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Nursing and computers: Caring in the context of information technology

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NURSING AND COMPUTERS

CARING IN THE CONTEXT OF INFORMATION TECHNOLOGY

by

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A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

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Abstract

NURSING AND COMPUTERS

CARING IN THE CONTEXT OF INFORMATION TECHNOLOGY

by

Lena Sorensen

Adviser: Professor Gary Winkel

This study looked at how computerization had been introduced into the nursing environment over the past twenty years, and examined how these changes impacted on nurses' work environment and nurses' ability to be caring, the "essence of nursing." This was achieved through a three part process: 1) an archival analysis of national nursing journals and proceedings from computer and nursing conferences, 2) a descriptive study of a large urban hospital that uses bedside computers, and 3) a comparative analysis of the first two to identify any differences.

The content analysis of the literature on computers and nursing showed that although the numbers of articles have increased greatly over the past twenty years, most of the risks and benefits cited were based on expectations and not grounded in empirical studies of nurses who use information systems. No studies were identified that examined the impact of computers on the

"art" of nursing, caring, nor had any looked at the placement of the terminals on the unit and how this may affect the nurses' work experiences.

Yet the results at the hospital site showed a complicated picture of problems and benefits. A questionnaire that assessed the nurse's perception of the physical environment, computer uses, caring behaviors and job satisfaction was distributed to the nurses on four non-critical care units. Sixty-eight questionnaires were returned. Although the nurses reported a relatively high ability to be caring to their patients "most of the time", most did not feel that the computer had any significant effect on caring. They reported an effect on behaviors that required more time--that the computer hindered their ability to find time to listen, talk and comfort the patient. They did report an increased ability to be perceptive to patients, to include patients in their care, and to feel more organized. Yet they felt there had been no change in autonomy and decision making abilities.

Sometimes the convenient location of the bedside computers prevented them from being with their patients because they felt "pressured" to use it to document their care. The nurses also felt that the standardization of this documentation lost some of the "richness" of their care.

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CHAPTER I

INTRODUCTION

Over the past 20 years there has been a significant increase in the utilization of computers in all areas of the hospital environment, particularly in direct health care areas. Although computers were initially introduced into hospitals in the 1960's, by 1965 only 8% of hospitals utilized any form of computer technology, i.e. hospital information systems for fiscal reimbursement, supply inventory and ordering, and patient records. This quickly grew to approximately 70% of U.S. hospitals by 1980 (Grier, Ziomek, MacLean & Kim 1985). Yet of these only 20% had information systems which incorporated any kind of nursing functions (Kjerulff, 1988).

Since 1980, Nursing Information Systems (NIS) have been developed in greater numbers for direct use by nurses in the day-to-day care of patients. These systems are only one example of a variety of computerized technologies being developed for clinical

settings. A New York Times (Madden,1988) article reported on the newest development, perhaps an extreme example of what is possible in this technology but a clue to what may come in the near future. This was a robot that was to be used in a New England hospital to deliver meal trays. As the developers of the robot explained: "the idea is to increase the quality of service by relieving the nurses of a lot of the routine things they have to do"(p. 7). [emphasis mine] This innovation was hailed in the press as an advancement in health care technology because it has the potential to carry out routine tasks. Underlying this enthusiasm is the assumption that technology has the power not only to increase efficiency but also to "free up" nurses' time for other activities which contribute to the quality of patient care.

Despite the extensive use of computer technology in many different forms in the nursing care setting, very little research has been done to assess its impact on nursing. A 1986 survey of 2,133 nurses across the country found mixed results when nurses were asked to assess the effect of the computer on their work (Packer, 1986). This survey found that although 87% of nurses who used computers in their work reported that they preferred to work at a hospital that used computers, as many as 67% of these same nurses reported that the use

of computers prevented them from having direct contact with their patients. Such "hands-on", face to face contact is often considered an essential part of caring, the "art" of nursing. Given these contradictory findings and the very preliminary state of research, little is actually understood about how computers are perceived and what factors contribute to these confusing reports from nurses.

Indeed, the role of caring in nursing, though often alluded to, is itself poorly defined and often undervalued. Due to the severe financial crisis in health care delivery in the past ten years, hospitals have been increasingly forced to move towards more cost effective systems and to increase efficiency and productivity by restructuring staffing patterns, changing billing reimbursement policies and other general management strategies. Health care policy is moving from a scientific to an industrial orientation (Freedman, 1985). Nursing Information Systems (NIS) are being developed with the hope that these systems will increase the accuracy and accountability of nursing work performed within hospitals. Computer technology is becoming more and more an integral part of nursing and medical care as hospital management searches for cost saving methods of health care delivery.

Nurses' responses to this change in the hospital

environment have focused on the role of computers in education and on the identification of applications and implications for their use in hospital/community health settings. Many articles discussed the impact of computers in nursing in this context (Adams, 1986; Fagerhaugh, Strauss, Suczek & Wiener, 1980; Zielstorff, 1981), some focused on nurses' attitudes and knowledge of computers (Carl, 1986; Jordan-Marsh & Chang, 1985), while others discussed their potential applications within the clinical setting (Nathanson, 1983; Replogle, 1986) and nursing education (Armstrong, 1984; Park, Damrosch, Heller & Romano, 1986). The majority of authors emphasize the need for nurses to take an active role in the development of these new information systems (Birckhead, 1975; Hannah, 1976; Romano, 1985; Zielstorff, 1977).

The introduction of the computer into the hospital setting, has been accompanied by a recent reemphasis in the nursing literature of the significance of caring as an aspect of nursing. Leininger (1977) asserts that caring is the "essence" of nursing and the central unifying concept in nursing theory and practice. In addition to supporting the centrality of caring as a construct, Watson (1979) urges nurse researchers to study caring as a unique construct and increase our "scientific" understanding of it so as to more fully

develop the profession of nursing.

Hands-on care has been demonstrated as a significant factor in promoting healthy physical and emotional development of premature infants in the highly technologized environment of the intensive care unit (Goleman, 1988; Jones, 1982). This direct human contact has traditionally been recognized as a significant component of nursing. But as nursing moves more and more into a technology filled work environment, some fear this aspect of nursing will be lost.

Many authors who discuss the advantages and disadvantages of computerization in nursing emphasize the uniqueness of caring and touch to the quality of nursing and argue that it can never be automated (Adams, 1986; Selby, 1987; Zielstorff, 1987). Yet as computerized programs are developed, all nursing functions must be identified in finite forms and labeled for use within these programs. With this identification and labeling of functions to create a scientific structure for nursing activities, there has been a push to standardize all functions and create scientific definitions. To fit in this system, caring must also become a measurable function, that is, one defined by specific operations or procedures.

Emphasis on the maintenance of the affective quality of the nursing role in the context of

computerization is frequently a part of the defense of automation of nursing units. A focus on caring is used to allay the fears of some nurses that automation may cause nursing to lose its unique position in the health care arena.

This fear may not be unfounded. When one examines the literature dealing with the development and the introduction of computers into other work settings (offices and factories), one gets a picture of significant change in work contexts (role structure and physical environment) where computer automation has been incorporated. This research revealed mixed results for workers involved with this new automation (Attewell & Rule, 1984); some authors discussed the changes in work content as often characterized by routinization and deskilling (Patrickson, 1986; Shaiken, 1979), others discussed the change in work roles and staffing (Baacklund, 1986; Giebink & Hurst,1975), while still others emphasized the increase in productivity and efficiency often brought about by the increased control and monitoring of work tasks by management (Braverman, 1985; Werneke, 1983). In addition to these mixed outcomes, analysis of the diffusion of technology in women's work roles was compounded by the vulnerable position of women as second class workers (Lie, 1982; Women's Bureau, 1985 & 1986). As these reports have

demonstrated, the positive outcomes of increased productivity--efficiency and profits for a work setting --may not always benefit the quality of the work experience for the workers (Braverman, 1985).

Although few published studies have attempted to identify the impact of computer technology on the day-to-day activities of nurses, those that have focused on this area raise significant questions for future research. One early study of a hospital that had installed a nursing information system found that there were significant staffing changes, changes in nursing responsibilities and increased emphasis on nursing documentation (Giebink & Hurst, 1975). Another research project conducted by the National Federation of Nurses' Unions in Canada (Desborough, 1987) interviewed nurses from health care agencies across Canada regarding their perspectives on the impact of computers on nurses, their ability to deliver nursing care and their perceptions of this impact on patients. One of the major concerns of the nurses who participated in this study was the increased workload resulting from computerization because of the increased patient information that was produced. Instead of helping them in their patient care, this information was viewed as a burdensome addition to their responsibilities. This result is significant considering other workload related stress

factors for nurses today (staffing shortages, increased acuity of patients, financial pressures in health delivery).

Studies designed to examine the quality of nurses' work experience usually focus on individual factors, such as job satisfaction, the outcome quality of patient care and environmental design implications affecting the nurse's ability to provide patient care. No published studies to date have looked at the work setting as a whole or at how computer technology impacts on the various aspects of the hospital health care delivery system. Thus there is a present need for research which analyzes the interface between the goals of the hospital administration and those of health care workers, the structure and quality of the nursing unit both in physical dimensions and work roles, and the introduction of computers into the work context of nurses as providers of care.

At the First National Conference on Computer Technology in Nursing in 1981, Zielstorff (1981) predicted that three separate areas in health care will be influenced by computer technology: 1) data-related functions; 2) the hospital's organizational structure; and 3) the decision-making ability of computer users. These areas are significant and must be examined within nursing settings that have been automated, recognizing

the interrelationship of them. Yet no studies to date have gone beyond an examination of these three areas as separate outcomes. Studies must examine the relationship between computerization and the context of present health care policy. Moreover none have looked at a specific site where computerization has been introduced with these questions of policy or the broad issues of health care ideology in mind.

This study will identify and analyze significant issues within the complex process of technological change in the nursing profession. These issues will be considered through a comparison between nursing literature related to computer use over a twenty year period and the actual experience of nurses using computers in their daily work within a specific setting. The purpose of this study is to look at how computerization has been introduced into nursing over the past twenty years, and to examine how these changes have impacted on the hospital work environment. The complex factors within the larger health delivery system will be considered in the interpretations of the research outcomes. Since caring has already been identified by several nurse leaders as the essence of nursing, the analysis will focus on how this construct is discussed and how it is perceived in the context of computer use on specific nursing units.

CHAPTER II

LITERATURE REVIEW

This literature review will deal with a broad network of issues. In many past studies these have been dealt with separately, but in trying to identify the interrelatedness of effects within nursing and computer systems, these concepts should be considered as a whole. This literature review involves the following areas: definition of the environment and the role that environment plays in the nursing context; the hospital environment from a social/historical perspective and specific environmental research relevant to the effect this environment has on the workers within it; the meaning of work and environmental issues within work settings; job satisfaction and issues relevant to nurses' job satisfaction and stress; the social history and development of computer technology within nursing settings; a social/historical perspective of caring within nursing and how it is used in reference to the role of computers in hospital nursing. These complex

issues are interwoven within nursing and are especially relevant today as the nursing profession struggles with the myriad of changes in the health delivery system and with the introduction of computers.

ENVIRONMENTAL THEORY IN RELATION TO NURSING

The nursing environment is more than the physical dimensions of the spaces in which nurses work. It is a complex milieu in which nurses interact with a diverse group of people (i.e. other staff, patients, visitors) and with multi-functional structural spaces. In the past twenty years, theorists and researchers have focused attention on the environment as a complex system of dimensions with which people interact and have demonstrated the important role of the environment in behaviors and perceptions.

Proshansky, Ittelson and Rivlin (1970) in the early stages of the development of environmental psychology theory identified thirteen assumptions as guidelines for understanding the dynamic interaction between people and the environment. They recognized the environment as a complex interaction of social, physical, personal and psychological dimensions that must be understood within a social historical context. Traditionally the environment has been referred to either as its physical dimensions (i.e. structure, design) or as its

affective/human interactive qualities (i.e. milieu).

These thirteen assumptions identify specific components of the environment, from physical spaces to the complex experiences of people within these spaces. Although all of their assumptions are relevant to the understanding of the nursing environment, two of these assumptions help to clarify the concepts of the complexity of the environment that this thesis speaks to.

> Assumption # 3 The physical setting that defines and structures any concrete situation is not a closed system; its boundaries are not fixed either in space or time.(p.15)

> Assumption # 4 Behavior in relation to a physical setting is dynamically organized: a change in any component of that setting has varying degrees of effects on all other components in that setting, thereby changing the characteristic behavior pattern of the setting as a whole.(p.16)

The openness of the environment helps to understand the sense of movement or process that is present in any given space--the experience at a given moment is affected by past experiences and expectations. The behaviors that take place within any given space is also

influenced by the expected behaviors that are defined by a larger ideological system that the given environment is a part of.

The fourth assumption speaks to the interdependency of each component of the environment--people as well as objects. If the function or design of one component is altered, then all other components of this environment will change in some way. When looking at the nursing unit, this is an important assumption. As computers are introduced into this environment, things will change. How and to what degree is dependent on many factors. But it is important to recognize that there will be some change on the nursing environment.

In addition to the complexity of these social, physical, personal and psychological dimensions, the environment is now recognized as being influenced by the process of history or specific time in which it is developed. This concept is especially important in understanding the work environment of nursing.

In their study of institutional settings for children, Rivlin and Wolfe (1985) bring the discussion of the analysis of a specific setting beyond the physical dimension. They emphasize the importance of understanding the environment as a complex system of historical, social, political as well as physical dimensions in which we are all immersed and how this

complexity of forces influences the people within a given setting. The environment (made up of the interactions between the structures and people) is therefore reflective of the larger system of which it is part. Rivlin and Wolfe write that the

> environment is part of a totality rather than a backdrop for behavior. In the same way that it may limit or support action, it also reflects and helps to define a system of social relations and the person as a part of that system. (p. 8)

The work environment is a special system that must be analyzed not only by the complexity of the environment in which it is carried out but also by the meaning of work within the complex system of a given society. In his classic studies of the history of work in America, Gutman (1976) has demonstrated the importance of analyzing the experience of work within a given time period as it is influenced by race, gender, political, economic and social factors. If one ignores the interaction of these factors and their influence within the work setting, our understanding of the complex reality of a people's work experience is severely limited.

Proshansky (1978) discussed the interdependencies between the environment and people, and their

experiential consequences. In his concept of place identity, he has woven the dimensions of the physical environment into the development of a person's self-identity. The concept of place identity has three major dimensions: 1. a cognitive-descriptive structure; 2. an affective-evaluative dimension (preference, attachment); 3. a social structural dimension (social role influences). The interrelationship of these three dimensions must be understood in interpreting people's experiences within a given setting.

The importance of the social/symbolic role of the environment in people's lives has been understood by many other authors. Foucault (in Wright & Rabinow, 1982) discussed the power of the 'language' of the design of the physical environment in social control and interaction. In his discussion of the design of prisons, he demonstrates how the spatial arrangements reflect the power or status of each individual within the social hierarchy of this institution. The control and allotment of physical space has also been demonstrated to be determined by the social role of gender (Ardener, 1981). Other researchers (Konar, Sundstrom, Brady, Mande & Rice, 1982; Sundstrom, Town, Brown, Forman & McGee, 1982; Walton, 1975) have identified symbolic ways that the size and location of spaces influence people's behavior. The environment not

only interacts with people through the reinforcement and development of social identity but also enables satisfactions of certain human needs--privacy (Cumming & Cumming, 1962; Laufer & Wolfe, 1977), control (Baum & Valins, 1977; Hall, 1974;), personal space and territoriality (Gutman, 1972; Lang, Burnette, Moleski & Vachan, 1974).

The relationship of the physical environment and people's behavior in institutional settings has been studied extensively. Recognizing the contextual nature of the physical environment as part of a social/ political system, Rivlin and Wolfe (1985) remind us that "...people's attempts to exert control over their lives take place within a culture in which there are dominant values concerning the possession and use of physical environments and their elements" (p.7). Pasmore, Petee and Bastian (1986) allude to the power of these dominant values in their discussion of the diffusion of technology into hospital settings. They attributed the failure of a project to introduce new computers into a hospital work setting to the strength of the cultural hierarchical role of hospital workers. Using an approach called sociotechnical systems theory to analyze a hospital laboratory setting and to facilitate the implementation of computers into the laboratory work setting, they found by excluding the medical staff in

the original discussions of the potential changes, the overall effect was not beneficial to the laboratory technician. The medical staff's noncompliance with the use of the new system contributed to the failure of this laboratory system. The power of the various roles within a work setting must be recognized as an influential force in each role interaction and planned change.

