding computerization as it affects nursing practice. One of the potential problems identified by nurses was related to impersonalized nurse/client relationships. Further exploration of this area is needed.

In many organizations, decisions concerning computers are made without consulting nurses or after consulting nurses who do not have the knowledge necessary to make informed decisions about computers (Morrow, 1985). Adams (1986) emphasized the importance of nurses learning to change their roles and nursing practice to manage this new technology: "future populations will be composed of the computer literate and the computer illiterate. The computer literate will have knowledge, and as a result, power and influence" (p. 23). To survive and retain control of the nursing profession, nurses must not simply react to computer technology; they must actively participate in the design, planning, implementation, and evaluation of computerized information systems.

Previous studies (Chang, Jordan-Marsh, & Chang, 1981; Krampf & Robinson, 1986; Melhorn et al., 1979;

Merrow, 1985; Ronald, 1982) have found that those who have used computers had more positive attitudes toward the use of computers in nursing. However, Nelson and Carlstrom (1985) point out that "computer technology in nursing and nursing education is still in the embryo stage of development" (p.87). If nursing is to progress in the Information Age, areas of acceptance and resistance to the use of computers must be identified.

The purpose of this study was to describe the attitudes of nurses toward the use of computers in nursing practice and to examine the association of these attitudes with selected demographic variables and computer use variables. The research questions explored were:

1. What are nurses attitudes toward the use of computers in nursing practice?
2. What demographic variables influence nurses' attitudes concerning the use of computers in nursing practice?
3. How does ownership of a computer and regularity of its use influence nurses' attitudes toward the use of computers in nursing practice?
What do nurses use home computers for?
4. How much of the variance in nurses' attitudes toward the use of computers in nursing practice

can be explained by demographic and computer use variables?

5. What, if any, ethical dilemmas do nurses perceive related to the use of computers in nursing practice?

A questionnaire to measure nurses' attitudes toward the use of computers in nursing practice was developed. A Change Model of the Use of Computers in Nursing Practice, based on Lewin's (1947) theory of change, was developed to identify driving and resistant forces involved in the process of the utilization of computers in nursing.

Identification of nurses attitudes toward the use of computers in nursing practice would enable the nursing administrator to identify areas of acceptance and resistance to change among staff. Areas of resistance may then be addressed and appropriate strategies toward change applied. The association of certain individual characteristics and attitudes would identify specific populations where education and other support measures may be focused. This would facilitate the process of changing nurses' negative attitudes and therefore; the successful utilization of computers in nursing practice.

The results of this study may have significance for the development of inservice and continuing education

programs, as well as, undergraduate and graduate nursing educational programs. Successful education programs would produce nurses who are prepared to actively participate in the design, planning, implementation and evaluation of computerized information systems resulting in optimum utilization of this new technology.

Results of this study may have importance in linking previous research in this area to current findings as well as identifying socio-behavioral concerns of nurses associated with the use of computers in nursing practice.

The pressure of decreasing funds, greater workloads, increasing acuity levels, a continuing nursing shortage, and constant breakthroughs in both the information and health care industries requires almost constant change. This change, however, gives nurses an opportunity to explore, develop, and expand their roles in a new environment (McPhillips, 1987). Nurses must take advantage of the opportunity and prepare for their future roles in health care. Knowledge of computers and the ability to utilize this technology in nursing practice, education and research will be required.

Chapter 2

REVIEW OF THE LITERATURE

Introduction

This chapter contains a review of the literature related to nurses' attitudes toward the use of computers in nursing practice and the variables which influence these attitudes. Most of the studies reviewed were directed toward identifying attitudes of nurses toward specific uses of computers in nursing practice, as well as specific areas of resistance, concern and knowledge. Literature presented will also identify areas of nursing practice in which attitudes have not been investigated such as: the improvement and documentation of the quality of care; dehumanization of nursing care; computer literacy of nurses; ethical dilemmas; and costing of nursing care.

Initial studies of nurses' attitudes toward computers were done in the 1960's when computers were first introduced in the clinical area. Although the progress of computer technology was still painfully slow in the mid-seventies, the computer revolution did begin to impact on nursing practice areas (Hofmann, 1971). In 1975, one of the first large scale computerized medical information systems was implemented at the Clinical Center of the National Institute of Health (Carlsen, 1984). Boston's Massachusetts General Hospital and the

El Camino Hospital in California were also pioneering the Technicon Hospital Information System (Carlsen, 1981; Thoren, Paulsen & Gould, 1968). Research studies which expanded and updated the previous findings in the sixties are also reviewed.

In the early 1980's, computers became less costly and the computer began to move more rapidly into the nursing department. Researchers began to earnestly explore the impact of this innovation upon nursing practice. The investigation of nurses' attitudes toward the use of computers was expanded to include the identification of individual characteristics of nurses which may influence attitudes and the relationship between these characteristics and attitudes.

Early Research - 1960's

Early research on nurses' attitudes toward computers found nurses and nursing students markedly negative toward computers (Friel, Reznikoff, & Rosenberg, 1969; Reznikoff, Holland & Stroebel, 1967; Reznikoff & Rosenberg, 1969). In 1967, one of the earliest and most frequently cited studies about attitudes of nurses toward computers was reported by Reznikoff, Holland and Stroebel. The setting for this study was a private psychiatric hospital where automation was being introduced into the clinical environment. Despite attempts to educate employees concerning the potentials

and limitations of computers, Reznikoff et al. (1967) found that the staff were threatened by the concept of a machine coming in and "taking over" as evidenced by their negative attitudes toward computers. The purpose of this study was to obtain more objective and comprehensive information on attitudes toward computers and to evaluate them in terms of possible contributing background variables.

Attitudes were assessed through the use of thirty-five questions taken from a sixty-one item questionnaire developed by Kobler (no date or reference given). These questions were judged by five psychologists to clearly express favorable or unfavorable attitudes toward computers. Reliability of the tool was not stated. Biographical information was also requested. All full-time employees were asked to complete the instrument. Of those distributed, 372 questionnaires were utilized for statistical analysis. No information regarding the number of employees or percentage of return was given.

Using computed total attitude scores for each participant, analysis of variance was employed to compare the participants who were grouped on the basis of each of six biographical variables- age, highest grade of degree completed in school, marital status, department and years employed at the study hospital. Each

response was dichotomized as being negative (1-3) or positive (4-6) and analyzed for association to the biographical groupings.

Formal education was found to be the single demographic variable that contributed most to group differences. Personnel with some college education had more positive attitudes than those with a high school diploma. Males were far more positive in attitudes toward computers than females. Professional and medical staff were significantly more favorable in their attitudes than other employees. Nursing students were found to be consistently less positive than all other groups, including clerical, housekeeping, and maintenance personnel.

For those employed at the study hospital less than one year or more than ten years, attitudes toward computers were more negative than for those employed an intermediate length of time. The authors suggest that "...those employed in a given position for a sustained period of time...might be rather rigid about their pattern of duties and possibly more dubious of their own capacities for adapting to new procedures" (Reznikoff et al., 1967, p. 424).

A factor analysis revealed nine factors which were grouped into three subject areas: 1) the usefulness and efficiency of computers to function in this complex

society; 2) the need for constant human control of computer activity and the dangers of dehumanization; and 3) the misapplication and exploitation of computers and the unwarranted assumptions that are made about their future potential. The most significant source of variance in attitudes was the second subject area dealing with human safeguards in the use of computers.

Reznikoff et al. (1967) proposed that attitudes toward computers may be influenced in a positive direction by "an educational program specifically designed to provide information and understanding of computer techniques" (p. 423). A follow-up study was suggested to evaluate personnel's attitudes toward computers before and after education programs.

Concern about the negative attitudes found among nursing students in the previous study prompted Rosenberg, Reznikoff, Stroebe and Ericson (1967) to conduct a follow-up study at the same institution. Rosenberg et al. (1967) hypothesized that:

the attitudes of nursing students toward computers would change during their psychiatric affiliation, and that the more closely the students worked with the computer produced reports, the more favorably impressed they would be with the benefits of the

automated techniques in the care of
psychiatric patients. (p. 45)

The study was experimental in nature and limited to the student nurses.

The same thirty-five item questionnaire utilized in the previous study by Reznikoff et al. (1967) was administered to thirty-four junior and senior nursing students from five diploma programs at the beginning and end of their three month psychiatric affiliation with the study hospital. The method of assigning subjects to the experimental and control groups presents a threat to the validity of the study results. The nursing education department selected and made assignments based on data (type of data is unknown) furnished by the students' home nursing schools, an individual assessment by the department and on the needs of the hospital. No information on the equivalence of the study groups is given. Also, attributes (age, sex, years of education, etc) which were found to influence attitudes in the previous study were not examined. Twenty-six students were assigned to nursing units which used automated nursing notes and twenty-eight to units where only traditional narrative notes were used.

Total attitude scores were computed for each student. Initially, the mean attitude scores (109 and 103, respectively) for the exposed group and the non-

exposed group were neither positive or negative (maximum positive score = 210). Using a t-test, no significant difference was found in the initial attitudes of the groups toward computers. However, at the end of three months, the attitudes of the exposed students showed a significant change in attitudes in the positive direction ($p < .001$). The non-exposed group also favorably changed their attitudes, but it was not statistically significant. Results of the study support the hypothesis that nursing students, after exposure to automation, would change their attitudes in the positive direction toward the use of automated techniques in the care of psychiatric patients.

Friel et al's. (1969) evaluation of attitudes of nursing personnel is an extension of the two previous research studies by Reznikoff et al. (1967) and Rosenberg et al. (1967). The previous studies were conducted at a private, non-profit teaching psychiatric hospital. In this study, Friel et al. (1967) examined the attitudes of nursing personnel at a general hospital prior to the extensive use of computers. The hypothesis was that the findings of the previous studies would not be unique to that setting of the Reznikoff et al. (1967) study.

Nurses' attitudes were obtained by using the same thirty-five item questionnaire developed by Kobler and

modified by Reznikoff et al. (1967). In addition, subjects were also asked to indicate their age, education, duration of employment, marital status, department and position in the hospital. One-hundred and eighty nursing students, licensed practical and registered nurses employed or attending nursing school at St. Frances Hospital were asked to anonymously complete the tool. All the questionnaires were completed.

Data were analyzed using analysis of variance and t-tests. These findings were then compared to the results of the attitude survey of the Institute of Living Nursing personnel in the Reznikoff et al. 1967 study. As in the Institute of Living population, a borderline relationship between age and computer attitudes ($p < 0.10$) was found, with those in their teens the most negative. In both studies, staff members who were employed for less than one year or more than ten years were less positive in their attitudes towards computers than those in the intermediate ages ($p < 0.05$). Marital status was found to be unrelated in both studies.

Friel et al. (1969) found, as did Reznikoff et al. (1967) more favorable attitudes among subjects as years of education increased. When the attitudes of the entire nursing groups of both study hospitals were

compared, no significant differences were found. However, nursing students at both study hospitals were significantly less positive in their attitudes toward computers than the more senior nurses. The hypothesis that computer attitudes found in the Reznikoff et al. (1967) were influenced by identifiable demographic variables and not the type of setting is supported by the findings of this study.

Research of the 1970's

In the 1970's, researchers found that nurses (Thies, 1975) and nursing students' attitudes were less positive toward the use of computers than were medical students or faculty (Startsman & Robinson, 1972). A replication of the Startsman and Robinson study by Melhorn et al. (1979) reported that nursing students were more positive toward computers than any other hospital personnel groups; however, staff nurses were the least positive. It was also found that participants were exposed to computers more. Among those who used them regularly, attitudes were more positive.

The first study to obtain more comprehensive information for evaluation of the "man-machine interface" problems was Startsman and Robinsons' (1972) study which surveyed personnel at a large university medical center to determine their attitudes to computers prior to the implementation of a computerized medical

information system (MIS). The twenty item Likert-type attitude survey, developed by the researchers, was sent to 460 personnel, of which 73% completed the instrument. The groups of participants represented included: medical students, nursing students (diploma), residents and interns, faculty members, registered nurses, ancillary personnel and medical record librarian students.

The attitude survey consisted of ten positive and ten negative statements about computers which were extracted from a pool of 63 statements given in a preliminary study to seventy-five medical and nursing students and licensed practical nurses. Using the method of summated ratings, the statements were found to be the twenty best attitudinal discriminators. No further information was given about the preliminary study. Using the split-half method, reliability of the scale was .87.

Participants were also asked to complete a short checklist to determine their age, relationship to the medical center, and previous experience with computers. In addition, three open-ended questions regarding the feasibility of computer applications in medicine as well as one concerning the survey tool itself were presented.

Attitude scores were computed. The mean total attitude score was positive, 51.8. Based on total scores for each group, staff nurses, ancillary personnel

and student nurses' (Group I) attitudes were not as favorable as faculty, house officers, medical students and medical record students (Group II). On an 80 point scale (where the higher score indicated a more favorable attitude), Group II scored at least eighty points higher on the average than Group I. Results support the findings of previous studies (Friel et al., 1969; Reznikoff et al., 1967) that the higher the level of education the more positive the attitudes toward computers. In this case, faculty members, exhibited the highest scores while ancillary personnel had the lowest. In contrast to the findings of Reznikoff et al. (1967) that males had significantly more positive attitudes, no correlation with sex was found.

In addition, it was found that none of Group I indicated any previous experience with computers, while 42% of the Group II did. Startzman and Robinson (1972) suggested that the difference between the attitudes of these two groups may be partly attributed to familiarity with computers. However, no significant differences were found in responses to any of the statements among those in Group II who had previous experience with computers and those who had not.

Individual responses of all participants were subjected to factor analysis which yielded four factors,

which explained 42% of the total variance and included 16 of the original statements. The four factors were:

- | | |
|------------|---|
| Factor I | A general evaluation of computers...whether or not they are good, efficient, necessary and so forth. |
| Factor II | Willingness to use or accept the use of computers. |
| Factor III | Potential threat of computers to employment. |
| Factor IV | Possible benefit of the application of computers to the problems of hospitals. (Startsman and Robinson, 1972) |

Means and standard deviations of the standardized factor scores for each of the seven groups of study participants were computed and indicated that the vast majority of participants realized the importance of computers and their general capabilities. Despite their positive attitudes, ancillary personnel, nurses, students nurses, and interns were the least willing to participate with or use computers. Startsman and Robinson (1972) propose that these attitudes may be partially explained by the groups perception that the computer would at a threat to employment and that the

hospital's problems could not be alleviated through the use of computers.

For non-physician groups, Startzman and Robinson (1972) found the most significant factor which influenced favorable attitudes appeared to be the type of education. Participants with at least some college education had more favorable attitudes toward computers.

Prior to the implementation of computer applications in health centers, Startzman and Robinson (1972) recommend that individuals' opinions be surveyed to allow insight into areas of acceptance and rejection. If discreetly presented, the authors suggested that the survey could arouse interest and perpetuate a feeling of genuine concern for the individual's opinion. In addition, it was recommended that those employees not previously educated in the use of computers be oriented to the use of computers as students or during initial periods of training.