HOSPITAL DESIGN

History

The historical process of the development of the hospital within this country has influenced the goals and expectations of nursing. The role of the hospital in the delivery of health care at a given period in time has influenced the structure and organization of the setting as well as the roles and responsibilities of the workers who staff it (Rosenberg, 1979; Thompson & Goldin, 1975; Tomes, 1984). The specific environment of the nursing unit must be understood within this complex system. The hospital, in turn, is influenced by the dynamics of the larger health care system which is undergoing change and the established cultural structures within this society that define what work ought to be within these changes. The temporal aspect of the nursing unit is also influenced by the 24 hour basis

in which care is given and the development of the therapeutic relationship with patients, entry, treatment and termination, over this time period.

There has been an extensive historical discussion of the design of hospitals and its impact on patient care. In a document originally published in 1859, Florence Nightingale discussed the importance of the physical environment in the healing of patients (Nightingale, 1969). She wrote

> In watching diseases, both in private houses and in public hospitals, the thing which strikes the experienced observer most forcibly is this, that the symptoms or the sufferings generally considered to be inevitable and incident to the disease are very often not symptoms of the disease at all, but of something quite different--of the want of fresh air, or of light, or of warmth, or of quiet, or of cleanliness, or of punctuality and care in the administration of diet, of each or of all of these. And this quite as much in private as in hospital nursing. (p.8)

Although Nightingale's theory of the environment's role in the curing of disease was not guided by any epidemiological study but rather by middle class, moral interpretations, she saw the evidence of disease linked

with the quality of the person's physical environment (Rosenberg, 1979). Her discussion of environmental factors (noise control, use of colors and shapes) has contributed to health care providers' awareness of the physical environment as an important factor for a patient's recovery (Nightingale, 1969).

Design

The idea that the physical environment can contribute to the recovery of patients was also integral to the theories of hospital construction expounded by Dr. Thomas S. Kirkbride, the superintendent of the Pennsylvania Hospital for the Insane in Philadelphia from 1840 to 1880. He emphasized the need to locate "insane asylums" always in the country so as to assure fresh air and proper drainage. He also discussed the need to limit the size of the hospital so as to prevent overcrowding and to design the size of rooms to permit privacy for patients as well as staff (Kirkbride, 1880; Tomes, 1984). Although his ideas dealt specifically with the design and size of mental hospitals in the late 1800's, the "Kirkbride plan" had a significant impact on all hospital construction in the United States from 1840 well into the 1900's.

More recently, concentration on the role of the physical design and layout of hospitals as they may influence therapeutic outcomes has been intensified by

some investigators (Bailey, 1966; Canter & Canter, 1979; Osmond, 1957 & 1966). Other researchers have expanded these ideas to include an understanding of the relationship of the style of design as a reflection of how society views health and illness and the role of the health care professions (Friedson, 1963; Mayhew, 1986; Rivlin & Wolfe, 1985; Thompson & Goldin, 1975). Forty (1984), in his analysis of modern hospitals in France and England, argued that the changes in the design of hospitals had little to do with curing and more to do with the symbolism of the power of the patron and the increase in the prestige of the professions, especially the medical profession.

Analysis

The physical environment also has been demonstrated to have an effect in producing or reducing stress (Baum, Singer & Baum, 1982; Saegert, 1975), on the levels of stress of patients within hospitals (Shumaker & Reizenstein, 1982), on the stress levels of nurses (Claus & Gailey, 1980) and on the work performance of hospital personnel (Ferris & Rowland, 1985). Physical factors within the intensive care unit (crowded areas and the increasing amounts of technological equipment) have been identified as factors significant to the level of stress of ICU nurses (Hoffman, 1981; Maloney, 1982; Vincent & Coleman, 1986; West, 1975;). Despite the

knowledge of the importance of social support within a given work setting as a buffering effect on work stress (LaRocco, House & French, 1980), physical factors within the ICU, specifically the numerous pieces of technology, have been shown to contribute to the nurse's stress level. Although all of these studies demonstrated the relationship between the physical environment and stress, none of these studies have taken into consideration the nonphysical factors that comprise the environment, the social, personal, psychological and temporal properties discussed earlier.

Researchers have not only looked at the overall design of hospitals and their effects on general health care but have also looked at specific spaces within the hospital and their effects on patients, families and staff (Conway, Zeisel, Clayton, Heining, Phaneuf & Welch 1978; Cotton & Geraty, 1984; Olsen & Winkel, 1982; Ryan, 1972; Spivack, 1967). The significant role of the nurses station as a spatial entity has also been studied. Researchers have found that the radial design of the nurses station close to patient rooms had a positive influence on nurses' job satisfaction and decreased their stress level (Trites, 1969). Some researchers found that the number and quality of the nurse's interactions with patients and visitors improved as the nurses station was more open and accessible

(Edwards & Hults, 1970; Goldstein, 1979). The kind and quality of tasks that the nurse is able to perform has also been shown to improve with the accessibility of the nurses station to patient rooms (Kenny & Canter, 1981; Trites, 1969).

The design of nurses station has been influenced by some of these results. One such design, the Frieson-design, was based on the philosophy that the more accessible the nurse to the patient and the more accessible information is to the nurse, the better the work outcomes will be (Abrami & Johnson, 1990; James & Tatton-Brown, 1986; Thompson & Golden, 1975). The original intent of the Frieson design was to decentralize supplies and communication areas and decrease the amount of traveling the nurse needed to do while caring for her patients by having everything readily available at the bedside area.

The analysis of nurses' work performance is not new to nursing. At the turn of the century, nursing leaders looked to the new trend in "scientific management" as a way to redefine nursing and as an attempt to elevate its practice and status (Reverby, 1987). Nursing efficiency became the goal.

> As promulgated by "scientific managers", efficiency required the systematic breakdown, analysis, and timing of the steps in a work process; the search

> for standards and the "best way" to perform each task; the separation of mental from manual labor; and ultimately, managerial control over the planning and execution of work. (p. 143)

Frank and Lillian Gilbreth, leaders in the scientific management movement, introduced these efficiency studies to nursing by the application of time motion studies in the hospital setting (Reverby, 1987). Nursing's participation in these studies became a way to provide the "scientific evidence" needed to clarify the relationship between nursing's dual role with "science and sentiment" (caring). Although, as Reverby goes on to show,

> [t]he study of the physical structure of the hospital's impact on the nurse's work did not always lead to agreement that the nurse's comfort, or right to determine her own work pace, was an important consideration in hospital efficiency. (p. 154)

There seems to be a close parallel to what was happening at the turn of the century (the changes in health care structure and nursing) with what is happening today. Nursing leaders are again struggling with the dual role of the "art and science" of nursing and are calling for standardization and research that will provide

scientific evidence of the unique functions and economic efficiency of nursing work (Watson, 1979). A further discussion about the present emphasis on the art and science of nursing appears in a later section of this chapter.

MEANING OF WORK

The majority of literature on hospital design and behavior has focused on the provision of care to patients and visitors. This is due partly to the fact that hospitals are institutions providing care to patients even though they are also work settings for a large numbers of people. Much of the work involving the job conditions of various workers within the hospital (the structure and design features of their work settings) has focused the evaluation either on cost effectiveness of various staff which gets played out in developing models of efficiency, or on the quality of care provided to patients. Again as Forty (1984) has reminded us in his analysis of modern hospitals in France and England, the changes in the design of hospitals had little to do with curing and more to do with the symbolism of the power of the patron and the increase in the prestige of the professions, especially the medical profession.

The meaning of work as it is reflected in the

physical work environments of hospital workers has been almost completely ignored. Yet there is a precedent for philosophers and sociologists to study these issues in other work settings. In his classic study, Men and Their Work, Hughes (1958) discusses the social/ psychological factors significant in man's work (he does not discuss women). He writes:

> In our society, at least one strong strain of ideology has it that a man may do any work which he is competent to do; or even that he has a right to the schooling and experience necessary to gain competence in any kind of work which he sets as the goal of his ambition. (p.42)

Even Hughes does not fully believe in the equality of opportunity although he does believe that the ambition for this equality and the prestige of a man's work is significant--something that he is judged by in his life by others as well as himself. Unfortunately this myth of the equality of opportunity is one that has pervaded the American work ethic for a long time. It has contributed to a misdirection of research in that it has involved the study of individual qualities of people and how they contribute to or hinder a person's work achievements. Many people have since demonstrated 1) that the race, gender and class of a person

significantly affects the person's choices in selecting a work role (Gutman, 1976), and 2) that the physical setting has a role in influencing the level of stress and satisfaction of the workers within it (Konar, Sundstrom, Brady, Mande & Rice, 1982).

The concept of the meaning of work is significant in understanding qualities of work settings. In his research on sample work groups in Israel, Harpaz (1986) identifies the conceptual framework that the International Committee on Meaning Of Work has developed.

> The meaning of working has been conceptually defined in terms of five major domains: centrality of work as a life role, societal norms about working, valued work outcomes, importance of work goals, and work role identification. (p.597)

This definition is significant for the understanding of hospital work settings from an environmental psychologist's perspective because it includes a multi-dimensional perspective identifying temporal, social and psychological factors as contributing to the meaning of a person's work. Although it does not include the physical dimension, other literature has demonstrated the role that the physical environment plays in an individual's work experience.

JOB SATISFACTION

Job satisfaction is another area that many researchers have examined when evaluating the conditions of the work environment and in particular the relationship that technology has with job satisfaction. Shepard (1977) reviewed a number of research papers that have attempted to identify how and which work characteristics are affected by the introduction of technology into the work setting. The one agreed upon outcome was that technology affected the nature of work but there was much disagreement as to how and whether it was a change in the degree of job satisfaction or a sense of alienation that occured.

Control by workers of their work environment has been found to be a significant factor in high levels of job satisfaction. In a review of 88 studies measuring work content and workers' perceptions of various factors within the work setting, Spector (1986) found that all the studies showed that:

> high levels of perceived control [by workers] were associated with high levels of job satisfaction (overall and individual facets), commitment, involvement, performance and motivation, and low levels of physical symptoms, emotional distress, role stress, absenteeism, intent to turnover, and turnover. (p.1005)

Although many researchers have identified the importance of having some control over one's work setting, a 1973 special task force from HEW (Work in America) found that "bureaucracies typically organize the work environment in such a way as to minimize the independence of the worker and maximize the control and predictability for the organization." (Simpson, 1985 p. 66) Control of workers is therefore operationalized by bureaucracies as an administrative responsibility. As Rivlin and Wolfe (1985) have stated, the environment only "reflects and helps to define a system of social relations and the person as a part of that system." (p. 8)

Hackman and Oldham (1975), in their development of the Job Diagnostic Survey, found several core job dimensions as relevant to the outcome of job satisfaction and motivation--skill variety, task identity, task significance, autonomy and feedback. Herzberg's theory of motivation-hygiene as it relates to job satisfaction is discussed in Simpson's article on job satisfaction and nurses (Simpson, 1985). Five factors are identified as strong indicators of job satisfaction: 1) achievement, 2) recognition, 3) work itself, 4) responsibility, and 5) advancement. Five factors were seen as indicators of dissatisfaction: 1) company policy and administration, 2) supervision, 3)

salary, 4) interpersonal relations, and 5) work conditions. These factors, especially the ones that are indicators of dissatisfaction, are very relevant to the potential and actual impact that computers are having on nursing. The kind of company policy and administrative style that fed the need for computerization within a given nursing setting and the expected supervisory style that becomes incorporated into the software and use of these systems will affect the nurse's degree of job satisfaction. It will also be important to see how computers actually enhance or hinder nurses' work conditions.

McCauslin (1985) looked at how the role of nurse executives affected staff nurses' degree of job satisfaction, taking into consideration the organizational climate of the hospital as having an influence on this dynamic. Using the job satisfaction instrument developed by Munson and Heda (1974), she found that there was a complex interactive relationship between the amount of power the nurse administrators have, organizational policies and climate, and nursing job satisfaction. This study demonstrated the importance of including organizational factors in the analysis of job satisfaction of nurses.

The Munson/Heda (1974) instrument, based on Herzberg's principles, divides the characteristics into

four indices measuring job satisfaction:

> Intrinsic task satisfaction: Closest to a satisfier of self-actualizing needs. Direct connection between task and satisfaction.
>
> Involvement satisfaction: Closest to a satisfier of ego needs as shown in a desire for power with or over others;
>
> Interpersonal satisfaction: Closest to a satisfier of belongingness needs as shown in a desire for warmth in personal relations;
>
> Extrinsic satisfaction: Indirectly related to many needs, but directly reflecting the satisfaction with employment as a device for satisfying such needs off the job; (p. 161)

This instrument provides one with the ability to integrate the complexity of the experiences within a work setting into an assessment of the nurse's satisfaction with her work.

Although one author found in a study of 761 women that women were often reluctant to raise dissatisfactions within work conditions because they felt this might be seen as their personal failure to improve a condition (Agassi, 1982), many authors have found significant factors contributing to nurses' (women's) dissatisfaction (Benton & White, 1972; Godfrey, 1978; Slavitt, Stamps, Piedmont & Haase, 1978).

A number of factors appear repeatedly in research forecasting dissatisfaction among nurses--low pay, lack of autonomy, low job status, lack of recognition (especially by doctors), overwhelming job requirements, and lack of time to provide support/caring for patients.

The importance of being able to provide adequate support to patients in addition to meeting their physical needs was found to be a prime indicator of job satisfaction for student interns in an extended health care facility (Labovitz & Orth, 1972). These findings on the need to provide complete care to patients point to the centrality of the nurse's need to be able to control the activities within her work setting.

CARING AND NURSING

Any discussion about caring in nursing must first recognize the role of gender as a significant factor in directing the expectations of what nurses should be and do from people both within the profession and by those outside of it. Nursing is a woman's profession, reflecting all the images and responsibilities of women in this society. The majority of nurses today are women and historically, one can trace the origin and development of its practice within the role of women's work. For this reason, many of the discussions and conflicts that have affected nursing throughout its

development have centered around certain feminine attributes. In this century particularly, a major discussion has been on the role of nursing as a profession (Melosh, 1982) and specifically the task functions of nursing as to whether they constitute a science or an art. The dichotomy of the art and science of nursing is an important one. By asserting that certain aspects of nursing is grounded in scientific theory has the expected goal of achieving a critical criteria within this society's norms for meeting professional status--that it has a unique theoretical knowledge. But historically, nurses have been women and have struggled to maintain the uniqueness of this characteristic by asserting that the art of nursing--the caring, humanistic quality--is a quality that deserves recognition and status as a significant component of nursing working. Caring--the art of nursing--complements the scientific knowledge to make nursing unique. Thus as a profession nursing--both the art and science--deserves the same status as all other professions, particularly medicine.

Nursing as a woman's profession shares all the discriminatory and symbolic statuses that women have in this society. This "unique role" (as a caring profession) is likely to have a more limited effect on elevating nursing's status in the health care hierarchy

today than we are being encouraged to believe (Sarason, 1985). As Coser argued over 25 years ago, "Our culture is achievement-oriented, so caring for patients is not sufficiently rewarded." (Coser, 1963)

Yet this emphasis on caring as an unique and valuable function is not new to nursing. In her analysis of the history of nursing between 1850-1945, Reverby (1987) warns us that

> caring is not just a subjective and material experience, it is also a historically created one. Particular circumstances, ideologies, and power relations thus create the conditions under which caring can occur, the forms it will take, and the consequences it will have for those who do it. (p. 202)

Others have attempted to identify the components of caring as a generic concept. Mayeroff (1971) approached caring from a philosophical perspective ignoring any significant role of gender in defining the attributes of caring. Mayerhoff sees caring as an essential part of life and not dependent on one's specific role, whether as parent, teacher or therapist. All caring for him shares a similar pattern as a process and is "helping another grow and actualize himself,...a way of relating to someone that involves development..."(p.1). He has identified eight major ingredients that he feels are

essential components in the process of caring: 1) one must have knowledge of general ideas and ideas specific to the person or idea being cared for, 2) one must be able to alternate rhythms by learning from past experiences, 3) patience in participating over time in the growth of this development, 4) being honest with oneself, being self-aware, 5) trust between the carer and the person cared for, trust in the others ability to grow in his/her own way , 6) humility of the carer, recognizing one's own ability and need to learn from each situation, 7) hope in the future possibilities, and 8) courage in a willingness to explore the unknown for the sake of helping another to grow.