Improvement of the survey instrument was recommended by the authors to include "the addition of statements concerned with humanistic aspects of computers...and statements dealing with computer applications in medical care..." (Startzman and Robinson, 1972, p. 227).

In the next seven years, computers became more prevalent in society and in the health care industry.

Melhorn et al. (1979) chose to replicate the Startzman and Robinson (1972) study in the same setting to assess current attitudes toward computers and determine if there were any changes in health care personnels' attitudes toward the use of computers in health care.

In 1979, computerization at the University of Kansas Medical Center was limited to patient admitting, business and financial affairs as well as computer assisted instruction in a few departments. Mini- or micro- computers had been used in such clinical settings as Radiology, Cardiology and the Clinical Laboratory. One out of every ten people in each category of hospital personnel were asked to participate in the study, with seventy-eight percent responding. The survey instrument included 15 of the 16 statements with high factor loadings from the Startzman and Robinson questionnaire. One item, was inadvertently omitted from the study. Eight additional questions which dealt with attitudes about computers at the study hospital were included in the tool. High scores on this Likert-type questionnaire indicated more positive attitudes. Demographic information regarding the subjects' age, position, length of association with the medical center and previous experience with computers was also obtained.

In this study, overall attitudes toward computers were positive as in the Startzman and Robinson study

seven years before. Total attitude scores for both studies were essentially identical. No statistically significant differences among the subjects' hospital position were found in this study as was found in the Startzman and Robinson (1972) study. However, in contrast to the earlier studies and others (Friel et al., 1969; Reznikoff et al., 1967), nursing students were found to have more positive attitudes toward computers than staff nurses and other hospital personnel.

Factor analysis yielded four factors accounting for 48% of the total variance. These factors were:

- | | |
|------------|--|
| Factor I | Willingness to use and a desire to learn more about computer assisted diagnosis. |
| Factor II | General evaluation of computers. |
| Factor III | Potential threats of computers to employment. (Similar to Third factor of Startzman and Robinson's 1972 study) |
| Factor IV | Attitudes toward specific uses and scientific applications of the computer. |

The mean ratings for each factor from this study and the Startzman and Robinson (1972) study were very

close, although participants in the present study had more positive attitudes for Factors II and IV.

Using analysis of variance, each factor was then compared among the six hospital groups. The responses of nurses and nursing students were very similar to those found in the Startzman and Robinson (1972) study. Staff nurses were somewhat negative toward willingness to use and learn about computer assisted diagnosis and were the group most threatened by loss of employment. Student nurses were the group least concerned by loss of employment; however, they were negative with respect to computers in general. They were the most negative group toward specific uses and scientific applications of the computer.

Some differences did exist between the subjects of the study seven years ago and the present study. As expected, more of the participants in the present study indicated previous experience with computers. Those who worked with computers daily or extensively were found to have higher attitude scores than those who reported limited contact. However, the researcher's expectation that the attitudes toward computers would be more positive seven years after the Startzman and Robinson (1972) study was not supported by the present study.

Research in the 1980s

Research in the 1970's showed that nurses, (especially student nurses) held relatively negative attitudes, when compared to other hospital personnel toward the use of computers in health care. Variables which were found to be related to attitudes were: age, sex, years of employment at the study hospital, level of education and experience with computers.

In the 1980's, continuing education and national and international conferences on computer applications in nursing have sought to address some of the areas of resistance to the use of computers in nursing practice. Special interest groups were organized for computer applications in nursing (Chang et al., 1983). Computers have also become more prevalent in the nurses everyday life; i.e., at the bank, library, schools, retail stores, etc. Several schools of nursing began to provide some level of computer education to students. In 1983, the Department of Nursing at Thomas Jefferson University began implementing a five year program for the integration of the computer into nursing education. In 1985, the University Of Maryland School of Nursing decided to develop and implement undergraduate coursework in nursing applications of computer systems in health care as well as a foundational prototype graduate course (Romano, Damrosch, Heller & Parks, 1989). Happ (1986) reports that computer-aided

instruction is widely employed in teaching technologies through simulation to undergraduate nurses. Studies in the 1980's which explore changes in nurses' attitudes toward the use of computers in nursing practice and the variables which influence them will be reviewed in the next section.

Attitudes and Knowledge

The need to educate student nurses to utilize this new technology became evident (Carlsen, 1984). Ronald (1982) studied the attitudes of nursing educators toward computers and their perceptions of the need for faculty to learn about them. Attitudes were measured through the use of a questionnaire composed of sixteen statements with high factor loadings from a Likert-type instrument developed by Startzman and Robinson (1974). Reliability of this scale by split-half method was reported by Startzman and Robinson to be .87. In Ronald's study, a coefficient alpha of .63 was computed. In addition, subjects were also asked to supply information about their age, type of program employed in and previous experience with computers.

Learning needs were assessed through a two-part questionnaire developed by Ronald. Subjects identified current knowledge about a statement and desired knowledge about the same statement on a scale of 0 to 4. The difference between their current and desired

knowledge was defined as their learning need in respect to that statement. Content validity was established through reference to the literature and review by two nurses expert in the use of computers in nursing. Using coefficient alpha, reliability for the three scales was computed to be .95 for the current knowledge scale; .93 for the desired knowledge scale and .95 for the learning needs scale.

Three hundred nursing faculty with a master's degree or above who taught in Schools of Nursing within the continental United States were selected at random from a list of nursing educators who were members of the American Nurses Association. Of this potential sample, only 53% of the questionnaires were usable for data analysis.

Results of the study indicated that nursing educators had moderately positive attitudes toward computers. They were highly supportive of computers with respect to their efficiency and importance in modern society (Factor I). However, it is interesting that they had the least positive attitudes toward acceptance and use of computers (Factor II). No significant difference in attitudes of faculty members based on the type of program in which they taught, their age or number of hours of computer instruction which they had had was found.

To explore possible relationships, cross-tabulation of attitude scores and the variables, type of program employed in, age and previous experience with computers, was completed. It was found that the respondents with the most positive attitude scores were from diploma schools (30.8), next from baccalaureate and graduate programs (23.5 and 22.2, respectively) and the lowest from associate degree programs (15.8). Since all respondents possessed masters degrees and above, Ronald hypothesized that faculty from baccalaureate and graduate programs were more positive than educators in associate degree programs because they were more likely to be working toward or possess a doctorate. The large difference between diploma and associate degree faculty was explained by the probability that most diploma programs were hospital based rather than college based. Therefore, diploma school nursing faculty could have been more likely to have been exposed to use of computers in the hospital. This familiarity could influence their attitudes.

With respect to age, those in the highest age group (60-69) had more participants (20%) with highly positive scores than those in the lowest age groups (20-29) with only 9.1%. These findings supported other studies (Chang et al., 1983; Reznikoff et al., 1967) which found that younger people have less positive attitudes toward

computers than older people. In a faculty situation, the older nurse may be more educated. However, since the number of respondents in these two categories was so small, no meaningful comparisons could be made.

With regard to hours of instruction, those who had instruction about computers had a more highly positive attitude toward computers than those who had not. Ronald proposes that it appears that knowledge about computers might have had a positive influence on educators' attitudes.

Analysis of the data from the learning needs scales suggested that nursing educators had a need to learn about computers, but that there was a high degree of heterogeneity among them with respect to their learning needs. The learning need which appeared to have the highest priority was to learn about the application of computers to education and the least need was to learn about how computers function. Graduate faculty had significantly greater knowledge about computers and significantly less need to learn about them than other faculty groups ($p < .05$).

In future studies, Ronald recommended that the attitude scale be expanded to include statements related to the humanistic aspects of computers. This was found to be an area of concern to health professionals and might explain a significant amount of

variance in overall attitudes. Ronald also recommended that statements concerning specific computer applications in nursing be added to the attitude scale.

Merrow (1985) studied nurse educators' and nursing service personnel's knowledge and attitudes toward computer applicability in nursing practice in order to facilitate planning for education in the area of computer-based nursing practice. A stratified random sample of twelve hospital and NLN-accredited baccalaureate schools of nursing was selected via an initial mail survey. Three institutions from each of the following study groups were randomly selected: hospitals with and without a computer(s) used by staff nurses and Baccalaureate nursing schools using at least one hospital for clinical experience in which computer were used by staff nurses and one where computer(s) were not.

One nursing administrator and two staff nurses/faculty members were chosen by the director of nursing or dean of the school according to guidelines provided by the researcher. Merrow (1985) acknowledged that the biases of those selecting the study participants may have influenced the selection of subjects.

The study tool was inadequately described by the article. Validity and reliability of the tool is not addressed. The study instrument is described as an interview schedule combining direct questions with open-ended questions and containing three sections. The first section focused on attitudes toward computers in general and in nursing practice. Section II addressed the subjects' knowledge of computer applicability to nursing practice. In addition, a few questions, related to the subjects sources of learning about computers and factors that facilitated and inhibited such learning, were also included in this section. Demographic and employment variables were gathered in the third section.

Data were collected by individual face-to-face interviews lasting 30-45 minutes. The interviewer subjectively rated each subject for attitude toward and level of knowledge of computer use in nursing practice. The scale used for rating is not presented.

The entire study sample (n=36) was registered nurses with ninety-seven percent being female. A majority of the sample (75%) was ≤ 49 years. Just over half (52%) of the subjects held a masters degree in nursing as their highest nursing degree, with only six percent having doctoral degrees in fields other than nursing.

The majority of nurses (61%) interviewed were considered to have positive attitudes toward computers, with twenty-two neutral in their attitude toward computer use in nursing practice and considered to be open to learning more about computer use in nursing practice. Nursing service personnel comprised a majority of the participants considered to have negative attitudes.

As found in previous studies (Melhorn et al., 1979; Ronald, 1982), regular use of computers resulted in positive attitudes toward computers. The majority of subjects with negative attitudes had never used a computer in clinical practice. Also, as the level of education increased, it was found that certain positive attitudes did as well. Those participants who were baccalaureate or master's prepared nurses, offered significantly more comments regarding the improvement of the quality of nursing care than those who were diploma or associate degree graduates.

Chang et al. (1983) conducted a pilot study to investigate differences in nurses' expectations regarding the use of computers between two groups of nurses (pace-setters and middle-major). Pace-setters were described as persons "who are progressive, but derive much of their stimulation and gratification from social interactions and from being among the first to

adopt innovations..." while the middle-majors are persons "who follow the pace-setters in accepting new innovations" (Chang et al., 1983, p. 519).

Specific areas of comparison were: 1) differences in expectations with respect to their personal life, relationship to their profession, their view of health care system and cost and 2) differences in their willingness to interact with the computer to accomplish specific nursing activities (e.g., charting nurses' notes, medications, lab work, etc.). Attitudes were identified through semi-structured questions which addressed the extent in which nurses expected the use of the computer to influence the areas of comparison.

Nurses were also asked to indicate whether they were "very willing", "somewhat willing", or "not willing" to utilize a computer to perform a list of nine nursing activities. These questions were rated either positive or negative--"not willing" being rated as negative and the others as positive. These activities were those known to be commonly available for use of a computer to perform; for example, chart medications, order supplies, individualized care plans, etc.

Demographic information was obtained for: age-groups, sex, previous experience with computers, and type of nursing in which currently engaged. Validity was established by review of the tool by five nurses and

non-nurses experienced in the use of computers. Reliability was to be obtained as part of the study; however, this information was not given in this article.

A small sample of twenty-six subjects participated in this study voluntarily and anonymously. The pace-setter group (Group A) consisted of 14 volunteers from a 3-day computer conference in nursing where many hospital and school administrators sent their nursing personnel, many of whom were the designated computer liaison persons in the hospitals, or faculty asked to provide leadership in computer education in their schools. The participants were approached individually at the conference and asked to participate in the study.

The middle-majority group (Group B) were selected from a more general workshop dealing with psychological aspects of patient care. These twelve subjects worked in acute care, critical care, psychiatric, and doctors offices. None of the group used a computer daily or even weekly. Only three of the 12 reported being able to perform data entry or word processing.

The modal group for Group A (41-45) was older than Group B (31-40). Group A had more educators, administrators, and were experienced in using home computers. Most of Group A were able to program or perform data entry, word processing or data management on the computer. Two of the participants in Group A

used computers on a daily basis and others irregularly or never.

Data from the questionnaires were analyzed by comparing responses of Group A to Group B. Chang et al. (1983) found that the pace-setters in Group A responded more positively to expectations in each area of life than did the middle-majors in Group B. The majority of Group A (78%) expected the use of computers to provide more information, save time, and to be generally helpful. Only 33% of Group B indicated positive expectations, and 3 stated concerns in the areas of loss of identity, loss of privacy, and loss of control. Chang et al. (1983) proposed that Group B's attitudes and concerns are "a reflection of their current understanding of what the computer can do" (p. 521).

A majority of Group A members favorably responded to the use of computers to save time, ease the retrieval of information and provide more time at the bedside. Only 3-4 members of Group B participants responded positively to each area.

Participants' willingness to interact with computers to accomplish the nine nursing activities was tabulated. The mean percentage of participants who checked "very willing" in Group A was 86% and "somewhat willing" 14%; compared with 52% "very willing" for Group B and 10% "somewhat willing".

Although, the pace-setters (Group A) were willing to use computers in their practice, they were less willing to use computers to teach students/patients. However, the middle-majority group (Group B) were only "very willing" to use the computer as a reference and to order supplies. They were less willing to use the computer to perform nursing tasks, i.e., to enter Dr.'s orders, generate individualized care plans, etc.

The results of this study supplement the research regarding attitudes of nurses toward specific uses of computers in nursing practice; however, due to the design of the study, the results cannot be generalized to other populations.

In 1985, Stronge and Brodt developed an instrument to measure nurses' attitudes toward computerization. which was used in their 1986 study. Sixty-six statements were initially included in the pilot questionnaire with the intention that 20 statements would be retained. Approximately equal numbers of positive and negative statements were randomly distributed throughout the tool to avoid response bias. A Likert-type scale with five degrees of responses (i.e. strongly agree to strongly disagree), ranging from 1 to 5, was utilized to quantify the responses.

The major areas addressed by the questionnaire statements were: 1) job security, 2) legal ramifications, 3) quality of patient care, 4) capabilities of computers, 5) employees willingness to use computers and 6) benefit to the institution. These issues were identified by the authors by review of related literature.

The instrument was piloted among 60 junior and senior nursing students and faculty at Marycrest College in Davenport, Iowa. The method of selection for this sample was not given. Eighty percent of those requested to complete the instrument participated.

The completed questionnaires were examined for problems with design of the questions. Comments and suggestions for improving the tool were considered. Nineteen statements which had an index of discrimination above .50 were accepted for inclusion in the final tool. Content validity was established by comparing the content of the nineteen statements with the list of six areas to be assessed by this tool. This comparison revealed that only the area of job security was considered to be inadequately covered. Therefore, an additional statement with an index of discrimination of .48 was added. Reliability of this 20 item tool, utilizing the Spearman-Brown prophesy formula, was high (.90).