Yet caring has traditionally been considered a feminine identity "trait" (Noddings, 1984). Perhaps because of this caring has always been accepted as a significant component of nursing functions. But caring has not been unique to nurses. The focus of caring being gender specific has become intensified in the past ten years as more work is being done on developmental theories of women. Gilligan (1982) in her study of moral development found that there was a different style of reasoning happening for women than for men. She identified a relational quality in women's reasoning that she had not seen in men's moral reasoning. Taking into consideration this new component, Gilligan develops

the concept of the "ethic to care" in women's moral development.

The role of gender in the phenomenon of caring has sparked much discussion. In a recent article analyzing the implications of this theory, Tronto (1987) presents an alternative interpretation of the relational role of reasoning, the ethic of care, in women. She suggests that this is a phenomenon that is cultural and class based and has also been noted in populations of peoples who are in lower power positions within a given society i.e. Blacks, Chicanos, and Indians. She suggests that "[w]hile white women and minority men and women occupy vastly different positions in the social order, they disproportionately occupy the caretaking roles in our society" (Tronto, 1987, p. 652). Tronto goes on to say that it is the advantage of this social role that provides the experience for an ethic of care to develop. She summarizes by saying

> In the final analysis, successful advocacy of an ethic of care requires the exposition of a social and political theory that is compatible with the broadest levels of care....Proponents of an ethic of care must specify which social and political institutions they understand to be the context for moral actors. (p. 661)

The recent emphasis on caring in nursing has steered

away from a moral context yet the reasoning that Tronto and Gilligan have identified--the ethic to care--is very much a part of the way nursing is now viewing caring, the art of nursing. This art of nursing has a definite relational quality as it is understood in the context of its expression with patients. Now in the new climate of complex technology, caring is also being critiqued as measurable phenomenon, an attempt to elevate it to scientific status.

Previously, caring has been discussed as a generic term that has not distinguished any difference between who gives the caring and the caring behavior. Yet questions arise as to the difference between interpersonal caring and caring that is delegated as part of a work role. Some have speculated that the difference between lay caring and professional caring is not so much in the behaviors as in the orientation of the person doing the caring. The professional carer (nurse) is a specialist providing a service while the lay carer provides the caring on a more equal basis (Kitson, 1987). The "obligation to care" within nursing has played itself out differently at different times in history depending on the social and political forces within health care at that time--from Nightingale's emphasis on socialization towards femininity and middle class values to the scientific-management and efficiency

models of caring (Reverby, 1987).

Since 1945, there has been a continuing effort by nursing leaders to identify significant components of nursing (Kreuter, 1967). Caring is again discussed although a clear definition has yet to be agreed upon. Leininger (1981) asserts that caring is the essence of nursing and defines caring behaviors as "those assistive, supportive, or facilitative acts toward or for another individual or group with evident or anticipated needs to ameliorate or improve a human condition or lifeway" (p.9). She goes on to further describe "professional caring as those cognitive and culturally learned action behaviors, techniques, processes, or patterns that enable (or help) an individual, family, or community to improve or maintain a favorable healthy condition" (p. 9).

Watson (1979) focused on caring in the nursing profession and distinguished caring from curing by grounding it in humanistic values. She has identified ten "carative factors" which include interpersonal sensitivity, respect and commitment to teaching. Having suggested these carative factors, she recognized the continued ambiguous status of caring. "Because caring knowledge in nursing science deals with a phenomenological paradox of facts, meaning, and context, and because this knowledge is relational and expressive,

it is often silent and invisible" (Watson, 1987, p. 11). Nurses are being challenged to quantify this phenomenon so as to make it visible within the health care hierarchy.

When Leininger (1981) asserted that caring was the essence of nursing she also recognized the ambiguity of the construct. Along with Watson (1979), she encouraged nursing professionals to study and conceptualize clear components of caring so that it can be measurable and reimbursable in this new call for an economically efficient health care policy.

In an attempt to identify measurable caring behaviors, a number of researchers have looked at different nursing units to identify nurses' and patients' perceptions of caring behaviors (Ford, 1981; Henry, 1975; Larson, 1981; Ray, 1981). Ford, Henry and Larson focused their analyses on the caring behaviors of the nurse towards the patient and identified a variety of interpersonal behaviors (i.e. helping, listening, empathy and support) as categories of caring. Larson (1981) developed the Caring Assessment Instrument (Care-Q) from her research with oncology patients and nurses that identified caring behaviors of nurses. This instrument identifies 50 nurse caring behavior items and six caring themes (anticipates, comforts, explains and facilitates, trusting relationship, monitors and follows

through and accessible) into which these nurse behaviors fall.

Ray (1981) went beyond the dyad of the nurse/patient relationship and studied caring on the institutional level. Her analysis of caring conceptualized four categories/dimensions of the phenomenon: 1. psychological (cognitive and affective), 2. interactional (social and physical), 3. practical (technical and social organization) and 4. philosophical (spiritual, ethical and cultural). Using the hospital institution within the health care hierarchy as her unit of analysis she concluded that "the classification system reflected the current shift from humanistic-religious dimensions of caring to practical dimensions influenced by the relationship of caring to the bureaucratic dominant American social structures" (Ray, 1981). This analysis begins to incorporate the concept of caring into the social, political and historical context of the setting.

But the importance of identifying caring as a scientific entity, a measurable construct, is not necessarily a positive goal for nursing. Dunlop (1986), similarly to Tronto's argument, emphasizes the importance of viewing caring in the context of the social and institutional structures in which it is being expected. She argues against the operationalizing of

caring into component parts because

> if caring were the sort of entity that could be analyzed into its component parts and spelt out in universal rules, it could be computerized and nurses would become obsolete. (p. 669)

Her emphasis is on recognizing caring in its contextual dimensions and analyzing its role in nursing from a relational process much as Benner and Wrubel (1989) has analyzed expert reasoning in nursing. Yet even with these warnings and analytical discussions, the emphasis in nursing today continues to be on the identification of the specific nursing functions, including caring, that compose what nursing "is". The impetus to do this comes primarily from the fiscal pressures in the larger health delivery system (Johnson, 1988).

The conflict between the art and science of nursing, and the science of caring, continues into this thesis. In an effort to further understand the impact of computer technology into the work of nurses, it is essential to identify the role of caring within this automated context. But to do so in a way that permits some form of comparative analysis between computer dynamics and the complexity of the caring role, caring is forced into an operationalized mode. Thus there is the cooptation of caring as a subjective "art" essential in the expression of nursing yet now becomes objectified

so that it has a role in the "science" of research.

SOCIAL DEVELOPMENT OF TECHNOLOGY

Just as nursing is struggling with its role within a social structure that values science above art, society is expanding more and more into an age of science and technology. Although some form of technology has always been a part of this industrial society, electronic technology has now become an integral part of our everyday lives. Too often consumers of technology respond to these changes as though they were a "natural" development inevitably linked to "progress". But in actuality, technology is a production of a society and therefore shaped by all the social, political and economic forces that motivate and reward development of these innovations. "The characteristics of a society play a major part in deciding which technologies are adopted" (Mackenzie & Wajcman, 1985, p. 6). Mackenzie and Wajcman (1985) go on to say that when one begins to "focus on the effect of society on technology, then technology ceases to be an independent factor" (p. 3).

Here technology is defined as more than the physical objects; technology is also the human activity of what people do with these machines and the knowledge or know-how that people have who use, repair and design

them (Mackenzie & Wajcman, 1985). Others, focusing on computers as the form of technological change, emphasize this phenomenon as a "web of computing", distinguishing it from a discrete-entity model which ignores the social and historical context in which it has been developed (King & Schacci, 1982).

Winner (1985) argues that "machines, structures and systems of modern material culture can be accurately judged not only for their positive and negative environmental side effects, but also for the ways in which they can embody specific forms of power and authority" (p.26). When understood in its historical and social context, technology no longer remains a neutral object but rather is understood as a powerful symbol of the social forces that have created it. Bush (1983) describes technology as organized systems of interactions that utilize tools and involve techniques for the performance of tasks and the accomplishment of objectives. She warns us against the assertion that as a scientific development it is value-free or that technology is capable of solving things on its own. Both assertions are dangerous and wrong. Both seduce people into a passivity which results in a loss of control over technology's development and operation (Bush, 1983).

Unfortunately without a contextual analysis, computers transcend human comprehension and become a

powerful tool of the social and political forces that own them (Dreyfus & Dreyfus, 1986; Weizenbaum, 1976). Noble (1977 & 1984) demonstrated through his historical analysis of the development of engineering and industrial automation that the more advanced technology became the more institutional roles and statuses actually remain the same. Although the advancement of industrial technology opened up new areas of study and work roles, the same people who controlled earlier societies (middle and upper class white men) maintained control and reaped the benefits of the new technology.

One author (Braverman, 1985) argues that within this political, capitalist society, an important goal of this technological innovation is control of workers.

> Thus, in addition to its technical function of increasing the productivity of labor--which would be a mark of machinery under any social system--machinery also has in the capitalist system the function of divesting the mass of workers of their control over their own labor. (p. 81)

Therefore it is essential when considering the interaction between people and computers, to understand the multi-faceted history and diffusion of this technology into any setting.

COMPUTERS AND HEALTH CARE

As hospital management follows an industrial model, technological tools are being designed and implemented to achieve cost reduction goals. It is within this trend towards an industrial management of hospitals that the information technology gets integrated.

> With health care costs for the United States approaching 11 percent of the gross national product, the current reformation of health care policy is being molded by a quest to relate the costs of production to the prices of services and then to reduce production costs. The apparent shift in health care policy is one that moves us from a scientific to an industrial orientation. (Freedman, 1985, p.579)

Hospital administrators and providers at all levels are being deluged with articles and advertisements that proclaim the power of the computer to achieve this cost reduction as well as its ability to enhance the provider's work through more efficient use of time and to decrease the numbers of clerical tasks (Blum, 1984; Zielstorff, 1981).

It is no longer a question of whether or not hospitals will incorporate computers into patient care;

they are now a integral part of the hospital's operation (Barber, 1979; Hannah, 1976; Grier, Ziomek, MacLean & Kim 1985; Kjerulff, 1988; Zielstorff, 1977 & 1981). Although computers were initially introduced into nursing systems in the 1960's only 8% of hospitals utilized computers in 1965; this quickly grew to approximately 70% of U.S. hospitals in 1980 (Barker, 1971; Grier, Ziomek, MacLean & Kim, 1985). Only 20% of these hospital information systems have nursing interaction (Kjerulff, 1988). Now computers are being developed and integrated into the privacy of patient rooms and are involved in planning and documenting nurse-patient interactions (Drazen & Huske, 1988; Nathanson, 1983; Replogle, 1986). The Study Group on Nursing Information Systems (1983) developed a working definition of Nursing Information Systems (NIS) as "the automated processing of the data needed to plan, give, evaluate, and document patient care, as well as the data necessary to support the delivery of nursing care, such as staffing and cost" (p.101). This definition combines the goals of nursing with the expectations of the hospital management.

When looking at various work settings in which computers have been integrated, it is clear how this technology contributed to a change in the basic work structure. Baacklund (1986) found, through interviews

with managers and workers from both private and public agencies, that changes in technology had the result of broadening occupational tasks and skills of employees, while requiring a worker to become more flexible in personnel skills and personal qualities, managing more and a greater scope of responsibilities. Baacklund goes on to forecast that this change or upgrading in employee skills will diminish the need for unskilled labor. This will threaten most directly people with little education while it will expand the roles of skilled workers.

As computers become more integrated into the nursing work setting, nursing is moving from an emphasis on teaching nurses about the pros and cons of automation to an analysis of nursing practice and the impact computers will have on it (Adams, 1986; Romano, 1980; Zielstorff, 1977). In addition to encouraging nurses to take an active role in the development and implementation of computer technology, authors have recently called for an analysis of the work tasks and content of nursing (Zielstorff, 1977) and challenging nurses to return to the "true role" of nursing--to care and to touch (Romano, 1985; Selby, 1987; Zielstorff, 1987). This return to task analysis and the scientification of the caring functions is very reminiscent of the efficiency era in nursing at the beginning of this century as discussed earlier, citing

the work of Reverby. The efficiency era was a period in which a general emphasis on efficiency was found in work, recreation and housework.

Only a few researchers have looked at the work context of the nursing unit to assess what changes have happened after computerization. Looking at the impact of technology on patients, providers and care patterns, Fagerhaugh et al. (1980) found that as technology increased, specialization of the providers increased, there was a need for more coordination of people and machines. As Naisbitt predicted (cited in Romano, 1985), with the integration of technology in work settings, there will be an increased need for the "softer" tasks, the increased need for touch. One project directly analyzed the implementation of a hospital information system on a nursing unit and found that there was a resulting "major reorganization of nursing duties...reducing the number of aides, adding to the nursing staff, and placing the nurse in a different role which made her responsible for accurate record-keeping" (Giebink & Hurst, 1975, p.200). Other studies looking at the effect of computerization in health care found similar outcomes (Lundsgaarde, Fischer & Steele, 1981).

As bedside computers are being discussed more and more as the way of the future, the physical arrangements

of the unit begin to take on a new importance in this technological era. Bedside computers are being suggested as the answer to the significant fiscal and staffing problems facing nursing today (Drazen & Huske, 1988; Gross, 1989). Abrami and Johnson (1990) link the compatibility of a specific architectural design with the philosophy of bedside computers:

> A Frieson design is one which minimizes the nursing station as the most important point on a nursing unit for all levels of communication about a patient. Instead, it stresses the importance of placing more of this communication at the bedside. This architectural philosophy is very similar to the information system philosophy of doing as much as possible in terms of data entry and retrieval at the bedside. (p. 17)

This change in work structure and context is an important area that must be understood to more accurately clarify the complex role that computerization is having on nursing presently and in the future.

SUMMARY

This review has discussed areas significant to the introducation of computers into nursing practice within hospitals--environmental factors, social/historical perspectives of hospitals, health care and

computerization, work role issues and nursing roles and caring constructs. This review has demonstrated how these issues are interwoven within nursing and how they are especially relevant today as the nursing profession struggles to understand and anticipate the changes inherent in computerization of the nursing role. Research needs to be developed that will identify these complexities and clarify what if any changes are occurring because of these interactions with computerization.

CHAPTER III

METHODOLOGY

GOALS OF THIS STUDY

The purpose of this project was to identify theoretical constructs and themes through an analysis of the nursing literature and conferences in the past twenty years and to begin to verify these constructs through a study of a representative group of nurses at a chosen hospital who use nursing information systems. This study identified how computerization was introduced into nursing over the past twenty years, and examined how these changes impacted on the work environment. The complex factors within the larger health delivery system was considered in the interpretations of the research outcomes. Since caring had been identified as the "essence" of nursing, the analysis focused on how caring was discussed and how it was perceived in the context of computer use on specific nursing units.

This study identified significant dynamics arising

from the complex process of technological change within the nursing profession. This was done through a three part process: 1) archival analysis of national nursing journals and computer and nursing conferences over the past twenty years, 2) a descriptive study of the impact that computerization had on one hospital setting, and 3) a comparative analysis of the first two analyses--what researchers and nursing professionals have identified as what "ought to" happen (what was expected) as a result of computerization within nursing units (archival analysis) with the empirical analysis of a hospital facility where a nursing information system has been incorporated into the day-to-day work responsibilities of nurses (what actually is).

Through this three part analysis, a more complete and detailed understanding of the interaction between computerization and nursing has been achieved. Questions have been identified for future research.

Phase 1 : Literature Analysis

Published reports and research over a given period of time often form the prevailing thought about specific themes. Through analysis of significant national nursing publications, one is able to get insight into the development and scope of thought that reflects the nursing profession's stand on computerization in

nursing. It is important to look at nurses' own perceptions or research on this issue rather than on perspectives from other disciplines. That is not to say that this nursing literature is not influenced by other disciplines but rather that the articles included within nursing literature will reflect the synthesis of nurses' thinking to all of these points of view.