Brodt and Stronge (1986) utilized the study instrument that they developed and piloted in the previous 1985 study to measure nurses' attitudes toward computerization and to evaluate these attitudes in relationship to possible contributing variables. All nurses, except "stand-by" nurses, at Galesburg Cottage Hospital, in Galesburg, Illinois were asked to complete the questionnaire. Confidentiality was assured. Demographic data were gathered, though the method was not identified. Eighty-two percent of the 225 Licensed Practical Nurses (LPN), Associate Degree Nurses (ADN), Diploma Nurses, and Baccalaureate Degree Nurses (BSN) completed the survey. Only five participants were male. A range of 20 to 100 points was possible on the tool, with 20 being the most negative. The mean total attitude score was positive (79.8).

A one-way analysis of variance (ANOVA), performed on the attitude survey scores of LPNs, ADNs, Diploma Nurses and BSNs revealed a significant difference ($p < 0.001$) between the four groups, with the means of the BSNs being the most positive (74.29) and the LPNs the most negative (63.90). Further analysis, using a Scheffe multiple comparison analysis, revealed that a significant difference existed between LPNs and any level of RNs, with the more favorable attitudes held by the RNs. Finding that the higher the level of

education, the more favorable the attitudes toward computerization is consistent with other studies (Chang et al., 1983; Friel et al., 1969; Reznikoff et al., 1967; Startzman & Robinson, 1972).

The nurses were grouped by length of service in the nursing profession (<10 years, 11-20, 21-30 and >31). ANOVA revealed a significant difference ($p < 0.01$) among the four groups. Using the Scheefe multiple comparison procedure, analysis revealed a significant difference existed between nurses who had worked in the profession less than 10 years and those who had worked for 21 or more years, with the more favorable attitudes among the nurses who had worked longer.

Attitudes of nurses toward computerization by type of nursing unit, utilizing ANOVA revealed a significant difference among the seven groups organized according to the nursing unit they worked--Obstetrics(OB), Operating Room(OR), Psychiatrics(Psch), Medical-Surgical(Med-Surg), Rehabilitation-Pediatrics(Rehab-Peds), Critical Care and Nursing Administration. Based on the means of the seven groups, the Scheffe multiple comparison analysis procedure was utilized to first compare the Med-Surg group to the Rehab-Peds group, and then to Nursing Administration. A significant difference was found between the Med-Surg group and both Rehab-Peds and Nursing Administration nurses, with the Rehab-Peds and

Nursing Administration nurses having more favorable attitudes toward computerization. Brodt and Stronge (1986) propose that this finding could be explained by the possibility that there were "more LPNs on the Med-Surg nursing unit, while in the Rehab-Peds and Nursing Administration groups, the level of education is higher" (p.86).

Krampf and Robinson (1984) also developed an instrument to assess professional nurses attitudes toward the computer in a hospital environment. The survey was composed of ten questions (Part I) related to computers and ten items (Part II) to gather certain background data. The method of responding varied with each question. The questions in Part I focused on these key issues: 1) relevance of computers to the provision of quality and efficient nursing care, 2) expectation of nurses that they will gain personal satisfaction in learning to use computers, and 3) misperceptions about prerequisites needed to becoming technically competent in using a computer.

Questionnaires were distributed by the head nurse of each unit to 363 full-time professional nurses at a large metropolitan, teaching hospital. The method of sample selection was not given. A high response rate of 66% was obtained. The majority of the sample were Diploma graduates (45%), with only three percent of the

sample Master's prepared or higher. Most of the sample (26%) were in the 20-29 year age group and the fewest (8%) were 50 years or older. Those who had limited or no experience with computers were fairly evenly divided (31% and 34%, respectively). Only 2% had extensive experience.

Cross tabulation of responses with the three background variables of age, educational attainment and history of computer use yielded no significant differences. A majority of participants responded favorably to the key issues. Ninety percent indicated that computers were relevant to improving their productivity and effectiveness and sixty-five percent to enhancing the provision of nursing care. It was also found that nurses felt they would gain personal satisfaction from using a computer (79%). Despite the indication that participants expressed positive attitudes toward the use of computers in nursing practice, sixty-five percent were hesitant before personally looking forward to using a computer. They preferred to "wait and see".

The majority of the sample did not believe in the common misperceptions that 1) a good math background is a prerequisite for computer use and 2) computers tend to make numerous errors. Krampf and Robinson (1986) found that as age, level of education and exposure to

computers increased, the more likely the nurse would be challenged rather than frustrated by a computer problem. As in previous studies (Brodt & Stronge, 1986; Chang et al., 1983; Friel et al., 1969; Melhorn et al., 1979; Reznikoff et al., 1967; Ronald, 1982; Startzman & Robinson, 1972) age, level of education and previous exposure to computers appear to positively influence nurses' attitudes toward the use of computers.

Evaluation of Effects of Use of Computers in Nursing Practice

Johnson, Burkes, Sittig, Hinson and Pryor (1987) conducted a study to evaluate a Nursing Information System (NIS) which was under development and being gradually implemented at LDS Hospital in Salt Lake City, Utah. Computerized charting at the bedside before and after implementation of Patient Independent charting was studied. Two acute-care divisions were the study units and one the control. Differences in three areas were investigated: nursing time distribution, nurse attitudes toward computerization and compliance with charting standards. Three hypotheses were tested:

- 1) After computerization, less time would be spent on paperwork and communication and more time on patient care and computer usage.
- 2) Nursing attitudes will be more positive with experience.

3) Patient specific charting will result in a greater improvement in charting compliance then Patient Independent charting did.

The study was conducted on a 48 bed unit with the entire nursing staff of 50 full and part-time nurses participating in the study. The same subjects were utilized for pre- and post-implementation.

For the time distribution study, a work sampling study was designed by Dean Sittig, based on the literature, to evaluate the distribution of nurses' work. Three nursing divisions, each within a different seven-day period, were studied by trained observers two months prior to implementation and the one division five months after charting implementation. Activities were categorized, study observations results totaled and percentages and standard deviations determined. Other variables examined were number of staff nurses, acuity, patient census, total daily nursing hours per patient, and average hours of patient care per nurse.

Only one of the three units had implemented computer use and had pre- and post- study results. Results of the work sampling studies indicated that there were statistically significant differences in pre- and post-implementation patient care, paperwork, and computer use activities: patient care decreased 7%, paperwork decreased 9%, and computer-use increased 15%.

Johnson et al. (1987) believe "the decrease in the amount of time spent in direct patient care could clearly be a result of the (increased) number of student nurses assisting but there could be some truth in saying the nurses were spending more of this time charting at the computer" (p.366).

Nursing attitudes and satisfaction were measured by a Likert-type questionnaire designed by Marijo Burkes (no date given). The questionnaire had five sections measuring knowledge, beliefs, satisfaction with computer charting, motivation, and individual demographic and experience data. The "Beliefs" section consists of modified questions designed by Stronge and Brodt, 1985).

Johnson et al. (1987) preliminary comparison of pre- and post-implementation questionnaires on the nursing division using computer charting did not show a significant difference in attitudes. However, nurses did have consistently positive attitudes concerning the computer, particularly as measured in the satisfaction and motivation areas. A regression analysis on the four areas indicated no significant difference in attitudes for knowledge, satisfaction, or motivation. Results of the Belief section revealed a decline in attitude post-implementation. Analysis of attitudes and nurses

demographic and individual characteristics were not completed at the time of this report.

Chart audits showed a significant increase in charting of care plan actions, from prestudy of 19% to 38%. Minimum hospital standards for charting were met post-implementation but were not met pre-study. Charting was more complete after computerization and was also more legible, dated and timed more often.

Johnson et al. (1987) found that the nurses's adjustment to the drastic change in their charting has for the most part, been positive and contributes this to: 1) teamwork in designing of the programs directed toward meeting nurses' and patients' needs and 2) involvement of the nurses at all levels which encouraged the nurses to take ownership for the changes.

Cognitive Style, Social Influence and Attitudes

Aydin (1987) investigated the effects of individual nurses' traits such as, cognitive style and age, as well as social influence on both attitudes toward a medical information system (MIS) and use of the system. The study was conducted at a 420-bed university teaching hospital. At the time of the study, the pharmacy module of the MIS had just been implemented and all of the nurses had been taught to use the module.

Aydin (1987) examined the personal characteristics of the respondents and the social influences which might affect information system acceptance. One of the personal characteristics examined in this study, is the cognitive style of the respondents. Two models of cognitive style are identified for use in this study: 1) an analytic, systematic approach to problem solving and 2) a more intuitive global approach. In this study, the Myers-Briggs Type Indicator (MBTI), in its abbreviated form - "Form AV", was utilized to measure cognitive style. The MBTI is recognized as a reliable instrument which measures behavior, classifying individuals' modes of evaluation as either thinking or feeling. Other individual differences measured were: age, type and level of nursing education, number of years in nursing, tenure at the study hospital, job title, and previous computer experience.

Aydin (1987) hypothesized that the attitudes of the nurses' peers and immediate supervisors may well influence the successful implementation and use of an MIS. Social information processing is described as the information a worker receives from others about the task or job. The workers' job or task characteristics are therefore defined by information received from others about socially acceptable attitudes and actions. Social

information effects of membership in a particular department or unit was also examined in this study.

The sample included the 68 clinical nurses working on all shifts of medical and surgical units during a 24-hour period. The response rate was 57% (n=39), with 95% of the sample being female. Individual unit response rates ranged from 23% to 100%. The majority of the sample (74%) had either an associate degree or diploma nursing education, while 26% held bachelor's degrees. The majority (69%) had no previous computer exposure of any kind.

Three different methods of collecting data were utilized. First, through interviews with nursing managers of the units, job requirements and nursing task were determined to be basically the same for all units.

Also, both managers and participants indicated that the objective characteristics of the MIS tasks were the same for all units.

Second, an audit was conducted on each unit, without notification, to determine the individual nurses' use of the MIS. The audit was conducted during a 24-hour time period one week before the survey. This consisted of comparing the nurses' handwritten "intake-output" records of intravenous (IV) medications on patients' charts with the nurses' computers charting of the same IV medications. The audit was performed by the

researcher in consultation with the hospital nursing support team responsible for computer implementation.

The third method of measurement was by a survey which consisted of three sections: demographic characteristics; questions directly related to the MIS including self-reported use and attitudes as well as perceived attitudes of workplace friends, co-workers, and manager; and the short form of the Myers-Briggs Type Indicator. Confidentiality was assured, but surveys were identified in order to match participant to the audit of MIS use.

No information is given concerning validity or reliability of the questions concerning attitudes and perceived attitudes of workplace friends, co-workers, and manager. No information regarding the development or any description of the questions or statements was given. It is known that the survey was pilot-tested with nurses on one floor and then distributed to all nurses in the selected units during one 24-hour period. The nurses in the pilot-test unit were also included in the study.

The personality variable, cognitive style, was measured by the abbreviated version (Form AV) of the MBTI. Respondents were grouped into four categories based on the thinking/feeling scale of the MBTI:

- 1) high thinking (thinking score higher with a difference between thinking and feeling categories of more than five points)
- 2) low thinking (thinking score higher than feeling score, but with a difference of five points or less),
- 3) low feeling (feeling score higher than thinking score, but with a difference of five points or less),
- 4) high feeling (feeling score higher with a difference of more than five points between thinking and feeling).

The participants' perceptions of the attitudes toward the MIS of their manager, co-workers, and workplace friends were measured by a seven point Likert-type scale. The higher the score, the more positive the response.

The dependent variables included the participants' attitudes toward the MIS, their self-reported use of the MIS, and the audit results of the actual use of the MIS. As before, the higher the score, the more positive the attitudes. Attitudes toward the MIS were measured by agreement, on a seven point Likert-type scale, with this single statement: "The MIS is worth the time required to use it" (p.604). Self-reported use was also measured, on a scale of 0 to 10, by responses to a

single question: "If you chart 10 IV's on intake and output reports, how many of these same IVs do you usually chart on the computer?" (p. 604). The reliability of this method of measurement is undetermined and questionable with the use of a single question or statement.

Results indicated that the correlation between attitude toward the value of the MIS and self-reported use of the MIS for charting of IVs was not significant; therefore, attitude and use variables were analyzed separately. Computer experience was also deleted from the analysis because the majority (69%) reported no computer exposure at all and only three had used a computers extensively.

No significant correlations were found between any of the individual difference variables and attitude toward the system. However, significant correlations were found between the subjects' attitudes toward the MIS and perception of friends' attitudes ($r=.81$), co-workers' attitudes ($r=.76$) and manager's attitude ($r=.48$). Regression analysis on friends', co-workers' and manager's attitudes resulted in an adjusted R square of .71 which was significant at $p<.001$. The strongest predictors of the participants' attitudes toward the MIS were found to be the perceived attitudes of workplace friends and co-workers. Managers' attitudes toward the

MIS were not found to significantly influence the subjects' attitudes toward the MIS.

Analysis of variance on work unit showed significant differences between work units on both the respondents' attitude toward the MIS and the perception of friends' attitudes toward the MIS. However, there was no significant difference among units, for perceived attitudes of co-workers or managers.

Significant correlation was found between self-reported charting of IVs on the computer and MBTI type ($r=.56$). "Feeling" types charted by computer significantly less than "thinking" types. No other individual difference variables showed significant correlations with self-reported MIS use.

The study was designed to match survey responses with actual computer use in the audit. However, the audit was performed prior to the administration of the survey to prevent influencing the use of the MIS. Normal fluctuations of staff and low survey response rates in some units, resulted in an insufficient number of nurses in the audit also returning the survey. Since the survey and the audit did not include the same sample of nurses, statistical comparisons were not performed. It was noted that the audit of actual MIS use showed each unit charted somewhat fewer IVs on the

MIS than they indicated in the self-reports by participants.

Analysis of variance (Kruskal-Wallis) showed no difference between the work units on actual MIS use. The audit showed that the nurse who gave more IVs, charted a lower percentage of them on the MIS.

Aydin (1987) acknowledges that the sample was small. A replication of the study was being conducted. If this study results are replicated, Aydin (1987) proposes that since:

the strongest predictors of attitudes toward the MIS were the perceived attitudes of workplace friends and co-workers...it follows that knowledge of the networks of social influence between workers is essential in ensuring successful implementation of job changes. Involvement of central members of social networks in implementation may be more significant than that of managers in influencing the attitudes of workers affected by the proposed changes. (p.605)

Aydin (1987) also advises that the significance of cognitive style be considered when information system designers structure a system. The acceptance and effective use of computer systems by enhanced the consideration of the predominant cognitive styles of that work setting.

Attitudes and the Use of Computers in Support of Patient Care

Bongartz (1988) explored the difference in attitudes and perceptions with regard to the use of computers to support patient care held by two different groups of nurses: 1) nurses employed in a hospital that uses computers to support patient care and 2) those employed in a hospital that does not. The purpose of the study was threefold:

- 1) To survey the attitudes of professional nurses toward computerization through the use of a valid and reliable instrument designed specifically for this purpose ...
- 2) To determine in what areas and to what extent attitudes toward computerization differ between nurses employed in a hospital that uses computers to support patient care and nurses employed in a hospital that does not...
- 3) To gain an insight into how nurses perceive the influence of computers on nurses' roles and on the nursing profession. (Bongartz, 1988, p. 204)

The study was conducted at two hospitals in a large metropolitan city. Computers had been used on nursing units in the user hospital for several years for order entry, test result retrieval, medication administration lists, and nurse care planning.

Computers are not in use on nursing units at the nonuser hospital.

The questionnaire used in this study was a twenty question Likert-type scale developed by Stronge and Brodt (1985). The questionnaire was previously described in detail in a review of the pilot study in this section (Stronge & Brodt, 1985). Using the Spearman-Brown prophesy formula, internal consistency of the questionnaire was .90, indicating a reliable and internally consistent questionnaire.

A descriptive survey technique was used for this study. Registered professional nurses (RNs) and licensed practical nurses (LPNs) employed full- or part-time were asked to participate on an anonymous basis. Questionnaires were distributed to a large sample of 726 nurses (user nurses) at the user hospital, 60.6% of whom completed the tool. In the nonuser hospital, 483 questionnaires were distributed with 57.3% of the nonuser nurses responding. Four of the tools were not usable.

The user group and the nonuser group were similar with respect to age, years worked as a nurse, and years worked in that hospital. Attitudes of the RNs and LPNs were not examined separately.

The data were analyzed in a two-step fashion. An overall attitude score for each group was computed

first; then, a score for each of the six topics was computed for each group. The individual scores were summed to obtain each nurse's attitudes score, then averaged to obtain an attitude score for the user and nonuser groups.

Bongartz (1988) found that nurses in both groups had a favorable attitude toward computers which is consistent with other studies (Brodt & Stronge, 1986; Johnson et al., 1987; Krampf & Robinson, 1984).

However, the score of the nonuser group indicated a slightly more favorable attitude than that of the user group. The nonuser group perceived the computer as a possible threat to job security.

Surprisingly, the effect of computers on the quality of patient care was evaluated more favorably by the nonuser group. Dissatisfaction with the computerized hospital information system was evident by comments made on the questionnaire: "the use of the computer did not save time because paperwork was duplicated...; It was often difficult to access a terminal..." (Bongartz, 1988, p. 209).

Another significant difference was found in the nurses' attitudes toward the capabilities of the computer. Once again, the user group had a slightly less favorable attitude than the nonuser group.

Both groups held favorable attitudes toward the areas of legal ramifications, willingness to use computers, the computer's benefit to the institutions, its cost-effectiveness, and its enhancement of communication within the hospital. Both groups perceived the computers as a means of error reduction in documentation. Also, they believed that patient privacy and confidentiality were not compromised by the use of computers.

In an attempt to determine what accounted for the differences between groups, Bongartz (1988) did examine whether the two groups differed with regard to age, years worked as a nurse, and years worked at the hospital. A significant difference was found to exist between the two groups in age and number of years worked as a nurse. The nonuser group was significantly younger than user group and the nonuser group had worked significantly fewer years than the user group. A partial correlation showed no correlation between age and number of years worked with the total attitude score or scores on job security, patient care, or capabilities of the computer in each group. Bongartz (1988) concluded that "the individuals' lack of knowledge leads to misconceptions that may contribute to resistance against computers" (p. 209).

Summary

Literature has been reviewed which described nurses' attitudes toward the use of computers. Early studies (Friel et al., 1969; Reznikoff et al., 1967) revealed nurses' attitudes toward computers in general to be negative with nursing students the most negative. In later studies (Bongartz, 1988; Johnson et al., 1987; Krampf and Robinson, 1984; Melhorn et al., 1979; Merrow, 1985; Ronald, 1982; Startzman and Robinson, 1972) overall attitudes of nurses were found to have changed to positive.

Variables which may have influenced changes in attitudes were examined. In many studies (Brodt and Stronge, 1986; Chang et al., 1981; Friel et al., 1969; Krampf and Robinson, 1984; Reznikoff et al., 1967; Startzman and Robinson, 1972), years of education was found to positively influence nurses' attitudes toward the use of computers. Nurses who had had education concerning computers were found by Ronald (1982) and Chang et al. (1981) to have more positive attitudes than those who did not. Nurses who had had previous experience with computers were found to have positive attitudes toward the use of computers (Krampf and Robinson, 1984; Melhorn et al., 1979; Merrow, 1985). Ownership and experience in the use of a home computer

was found by Chang et al. (1981) to positively influence nurses' attitudes.

Several researchers (Chang et al., 1981; Krampf and Robinson, 1984) found that older nurses were more positive toward computers. Brodt and Stronge (1986) found that nurses who had worked in the nursing profession over 21 years had more favorable attitudes toward computers than those who had worked less than 10 years. This was thought to have been interrelated with age. Results of two studies (Friel et al., 1969; Reznikoff et al., 1967) revealed that nurses who worked at the study hospital <1 year and >10 years were more positive.

Further research concerning socio-behavioral and humanistic aspects of the use of computers in nursing practice as evidenced by the few studies which addressed these issues. Identification of specific variables which may influence acceptance of the use of computers in nursing practice is needed. This researcher will attempt to identify and describe current attitudes of nurses at a regional acute care hospital, demographic and computer use variables which may influence these attitudes, and compare these with the studies reviewed.

Chapter 3

Methodology

Introduction

Using computers in nursing practice is becoming a reality in many health care institutions today. The process of implementing the use of computers in nursing practice is a change of monumental proportion. Nurses' attitudes toward computers and their use in nursing practice will influence the nurses' ability to actively participate in and fully integrate this change.

Research on nurses' attitudes toward the use of computers in nursing practice has been limited. The present study provided initial data for evaluation of the socio-behavioral effects of the use of computer systems in nursing. The discovery of areas of resistance to the use of computers is essential for nurse administrators and educators for the successful integration of change.

Theoretical Base

A conceptual model used for analysis of the process of change relating to the implementation of a computerized patient care system into nursing practice was developed. The theoretical base for this model was Kurt Lewin's (1947) theory of social change.

Constancy and Resistance to Change

According to Lewin (1947), periods of social change differ markedly from periods of relative stability; however, these two states of affairs should be analyzed together for two reasons:

1. Change and constancy are relative concepts; group life is never without change, merely differences in the amount and type of change that exist;
2. Any formula which states the conditions for change implies the conditions for no-change as limit, and the conditions of constancy can be analyzed only against a background of 'potential change'. (p. 13)

It was important to Lewin (1947) to distinguish between the two concepts of "constancy" and "resistance to change". Lack of change or constancy occurs when the conditions under which the group lives stay constant for a period of time; for example, no one leaves or joins the group, no major conflict occurs, the facilities for activities or work remain the same, etc. In addition, there is an unchanged level of production. The same conditions lead to the same effect.

However, if the production level of the group were maintained despite loss or gain of a member or change in facilities, then "can one speak of 'resistance' to change

of the rate of production?" (Lewin, 1947, p.130) The answer is no. Lewin (1947) theorizes that "only by relating the actual degree of constancy to the strength of forces toward or away from the present state of affairs can one speak of resistance of 'stability' of group life in a given respect" (p. 14).

Social management requires insight into the desire for and resistance to specific change. Lewin (1947) presents a system of analysis which enables one to model the social forces in a specific group setting.

Social Fields

A basic tool for analysis of group dynamics is the model of the group and its environment as a "social field". The "life" of the group is viewed by Lewin (1947) as:

occurring in, and being the result of, a totality of coexisting social entities; such as, groups, subgroups, members, barriers, channels of communication, etc...the fundamental characteristic of the field is the relative position of the entities...the relative position represents the structure of the group and its ecological setting...what happens within such a field depends upon the distribution of forces throughout the field.
(p. 124)

Social States As Quasi-Stationary Processes

A social state is a quasi-stationary equilibrium which Lewin (1947) states is "like a river, continuously changes its elements even if its velocity and direction remains the same" (p. 15). One set of forces, driving forces, drive the situation toward the social change. The strength of the opposing forces, (restraining forces) at the time determines the direction of the change. When these two forces, driving and restraining change, are equal in strength, a level of "quasi-equilibrium" is occurring.

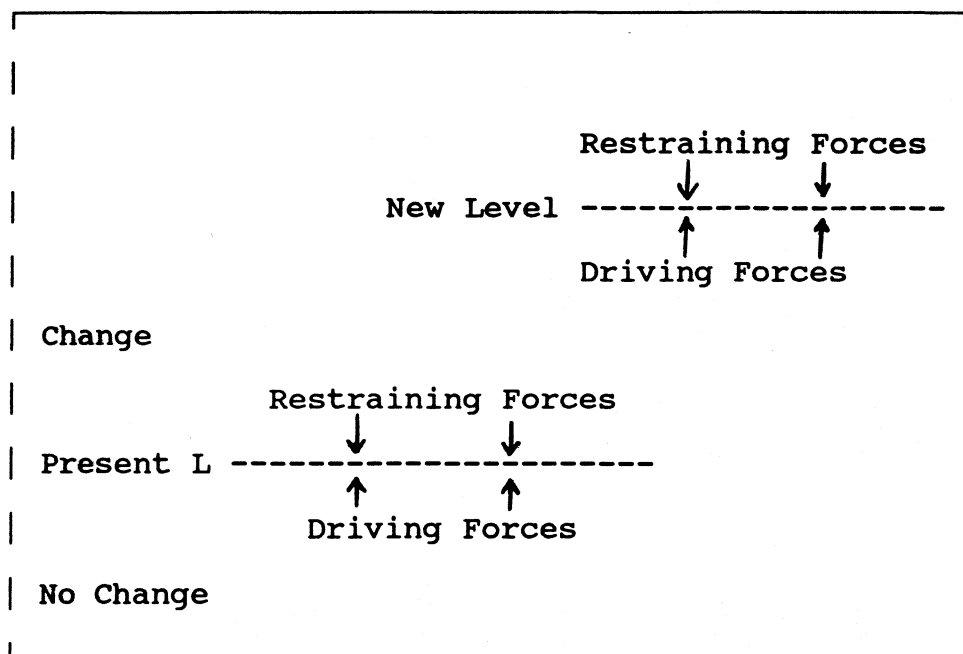
Lewin (1947) presents this process as a dynamic one in which the balance may be disturbed at any point in time by a change in the set of forces involved. The balance of these forces is shown as Level L in Figure 1.

Change of Force Fields

Change from the present level of functioning to the desired one is accomplished by transplanting the force field, in its entirety, from the present L to the new L. This may be done by adding or diminishing forces in the desired direction. To decide how best to bring about this change, Lewin (1947) states: "the constellation of the social field as a whole has to be studied and so reorganized that social events flow differently" (p. 23).

Figure 1

Model of Lewin's (1947) Change Theory



Changing as Three Steps

Lewin (1947) views change as occurring in three phases: (1) unfreezing (if needed) from the present level, (2) moving to the new level and (3) freezing group life at the new level. The constancy of this new equilibrium is determined by the maintenance of the balance of restraining versus driving forces. Successful change is defined by Lewin (1947) as permanency (freezing) of the new level for a desired period of time.

Model of Planned Change for the Introduction of the Use of Computers in Nursing Practice

The computer revolution is changing everyone's job and as a result, the social equilibrium in the work place. Socio-behavioral aspects of change associated with this technological innovation may be assessed through the two instruments developed by this researcher. Once identified, the manager may utilize this information to plan for change.

A multitude of factors which may influence the change process for a particular situation must be considered. First, since the implementation of a computerized patient care system is a planned change, this concept must be defined. In this study, planned change is defined as a conscious, deliberate and intended process which occurs in a social system,

consisting of forces which may be driving and/or restraining the change. These forces must be identified.

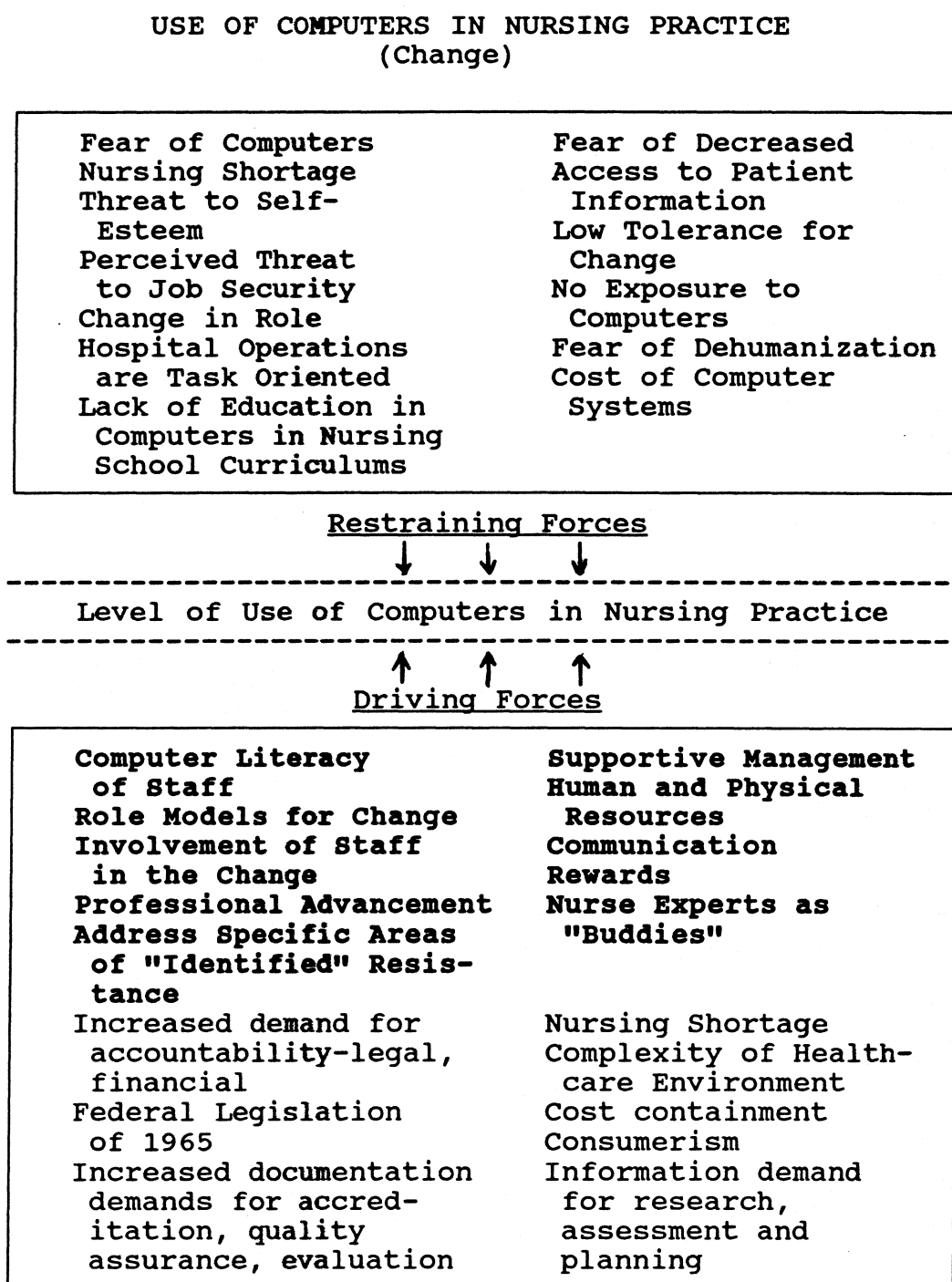
Lewin's (1947) model of the process of social change was utilized as the theory base for the conceptual model developed by this researcher, Figure 2, to analyze and plan the change process of integrating the use of computers in nursing practice. This model identifies the critical forces, driving and restraining, involved in changing the current state of quasi-equilibrium - "of not using computers in nursing practice" - to a new state - "of using computers in nursing practice". The driving forces (in bold type) are key elements involved in the successful move toward the use of computers in nursing practice.