Major nursing journals over the past twenty years, 1969 to 1989, were reviewed and articles that discussed the role of computers within hospital settings and the role of the work of nurses within these settings were reviewed and analyzed. Patterns of thought and research over this twenty year period when computers were being introduced into hospitals and particularly into the work environment of nurses were identified. Articles describing present and futuristic views of nursing and computers, as well as articles that dealt with specific research that evaluated nursing unit settings and computerization were content analyzed.

Conference proceedings provided a sampling of research done in hospital settings across the United States. This offered access to issues that were being raised in hospitals that have had computers as an integrated part of their hospital settings for much of the past twenty year period as well as hospitals that only recently incorporated computers into their nursing

units. Two computer technology and nursing conferences sponsored by the National Institutes of Health in 1981 and 1982 and the proceedings of the Symposium on Computer Applications in Medical Care (SCAMC) from 1981 to 1989 were reviewed. These two sets of conferences were chosen because they reflected the national representation of nursing leadership in the forefront of research in nursing and computers. The NIH conferences on Computer Technology and Nursing were exclusively nursing forums for discussing the changes in nursing as computer technology was introduced into health care. The SCAMC conferences reflected the current work done both in the evaluative research of computers information systems (Hospital Information Systems, Nursing Information Systems and Medical Information Systems) in healthcare and the development of new technology that affects the delivery of health care today. Nursing became a separately recognized category at SCAMC in 1981 when it was apparent that nursing was contributing significant thought and research into the area of computerization in hospitals and particularly as it relates to the nursing profession (practice and education).

Caring has already been identified by several nurse leaders as the "essence" of nursing. Thus, the analysis of the journals and conferences included articles that

dealt with ways in which caring has been defined over this twenty year time period and identified patterns and questions associated with the introduction of computerization.

A systematic content analysis (see appendix for analysis form) was done of the literature and identified issues raised and how they were discussed over time. In addition the identified patterns of use and issues that arose in the wake of this technological change, close attention was paid to specific physical areas within the nursing unit regarding the positioning of the computers (terminals, printers etc.) to determine how spatial dimensions of the nursing unit were affected by the introduction of computers within this work setting.

The topics and results of research from the conference proceedings and journal articles were examined by considering the following questions:

1- What changes have there been in national health care policies over this twenty year period and how have these changes affected the role of the nurse?

2- What themes can be identified regarding the impact of computerization on nursing?

3- How are computers discussed and used with regard to their role within the nursing unit, their effects on nursing functions, and patient care?

4- Have authors identified specific locations on

the nursing unit as the ideal place for the computer--at the nurses station, at a separate work station or at the patient bedside? Are these locations influenced by or related to specific nursing functions?

5- How is caring defined as it relates to nursing and how is it considered when discussing the use of computers in nursing?

The data analysis for this phase of the study involved a descriptive analysis of the articles and research discussing the patterns and frequencies of when and what was being discussed in the journals and conference proceedings. Patterns of ideas were identified by qualitative methods.

Phase 2 : Analysis of a Hospital Setting

The first step of this phase was to identify hospitals in the Northeast geographic area of the United States that have computers on nursing units and have integrated Nursing Information Systems. The Northeast region was selected because of the geographical convenience of the researcher. A 320 bed teaching hospital in a large urban setting was chosen for participation in this study. A questionnaire was created that assessed environmental dimensions, computer usage, nursing job satisfaction, and nurses' perception

of caring qualities within their work role. This was distributed to a all the nurses working on four medical/surgical units. These units were chosen because of similarity in patient diagnostic admissions (all medical or surgical in nature) and because the nurses on each unit used the Nursing Information Systems in their routine work. Two other medical units within the hospital were excluded because of their participation in another research study concurrent with this study.

The results were analyzed through descriptive and multivariate analysis of variance of the nurses' perceptions of the above factors. Exploratory regression analysis were performed on the outcome variables to identify variables within this setting that contributed to the experiences of the nurses. Factor analysis and cluster analysis of the caring behaviors and the job satisfaction items were conducted to identify significant clusters of ideas that represented themes of behaviors.

The questionnaire was distributed to the nurses on the four units, on all three shifts during the last two weeks of August through the end of October of 1989. Two nurses who worked on two of the units assisted in the distribution of the questionnaires. Each nurse received a packet that included a letter of introduction, consent form, directions for completing and returning the

questionnaire and the questionnaire (see Appendix). The nurse research assistants collected the consent forms from each nurse who agreed to participate in the study separate from the questionnaires. The completed questionnaires were returned in sealed envelopes to the two assistants to assure confidentiality. These sealed questionnaires were returned in one month intervals to this researcher.

The nursing questionnaire focused on the following areas: (1) environmental factors, size and layout of various features of the nursing unit; (2) computer use and location on the nursing unit; (3) job satisfaction; and (4) perception of caring qualities in their role as nurses on this unit. This questionnaire evaluated the nurse's own perception of what kind of impact the use of the computer had on her nursing role. The questionnaire did not evaluate the performance of the computer system nor did it attempt to evaluate or measure nurses' actual performance (see Appendix 4 for copy of questionnaire).

The instrument used in this study for measuring nursing job satisfaction was developed by Munson and Heda (1974). Munson and Heda recognized job satisfaction as being influenced by organizational factors. The assumption of the organizational influence in assessing job satisfaction was important in the present study because the concept of environment incorporated the

physical, social, political and temporal/historical contexts.

In the Munson/Heda scale, four indices are used for measuring job satisfaction--intrinsic task satisfaction, involvement satisfaction, interpersonal satisfaction and extrinsic satisfaction--each measured on a 7 point scale from "none at all" to "maximum" (see questionnaire for specific questions). In addition to questions about 12 job characteristics, each nurse was also asked to evaluate each characteristic as to how important it was to her.

Munson and Heda (1974) reported a split-half reliability for the 12 item scale as .74 or .85 when corrected for length by the Spearman-Brown formula and an item reliability range from .33 (.50 corrected) to .63 (.77 corrected with a mean correlation of .44 (.61 corrected) (Munson & Heda 1974 p. 161).

Three elements of data are involved in scoring each question: (a) score = the response to part (a): "How much is there now?" ; (b - a) score = the response to part (a) : "How much is there now?" subtracted from part (b): "How much should there be?"--this is a measurement of dissatisfaction (the higher the score the more the dissatisfaction); I(b-a) score = the (b-a) score multiplied by the rating of importance of the question. In reporting the results, each score is subtracted from

a constant ([b-a] scores from 10 and I[b-a] from 20) so that in the tables a higher score reflects a positive relation with satisfaction (Munson & Heda 1974, p. 161). The authors of this Job Satisfaction Questionnaire explain the reasoning behind this scoring:

> An explicit assumption in the construction of the (b-a) score gives a special value both to it and to the I(b-a) score. Both the (a) and the (b) responses are unanchored in verbal description except at the extreme points (none at all; maximum), and both scales are identical. Thus, one person might circle a three to indicate what for him was a reasonable amount; another might circle a five. We assumed that a person would use the same implicit value for both (a) and (b) scales, and that the difference, the (b-a) score, would eliminate a large part of the variance that would result from implicit scaling. Therefore, the (b-a) score would be a netting out, an assessment of the job characteristics against the implicit yardstick which each person brought to the job. (p. 161)

It is this scoring that is described in the results section of this study.

In attempting to assess nurses' perception of their quality of caring, the definition of caring offered by Leininger (1981) was used. Leininger (1981) defines

caring behaviors as "those assistive, supportive, or facilitative acts toward or for another individual or group with evident or anticipated needs to ameliorate or improve a human condition or lifeway" (p.9). She goes on to further describe "professional caring as those cognitive and culturally learned action behaviors, techniques, processes, or patterns that enable (or help) an individual, family, or community to improve or maintain a favorable healthy condition" (p. 9).

The behaviors used for the assessment of the nurse's perception of her ability to be a caring provider come from nursing behaviors identified in a research project conducted by Larson (1981). Larson identified these behaviors through a Q-Sort Methodology with a sampling of nurses and patients on an oncology floor. Although these behaviors were identified through research on an oncology unit, they are consistent with behaviors identified by other nurse researchers who have attempted to conceptualize an operational definition of caring (Ford, 1981; Henry, 1975; Leininger, 1977; Ray, 1981; Watson, 1979). These caring behaviors therefore have content validity.

Larson's Caring Assessment Instrument (Care-Q) is an instrument designed to assess fifty caring behaviors of nurses. This instrument was developed through a two-part process using a Delphi Survey and then a Q-

methodology to identify significant nursing caring behaviors. For the purpose of this study, only those caring behaviors that showed the highest mean ratings for their importance to both the nurses and patients were used. The result from Larson's analysis was ten essential behaviors that represented caring for the nurses and ten for the patients. The combination of these behaviors resulted in 15 behaviors (see Appendix). Larson originally clustered these behaviors into themes. These four themes are: 1) monitoring and following through behaviors; 2) accessibility, 3) ability to comfort and 4) ability to develop a trusting relationship in the role as a nurse. The four themes were consistent with the nursing literature on the essential components of caring (Leininger, 1977; Watson, 1979) and therefore fulfilled content validity.

In her own study, Larson used a test-retest with a one week interval for reliability which demonstrated a perfect correlation (1.0) for the most important and least important items but failed to demonstrate sufficient coefficients for the other behaviors. Because of this limited test of reliability, only the most important behavior items (those with the highest mean) were chosen for this questionnaire as being reflective of the caring construct. Recognizing the limited support the previous tests for reliability have

shown, this scale was further tested for reliability using a split-half reliability test for internal consistency.

In the analysis of the results of the caring perceptions, a cluster analysis was performed on the fifteen behaviors to identify the significant relationships from this group of nurses. These new clusters were then compared for compatibility with Larson's original four themes to assess for further validity. The use of this caring scale assessed the nurse's own perception of her ability to provide caring in her interactions with patients. It is important to note here again, that this scale did not evaluate or measure actual nursing care performance, only perception of caring abilities. The responses to the second part of the caring perceptions (the nurses' rating of the effect of the computer on each caring item) was conceptually analyzed as to patterns of effects.

The completed questionnaires were statistically analyzed to identify correlations between computer usage and the nurses' perceptions of their work performance and satisfaction. The results were analyzed through descriptive statistics describing the demographics of the nurses participating in the study, and comparisons of the hospital units involved. Through a multivariate analysis of variance using the Hoteling's T2 test, the significant outcomes from the questionnaire were

explored through a exploratory method of regression analysis with--section III Computer Systems, Section IV Computer use, satisfaction & training and Section V Impact of computers on nursing.

Phase 3 : Comparison of the analysis of the literature review with the hospital analysis

The final phase of this study was a comparison of the descriptive profile of the computerized nursing units with the results of the analysis of the archival data to identify what expectations were actualized in this site specific a hospital situation. The comparison involved a qualitative exploration of the literature results with the statistical results of the questionnaire.

CHAPTER IV

RESULTS

This chapter includes the discussion of the results of the three phases of this study: 1) the analysis of nursing journals and relevant conferences from 1968 to 1989, 2) the results of the study of one hospital which has integrated computers at the bedside, and 3) the comparison between the results of the literature review and the actual experiences of the nurses using the computers.

JOURNAL ANALYSIS

This review of the literature on computers and nursing showed that the number of articles focusing on computers in hospitals and other nursing settings has increased greatly over the past twenty years and that a wide range of potential benefits and hazards have been discussed. This review also showed that most of the risks and benefits cited were based on expectations. Few were grounded in actual studies of nurses in work settings who were using computers in daily nursing

tasks. Yet such literature often has a strong influence over other people's expectations as well as on their long term planning. For this reason it was decided to review the major nursing journals published over the past twenty years systematically to find how many articles dealt with the role of computers in nursing work in hospitals, and to identify what benefits and/or hazards were suggested or identified through empirical studies to be a result of this innovation.

It is essential to identify the presumed effects of computer use by nurses and to highlight those that have been demonstrated through evaluative processes to be outcomes of this innovation. By comparing this analysis of the nursing literature with the results of a detailed study in an actual setting where computers have been integrated into the nurses' work environment, one can see if the promises and concerns that are under discussion in the literature are accurate or representative of the documented experience of nurses in the workplace. A discussion of this comparison is presented at the end of this chapter.

Because this is a study of how nurses perceive their work experiences with computers, only professional nursing journals (i.e. journals which represent the views of nurses, nursing administrators, educators and policy makers) were examined. Eight national nursing

journals, from 1968 to 1989, as well as the published proceedings of two national conferences from 1981 to 1989, focusing on nursing and computers were reviewed, content analyzed, and coded (see Appendix 1). This review targeted articles that discussed the impact of automation and/or the introduction of computer information systems on the work of nurses.

Each article identified within this framework was reviewed for content and the results anticipated or demonstrated by each were recorded on a coding sheet (see Appendix 1). Two people searched through the journals and conferences to identify articles and one person coded the articles, thus limiting the variance in coding. Each article was identified by its author's occupation, the site discussed (hospital, specific unit or geographical area) and the focus of the article (research, theoretical, opinion, evaluation, description of process or a combination of these). Then an assessment was made as to what kind and degree of impact was discussed--nurse-patient relationships, nursing administration, financial, and/or communication. If an impact was identified, it was rated on a three point scale (decreased, no effect, increased). Since many of the articles discussing the overall implication of computer automation in nursing refer to the essential "art" of nursing or caring as the essence of nursing,

the review also included articles that dealt with caring behaviors in automated settings.

Of the 8 journals and 2 conferences reviewed, 119 articles were identified as dealing with the use of computers by nurses in hospital settings--78 in journals, 41 in conferences--the majority of the journals being cited in the last 10 years. One reason for this recent increase is that one journal, Computers in Nursing, began circulation in 1983, becoming one of a number of new journals in healthcare that focused exclusively on computers. Ninety-three (79%) of the 119 articles in the journals and conferences were written by nurses and 19 (16%) were a joint authorship between a nurse and another discipline (i.e. M.D., Psychologist, Systems Analyst). Thus the results that are reported here reflect the ideas of nurses and not other disciplines who are attempting to persuade nurses to a specific approach of thinking.

Only 29 (24%) of the 119 articles even mentioned a specific location of the computer on the nursing unit: nurses station (n=9), bedside (n=9), other (usually office or clerk's desk; n=6) or multiple places on/off the unit (n=5). Yet all of the articles that discussed bedside computers (n=9) focused in particular on location as a factor in the use or convenience of the computer; similarly, the articles which specifically

discussed locating computers at the nurses station focused on the assumed convenience in this location.

The majority of the articles (n=44) involved descriptions of a specific hospital's experience implementing computers in the nursing setting. Only 24 of the articles actually cited any research conducted at a given hospital in support of their assertion of any changes (Table 1).

Table 2 summarizes the themes that the articles discussed as regards the kind of impact that computers have on nurses. In Table 3, 60 articles identified time as an important area that was affected by the use of computers, with the majority of the authors (n=49) reporting that by the use of the computer nurses will save time especially in clerical tasks. Only 9 articles suggested that the time, nurses spent in indirect patient care would increase. Fifty-eight of the authors reported that the use of computers would affect the productivity of the nurses. The majority of the authors suggested that the computer will or has increased productivity. Of the 36 articles that discussed both the computer's impact on time and productivity, 31 authors thought that as the time nurses spend in documentation decreases, the result will be an increase in productivity. Thirty of the articles also discussed the changes in productivity and quality of care as a

result of nurses using computers, 26 of these authors offered the view that as productivity increased, the quality of nursing care would or did increase in settings where nurses used computers. Forty-four authors suggested that the quality of nursing care would increase as a result of computers being integrated into nurses' work.

Only 24 of the 119 articles discussed the impact that computers might have on nurse/patient contact and of these, 17 suggested that the amount of contact would increase while only 4 suggested it would decrease (see Table 3). Twenty-one authors discussed both nurse/patient contact and the time nurses spend in documentation and of these 14 felt that as time in documentation decreased, the time with patients would increase. The assumption made was that as more time became available, this available time would be used in more time in direct contact with patients.

Only 15 or fewer articles discussed issues that affect the specific impact on job satisfaction, workload, status or staffing numbers. Although 58 authors reported that computers would have an impact on nursing (all reporting this impact to be positive) few authors focused on the actual nursing role. Rather they dealt with specific tasks (documentation time, nurse/patient contact) or productivity and quality of

nursing care. Productivity was never actually defined in any of the articles but often seemed to be used interchangeably with efficiency and a measurement of the time expended in a given task.