When the driving forces are greater than the restraining forces, change will occur. This new state of use of computers in nursing practice is viewed as a state of quasi-equilibrium. It must not be "frozen". In the current environment of innovation and exciting new challenges, the nurse must be prepared to change and move ahead with other professions.

Purpose of the Study

The purpose of this study was to describe the attitudes of nurses toward the use of computers in

Figure 2
Change Model of the Use of Computers in Nursing Practice



RESISTANCE TO USE OF COMPUTERS IN NURSING PRACTICE
(No Change)

nursing practice and to examine the association of these attitudes the demographic variables of: age, position, degree in nursing, degree in fields other than nursing, years of experience in nursing, years employed at the study hospital, previous education in the use of computers; and computer use variables of ownership of a home computer and regularity of its use.

Research Questions

The following research questions were explored:

1. What are nurses attitudes toward the use of computers in nursing practice?
2. What demographic variables influence nurses' attitudes concerning the use of computers in nursing practice?
3. How does ownership of a computer and regularity of its use influence nurse' attitudes toward the use of computers in nursing practice? What do nurses use home computers for?
4. How much of the variance in nurses' attitudes toward the use of computers in nursing practice can be explained by demographic and computer use variables?
5. What, if any, ethical dilemmas do nurses perceive related to the use of computers in nursing practice?

Hypotheses

Several null hypotheses were tested:

- (1) There will be no significant association between nurses's attitudes towards the use of computers in nursing practice and age.
- (2) There will be no significant association between nurses's attitudes towards the use of computers in nursing practice and position held at the study hospital.
- (3) There will be no significant association between nurses's attitudes towards the use of computers in nursing practice and degree in nursing.
- (4) There will be no significant association between nurses's attitudes towards the use of computers in nursing practice and degree in field(s) other than nursing.
- (5) There will be no significant association between nurses's attitudes towards the use of computers in nursing practice and years of experience in nursing.
- (7) There will be no significant association between nurses's attitudes towards the use of computers in nursing practice and years employed at the study hospital.

- (8) There will be no significant association between nurses's attitudes toward the use of computers in nursing practice and previous education in the use of computers.
- (9) There will be no significant association between nurses's attitudes toward the use of computers in nursing practice and the completion of computer courses(s) as part of the nursing curriculum.
- (10) There will be no significant association between nurses's attitudes toward the use of computers in nursing practice and ownership of a home computer and regularity of its use.

Study Variables

The independent variables include age, position held at study hospital, degree in nursing, degree in field(s) other than nursing, years of experience in nursing, years of employment at the study hospital, previous education in the use of computers, completion of computers education course(s) as part of the nursing curriculum and the ownership of a home computer and regularity of its use.

The dependent variable is nurses's attitudes toward the use of computers in nursing practice.

Definition of Variables

The following variables are operationally defined for the purpose of this study:

Nurses: Registered and licensed practical nurses who practice at PGHMC.

Attitudes: a learned predisposition to respond in a consistently negative or positive manner to a person, object or issue (Fishbein and Ajzen, 1975, Petty & Cacioppo, 1981). In addition, attitudes, if measured appropriately, have the "presumed ability to direct (and thus allow prediction of) behaviors" (Petty & Cacioppo, p. 7). This variable was measured by the Computers in Nursing Practice Questionnaire.

Nursing practice: "all experiences and events a practicing nurse encounters in the process of providing patient care. Some events may be experienced by the client, others by the nurse, and some may be observed in the environment or in the nurse-client interaction" (Chin & Jacobs, 1983, p. 165).

Position: normal role in the organization. This role was identified in the demographic tool as; staff nurse, assistant clinical manager, clinical manager, supervisor, or director.

Nursing Unit: the specialty area where the nurse usually works. The nursing unit was identified in the

demographic tool as; medical-surgical units, intensive care units, specialty units, and all units.

Degree in Nursing: level of education completed in nursing; identified as L.P.N., Diploma, Associate Degree, Bachelor's Degree or Master's Degree in nursing. This variable is measured in the demographic tool as the highest degree in nursing completed.

Degree in a Field(s) Other Than Nursing: degree completed in a realm of knowledge that is not nursing. This variable was measured in the demographic tool by a "yes" or "no" answer. The nurse was then asked to write in the degree earned.

Years of experience in Nursing: number of years of work experience in the profession of nursing. The variable was measured in the demographic tool as one to ninety-nine years employed in any field of nursing.

Years of Employment at Penninsula General Medical Center: number of years of working at PGHMC in nursing. The variable was measured in the demographic tool as one to ninety-nine years of employment in nursing practice at PGHMC.

Previous Education in the Use of Computers: courses completed in the use of computers completed in high school and/or college as well as continuing education courses at PGHMC, other hospitals or other sources. This variable was measured by the demographic tool where

respondents were asked to check the source of the course and then list the course.

Study Design

A descriptive correlational design was used for this research. This method was chosen to identify and describe nurses' attitudes concerning the use of computers in nursing practice and to discover possible relationship(s) of certain independent variables to these attitudes. The setting was an acute-care regional medical center. Data were collected using a demographic tool and a Likert-type questionnaire designed by the researcher.

Study Population and Sample

The population for the study consisted of 565 registered and licensed practical nurses employed either full-time or part-time at PGHMC in Salisbury, Maryland. Approximately eighty-one percent of the nursing staff are registered nurses and nineteen percent are licensed practical nurses. The facility is a 383 bed acute-care regional medical center providing a complete range of medical-surgical specialties including anesthesiology, open heart surgery, oncology, hemodialysis, obstetrics-gynecology, intensive and coronary care, respiratory therapy, radiology, cardiology-including cardiac rehabilitation, pediatrics, emergency services, physical therapy and a wide range of outpatient services.

The implementation of a computerized hospital information system (HIS) had begun about a year before the study. At the time of the study, several ancillary departments - admitting, radiology, cardiology, pulmonary function, respiratory therapy, and laboratory - were computerized. Nurses had received inservice education in the use of these functions. Most of the nurses were delegating these tasks to the unit secretaries. The patient care system was scheduled to be implemented in approximately one year.

A twenty percent random sample of 113 registered nurses was selected from the entire population of nurses. Every fifth nurse was selected from a payroll roster which was arranged by unit assigned as provided by PGHMC personnel office. Participation in the study was voluntary. No other criteria for selection were used.

Instrumentation

Computers in Nursing Practice Questionnaire

The computers in nursing practice questionnaire (CNPQ) is a 33 item self-report instrument developed by this researcher to measure nurses' attitudes toward the use of computers in nursing practice (Appendix I). Each statement in the tool was presented using a Likert-type scale with four possible responses; strongly agree, agree, disagree, strongly disagree. The possible range

of scores was 1-4. In twenty-two of the items, a high score indicated a more favorable attitude; in eleven of the items, a high score indicated a less favorable attitude. Therefore, prior to scoring the CNPQ, the eleven items were recoded so a high score would always indicate a more positive attitude towards computers.

The items in this questionnaire were developed after a thorough review of the literature which revealed a sparsity of specific inquiry into the attitudes of nurses toward the use of computers in nursing practice and an appropriate instrument to measure the attitudes. As suggested by Startzman-Robinson (1972), statements were developed to inquire about humanistic aspects of nursing. Other issues addressed were the use of computers in nursing in relationship to: quality of care, communication, growth and control of nursing practice, to reduce and assist with the documentation of care, to cost nursing services, general attitudes toward the computer. Three questions specifically concern the computerized patient care system at the study hospital.

Validity

Content validity was established through reference to the literature and review by two nurses who were knowledgeable about the use of computers in nursing. Three questions regarding the computerized Hospital Information System (HIS) being implemented at PGHMC were

added for purposes of evaluation and to examine the possible influence of dissatisfaction with the current uses of the computerized HIS at the study hospital.

Reliability

To establish empirical study reliability, test-retest reliability of the CNPQ was determined. The instrument was administered to 15 nurses working at a general hospital. The tool was then readministered to the same nurses in two weeks. The nurses were instructed to write in any comments or questions regarding the construction of questions. No comments or questions were offered. Cronbach's alpha was used to determine internal consistency and yielded a value of 0.8839 which indicates a high degree of homogeneity among the questions in the CNPQ. Refer to Appendix I for a copy of this instrument.

Demographic Instrument

A sixteen item demographic tool was developed and utilized to gather information regarding the following variables: age, sex, race, current position, full or part-time employee, unit and shift worked, number of hours in shift worked, highest degree in nursing, degree in another discipline, number of years employed in nursing, number of years employed at PGHMC, previous education in the use of computers, a computer course as part of the nurses' nursing school curriculum, use of a

computer in nursing practice, ownership of a home computer, regularity and purpose of its use (Appendix II). The questions were single words, brief questions or statements which were answered by checking the appropriate box. Several items required the participant to write in a response. For example, those who had previous education in the use of computers were asked the list the course(s) taken.

Data Collection

A plan for data collection was presented to the Vice President for Nursing at the study hospital and approved. The Vice President for Nursing wrote a supporting letter to the staff which accompanied the questionnaire (Appendix III). The plan for data collection was also reviewed and approved by the Human Volunteers Committee of Salisbury State University of Salisbury, Maryland (Appendix IV). The research project and plan for data collection was presented to nursing managers at the PGHMC nursing management meeting.

A computer list of the entire nursing staff (565) by department was obtained from personnel. A random sample of 113 nursing staff was selected by picking every fifth staff member from the list. One-hundred and thirteen questionnaires were distributed by the nursing department secretary. Participants were assured by letter that participation in the study was voluntary and

anonymity would be assured (Appendix V). Participants were to return the questionnaires to the nursing department secretary in an enclosed envelope by interdepartmental mail in one week. After ten days, a second packet was distributed in the same manner to nursing staff who did not respond to the first mailing. They were once again requested to participate; however, voluntary participation was reiterated (Appendix VI).

Each packet contained: a supporting letter from the Vice President of Nursing; a disclosure form describing the nature of the study, its importance to nursing and the researchers phone number for questions; a demographic tool; the CNPQ questionnaire and a addressed envelope to return the tools to the nursing department secretary. Approximately fifteen minutes was

required to complete the questionnaire and demographic tool.

Data Analysis

The SPSSX Computer Program at Salisbury State University was used for data analysis. Data from the demographic tool was utilized to describe the sample and to correlate with nurses' attitudes. Frequencies and were done to examine the distribution of the variables. A total attitude score was computed and correlated with the independent variables. Questions on the CNPQ were then grouped by factor analysis. Relationships between the independent variables and the Factors were examined using bivariate correlations. Forward multiple regression was utilized to examine the variance of the total attitude score accounted for by the independent variables. Tables in the following chapter illustrate the relationships.

Limitations of the Study

The generalizability of the research findings is limited to the nursing staff at PGHMC. The Hawthorne Effect which is the possibility that the study sample responded in a particular way because they were aware of their participation in the study must be considered.

Chapter 4

DATA ANALYSIS

Introduction

The purpose of this study was to describe nurses' attitudes toward the use of computers in nursing practice and to examine the relationship between these attitudes and certain demographic and computer use variables. Descriptive data were also obtained regarding the specific uses of computers in nursing practice by the participants, previous use of computers in other health care settings, specific ethical dilemmas, satisfaction with the training, support and function of the computerized patient care system modules in use at the time of the study, and computer topics that participants would like to have more information and/or continuing education on. An attitude questionnaire developed by the researcher, was used to collect data regarding nurses' attitudes toward the use of computers in nursing practice in the following areas: documentation and evaluation of quality of care, dehumanization of nursing care, costing of nursing care. Nurse's attitudes toward the need for nurses to be computer literate and possible ethical dilemmas were also assessed using the questionnaire. Open-ended questions were also included in the questionnaire to gather the descriptive data. A demographic tool designed by this researcher was utilized

to obtain information concerning the demographic and computer use variables of: age, sex, race, position, unit, degree in nursing and/or other fields, years of experience in nursing, years employment at the study hospital, previous exposure to computers, completion of computer course(s) as part of their nursing curriculum and ownership of a computer and regularity of its use were gathered by a demographic tool.

Within this chapter, the sample will be described using demographic data, tests of reliability of the instruments as used in this study will be presented, and associations and correlations between the variables identified in Chapter 3 will be examined. Descriptive information will also be presented.

Reliability of Study Instrument

Computers in Nursing Practice Questionnaire

Internal consistency of the Computers in Nursing Practice Questionnaire, as developed by this researcher and used in this study, was determined by using Cronbach's alpha. This computation yielded a value of 0.8494 indicating a high degree of reliability.

Sample Characteristics

In order to determine nurses' attitudes toward the use of computers in nursing practice, a random sample of 113 registered nurses was selected. The sample was drawn from the entire nursing population of 565 licensed

practical and registered nurses employed at the PGHMC. A demographic tool and an attitude questionnaire, the CNPQ, were distributed to these nurses by the nursing administration secretary as paychecks were given. The tools were returned in an enclosed envelope to the nursing secretary through interdepartmental mail. Those who did not return the first survey instruments in ten days were sent another packet to return in one week. Data were collected in October of 1988. Sixty-six (58%) nurses responded to the first information request. After the second mailing, a total of seventy-five percent (85) of the instruments were returned. Two packets were returned unopened due to employee resignations. All questionnaires were used for data analysis. Table 1 summarizes information on subject responses for the study.

Information from the sample of 85 full and part-time licensed practical and registered nurses working in an acute-care medical center was used. Table 2 describes the characteristics of the sample. Ages were grouped into ten year spans, starting with 20 to 29 years and ending with 60 to 69 years. The majority of the sample fell into the first three age groups and

Table 1

Subject Responses

(n=85)

Responding to		Responding to		Total	
First Contact		Second Contact		Respondents	
Number	Percent	Number	Percent	Number	Percent
66	58%	19	17%	85	75%

Table 2
Characteristics of the Sample

	Number of Responses (N = 85)	Percentage
Age (in age groups)		
20 - 29	20	23.5
30 - 39	21	24.7
40 - 49	24	28.2
50 - 59	15	17.6
60 - 69	5	5.9
Sex		
Female	83	97.6
Male	1	1.2
Missing Value	1	1.2
Race		
White	74	87.1
Black	8	9.4
Other	2	2.4
Missing Value	1	1.2
Table continues		

	Number of Responses (n = 85)	Percentage
<hr/>		
Position		
Staff Nurse	71	83.5
Assistant Clinical Manager	5	5.9
Clinical Manager	5	5.9
Nursing Supervisor	3	3.5
Director	1	1.2
Employment Status		
Full-time	51	60.0
Part-time	34	40.0
Nursing Degree		
LPN	12	14.1
Diploma	35	41.2
Associate Degree	15	17.6
Bachelor Degree	21	24.7
Masters Degree	2	2.4
Other Degree		
Yes	7	8.2
No	74	87.1
Missing Value	4	4.7
Table continues		

	Number of Responses (n = 85)	Percentage
<hr/>		
Years of Employment		
in Nursing (in years)		
1 - 10	34	40.1
11 - 20	24	28.4
21 - 40	27	31.5
Years on Nursing		
at PGHMC		
1 - 10	54	63.5
11 - 20	17	20.0
21 - 30	13	15.3
31 - 40	1	1.2
Education in Computers		
None	31	36.5
High School	3	3.5
College	11	12.9
PGHMC Inservice	38	44.7
Other Education	16	18.8
Table continues		

	Number of Responses (N = 85)	Percentage
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Course in Nursing		
School Curriculum		
Yes	7	8.2
No	78	91.8
Used Computers in Nursing Practice		
Yes	66	77.6
No	18	21.2
Missing Value	1	1.2
Ownership of a Home Computer		
Yes	24	28.2
No	61	71.8
Used Regularly		
Yes	6	7.1
No	21	24.7

were evenly distributed among these same groups. As expected, there were fewer participants in the 50 - 59 and 60 - 69 year age groups.

The majority of the sample were white, female staff nurses working in full-time positions. Forty-one percent, were Diploma School graduates. Only twenty-five percent were baccalaureate prepared nurses. A small percentage, eight percent, held a degree in another field. These were biology, elementary, education, social work and English literature. Due to small numbers of races other than white, few males and nurses who have degrees in other disciplines, the independent variables of sex, race and degree in another field were not utilized for statistical analysis.

Years of employment in nursing ranged from one to forty years, with a mean of fifteen years. For comparison with previous studies, this data were grouped into ten year time spans. The majority of the sample (forty percent) were employed in the 1 - 10 year time span. However, a large percentage (thirty-two percent) of the sample had been employed in nursing from 21-40 years. Employment in nursing at PGHMC ranged from 1 to 34 years, with a mean of eleven years. The majority, sixty-four percent, were employed in nursing at PGHMC from 1 to 10 years.

A majority of the sample listed PGHMC inservice as the source of their education in computers. Although one third of the participants reported having no computer training at all, seventy-seven percent reported that they have used computers in nursing practice. Sources of computer education for the rest of the sample were: high school, college (two at the graduate level), continuing education at another hospital, and/or adult education courses. Only eight percent had a course in computers in nursing school.

The participants were asked if they had used a computer in nursing practice and if so, how? A majority (78%) did report that they had. The specific uses were associated with the modules currently implemented at PGHMC: admission-discharge-transfer, ordering and obtaining results of diagnostic tests, and updating patient information. A nursing supervisor reported using the computer to monitor staffing patterns. Only one nurse used the system for nurse report forms which gives patient data for use in planning nursing care. Only three nurses had used computers in nursing practice in another hospital and one in a health department.

Twenty-eight percent of nurses owned a home computer, but only seven percent said they used it regularly. Reported uses of home computers were for:

word processing, bookkeeping, writing simple programs, budgets, games, business, and weather reports. Two of the participants who owned a home computer and utilized it for programming and bookkeeping were self-taught users. Information regarding number of times computers were used per month was found to be inadequate for analysis. Participants were unable to estimate it.

Correlation of Independent Variables with Attitudes

Total attitude scores from the CNPQ were computed and ranged from 61 to 110, with a mean of 87. The potential range of scores was 0 to 132. Using Spearman's Rho, the associations of selected independent variables with the total attitude scores were examined. Age was found to be negatively associated ($r = -.2506$) with attitudes toward the use of computers in nursing practice. With increasing age, attitudes toward computers became more negative. (Table 3) However, as years of education in nursing increased, nurses' attitudes were more positive ($r = .3752$). Ownership and regular use of a home computer were also significantly related ($r = .1919$ and $.2406$, respectively) to attitudes toward the use of computers in nursing practice. As ownership and regular use of home computers increased, attitude scores increased indicating more positive attitudes.

Table 3

Spearman Correlation Coefficients of Independent
Variables and Total Attitude Scores
(n=85)

Total Attitude Scores	
Correlation Coefficient	
<hr/>	
Independent Variables	
Age	-.2506 ²
Degree in Nursing	.3752 ¹
Ownership of Home	.1919 ³
Computer	
Regular Use of Home	.2406 ³
Computer	

¹ < .001

² < .01

³ < .05

Identification of Factors in the CNPO

Factor analysis was utilized to identify clusters of highly interrelated statements in the CNPQ. The equamax rotation technique (SPSSX, 1986) was applied, converging in 47 iterations. With this method, the Eigen value had to be greater than or equal to 1. The thirty-three questions clustered around ten factors. These factors are listed below accompanied by a brief description and the associated questions which clustered with each factor.

FACTOR I: DOCUMENTATION OF PATIENT CARE -
Questions 4, 5, 12, 14, 16. These questions were associated with the use of computers to assist the nurse with an accurate and efficient means of documenting patient care.

FACTOR II: HUMAN-MACHINE RELATIONSHIP -
Questions 9, 13, 20, 24. These questions addressed (1) the interaction between the nurse and the machine and (2) the effect of the use of computers on direct patient care.

FACTOR III: COSTING NURSING CARE - Questions 6, 19, 26, 29. The need and ability of nurses to utilize computers to identify the cost of nursing care was addressed by these questions.

FACTOR IV: EFFECT ON TIME AVAILABLE FOR DIRECT CARE - Questions 1,2,28. These questions

addressed the use of computers to facilitate the completion of nursing tasks which interfere with more "direct" patient care.

FACTOR V: NECESSARY TOOL FOR NURSING PRACTICE
- Questions 3, 7, 10, 21, 30. These questions were concerned with the necessity of the use of computers in nursing practice in a complex healthcare system.

FACTOR VI: ETHICAL CONCERNS: Questions 18, 22, 27. Ethical dilemmas associated with the use of computers in nursing were addressed by these questions.

FACTOR VII: KNOWLEDGE OF COMPUTERS - Questions 23, 25. These two questions were related to the nurses' knowledge of computers.

FACTOR VIII: BELIEF IN ABILITY TO MANAGE COMPUTERS IN NURSING PRACTICE - Questions 15, 17. These questions addressed the nurses' belief in his or her ability to utilize a computer in the practice of nursing.

FACTOR IX: NEED FOR NURSES TO BE COMPUTER LITERATE - Questions 8, 11. The belief that nurses' need to be computer literate to interact with other professionals is addressed by these questions.

FACTOR X: SATISFACTION WITH THE COMPUTERIZED HOSPITAL INFORMATION SYSTEM (HIS) AT THE STUDY HOSPITAL - Questions 31, 32, 33. These questions

Table 4
Correlation of Independent Variables and Factors I to X

	Factor I	Factor II	Factor III	Factor IV	Factor V	Factor VI	Factor VII	Factor VIII	Factor IX	Factor X
Age	ns	ns	-.4750 ¹	-.2129 ³	ns	ns	ns	-.1919 ³	ns	ns
Position	ns	ns	ns	ns	ns	ns	ns	.2173 ³	ns	ns
Nursing Degree	.2179 ³	.2441 ³	.3882 ¹	ns	ns	.2118 ³	.2007 ³	.2372 ³	.2643 ²	ns
Degree in Another Discipline	ns	ns	ns	ns	ns	ns	ns	.2294 ³	ns	ns
Years Employed in Nursing	ns	ns	-.3419 ¹	ns	ns	-.1959 ¹	ns	ns	ns	ns
Years Employed at Study Hospital	ns	ns	-.2812 ²	ns	ns	ns	ns	.2390 ³	ns	ns
Computer Course in Nursing School	ns	ns	ns	ns	ns	ns	ns	ns	.2128 ³	ns
Ownership of a Home Computer	ns	ns	ns	ns	ns	ns	ns	.2452 ³	ns	ns
Regularity of Use of Home Computer	.2137 ³	.1942 ³	.2392 ³	ns	.2462 ³	ns	ns	.1895 ³	ns	ns

¹ p<.001

² p<.01

³ p<.05

addressed the nurses' satisfaction with the modules of the computerized HIS currently implemented at their hospital.

Associations of Selected Independent Variables and the Factors

Using Spearman Rho correlations, the associations of selected independent variables and the ten factors derived from the factor analysis were determined (Table 4). Age was negatively associated with Factors III, IV and VIII. The older the nurse, the more negative the attitude scores were on items related to costing of nursing care ($r = -0.4705$), effect on time available for direct care ($r = -0.2129$), and the belief in ability to manage computers in nursing practice ($r = -0.1919$).

Nurses who held management positions had significantly ($r = 0.2173$) more positive attitude scores on items related to their belief in their ability to manage computers in nursing practice (Factor VIII).

Degree in nursing was significantly associated with seven of the ten factors. The higher the degree in nursing, the more positive the attitudes about documentation of patient care ($r = 0.2179$), human-machine relationship ($r = 0.2441$), costing nursing care ($r = 0.3882$), ethical concerns ($r = 0.2118$), knowledge of computers ($r = 0.2007$), belief in ability to manage computers in

nursing practice ($r=0.2372$), and the need for nurses to be computer literate ($r=0.2643$).

Having a degree in another discipline was significantly related only to Factor VIII, the belief in ability to manage computers in nursing practice ($r=0.2294$).

As the years employed in nursing increased, the attitudes toward costing nursing care ($r= -0.3419$) and ethical concerns ($r= -0.1959$) became more negative. This is probably intercorrelated with increasing age.

Having had a computer course in their nursing school curriculum was found to be positively related to Factor IX, the need for nurses to be computer literate ($r=0.2128$).

Nurses who owned a computer were found to have positive attitudes ($r=0.2452$) on items related to their belief in their ability to manage computers in nursing practice.

Nurses who regularly used a home computer had significantly positive attitude scores on items related to documentation of patient care ($r=0.2137$), the human-machine relationship ($r=0.1942$), costing of nursing care ($r=0.2392$), the computer as a necessary tool for nursing

practice ($r=0.2462$), and their belief in their ability to manage computers in nursing practice ($r=0.1895$).

Relationship Between Predictor Variables and the Total Attitude Scores

The forward method of multiple regression (SPSSX, 1986) was utilized to examine the relationship between selected independent variables and total attitude scores (Table 5). Based on Spearman Rho correlation analysis, the independent variables with statistically significant ($p=0.05$) association with the dependent variable (attitudes) were entered into the regression equation with the most highly correlated entered first. These variables in order of entry are: degree in nursing, regular use of a home computer and years employed in nursing at PGHMC (negatively correlated). This set of variables, explained sixteen percent of the variance in the total attitude score ($F=6.423$, $p=0.0006$), with the years of education in nursing as the most significant predictor ($R^2=10\%$).

Descriptive Data

Ethical Dilemmas

Nurses were asked to respond to the statement that "there are few ethical dilemmas that will develop related to the use of computers in nursing" and to give examples of anticipated dilemmas. Eighteen of the participants (21%) did not answer the question, some

Table 5

Multiple Regression of Predictor Variables and Total
Attitude Score

(n=85)

Total Attitude Scores		
	Adjusted R Square	F Ratio
Education in Nursing	.10	10.83 ²
Education in Nursing	.15	8.71 ¹
and Regular Use of Home Computer		
Education in Nursing	.16	6.42 ¹
and Regular Use of Home Computer and Years Worked at PGHMC		

¹ < .001

² < .01

³ < .05

indicating they did not understand it. This suggests lack of knowledge of potential uses and abuses of computers in nursing practice or a question which is not clear. Also, participants appeared to have been confused about what an ethical dilemma is.

Forty-six percent of the sample agreed that few ethical dilemmas would develop related to the use of computers in nursing, while thirty-three percent disagreed. Privacy and/or confidentiality of patient information was the most frequently cited dilemma which may be considered by many to be a legal problem. Other dilemmas mentioned by nurses were:

Accessibility to patient records when the
computer is "down".

Too much nursing time spent at the computer and
not at the patient's bedside.

Wrong information entered causes other staff to
make wrong decisions in treatment.

When system is "slow", patient care is jeopardized
due to delay in access to patient information.

Money spent on the HIS should instead be utilized
for more nursing staff.

Standardization needed for computer entry excludes
the documentation of psychosocial needs that are
on paper record.

Do not resuscitate orders may not be put on

computer chart.

Satisfaction with Training and Functioning of
Computerized Patient Care System at PGHMC (PCS)

A large majority of participants (82%) agreed that the training offered at PGHMC enabled the nurse to effectively utilize the computerized PCS in clinical areas. Comments from those who disagreed were mostly concerned with the amount of time allocated for training and time lapse between training for the particular module and the actual implementation. Staff from the operating room consistently expressed a need for more training. It was also evident from comments that some of the nurses have not used the system since their initial orientation. The unit secretary is doing these tasks. One nurse did express a concern that the training teaches only tasks and desired to know how to effectively use the system.

Provision of nursing support staff to address user questions and problems regarding the PCS was considered adequate by a large majority (82%) of the nurses. Among those who disagreed, these problems were expressed: inadequate coverage on nights and weekends (3), most nursing support staff don't have time to assist due to their own duties (1), and one nurse stated the head nurses on her floor were not knowledgeable about the computer.

Participants were asked if the PCS was "user friendly" and seventy-two percent agreed it was. However, the term "user friendly" may not have been understood by some nurses. Nine did not answer the question; five of the nine wrote that they did not understand the question. Others who disagreed stated that: the system was too slow; it takes too long to get into the functions; there are no error messages; the system needs some personality, friendly words or phrases and directions on the screen; and the need for error messages.

Computer Education Desired

Computer topics about which participants desired further information or continuing education were: use of computerized PCS for nursing care plans and nursing notes (5), basic programming (2), and word processing (1).

Summary

Using an attitude questionnaire (CNPQ) and demographic tool developed by this researcher, a random sample of eighty-five registered nurses at PGHMC were surveyed to determine nurses' attitudes toward the use of computers in nursing practice and to examine the relationship between these attitudes and certain demographic and computer use variables. Descriptive data was also obtained regarding the specific uses of

computers in nursing practice by the participants, previous use of computers in other health care settings, specific ethical dilemmas, satisfaction with the training, support and function of the computerized patient care system modules in use at the time of the study, and computer topics that participants would like to have more information and/or continuing education about.