Ultimately, this review of the literature showed that most articles measure the impact of automation in nursing in terms of the quality and quantity of patient contact and not in terms of the quality of the nurses experience in the role of health care providers i.e. nurses' sense of autonomy, or quality of satisfaction with their work content. This is an important distinction in that many authors have discussed the increasing levels of stress and burnout in nursing due to the changes in the role of nursing in the last two decades. Research must begin to identify the role that automation is playing in contributing or alleviating stress or burnout for nurses. Finally, this review of the literature demonstrated that many of the suggested risks and benefits of computerization in the nursing work environment have been based on intuition and unsupported assumptions rather than on analysis of case studies or detailed empirical evaluations.

Table 1

Type of article reviewed in the nursing journals and conferences

	n %
Description of implementation process	44(37%)
Theoretical discussion/review	26(22%)
Research	24(20%)
Prediction/opinion	18(15%)
Evaluation of software	5 (4%)
Combination of prediction & theory	2 (2%)

	119(100%)

Table 2

Focus of discussion in articles as to kind of computer impact in nursing

	All Articles	Research
Nursing in general	68	11
Communication/Documentation	61	12
Financial impact	51	8
Nursing Administration	38	4
Nurse/patient relationship	35	7

Note. n > 119 because some articles discussed more than one impact. [a]used for staffing or scheduling.

Table 3

Degree of Impact on Nursing Due to Automation as Discussed in Each Article

	Degree of Impact			
	Decreased %	No effect %	Increased %	n
Time away from patient				
All[a]	41	2	8	60
Research[b]	42	8	13	15
Productivity/efficiency				
All[a]	0	1	48	58
Research[b]	0	4	38	10
Quality of care				
All[a]	2	3	37	49
Research[b]	0	8	29	9
Nurse/patient contact				
All[a]	3	3	14	24
Research[b]	0	8	17	6
Number of staff				
All[a]	7	2	4	15
Research[b]	8	0	8	4
Job satisfaction				
All[a]	2	1	9	13
Research[b]	0	0	17	4

Table 3 continued

	Degree of Impact			
	Decreased %	No effect %	Increased %	n
Nurse's workload				
All[a]	3	0	3	6
Research[b]	0	0	4	1
Nurse's status				
All[a]	3	2	0	6
Research[b]	4	4	0	2
Caring				
All[a]	1	1	3	5
Research[b]	0	0	0	0

Note. Impacts are reported in order of most frequently cited. [a]% are related to the total number of articles (N=119). [b]% are related to the total number of research articles (n=24).

ANALYSIS OF A HOSPITAL SITE

Hospital computerization is both a tool for communication and a physical object that has become part of the design of the hospital setting, manifested by bedside terminals, monitors at nurses stations and central terminal data banks in administrative areas. This section examines how these two components--new communications techniques and the computers themselves--have been integrated into a hospital work setting and how they have affected the use of the various work spaces on the unit. The analysis focuses on the nurses' evaluation of the impact of computerization on their work environment and on their role as nurses in this changed context.

Nursing, the largest health care provider group within the hospital setting, is often described as a profession that is both an art and a science, emphasizing the unique art of caring as a significant trait. Often described as the "essence of nursing," caring has been identified as a significant quality that makes nursing what it is. This analysis of the impact of automation in the nursing unit includes an assessment of how nurses perceive their ability to provide caring in the context of an automated unit.

The Site

The study site is a 320 bed hospital in a large Northeastern U.S. urban setting which first installed computers on nursing units in 1987, phasing computers into all the units over two years. The system was fully "up" for all the nursing departments approximately 8 months before the beginning of this study. Four units out of the six medical/surgical units at this hospital were chosen for inclusion in this study. Two units were excluded because they were participating in another research project being conducted at the same time.

Nurses' questionnaire distribution and collection

A 16 page questionnaire was distributed to all nurses on the four units: 6 North, 6 South, 4 North, and 4 South. The questionnaire focused on the following areas: (1) environmental factors, size and layout of various features of the nursing unit; (2) computer use and satisfaction; (3) job satisfaction; and (4) nurses perception of their caring abilities on the units (see Appendix 4). It is important to note that this questionnaire did not evaluate or attempt to measure the actual performance of the nurses but rather their perceptions of their own performance and their use of the computer.

With the assistance of two nurses who worked on the

sixth and fourth floors, the questionnaires were distributed to the nurses on all the shifts either individually or at break times where refreshments were provided to encourage the nurses to spend the time completing the questionnaire. This process took place over a two month period.

Demographics

Sixty-eight completed questionnaires were returned out of 101 distributed to all the nurses working on each of these four units: 6N n=20 (74% return rate); 6S n=20 (77% return rate); 4N n=16 (70% return rate); 4S n=12 (48% return rate). This is an overall return rate of 64%. Most of the nurses worked fulltime (85%). The median age of the nurses was 24 and their ages ranged from 21 to 65. The patient:nurse ratio averaged 8:1 on each unit. The majority of nurses had bachelor degrees in nursing and were fairly well representative of a wide range of nursing experience--from 9 months to more than 40 years (see Table 4).

Table 4

Summary of Nurses' Work Experiences

Years	RN[a,b]	Unit[b]	Hospital[b]
less than a year	14	23	11
one to two	13	17	20
two to five	15	13	16
five to ten	12	12	16
more than ten	12	2	4

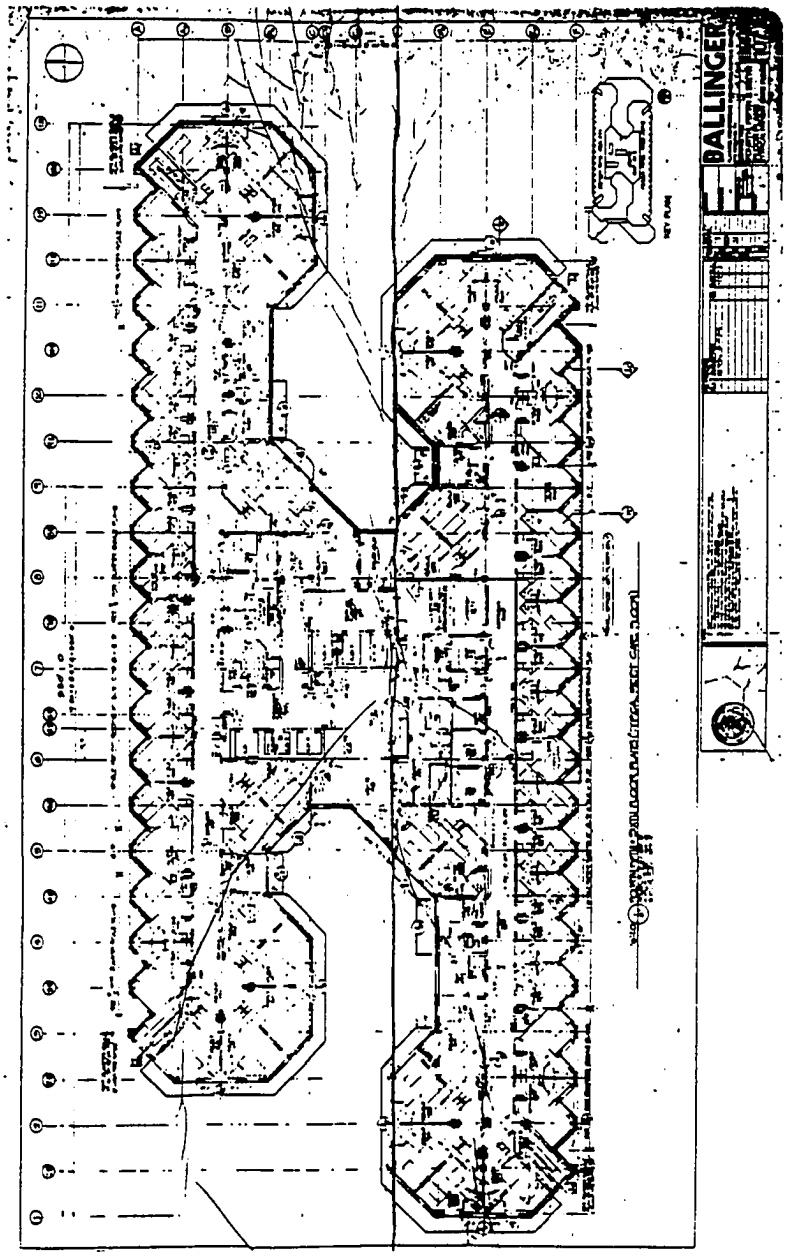
Note. N = 68. Nursing Degrees = Bachelors (55%), Associates (25%), Diploma (12%), Higher (5%). [a]One nurses did not report years as RN. [b]One nurse did not report any years of experience.

Using a General Linear Models Procedure (SAS) multivariate analysis of variance (MANOVA) no significant differences among the units were found with regard to age or years of experience as a nurse (d.f.=12, 179 F=.89 p=.5621).

Description of the Units

All units used in this study have similar physical layouts (see Figure 1, floorplan). Each unit (North and South) is one leg/corridor of an "H" shaped arrangement with the corridor connecting the north and south units

Figure 1 Floor plan of the typical patient care unit.



containing a public area with elevator banks and a reception desk shared by the two adjacent units. This central area, known as the Activity Communication Center (ACC), is the reception area for visitors as well as a work space for the ward clerks.

Each unit has 44 beds with single and double patient rooms. Patient rooms are situated along both sides of the long corridor. Each patient room has a computer station or Nurse Server built into the angled wall near the door. At this station is a terminal and keyboard, telephone, closet with supplies, medications and a counter area for writing or laying out materials. Patient charts are also located at the Nurse Server. These charts contain daily computer document forms from the nurses as well as the notes from doctors and other services. The nurse works at the Nurse Server to prepare medications or treatments for the patient(s) in that room or to send/retrieve information or document care on the computer.

In addition to the computers located in patient rooms, there is a terminal at each nurses station, called the Team Conference Center (TCC). Two other terminals are located at the Activity Communication Center (ACC) just outside the unit. A printer is also located at this central reception desk.

There are two Team Conference Centers (i.e. nurses

stations) on each floor located near the ends of the unit corridors. This reorganization of the work areas to include Team Conference Centers in the corridors and a Nurse Server in the patient rooms was designed so that nurses' work and documentation activities would take place at the bedside, the point-of-care, whereas the TCC was intended as a room to be used by all members of the care team (physicians, dietary, therapists, students etc.) not just by the nurses.

The design of this hospital was consistent with the architectural philosophy of a Frieson-design (Abrami & Johnson, 1990; James & Tatton-Brown, 1986; Thompson & Golden, 1975). The original intent of this design was to decentralize supplies and communication areas and decrease the amount of traveling by the nurse. The decrease in travel time would be accomplished by having everything readily available at the bedside area. This design was very adaptable for the placement of the bedside computers. Abrami and Johnson (1990) discuss the compatibility of this architectural design with the philosophy of bedside computers:

> A Frieson design is one which minimizes the nursing station as the most important point on a nursing unit for all levels of communication about a patient. Instead, it stresses the importance of placing more of this communication at the bedside.

> This architectural philosophy is very similar to the information system philosophy of doing as much as possible in terms of data entry and retrieval at the bedside. (p. 17)

In addition to these two nurses spaces, there is a nurses' lounge located outside of the unit in the cross corridor near the ACC.

Nurses' Evaluation of the Unit Environment

The nurses estimated that between one and twenty-nine people could be found using the TCC at any given time with the mean being 4.8 people. Thirty-eight (55.9%) of the nurses felt that the TCC was large enough for them to do their work. Several noted that they also had access to the Nurse Server in each of their patient's rooms as their primary work space. One nurse on the night shift commented, however, that it was difficult to use this space at night when the patient is sleeping because of the potential noise and disruption this work may cause.

Nurses were split in their feelings regarding work privacy at the TCC. Thirty-three (48.5%) felt there was enough privacy while 35 (51.5%) did not. About half of the nurses (n=31) commented that the TCC was often too small for the number of people in it and that due to the numbers, frequent interruptions and noise, the TCC was

frequently not a place for concentration and work. One nurse wrote "[One is] in a constant struggle fighting for room." Other nurses stated that with the refrigerator and narcotics closet in this room, it also became a high traffic area.

However, most of the nurses did feel that there was sufficient privacy to talk with staff (n=44,64.7%) and to talk on the phone (n=49, 72.1%) at the TCC. Eighty percent (n=55) felt that the TCC was also accessible to patient rooms.

The work of a typical nurse's day is one that is characterized by many critical interactions with patients and staff, often with little time for a nurse to recoup between these intensive contacts. The nurses lounge has been identified as being an essential space for nurses to "get away" from "being on" all the time, a place to regain some energy. When these nurses were asked to evaluate the nurses' lounge, most stated that although there was a room designated as the lounge, they did not use it because it was off the unit and inconvenient. Many commented that it was small and often used by other staff (i.e. dietary, housekeeping). Others noted that it was often the room that smokers used and therefore not a comfortable room for non-smokers. They stated that they sometimes used the patient lounge as a place to take a break but usually

were confined to the TCC as the place to "get away" from direct contact with patients. The TCC was also the space used for meetings and conferences or to eat, and was used by all staff and students who worked on the unit.

COMPUTER USE AND SATISFACTION

Computer Uses

When asked about the quality of the training and informational back-up available, the majority felt that both were adequate (78% & 81% respectively). Although the nurses were asked about various uses of the computer, the majority used the computer for four major tasks: to send information or messages (93%), to receive information (i.e. laboratory and test results) (99%), to write and revise careplans for patients (99%), and to document patient care and treatments (100%). When asked about the ease of computer use, 62 (91.2%) felt it was very to somewhat easy to use while only 3 nurses felt it was difficult. Similar results were obtained when nurses were asked specifically about the ease of entering and retrieving information from the computer (Table 5).

Table 5

Percentages of Nurses' Responses to Their Perception of Ease of Using the Computer

Data	Easy		Neither	Difficult	
	very	somewhat		somewhat	very
Entering	39.7	39.7	11.8	5.9	2.9
Retrieving	38.2	45.6	10	2.9	2.9

There were certain areas of computer use that some of the nurses found unsatisfactory. Two of these involved the writing of care plans and the documentation of patient care. Nineteen (29%) nurses reported a dissatisfaction with the careplan functions on the computer and eleven (16%) felt dissatisfied with the documentation function. Many of the nurses wrote comments specifically about their concern with these functions. One of the nurses stated that "[the] care plans [are] too structured, creativity and critical thinking not needed." Another noted that "care plans are dificult to update--very time consuming." Another nurse stated that "[I use the computer] as little as possible because I found that they are too inconvenient. [If I

used it] much more of my time would be used with less productivity--if I did most of my charting on them." Some of the nurses also discussed the frustration with the amount of information that has to be entered, feeling that much of this is redundant.

On average, the nurses estimated that they spent 22% of each shift working on the computer. Sixty-eight percent estimated that they spent 20% or more of their time each shift using the computer: writing/revising nursing care plans, documenting patient care, and/or sending/ retrieving information such as lab tests and results. With regard to actual functioning ("up" versus "down" times), 50% (n=34) felt the computer was only down "occasionally", while 39.7% (n=27) felt it was "rarely" down.

Assessment of Computer Impact on Work

This study reexamines a number of promises made in the nursing and computer science literature concerning the benefits resulting from the use of computers in nursing work. These promises fall into two major categories: those related to the direct care of patients and those that focuses on the effect of computers on nursing as a profession.

The benefits that the use of the computer have on the nurse's contact with patients result from the speed

and efficiency of the computer in entering and retrieving information in a consistent and organized form, thus decreasing the time that had originally been taken up by documentation. If this time is decreased, the literature goes on to promise, then the increased time available will be taken up with more direct time with patients doing those tasks that constitute what is often called the "art" of nursing--the humanistic behaviors, the "high touch" caring behaviors. The secondary gain from this is that with this increased time available to be with patients some of the "routine drudgery" of nursing work will decrease, thus resulting in a decrease in workload. Thus it is hoped that the computer can "take over" some of the clerical tasks of sorting and organizing information so that the task of communicating between people and departments will be easier and quicker.

The second category includes more far reaching predictions including the proposal that computerization in nursing will increase information in such a way that it will alter the character and quality of nurses' work. Some writers suggest that the computer will improve nurses' ability to make more accurate decisions confidently and consistently, to feel more autonomous thus enabling them to control their work responsibilities. These promises stem from the belief

that new information technology will have the capacity to store large amounts of diverse information, organize it in various combinations and cross-reference it between diverse subjects. Thus the computer would provide almost immediate summaries and conclusions that would otherwise take many people many hours to coordinate, retrieve and transmit to others. It is assumed with this new information available, decisions will be easier to make and the quality of outcomes for the delivery of health care will be higher. Moreover, if nurses take an active role in the development of computer systems then the special quality of nursing work can be enhanced as the system takes over routine chores.