Overall attitude scores from the CNPQ were positive. Variables found to be significantly associated with overall attitudes were age, degree in nursing, and ownership and regular use of a computer. Age was found to be negatively associated with attitudes toward the use of computers in nursing practice. As years of education in nursing increased, nurses' attitudes were more positive. Ownership and regular use of a home computer were also significantly related to positive attitudes toward the use of computers in nursing practice.

A factor analysis of the CNPQ resulted in the identification of ten factors. An examination of the association of these factors with demographic and computer use variables found that age, working in management position, education in nursing, degree in another discipline, years employed in nursing increased, having a computer course in nursing school curriculum and

ownership and regular use of a computer were significantly associated with selected factors analysis.

Multiple regression analysis indicated that sixteen percent of the variance in the overall attitude score was explained by these variables: degree in nursing, regular use of a home computer and years employed in nursing at PGHMC, with the years in education in nursing as the most significant explanatory variable.

Descriptive information concerning ethical dilemmas was obtained. The most frequently cited dilemma was privacy and /or confidentiality of patient information.

A large majority of participants agreed that the training offered at PGHMC enabled the nurse to effectively utilize the computerized PCS in clinical areas. Provision of nursing support staff to address user questions and problems regarding the PCS was considered adequate by a large majority of the nurses.

The majority of nurses reported that the PCS was "user friendly". Some suggestions were offered to make the system more "user friendly".

Chapter 5

SUMMARY AND CONCLUSIONS

Introduction

The purpose of this study was to describe nurses' attitudes toward the use of computers in nursing practice and examine possible significant correlations of these attitudes with the independent variables of age, sex, race, position, hours worked, unit, shift, degree in nursing, degree in another discipline, years employed in nursing, years employed at PGHMC, education in the use of computers, computer course in nursing curriculum, use of computer in nursing practice, ownership of a computer and regularity of its' use.

Data were collected through a thirty-three item attitude survey (CNPQ) and demographic tool developed by the researcher and administered to a large random sample (n=118) of all nurses employed at an acute care regional medical center. The CNPQ was found to have a high degree of reliability (.84). Data were analyzed using SPSSX (1986).

Discussion of the results of this study will be presented under the following headings: overall attitudes toward the use of computers in nursing practice; relationship of age, nursing attitudes and CNPQ Factors; relationship of position, nursing attitudes and CNPQ Factors; relationship of degree in nursing, nursing

attitudes and CNPQ Factors; relationship of demographic and computer use variables with CNPQ Factors; variance in nurses' attitudes; and descriptive information.

Due to the small number of subjects which were male or other races than white, the association of the independent variables of sex and race with nursing attitudes was not examined. In addition, since nurses frequently worked several units, rotated shifts as well as the number of hours in a shift; the association of unit worked, shift worked and number of hours with nursing attitudes worked in a shift was not analyzed. Implications for nursing and indications for further research will be discussed.

Overall Attitude Toward Computers

Nurses' overall attitudes toward the use of computers in nursing practice were positive which is in agreement with results of recent studies by (Bongartz, 1988; Brodt and Stronge, 1986; Krampf and Robinson, 1984; Johnson et al., 1987) . This is in contrast to studies of the 1960's and 1970's (Friel et al., 1969; Melhorn et al., 1979; Reznikoff et al., 1967; Startzman and Robinson, 1972) which found that the average staff nurse had negative attitudes toward computers. Variables which may have influenced this change in overall attitudes are discussed individually in this chapter.

Relationship of Age, Nurses' Attitudes, and Factors
From the CNPO

In contrast to other studies (Chang et al., 1982; Friel et al., 1969; Krampf and Robinson, 1984; Reznikoff et al., 1967), it was found that as the age of the nurse increased, attitudes became more negative. The null hypothesis for age is rejected. This finding is possibly related to the level of education of the older nurses (most of the sample were Diploma School graduates). In addition, it is likely that older nurses did not have any exposure to computers in high school, nursing school or college. Only sixteen percent reported having previous education in the use of computers in high school or college. Also, although 75% reported they have used computers in nursing practice, one third of this sample were found to have had no training in the use of computers.

These employees may perceive the use of computers as a threat to their official (or unofficial) position, self-esteem, status in the organization or to their job security. Resistance to change in their role or tasks and a low tolerance for any change may also have influenced these attitudes. Threat to self-esteem, low tolerance for change, resistance to change in their role, no exposure to computers, lack of education in computers in their nursing school curriculum, and perceived threat

to job security are all restraining forces identified in the Change Model of Computer Use in Nursing (CMCUN). (Figure 2)

Correlation of age with the ten factors identified in the CNPQ revealed that as the age of the nurse increased, attitudes became more negative toward the use of computers for costing of nursing care (Factor III), effect on time available for direct care (Factor IV), and the belief in the nurses' ability to manage computers in nursing practice (VIII). This is new information not previously documented in the literature. The education level and lack of exposure to computers may be interrelated with the age variable.

Relationship of Degree in Nursing, Nurses'

Attitudes and CNPQ Factors

Education (degree) in nursing was found to have a highly significant ($r=.3752$) positive relationship with attitudes toward the use of computers in nursing practice. This relationship of years of education has been found in many other studies (Chang et al., 1983; Friel et al., 1969; Merrow, 1985; Reznikoff et al., 1969; Startzman and Robinson, 1972; Stronge and Brodt, 1986). The null hypothesis for educational preparation was rejected.

Although few of the participants had courses in computers in college or nursing school, a baccalaureate

degree or above in nursing was found to influence the nurses' attitude toward acceptance of change--the use of computers. Additional years of education in nursing may increase the driving forces toward the use of computers; for these nurses may place more value in professional advancement or they may be role models for change. Restraining forces which may be reduced by education are: fear of computers, threat to self-esteem, perceived threat to job security, change in role and a low tolerance for change.

As years of education in nursing increased, nurses' attitudes were found to be more positive toward these seven factors: documentation of patient care, human-machine relationship, costing nursing care, ethical concerns, knowledge of computers, belief in ability to manage computers in nursing practice, and the need for nurses to be computer literate. This is new information not previously documented in the literature.

Relation of Ownership and Regular Use of a Computer
with Nurses' Attitudes and with CNPO Factors

Ownership and regular use of a home computer were found to be significantly related to positive attitudes toward the use of computers in nursing practice. Exposure to and previous use of computers have been found to be related to positive attitudes in many other studies (Chang et al., 1981; Melhorn et al., 1979; Merrow, 1985;

Ronald, 1982; Rosenberg et al., 1967). Fear of computers is one of the "restraining forces" and computer literacy one of the "driving forces" identified in the Change Model of Computer Use in Nursing. Reducing the fear of computers and increasing computer knowledge would result in a change in the balance of forces toward the use of computers.

Owning a computer was positively correlated to nurses' attitudes toward these factors: documentation of patient care, human-machine relationship, costing nursing care, ethical concerns and belief in ability to manage computers in nursing practice. In addition, those who regularly use a home computer were found to believe in the nurses' ability to manage computers in nursing practice. Computer literacy is a driving force toward the use of computers in nursing practice.

Relationship of Position with CNPO Factors

Nurses in management positions were significantly more positive toward the ability of nurses to manage computers in nursing practice (Factor VIII). Once again, this may be interrelated with education since nurses in management positions are usually required to have at least a Baccalaureate degree in Nursing or another discipline. The difference in attitudes between staff and nurses in management may also be related to the fact

that nurses in management positions received additional orientation (three hours) to the HIS at PGHMC.

In addition, this orientation was more comprehensive. Nursing staff were given a general orientation to the computer hardware and then instructed in the particular module that was being implemented. Perhaps, staff orientation should be similar to nursing managers. Nurse managers were also more involved than staff nurses in the change process, aware of the importance to the system to the nursing department and saw opportunities for advancement. These are driving forces in the CNPQ.

Relationship of Degree in Another Discipline
with CNPQ Factors

The only factor (III) found to be significantly related to degree in another discipline was belief in the nurses' ability to manage computers in nursing practice. Once again additional years of education have been found by others (Chang et al., 1983; Friel et al., 1969; Merrow, 1985; Reznikoff et al., 1969; Startzman and Robinson, 1972; Stronge and Brodt, 1984) to increase positive attitudes toward the use of computers.

Relationship of Years Employed in Nursing
with CNPQ Factors

Results of the analysis revealed that as years

of employment in nursing increased, the attitudes toward costing nursing care and ethical concerns becomes more negative. This concurs with other studies which found that overall attitudes toward computers were more negative for those employed in nursing over 10 years, (Friel et al., 1969; Reznikoff et al., 1969). The average number of years employed at PGHMC by the study sample was eleven years. These negative attitudes are possibly interrelated with increasing age for those employed over 10 years. The older nurses were found to be negative toward the use of computers in nursing practice.

More recent research findings by Brodt and Stronge (1986) disagrees with the current study and others cited in the previous paragraph for those employed for >21 years. Brodt and Stronge (1984) found that attitudes of nurses employed for >21 years were more favorable than those employed for <10 years.

Relationship of Computer Course in Nursing Curriculum
and CNPO Factors

The need for nurses to be computer literate (Factor IX) was significantly correlated with having a computer course in nursing school. Nursing educators and leaders

acknowledge the need for the integration of such courses in undergraduate as well as graduate level nursing school curriculums (Heller, Romano and Damrosch, 1985; Krampf and Robinson, 1984; Merrow, 1985; Nelson, 1985; Romano, Damrosch, Heller and Parks, 1989; Ronald, 1982; Walker, 1981). In 1988, The University of Maryland at Baltimore offered the first professional educational track in nursing informatics at the graduate level. Computer literacy is one of the driving forces which will move a nursing organization toward the use of computers. Knowledge of computers and their use in nursing will also reduce these restraining forces in the change model: fear of computers, threat to self-esteem, perceived threat of job security, fear of decreased access to patient information and no exposure to computers.

Variance in Attitudes

As a set of variables, nursing degree, regularity and use of a home computer, and years employed at PGHMC accounted for only sixteen percent of the variance in the overall attitudes with nursing degree as the most significant predictor ($F=10.83$). A positive variance for nursing degree and regularity of use of a home computer was found: however, years of employment at PGHMC was found to have a negative variance.

Descriptive Data

Uses in Nursing Practice

Several questions included open-ended responses. In the demographic tool, the participant was asked if they have used a computer in nursing practice and if so, how? A majority (78%) did report that they had used computers in nursing practice. The specific uses were associated with the modules currently implemented at PGHMC: admission-discharge-transfer, ordering and obtaining results of diagnostic tests, and updating patient information. A nursing supervisor reported using the computer to monitor staffing patterns. Only one nurse used the system for nurse report forms. Only three nurses had used computers in nursing practice in another hospital and one in a health department.

Most of the nurses at PGHMC have never used a computer in nursing practice. However, the majority are at least familiar with the computer and how it may be used to communicate with other hospital departments. The unit clerks are doing the majority of this communication. Nurses attitudes were positive therefore when they are asked to utilize the computer in nursing practice, they will begin this process with more knowledge of computers than before and with an overall positive attitude.

Ethical Concerns

Nurses were asked if "there are few ethical dilemmas that will develop related to the use of computers in nursing" and to give examples of anticipated dilemmas. A majority of the sample (39) agreed that there were few dilemmas. Eighteen of the participants did not answer the question, some indicating they did not understand it. This suggests lack of knowledge of potential uses and abuses of computers in nursing practice as well as confusion concerning what an ethical dilemma is. This question should be adapted in future studies. Perhaps, ethical situations could be presented for nurses to show agreement or disagreement. In addition, ethical dilemmas in nursing practice are more likely to become evident after the nursing module is implemented.

Privacy and/or confidentiality of patient information was the most frequently cited dilemma which may be considered by many to be a legal problem. Other ethical dilemmas as perceived by nurses were:

Accessibility to patient records when the computers is "down".

Too much nursing time spent at the computer and not at the patient's bedside.

Wrong information entered causes other staff to make wrong decisions in treatment.

When system is "slow", patient care is jeopardized due to delay in access to patient information. Money spent on the HIS should instead be utilized for more nursing staff.

Standardization needed for computers entry excludes the documentation of psychosocial needs that are on paper record.

Do not resuscitate orders may not be put on computer chart.

Satisfaction with Training, Support and Functioning of PCS at PGHMC

A large majority of participants (82%) agreed that the training offered at PGHMC enabled the nurse to effectively utilize the computerized patient care system (PCS) in clinical areas. Comments from those who disagreed were mostly concerned with the amount of time allocated for training and time lapse between training for the particular module and the actual implementation. Staff from the operating room consistently expressed a need for more training. It was also evident from comments that some of the nurses have not used the system since their initial orientation. The unit secretary is doing these tasks. One nurse did express a concern that the training teaches only tasks and desires to know how to effectively use the system.

Provision of nursing support staff to address user questions and problems regarding the PCS was considered adequate by a large majority (82%) of the nurses. Among those who disagreed, these problems were expressed: inadequate coverage on nights and weekends (3), most nursing support staff don't have time to assist due to their own duties (1), and one nurse stated the head nurses on her floor were not knowledgeable about the computer.

Participants were asked if the PCS was "user friendly". A majority of the staff (71%) agreed that it was. However, the term "user friendly" was not understood by some nurses since nine of the subjects did not answer the question, and five of the nine wrote that they did not understand the question. Others who disagreed stated that: the system was too slow; it takes too long to get into the functions; there are no error messages; the system needs some personality, friendly words or phrases and directions on the screen; and the need for error messages.

Educational Needs Perceived by Nurses

Few members of the sample expressed a desire for additional information or continuing education. Computer topics which participants desired further information or continuing education were: use of computer PCS for

nursing care plans and nursing notes (5), basic programming (2), and word processing (1).

Limitations

1. Study results may only be generalized to populations of nurses employed at hospitals.

Conclusions and Implication for Nursing

In this study of nurses' attitudes toward the use of computers in nursing practice in a regional acute care medical center, it was found that overall attitudes toward the use of computers were positive, with those nurses having a Baccalaureate degree or above more positive than those with fewer years of education. Ownership and regular use of a computer was also found to positively affect nurses' attitudes toward the use of computers. The only independent variable found to negatively affect nurses' attitudes was age. As the nurses' age increased, attitudes became negative.

Demographic and computer use variables which were found explained sixteen percent of the variance in the overall attitudes of the sample were: degree in nursing, regular use of a home computer and years employed in nursing at PGHMC. Degree in nursing was the most significant predictor. Years employed in nursing at PGHMC accounted for part of the negative variance.

Descriptive information given revealed that nurses did not understand the question of ethical dilemmas that may be associated with the use of computers in nursing. This may be due to a lack of knowledge concerning future uses of computers in nursing. The only "true" ethical dilemma identified was related to the dehumanization of nursing care. Who decides which direct nursing services may be replaced by technology?

As early as 1962, nurses were raising questions concerning the replacement of essential nursing functions by machines. In an editorial in Nursing Forum (1962), an unknown author gave an example of machines replacing the nursing function of patient education, "the mimeograph machine...disgorging tons of literature for patient consumption-information about hospital policy, routines, and nursing and medical management ... purportedly introduced to foster better interpersonal relation, in reality has created more interpersonal distance than closeness" (p. 18-19). How many nurses give a patient a large packet of literature to read without assessing their ability to read, reading level, language, culture? What will we sacrifice next in the name of efficiency?

In a more recent research study designed to forecast data about the future of nursing, Sullivan, Lee, Warnick, Green, Lind, Smith and Underwood (1987) found that

nursing experts were just as concerned today about dehumanization of nursing care. Using Delphi study methods, thirty-five nursing experts were asked to rate 20 forecast statements for both probability and desirability of occurrence in the years 2000 and 2020. Study results, based on an interrelation of the items with a high probability of occurrence (70% or above) and the items with a low probability of occurrence (30% or below), yielded three major themes of concern and change for the nursing profession: "shifting nursing's level of autonomy in society and health care, strengthening of patients' rights in health care, and increasing the interrelationship of high technology with humanistic caring by nurses" (p. 234). Nurses have a critical role to play in the ethical use of technology. This area needs further exploration. Developments and innovations in the use of computers in nursing are and will continue to have an impact on the practice of nursing. Nursing informatics is a new term which includes all aspects of computer use, from the theoretical to the applied. "It covers learning how to use the new tools and to build upon the capabilities provided by computers and other information technologies" (Ball and Douglas, 1988, p. 15). Ball and Hannah (1988) propose that the "impact of nursing informatics ultimately will be so profound as to

be a driving force for extensive change in the nature of nursing practice" (p. 85).

Nurses must be prepared to manage and utilize complex, ever-changing and voluminous amounts of information from a multitude of sources and the computer is a key to this new role. Before the implementation of computer use in nursing practice, the assessment of nurses' attitudes toward the use of computers in nursing practice is necessary to assist the nursing administrator in identifying potential problem areas which need to be addressed in the planning and implementation of a computer system. Areas of concern, resistance and deficit in knowledge of uses of computers among nursing staff may be identified. These restraining forces may be reduced and driving forces increased through strategic planning.

Recommendations for Further Study

Further investigation of possible negative effects of the use of computers in nursing on interpersonal relationship with the patient as well as other staff in the organization is recommended. Use of computers for communication as well as for technological monitoring of patient status could reduce one of the key elements in nursing, "caring" for patients.

Legal issues associated with the use of computers in nursing practice must be explored. The addition of

statements to the questionnaire concerning legal issues associated with the use of computers in nursing practice is recommended; for example, privacy and confidentiality of patient records, errors in computer entry resulting in errors in the care of the patient in other departments.

Nursing informatics is the future. Nurses will need additional education in the ability to manage and synthesize complex information from multiple sources. A computer literacy course should be part of every baccalaureate as well as graduate curriculum with application of this knowledge in nursing courses, including "hands on" use of computers in health care. The establishment of computers in college libraries for student use in research is recommended. Also, nurses who are experts in the use of computers in health care must be prepared to function as competent partners in the design, planning, and implementation of computerized patient care systems. Therefore, the expansion of master's level programs to educate nursing information specialist is recommended.

The expansion of this study to assess knowledge as well as attitudes about computers would be beneficial. Knowledge and attitudes may be highly correlated. This would be valuable information for nursing educators and nursing administrators.

COMPUTERS IN NURSING PRACTICE QUESTIONNAIRE

Please read each statement and check the appropriate category to indicate whether you "strongly agree", "agree", "disagree", or "strongly disagree" with the statement. Please respond to all items. Comments are welcome.

	Strongly Agree	Agree	Disagree	Strongly Disagree
1. Using computers will move nurses from behind the desk to the patient's beside.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Using computers will not improve the quality of care.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Computers increase speed of the transmission of patient information hospital wide.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Computers can help nurses to organize daily care activities; for example, medication and treatment reminders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Computers can help to improve patient care and safety, including better records of patient treatment and medications.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Using computers in nursing practice may have serious side effects that outweigh the benefits.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. A Computerized hospital information system will provide nurses with more accurate information for the clinical care of patients.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Nurses must be computer literate in order to interact with other professions in society.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Computer technology in nursing will make my job more difficult.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Using computers can enable the nurse to deliver more effective care in the highly complex health care environment of today.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Incorporating computer technology into patient care will lower the risk of complications for the patient.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Computers in Nursing Practice Questionnaire
Page Two

	Strongly Agree	Agree	Disagree	Strongly Disagree
12. Computers will provide objective means to evaluate nursing care.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Nurse-patient contact will decrease as a result of the use of computer technology in nursing practice.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Computers can assist in quickly identifying nursing diagnoses.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Nurses should rely on information system professionals to design computer programs for use in nursing practice.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Computers can provide the nurse with an efficient means to produce individualized care plans.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Computer technology is simply another effective tool for the nurse to use in delivering care in a highly technological society.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. There are few ethical dilemmas that will develop related to the use of computers in nursing. Give examples of anticipated ethical dilemmas_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Traditionally, charges for nursing services are lumped into the room charge. In the future, a computer system should be utilized to separately charge for nursing services.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Computers dehumanize care by removing the interpersonal aspect of nursing care.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Learning to use a computer in nursing practice is necessary for the development of the nursing profession.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. With the development of patient care information systems, the privacy of patient records is impossible to safeguard.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Computers in Nursing Practice Questionnaire
Page Three

	Strongly Agree	Agree	Disagree	Strongly Disagree
23. When computers are installed, some nurses will lose their jobs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Computers should be used only for menial repetitive tasks which require little thinking.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. People who are against using computers in nursing practice are the ones who know very little about them.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Computers are complex machines which only computer experts can understand and utilize.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. An inexperienced computer "user" can break the system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. By using computers to communicate, with other departments, the nurse will have more time to spend at the patient's bedside.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Nurses should be educated to use the computer to help the hospital accurately charge nursing services separately from the room charge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. The confidentiality of patient records is just as secure in a computerized patient care system as it is in a manual record system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. The computer training offered at PGHMC does provide the nurse to effectively utilize the computer system in clinical areas. If you disagree, please explain_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

32. The quality and quantity of nursing support staff is adequate to address user questions and problems regarding the patient care system (PCS). If you disagree, please explain_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Computers in Nursing Practice Questionnaire
Page Four

- | | Strongly
Agree
[] | Agree
[] | Disagree
[] | Strongly
Disagree
[] |
|--|--------------------------|--------------|-----------------|-----------------------------|
| 33. The PCS is user friendly.
If you disagree, please explain_____ | | | | |
| ----- | | | | |
| 34. Please list any computer topics you
would like to have more information
and/or CEU's on. | | | | |
| ----- | | | | |
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COMPUTERS IN NURSING PRACTICE QUESTIONNAIRE

BACKGROUND INFORMATION

Instructions: Please check the appropriate box. Do not put your name on this questionnaire.

1. Age: ☐ 20 - 29 ☐ 30 - 39 ☐ 40 - 49 ☐ 50 - 59 ☐ 60 - 69
2. Sex: ☐ Female ☐ Male
3. Race: ☐ Black ☐ Caucasian ☐ Asian ☐ Other
4. Current Position: ☐ Staff Nurse
☐ Assistant Clinical Manager
☐ Clinical Manager
☐ Nursing Supervisor
☐ Nursing Director
5. ☐ Full-time
☐ Part-time Number of hours per week _____ hours
6. Unit worked: ☐ Medical ☐ ICU ☐ Nursery ☐ Float Team
☐ Surgical ☐ ICU Stepdown ☐ Pediatrics ☐ OB-GYN & L&D
☐ Med-Surg ☐ CCU ☐ Outpatient Surgery
☐ Oncology ☐ CCU Stepdown
☐ Detox ☐ ER
7. What shift do you work? ☐ Days
☐ Evenings
☐ Nights

Number of hours in the shift? ☐ 12 hour shift
☐ 10 hour shift
☐ 7.5 hour shift
8. Highest Degree in Nursing: ☐ LPN
☐ Diploma
☐ Associate Degree
☐ Baccalaureate
☐ Masters
9. Degree in another discipline? ☐ Yes ☐ No
If yes, please list _____
10. Number of years employed in nursing: _____ years
11. Number of years employed at PGHMC in nursing: _____ years

Computers in Nursing Practice Questionnaire
Background Information
Page Two

12. Previous education in the use of computers:

- | | |
|---|--------------------|
| <input type="checkbox"/> None | |
| <input type="checkbox"/> High School | List course: _____ |
| <input type="checkbox"/> College | List course: _____ |
| <input type="checkbox"/> PGHMC Inservice | List course: _____ |
| <input type="checkbox"/> Other Hospital(s) | |
| Continuing Education | List course: _____ |
| <input type="checkbox"/> Continuing Education | |
| From Other Source(s) | List course: _____ |
| <input type="checkbox"/> Other () | List course: _____ |

13. Was a computer course part of your nursing school curriculum?
☐ Yes ☐ No

14. Have you used a computer in nursing practice? ☐ Yes ☐ No
If yes, how?

15. Do you own a home computer? ☐ Yes ☐ No

16. Do you use this computer regularly? ☐ Yes ☐ No
If yes, how many times per month? _____
For what purpose? _____



October, 1988

Dear Staff,

Attached is a research study being done by Joan Scott, who is a Master's student at SSU. Joan has worked with the Nursing Department and Patti Serkes in H.I.S. implementation, and her research study is centered on nurses' attitudes regarding computerization.

I hope you will take the time to complete the survey for Joan.

Thank you for sharing with her.

Sincerely,

Karen C. Poisker, MSN
Vice President for Nursing

KCP:med

PENINSULA GENERAL

100 East Carroll Street, Salisbury, Maryland 21801-5493
Telephone (301) 546-6400

Statement of Approval
Committee on Human Volunteers
Salisbury State College

Date October 21, 1988

MEMORANDUM TO: Karin E. Johnson/Beverly Joan Scott

FROM : Chairman, Committee on Human Volunteers

SUBJECT : Attitudes of Nursing Personnel Toward Computerization of
Nursing Practice
Title of Study

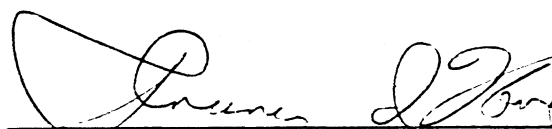
Salisbury State University
Sponsoring Agency

Grant Application No. _____

Karin E. Johnson/Beverly Joan Scott
Principal Investigator or Program Director

The Committee on Human Volunteers has considered the above application and, on the basis of available evidence, records its opinion as follows:

- (1) The rights and welfare of individual volunteers are adequately protected.
- (2) The methods to secure informed consent are fully appropriate and adequately safeguard the rights of the subjects (in the case of minors, consent is obtained from parents or guardians).
- (3) The investigators are responsible individuals, competent to handle any risks which may be involved, and the potential medical benefits of the investigation fully justify these studies.
- (4) The investigators assume the responsibility of notifying the Committee on Human Volunteers if any changes should develop in the methodology or the protocol of the research project involving a risk to the individual volunteers.


Chairman

Copy to Karin Johnson

COMPUTERS IN NURSING PRACTICE RESEARCH STUDY

October 13, 1988

Dear Colleague:

You were selected at random to be asked to participate in a nursing research study to learn about current nursing attitudes regarding the use of computers in nursing practice. Attitudes will be measured by the answers to a short questionnaire which is attached. It should take about 15 minutes to complete.

Responses are anonymous. No names are required. Please be as candid as possible in your responses and feel free to write in comments. Your participation is strictly voluntary. However, your participation is very valuable to the study.

Please return the questionnaire in the enclosed envelope to Mary Davis, Nursing Secretary, via interdepartmental mail in one week (by October 20). If you have any questions about this study or would be interested in the results, please contact me, Joan Scott, Graduate Nursing Student at Salisbury State University. You may contact me at work, 749-1244, ext. 6941, or at home, 632-0849.

COMPUTERS IN NURSING PRACTICE RESEARCH STUDY

October 26, 1988

Dear Colleague:

On Thursday, October 13, you were asked to complete a questionnaire concerning the use of computers in nursing practice. Research procedures require that I contact those who, for whatever reason, have not returned the study instrument. Your questionnaire has not been received so I am contacting you to urge you to complete the enclosed questionnaire. The validity of the study results depends upon the participation of all staff who were randomly selected. This will be the last time you will be contacted.

Some of you may have already responded; however, some questionnaires which have been received did not have the cover letter attached which had the study number on it. Since there was no way of identifying who had responded, these people will receive a second letter. If you have sent in your questionnaire, please do not complete a second one.

Be as candid as possible in your responses and feel free to write in comments. Your participation is strictly voluntary.

Please return the questionnaire in the enclosed envelope to Mary Davis, Nursing Secretary, via interdepartmental mail in one week from the date you receive it. If you have any questions about this study or would be interested in the results, please contact me, Joan Scott, Graduate Nursing Student at Salisbury State University. You may contact me at work, 749-1244, ext. 6941, or at home, 632-0849. Thank you for your time.

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CURRICULUM VITAE

Beverly Joan Scott

Personal

Birthdate: September 8, 1951

Address: Route 1, Box 1A
Newark, Maryland 21841

License: Maryland Nurse Registration
R051370

Education:

1985-1989 Master of Science Candidate
Department of Nursing and Health
Sciences, Salisbury State University,
Salisbury, Maryland

1982 Certification in Applied Epidemiology
Center for Disease Control
Atlanta, Georgia

1971-1973 Bachelor Of Science with Honors
University of Maryland School of Nursing
Baltimore, Maryland

1969-1971 Courses required for Bachelor of Science
Madison University
Harrisonburg, Virginia

Positions Held

Present Acting Director of Nurses
Wicomico County Health Department
Salisbury, Maryland

1980-1989 Assistant Director of Nurses
Wicomico County Health Department
Salisbury, Maryland

1978-1980 Supervisor
1977-1978 Acting Director of Nurses
1975-1977 Supervisor
1973-1974 Community Health Staff Nurse
Worcester County Health Department
Snow Hill, Maryland

1973-1974 Staff Nurse

News brief: the commission's 16 remedies for the shortage. (1989). American Journal of Nursing. 89(2), 278.

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Medical and Surgical
Peninsula General Medical Center
Salisbury, Maryland

Community and Service Organizations

Former member of the Board of Directors of the American Lung Association of Maryland (1978 to 1987).

Lower Shore Regional Council of the American Lung Association of Maryland (1976 to present).

Choir Member and Sunday School Teacher at Trinity United Methodist Church from 1976 to the present.

Professional Organizations

American Nurses Association

Maryland Nurses Association

Sigma Theta Tau