In nursing the discussion over the past twenty years has focused on the essential role of the "art" of nursing--the "hands on" quality--and how the computer could never duplicate this experience. Thus the subject of computer information systems in nursing has been approached with a mixture of resistance and fear on one side and unqualified optimism on the other.

This study also examines one further area related to the introduction of computer technology in nursing. This is the assumption of an improvement in status for nurses because of their redefined and upgraded responsibilities in the workplace. This optimism

persists despite the fact that in other workplaces (i.e. offices and factories) there have been reports of "de-skilling" of work roles and thus a decrease in status as a result of automation.

In this study, the nurses were asked if they perceived any change in status or in their ability to care for patients because of the presence of the computer. A group of questions focused on their ability to provide the affective qualities of nursing in their computerized environment and asked if they felt that the computer had had any effect on this aspect of their work.

The results are organized below in terms of specific outcomes. Each outcome was looked at for simple frequencies and variations of response and then exploratory multiple regression analysis was done on each variable to see what predictor variables affected the outcomes. Each outcome variable--time with patients, workload, decision making ability, autonomy, influence on sense of control and status--was entered into a Stepwise (SAS) multiple regression analysis with specific characteristics of the nurse (age, years of experience as a nurse and at the hospital and nursing unit, fatigue level at end of shifts and the nurses prior experience with computers), specific work conditions (adequacy and location of the nursing work

spaces, computer terminal location and numbers, adequacy of the training and backup of computer usage and the ease of using the computers) and the nurse's perception of how her colleagues felt about the computer (see Table 6; see Table 13 for summary of outcomes).

TIME WITH PATIENTS

The nursing literature on new computer technology has focused on the promises of speed of information entry and retrieval achieved by the use of computers and thus on the resulting decrease in the time spent on documentation. The promise has always been that with reduced time spent in documentation or clerical duties, nurses would have more time available to spend with patients. This assumption always went hand in hand with the assertion that nursing was an art as well as a science and that the resultant outcome of using this "high technology" would be "high touch" or direct contact with patients.

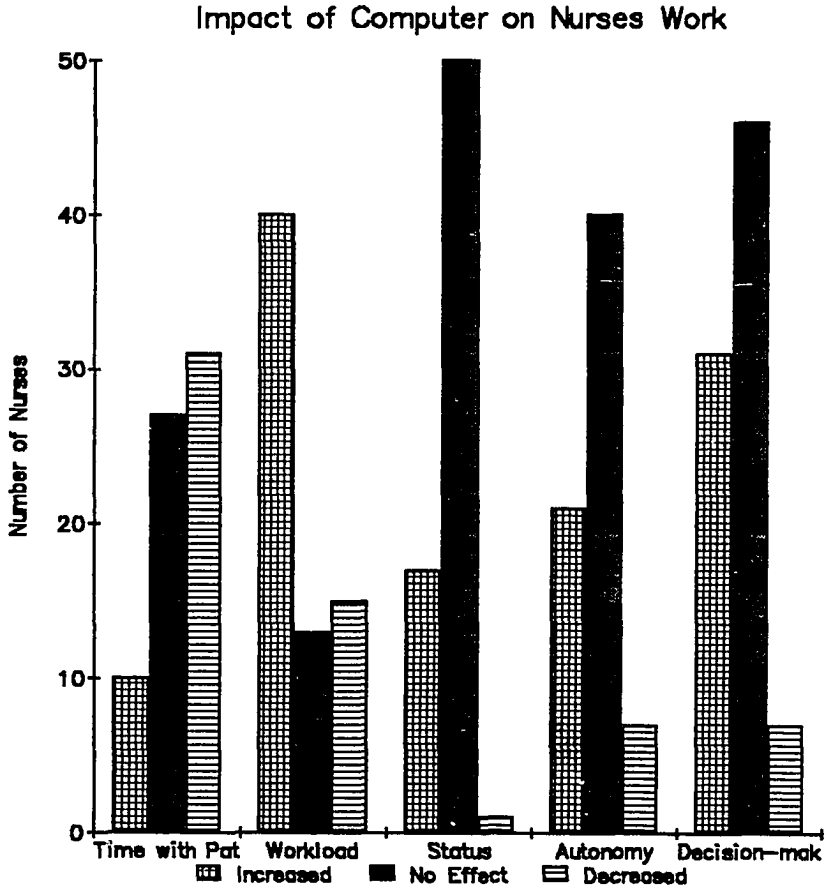
On a Likert scale from one (greatly increased) to five (greatly decreased), the nurses were asked how the computer affected the amount of time they spent with patients. Twenty-seven (39.7%) felt it had had no effect on this time while 31 (45.6%) felt that it had decreased their time with their patients. Only ten nurses (14.7%) felt that the use of the computer had

Table 6

Summary of Variables Entered into the Exploratory Multiple Regression Analysis

Outcome/Dependent Variables	Potential Predictor variables
* Time with patients	* Age
* Workload	* Years experience as RN
* Decision making	* Years experience on unit
* Autonomy	* Degree of tiredness at end of shift
* Influence on sense of control	* Adequacy of nurses station size
* Status	* Accessibility of nurses station to patients
	* Adequacy of numbers of computer terminals
	* Computer terminal convenience in location
	* Prior experience with computers
	* Adequacy of computer training,
	* resource backup,
	* and information;
	* Consistency of computer functioning
	* Ease of using computer
	* Perceptions of colleagues judgment of computer use

Figure 2



increased their time with their patients (Figure 2).

Not only did the majority of the nurses feel that the use of the computer had either no effect or had actually decreased their time with their patients, almost 59% felt that it had contributed to an increase of their workload. Although this questionnaire did not ask the nurses in what way they felt that their workload had been increased by the introduction of the computer, it is possible that the promise that computers would decrease time spent in documentation contributed to the rationalization of hospital management that increased time available to nurses should be used for nurses to take care of more clients. This rationalization was compounded by the nursing shortage and fiscal crisis in health care, since the computer was widely expected to relieve some of the strains of the nursing shortage and thus reduce hospital staff and budgets without decreasing efficiency.

Using an exploratory multiple regression model (Stepwise), variables that might affect the nurse's assessment of the impact of computers were entered into a Stepwise (SAS) equation to find the best model for predicting the factors that influence nurses' assessments of how the computer affected time with patients. The variables that were entered into this stepwise equation were those listed in Table 6. In

Table 7, the results show that those nurses who felt that the computer had had less of a negative effect on their time spent with patients had either been on their units for shorter times ($\underline{B}$=.2538 $\underline{F}$=7.70 $\underline{p}$<.01), or felt that they had adequate ongoing information about updates and/or changes available to them concerning the computer ($\underline{B}$=.4304 $\underline{F}$=3.38 $\underline{p}$<.10), or had colleagues who reacted more positively to the use of the computer ($\underline{B}$=.2773 $\underline{F}$=7.94 $\underline{p}$<.01).

As to the adequacy of ongoing information concerning changes (updates, policy changes) in the running of the computer, 46 nurses (67.6%) felt it was "adequate" while 22 nurses (32.4%) felt the information was "inadequate". There were significant differences among the units as to their assessment of the adequacy of the information available about changes and updates they received or the quality of the resource back-up when problems occur once operational (MANOVA $\underline{d.f.}$ =6,124 $\underline{F}$=2.66 $\underline{p}$<.05). The unit that was significantly different from the other three units was 4S: out of 12 nurses who returned questionnaires on this unit, 9 nurses felt that there was not adequate information available on any changes (updates, policies etc.) that related to the computer. Interestingly, this unit was one of the first units to install the computer (1987) but also the unit that returned the least number of

questionnaires. Perhaps there are some other concerns on this unit that are not being revealed in this questionnaire. On the other units a significantly higher percentage of nurses felt that there was adequate information available regarding changes than nurses who felt that there was not enough information. There was no significant difference among the units regarding their perception of the quality of training and other resource backup (Hotelling-Lawley, d.f.= 6,124 F=1.29 p=.2675).

The perceived judgment of colleagues contributed significantly to opinions about the introduction of computer technology. When asked to give their own impressions from conversations with colleagues as to how their colleagues judged the effect of the computer their work, only 27 (39.7%) felt others perceived the computer positively while 31 (45.6%) felt their colleagues viewed the computer as having had a negative effect on their work as nurses.

The perceived judgment of others was also shown to be positively correlated with the nurses' perception of the effect of the computer on their time with patients (r=.32552, p<.01). The more a nurse felt that others evaluation was positive, the more likely she was to feel that the computer increased the time she had with patients.

Finally, satisfaction with the careplanning and documentation functions of the computer also contributed significantly to nurses perception that the computer affected their time with patients. A General Linear Models Procedure (GLM) multivariate analysis of variance (MANOVA) showed that the nurses' degree of satisfaction with general documentation ability on the computer (d.f. = 1,66 F= 7.43 p<.01) and with the specific careplanning function on the computer (d.f.= 1,66 F=8.87 p<.01) was significantly related to their assessment of the effect the use of the computer had on the time spent with their patients. There was a significant difference in the Least Square Means for the effect that the computer had on the available time with patients (Likert scale of 1=greatly increased to 5=greatly decreased) when the nurse was satisfied (3.1) and dissatisfied (3.9) with the careplanning function. The LS Means difference were also significant between satisfaction (3.2) and dissatisfaction (4.1) with the general documentation function. In other words, when the nurse was satisfied with the careplanning and documentation functions of the computer programs, she felt that the computer had little or no effect on the time available to be with patients. Whereas if she was dissatisfied with these functions, she assessed the use of the computer to have decreased the time available to be with patients. As noted

earlier, many of the nurses felt that this function was too time consuming and often required "re-entering" the program or entering redundant information to make any changes in the careplan.

WORKLOAD

Along with the promise that the computer would release the nurse from much of the time spent in writing/documenting the care she gave, there was an underlying assumption that this new technology would decrease the stress and overall workload, making nursing work "easier" and refocusing on the "art" of nursing, the humanistic side. Ultimately the hope had been to decrease some of the stress of nursing work. Yet when these nurses were asked to evaluate how the use of computers had affected their sense of their workload, more than half (n=40,58.8%) felt that the use of the computer had increased their workload while only 22.1% (n=15) felt that it had decreased their workload (Figure 2).

Using an exploratory multiple regression technique, variables that might affect the nurses' assessment of the impact that computers had on their sense of workload were entered into a Stepwise (SAS) multiple regression equation to find the best model for predicting the outcome of what would determine the nurses' assessment of the computer's effect on their workload (see Table

Table 7

Results of Exploratory Multiple Regression Analysis of the Nurses' Perception of Computer Effect on Time with Patients.

R^2 = .2579

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	3	17.4908	5.8302	9.10*
ERROR	64	50 .3180	.7862	
TOTAL	67	67 .8088		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	1.3716			
YEARS UNIT	.2538	.0914	6.0526	7.70*
ADEQ. INFO	.4304	.2340	2.6587	3.38***
OTHER JUDGE	.2773	.0984	6.2430	7.94*

* p<.01
*** p<.10

VARIABLE SCALES

EFFECT ON TIME W/ PTS.	the lower the # the more it increased time
ADEQUATE INFORMATION	1 = adequate 2 = inadequate info.
YEARS ON UNIT	the lower the # the less time on unit
OTHER JUDGE	the lower the # the more positive

8). The variables that best predicted a positive assessment of this outcome include 1) that there were an adequate number of terminals (B=1.033, F=26.70 p<.001), 2) that the terminals were less conveniently located (B=-.5968 F=16.19 p<.001), 3) that the computer was easy to use (B=.0087 F=8.40 p<.01), and 4) that the nurse had prior experience using computers before using them in their work at this hospital (B=.5330 F=4.76 p<.05). The nurses who assessed the computer as having less of a negative impact on their workload (no effect or actually decreasing their workload) were also those 1) who used the computer for the least amount of time in their shift (B=.0189 F=5.55 p<.05), 2) had many years of experience as nurses (B=-.2050 F=5.05 p<.05), 3) had been on their respective units for less time (B=.3007 F=9.50 p<.01) and 4) felt that they had great deal of control over their work (B=-.6003 F=13.29 p<.001) (see Table 8).

The convenience of the location of the computer was significant in the outcome of the nurses' assessment of the change in workload. In this equation, there is a negative correlation between workload and convenience of the terminals; in other words the nurses who felt the computer had decreased their workload were also those who felt the computer was less conveniently located. This outcome seems to be the reverse of what would be

Table 8

Results of Exploratory Multiple Regression Analysis of Nurses' Perception of Computer Effect on their Workload

R^2 = .5514

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	8	45.6980	5.7122	9.07***
ERROR	59	37.1696	.6299	
TOTAL	67	82.8676		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	3.4312			
% TIME USE	.0189	.0080	3.4937	5.55**
YEARS RN	- .2050	.0912	3.1798	5.05**
YEARS UNIT	.3007	.0975	5.9854	9.50***
ADEQ.TERM.	1.0333	.1999	16.8202	26.70***
TERM.CONV.	- .5968	.1483	10.1983	16.19***
CONTROL	- .6003	.1646	8.3740	13.29***
EASE COMP.	.0087	.0030	5.2937	8.40***
EXPERIENCE	.5330	.2443	2.9986	4.76**

** p<.05
*** p<.001

VARIABLE SCALES

WORKLOAD	the lower the # the more it decreased
% OF TIME USED	the lower the # the less time used
YEARS RN	the higher the # the longer as RN
YEARS ON UNIT	the lower the # the shorter time on unit
ADEQUATE # TERMINALS	the lower the # the more adequate
TERMINAL CONVENIENCE	the higher the # the less convenient
CONTROL	the higher the # the more control
EASE OF COMPUTER USE	the lower # the easier the computers are to use
PRIOR EXPERIENCE	the low # = prior experience

expected. One would assume that if the terminals were very convenient then that may help in making the workload feel less because one would not have to move any distance to get things documented. The frequencies of the nurses responses to their perception of the convenience of the terminals showed that 53 (78%) felt that the terminals were very conveniently located. Only 3 nurses felt that they were inconvenient. With this in mind, one has to interpret this Stepwise result as the degree of convenience rather than necessarily meaning that if the terminals were inconveniently located, then the workload would seem less. The location of the computer terminals is a factor that has to be explored further to understand its role in affecting workload.

The majority of the nurses (n=65, 95.6%) felt that there were an adequate number of terminals on each unit and that they were conveniently located for their use. Yet in the open ended questions some of the nurses commented on the negative side of the location of the computers at the bedside. A couple of nurses wrote that they felt the computer had contributed to a decrease in staff cohesiveness. They felt that this was partly due to some nurses being "enthralled" by the computer and therefore spending much of their time on the computer rather than with patients or staff and depending on the computer for information that had often been discussed

among staff. They also noted that with the work station being at the bedside, it separated the nurses from each other, often contributing to a sense of isolation. This concern was also raised at a later discussion with nurses at the hospital. At this meeting the nurses stated that they and others had noticed over the years that both with the computer and the nurse work station in the patient's rooms, a nurse could go for much of a shift without seeing another nurse or staff person. Many of the nurses again spoke about how this contributed to a sense of isolation and decreased their ease of working in a group. With these open ended statements making the issue of the convenience of the computer a more complex issue, one can only raise that perhaps this concept of location is more complicated. Despite the convenient location, putting the terminal at the bedside may also contribute to a greater degree of aloneness and perhaps be part of what makes the nurse feel more of a workload burden.

It is interesting to note that a person's past experience with computers affected how much the person felt the computer had contributed to their sense of workload. Several researchers have suggested that a person's familiarity with computers affects that person's assessment or acceptance of them (Bongartz C., 1988; McConnel, O'Shea and Kirchoff,1989). The majority

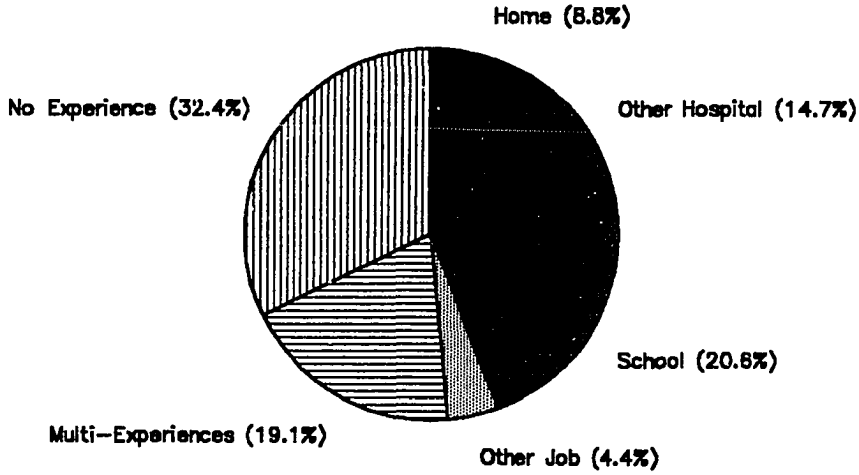
of the nurses in this sample had prior experience working with computers (n=46, 68%) in a variety of places. Only 22 of the 68 nurses (32%) had no previous experience with computers (see Figure 3). Yet more than half of the nurses in this sample (n=40, 58.8%) felt that the use of the computer had actually increased their workload and only 22% (n=15) felt that it had decreased their workload. But even with these frequencies it seems significant to note that nurses who had no prior experience with computers were more apt to feel that the computer had increased their workload (see Table 8). The factor of prior experience as an influence in perception of workload may have more to do with the nurse's perception of the difficulty in the use of the computer and not any change in direct patient care.

On average, the nurses estimated that they spent 22% of each shift working on the computer. Sixty-eight percent of the nurses estimated that they spent 20% or more of their time each shift using the computer--writing/revising nursing care plans, documenting patient care, and/or sending/ retrieving information such as lab tests and results.

As to the ease of using the computer, 62 nurses (91.2%) felt it was very to somewhat easy to use while only 3 nurses felt it was difficult. Similar results

Figure 3

Nurses' Previous Computer Experience



were obtained when nurses were asked specifically about the ease of entering and retrieving information from the computer (see Table 5).

DECISION-MAKING ABILITY

Another potential benefit of using this new information technology that has been suggested in the literature is access to information and the hope that by having current and accurate information available when needed, a nurse would be able to make decisions more quickly and with greater accuracy. In this sample 67.6% of the nurses (n=46) felt that the computer had had no effect on their decision-making abilities, and only 21.6% of the nurses (n=15) felt that the computer had increased their decision-making abilities (Figure 2). The majority of these nurses actually felt that the computer had had no effect on their decision making ability. When comparing these results with the nurses' responses to the caring questions, one sees that the nurses also felt that they were generally able to provide all the caring behaviors most of the time. The positive interpretation of these results is that the use of the computer has not decreased their ability to make decisions and that the decisions they are making provide them with the ability to provide good caring abilities most of the time.

A Stepwise Multiple Regression Analysis (SAS) of

the nurses' assessments of the computer's impact on their decision-making ability was run. Decision-making ability was significantly influenced by the adequacy of the computer's back-up resources, for example informational up-dates on changes or information in the computer Help Menu, (B=-.2144 F=3.51 p=0.655), how easy it is to use (B=-.0690 F=3.38 p<.10) and whether they had prior experience using the computer (B=-.3206 F=4.22 p<.05) (see Table 9).

In trying to understand other factors that might have contributed to differences in the nurse's assessments of the computer's impact on decision making ability, the open ended questions revealed some further possible reasons. Because it was assumed that the speed of the computer would increase available information for making decisions, the nurses were asked if the response time of the computer created any problems for them. The nurses were split in their replies: 32 (47.1%) felt it did cause them problems, while 36 (52.9%) felt it did not cause them any problems.

Of the nurses who wrote specific reasons about problems with response times, 19 explained that the system was occasionally "sluggish", perhaps due to overuse at peak times. These times usually occurred during the day when the majority of departments used the system. One nurse wrote "When it runs slow, it seems to

Table 9

Results of Exploratory Multiple Regression Analysis of Nurses' Perception of Computer Effect on Decision-Making Ability

R^2 = .2368

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	3	7.1702	2.3900	6.62***
ERROR	64	23.1091	.3610	
TOTAL	67	30.2794		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	3.9799			
ADEQ.BACK	- .2144	.1144	1.2684	3.51*
EASE COM.	- .0690	.0375	1.2197	3.38*
EXPERIENCE	- .3206	.1560	1.5255	4.22**

* p<.10
** p<.05
*** p<.001

VARIABLE SCALES

DECISION-MAKING ABILITY	the higher # the more it increased ability to make decisions
ADEQUATE BACKUP	the lower # the more adequate the backup help for the computer
EASE OF COMPUTER USE	the lower #s the easier the computers are to use
PRIOR EXPERIENCE	the low # = prior experience

take more of my time than paper charts." Another commented "If queues build up it takes forever for the screens to come up." Other nurses seemed to have similar frustrations. When the computer was "down", even if rarely, this meant that it was out of their control and there were no alternatives such as paper charting.

Six nurses explained that problems with computer response time were due to the time it takes to "scroll through menus". As one nurse explained "[There is] no direct command to go through menus, [it] takes time to save so [that one] can enter data on a different patient--half [the] time on computer is 'set-up' time, not charting." Another explained "Sometimes there are 'Roll overs', the screens delay with changes, and on occasion, the system may shut down." One nurse felt the problem for her involved the printing out of the notes which, "takes several hours to have printed and put into the chart." And yet another felt that information from other departments was sometimes slow in coming up: "At times, labs are needed for patients going down to OR or procedures." With these open ended statements, one gets a clearer sense of how the computer impacts on decision making ability beyond the amount of available information that is stored in the computer.

AUTONOMY

Along with the need to feel confident about

decision making, one quality often mentioned in the professional nursing literature is the need to feel autonomous in one's work. Although the nurses in this sample were only asked how much control they felt in their work (see section below) they were not asked what degree of autonomy they felt. However, they were asked if the computer had had an effect on whatever degree of autonomy they felt. Of the nurses in this sample, 58% (n=40) felt that the computer had had no effect on their sense of autonomy while 30% (n=21) felt that the presence of the computer had actually increased their sense of autonomy. Only 7 of the nurses felt that the use of the computer had decreased their sense of autonomy (see Figure 2).

A Stepwise Multiple Regression Analysis (SAS) of assessments of the computer's impact on the nurses' sense of autonomy was run. The nurses' sense of the impact of computers on daily work seemed to be most affected by the ease of using the computer (B=.1158 F=9.42 p<.01) and prior experience with computers (B=.5237 F=8.03 p<.01). If an individual's assessment was that computers are easy to use or she also had prior experience, then she was more likely to evaluate the effect on her sense of autonomy more positively (see Table 10).

The ease of using the computer and having had prior

Table 10

Results of Exploratory Multiple Regression Analysis of Nurses' Perception of Computer Effect on their Sense of Autonomy

R^2 = .2195

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	2	9.2711	4.6355	9.14***
ERROR	65	32.9641	.5071	
TOTAL	67	42.2352		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	1.9648			
EASE COMP.	.1158	.0377	4.7789	9.42***
EXPERIENCE	.5237	.1847	4.0749	8.03***

*** p<.01

	VARIABLE SCALES
AUTONOMY	the lower # the greater the sense of autonomy
EASE OF COMPUTER USE	the lower #s the easier the computers are to use
PRIOR EXPERIENCE	the low # = prior experience

experience using computers had a significant effect on how nurses viewed the impact on their decision making abilities, workload and sense of autonomy. In other words, nurses who had experience with computers felt that their autonomy and decision making ability had not been affected or had increased as a result of using the computer in their work while, those who had had no prior experience evaluated the effects of the computer on these work experiences more negatively.

COMPUTER INFLUENCE ON SENSE OF CONTROL IN WORK

Along with autonomy and decision making ability, having a sense of control over ones work environment is an important factor in establishing a satisfying work experience. When the nurses at this hospital were asked how much control they felt they had over their work, 32 nurses (47%) felt they had a great deal of control over their work. Thirty-two nurses (47%) also felt that the presence of the computer had somewhat to greatly influenced the amount of control they felt over their work (see Figure 2).

A Stepwise Multiple Regression Analysis (SAS) measured the nurses' assessments of the computer's impact on their sense of control. Sense of control over work was significantly related to the percentage of time on each shift that nurses used the computer (B=-

.0257 F=7.06 p<.01), availability of adequate back-up resources when using the computer (B=.3015 F=3.19 p<.10) and access to adequate information (B=-.8279 F=9.64 p<.01). In other words, nurses who felt that the computer had more of an effect on their sense of control were those who used the computer a greater percentage of their time on each shift, and who felt that the available back-up was adequate. Surprisingly, this group also includes nurses who felt that information on changes or updates was inadequate (see Table 11).

STATUS

One concern in other work settings where computers had been introduced had been the negative effect this innovation had had on the worker's status. Although it is still too early to assess any actual changes in the status of nurses due to automation, these nurses were asked to give their impression of any effect this new technology had on their status as nurses. Fifty of the nurses (73.5%) felt that its use had no effect while 17 nurses (25%) felt it had increased their status. Only one person felt that her status had decreased due to the use of computers in her work (see Figure 2).

As with the concepts above, an exploratory multiple regression equation (Stepwise) was run on the variables that predicted the outcome of computer use on

Table 11

Results of Exploratory Multiple Regression Analysis of Nurses' Perception of Computer's Influence on their Sense of Control over their Work

R^2 = .2622

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	3	20.4061	6.8020	7.58***
ERROR	64	57.4026	.8969	
TOTAL	67	77.8088		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	3.7345			
% USED	- .0257	.0096	6.3343	7.06***
ADEQ.BACK	.3015	.1687	2.8635	3.19*
ADEQ.INFO	- .8279	.2666	8.6493	9.64***

* p<.10
*** p<.01

VARIABLE SCALES

INFLUENCE ON SENSE OF CONTROL	the lower the # the more influence
% OF TIME USING COMP.	the greater the # the greater %
ADEQUATE BACKUP	the lower # the more adequate the backup help for the computer
ADEQUATE INFORMATION	1 = adequate 2 = inadequate

status. The best predictors of how the computer has affected the nurse's status is outlined in the table below. Since only one nurse felt that the use of the computer had decreased her status as a nurse, this equation must be interpreted as an indicator of degree of increased status or as showing no effect on status. The factors that were significantly related to the assessment of the computer impact on status were 1) age (B=.0172 F=5.30 p<.05), 2) years as a nurse (B=-.1401 F=6.05 p<.05), 3) years on a given unit (B=.0997 F=2.94 p<.10), 4) the adequacy of the training (B=.1843 F=6.17 p<.05), 5) adequacy of accessible information on changes in the system (B=-.2741 F=4.51 p<.05) and 6) the judgment of colleagues. The nurses who felt that the use of the computer had increased their status were the older, yet less experienced nurse, and the nurse who had been on the unit longer. But it is confusing that the nurses who felt less satisfied with their computer training and the accessibility of information on updates, and whose colleagues were perceived as being more negative about the use of computers were also those who felt that the computer had increased their sense of status (see Table 12). Perhaps these results need to be interpretted more from the simple frequencies--almost 74% of the nurses felt that the computer had no effect on their status. Thus, the results from this regression

Table 12

Results of Exploratory Multiple Regression Analysis of Nurses' Perception of Computer effect on their Status

R^2= .2760

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	6	5.3093	.8849	3.88***
ERROR	61	13.9254	.2282	
TOTAL	67	19.2352		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	2.0072			
AGE	.0172	.0074	1.2093	5.30**
YEARS RN	- .1401	.0569	1.3812	6.05**
YEARS UNIT	.0997	.0581	.6715	2.94*
ADEQ.TRAIN	.1843	.0742	1.4083	6.17**
ADEQ.INFO	- .2741	.1290	1.0298	4.51**
OTHER JUDGE	.1190	.0537	1.1202	4.91**

* p<.10
** p<.05

VARIABLE SCALES

EFFECT ON STATUS	the higher the # the more it increased
AGE	the higher the # the older the person
YEARS RN	the lower the # the less years as RN
YEARS ON UNIT	the greater the # the longer on unit
ADEQUATE TRAINING	the higher the # the less adequate
ADEQUATE INFORMATION	1 = adequate 2 = inadequate info.
OTHER JUDGE	the higher the # the more negative

model reflect only the 25% who felt the computer to have increased their status.

When asked if they felt that there had been adequate training in the use of the computers and adequate back-up and information subsequently to deal with problems or changes, as stated earlier the nurses responded relatively positively reporting they were adequately supported in the computer's use. Although this explorative analysis resulted in a conflictory relationship between the sense of increased status and the adequacy of training in the use of the computer, it is important to note that the majority of the nurses felt that the training had been adequate (though some felt it to be more adequate than others) and thus the interpretation is not actually that the training was inadequate but rather suggested degrees of adequacy.

As to the adequacy of available information about changes (i.e. updates, policy changes) in the running of the computer, 46 nurses (67.6%) felt that the information was adequate while 22 nurses (32.4%) felt the information was inadequate. A General Linear Models Procedure (SAS) multivariate analysis of variance (MANOVA) among the units and their assessments of the quality of available computer backup for informational help and informational updates, showed that there was a significant difference among the units as to their

assessment of the adequacy of the training they received as well as the quality of the back-up once operational (Hotelling-Lawley d.f. = 6,124 F=2.66 p<.05). In looking at each variable individually though, one sees that it is the assessment of the adequacy of information on changes to the computer system that is the significant factor (d.f 3,24 F=4.39 p<.01). The nurses' assessments of the adequacy of backup (help resources) was not significantly different among the units (d.f. 3,24 F=.17 p=0.9132). As has been mentioned earlier, the unit having the greatest dissatisfaction with the informational resources was 4S (see Table 13 for Summary of Computer Effects on Work Experiences).

Table 13

Summary of Exploratory Multiple Regression Models

	WORK EXPERIENCES					
INDEPENDENT VARIABLES	DEPENDENT VARIABLES					
	TIME W/ PTS.	DEC. MAKING	WORKLOAD	AUTONOMY	STATUS	INFLU.CONTROL
AGE	0	0	0	0	OLDER	0
RN EXPERIENCE	0	0	LONGER	0	LESS	0
UNIT EXPERIENCE	SHORTER	0	SHORTER	0	LONGER	0
TIREDNESS	0	0	0	0	0	0
NURSES STATION	0	0	0	0	0	0
NS ACCESS TO PTS.	0	0	0	0	0	0
#S OF TERMINALS	0	0	MORE	0	0	0
CONVENIENCE OF TERMINALS	0	0	LESS	0	0	0
COMPUTER EXPERIENCE	0	YES	YES	YES	0	0
TRAINING	0	0	0	0	LESS	0
INFORMATION	ADEQUATE	0	0	0	ADEQUATE	ADEQUATE
RESOURCE BACKUP	0	MORE	0	0	0	MORE
COMPUTER FUNCTIONING	0	0	0	0	0	0
EASE OF USE	0	EASY	EASY	EASY	0	0
OTHERS JUDGMENT	POSITIVE	0	0	0	NEGATIVE	0
% OF TIME USE	0	0	LESS	0	0	GREATER
CONTROL	0	0	MORE	0	0	0

CARING BEHAVIORS

The caring behaviors included in this questionnaire were taken from a study done by P. Larson (1981) using a Q-Sort-Methodology. In that study, Larson asked patients and nurses to identify specific nursing behaviors that demonstrated a sense of caring from the nurse. Larson gathered these caring behaviors into five themes: Accessibility; Monitoring and Following-Through; Anticipates; Trusting Relationship; and Comforts. These themes are consistent with factors raised by other theorists on the concept of caring.

Seventeen specific nursing behaviors identified by Larson were included in this project. Nurses were asked to identify on a five point Likert scale (1=all the time, 5=never) how often they felt they were able to fulfill each behavior (see Appendix for Questionnaire). Then they were asked to assess each behavior again as to whether or not they felt the computer had enhanced or hindered their ability to perform each task.

The caring behaviors were tested for reliability by calculating a split-half coefficient. The results were a Pearson Correlation Coefficient of .7777 ($p<.0001$).

In an effort to understand the cluster structure of Larson's caring items a cluster analysis (using the VARCLUS procedure of SAS) of the caring behavior results

Table 14

Results of Cluster Analysis of Caring Behavior with R^2

CLUSTER	VARIABLE	R^2 WITH OWN CLUSTER
I	time to talk w/ patient	0.7220
Comfort & Trust	time to listen	0.7109
	know pt. as individual	0.6764
	allow pt. to express feelings	0.5958
	pt. knows self best (weak R^2)	0.1977
	give good physical care	0.4961
	able to touch pt. when needed	0.5789
II	give shots, IVs. etc. well	0.6144
Monitors	manage equipment & treatments well	0.7672
	well organized	0.3574
	know when to call	0.4979

CLUSTER	VARIABLE	LARSON'S THEME
III Accessible	include pt. plan of care	0.5589
	give treatments & medications on time	0.6698
	respond quickly to patient	0.5408
IV Anticipatory	keep information confidential	0.5774
	put pt. first in all care	0.6268
	be perceptive of pt. needs	0.5497

from the nurses in this study yielded four clusters rather than the five themes that Larson has described. There is also a difference in the arrangement of individual caring behaviors that comprise the cluster results when compared with those in Larson's themes. An outline of the resulting cluster variables and the R-squared results for each variable within its cluster is given in Table 14. One variable does not fit well into any of these clusters, "assured that patient knows self best", showing only an R-squared value of .1977 with cluster I.

The intercluster correlations showed a strong positive correlation between Cluster I and Cluster III, those caring behaviors that emphasize trust and comfort with caring behaviors that are associated with being accessible to the patient (r=.6139). The caring behaviors that emphasized abilities to monitor and follow-through with tasks (Cluster II) showed a strong relationship with the behaviors that demonstrated abilities to anticipate patient's needs (Cluster IV), r=.50335. There was a weak correlation between the accessibility behaviors (Cluster III) and the anticipatory behaviors (Cluster IV), r=.24925 (see Table 14).

Larson's arrangement of the specific behaviors into her five themes--Monitors, Trust, Accessibility,

Table 15

Comparison of Cluster Results with Larson's Caring Themes

CLUSTER	VARIABLE	LARSON'S THEME
I	time to talk w/ patient	Comforts
Comfort & Trust	time to listen	Comforts
	know pt. as individual	Trust
	allow pt. to express feelings	Trust
	pt. knows self best (weak R^2)	Trust
	give good physical care	Monitor & Follows Through
II	give shots, IVs. etc. well	Monitor & Follows Through
Monitors	manage equipment & treatments well	Monitor & Follows Through
	well organized	Monitor & Follows Through
	know when to call	Monitor & Follows Through

CLUSTER	VARIABLE	LARSON'S THEME
III Accessible	include pt. plan of care	Trust
	give treatments & medications on time	Accessibility
	respond quickly to patient	Accessibility
IV Anticipatory	keep information confidential	Trust
	put pt. first in all care	Trust
	be perceptive of pt. needs	Anticipates

Comforts and Anticipates--were formulated from her interpretation of the results of her study of oncology patients and nurses at three different hospitals, examination of the literature on caring and from her own experience in nursing. In comparing her five themes with this analysis one is struck first with the difference in the number of resulting arrangements of the variables--she had five themes, where this analysis resulted in only four themes. Table 15 shows the comparison of Larson's five themes with the cluster arrangement in this study.

The theme which seems to be most alike is that labeled Monitors and Follows-through: both share the given variables. The first cluster however, is basically comprised of the trust and comfort themes and in this analysis has been labeled trust and comfort. It is clusters III (Accessibility) and IV (Anticipatory) which show the greatest difference, being comprised of the two accessibility variables plus a trust variable. Cluster IV (Anticipatory) includes the remaining two trust variables plus the anticipate variable.

Some of this variation may be due to having to split two of Larson's behaviors in this study so that each variable/question described only one aspect of caring rather than the original complex task variable that Larson used in her study. The behavior that Larson

addressed as "Allows patient to express feelings about his/her disease and treatment fully and treats the information confidentially," was interpreted in this study as asking about two behaviors rather than one. In this study, it was considered as representing two separate behaviors and thus resulted in being placed into two separate clusters (allows patient to express feelings--I; treats information confidentially--IV). The second Larson behavior, "Realizes the patient knows himself best and whenever possible includes the patient in planning and management of his/her care", was also divided into two behaviors and again resulted in being clustered into two separate areas ("patient knows self best"--Cluster I, Comforts & Trust; "include patient in plan of own care"--Cluster III, Accessibility). The variable, "able to give good physical care to patient", was clustered in the section with many of the Trust and Comfort variables rather than the Monitors & Follows Through theme that Larson developed.

Although there were some differences in the arrangement of the variables into themes between this study and Larson's arrangement, it is important to note that conceptually, the variables do not stand alone but rather measure together one major construct--nurse caring behavior. Leininger (1981) asserts that caring is the <u>essence</u> of nursing--the central unifying concept

in nursing theory and practice. She goes on to define caring as:

> ...in a generic sense as those assistive, supportive, or facilitative acts toward or for another individual or group with evident or anticipated needs to ameliorate or improve a human condition or lifeway...[P]rofessional caring as those cognitive and culturally learned action behaviors, techniques, processes, or patterns that enable (or help) an individual, family, or community to improve or maintain a favorably healthy condition or lifeway. (p.9)

The behaviors that have been identified by Larson and thus used in this study compose the "cognitive and culturally learned action behaviors, techniques, process, or patterns" that Leininger talks about as professional caring. Caring becomes not just techniques and skills but also affective behaviors that are culturally learned to assist another in maintaining or improving a healthy condition.

The four cluster themes that resulted from a cluster analysis of the responses to the individual caring behaviors are used below to organize the summarized results. In Figures 4 through 8 the results of the nurse's perception of being able to perform a particular caring behavior are summarized in each theme.

In Figures 9 through 12 the results of the nurse's perception of the impact of the computer on these behaviors respective to each theme are listed.

The majority of nurses felt that the computer had no effect on their caring behaviors (see Figures 9 through 12). When compared with the nurses' ability to provide care in this automated environment, these nurses actually felt that they were usually able to provide good caring behavior to all of their clients. There were some nurses who did feel that the use of the computer had an effect on their ability to provide various caring behaviors and they were split between their opinions as to whether or not it helped or hindered their ability. The area that seemed to have more nurses feeling a hindrance by the computer is in the area of comforting the patient--ability to give good physical care, having time to talk to the patient, to listen, and knowing when the patient needs to be touched for comfort. Here approximately 21% of the nurses felt the use of the computer had hindered their ability to provide good physical care, have time to talk and listen to the patient and 10% to 13% felt it had hindered their time to touch the patient when he/she needed comforting, respond quickly, to see patient as individual and to

Figure 4

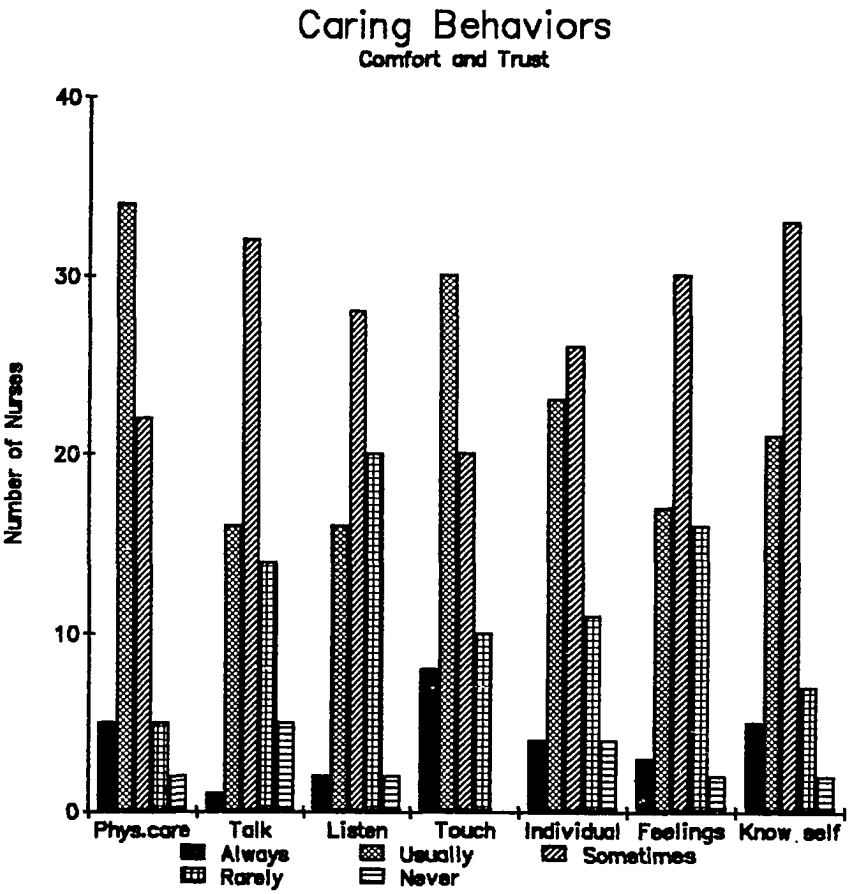


Figure 5

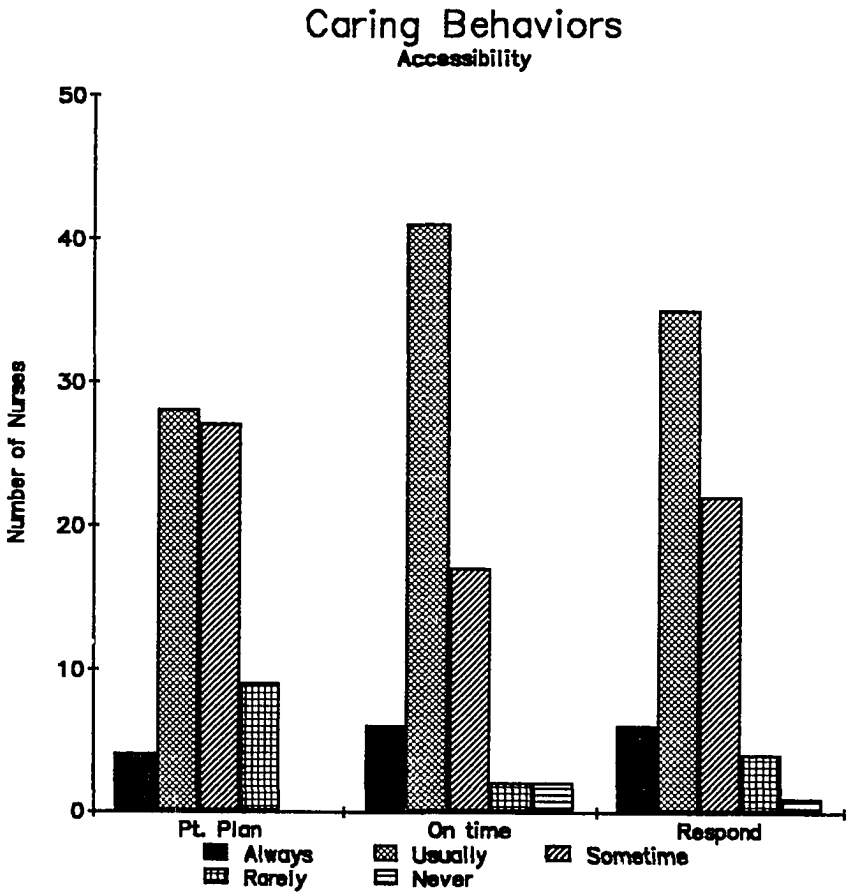


Figure 6

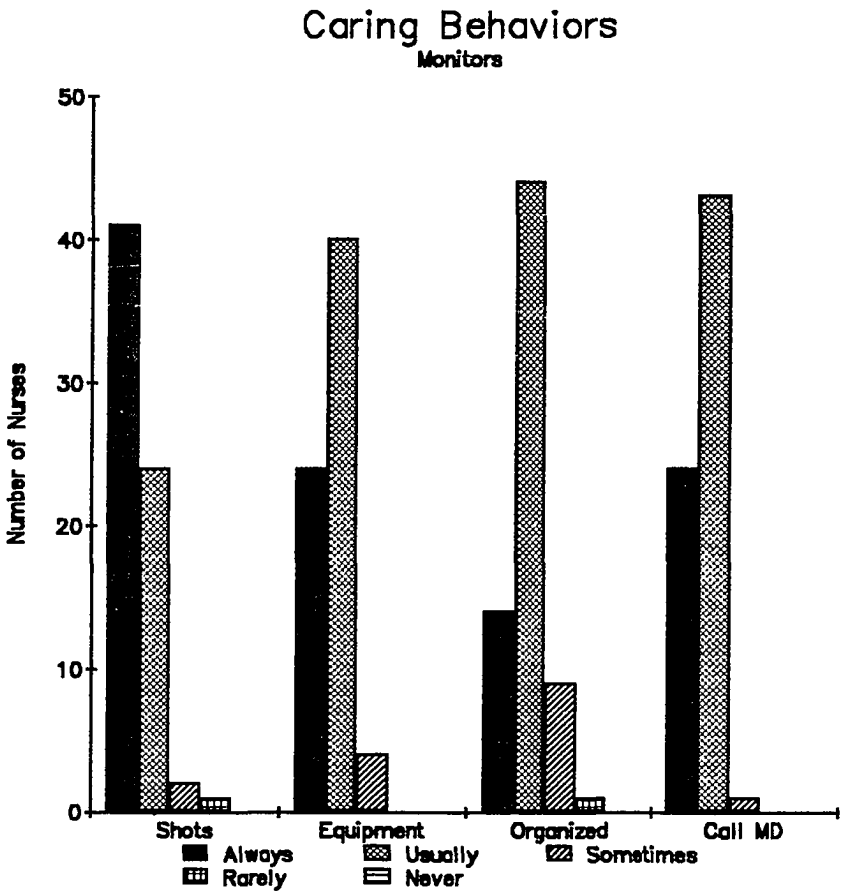


Figure 7

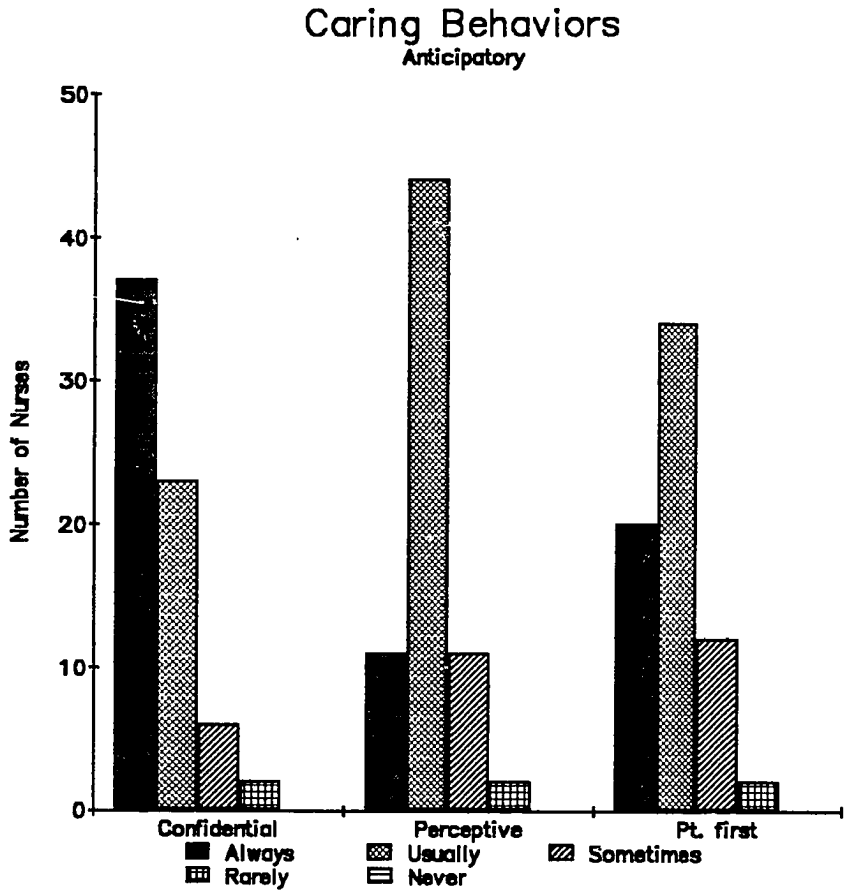


Figure 8

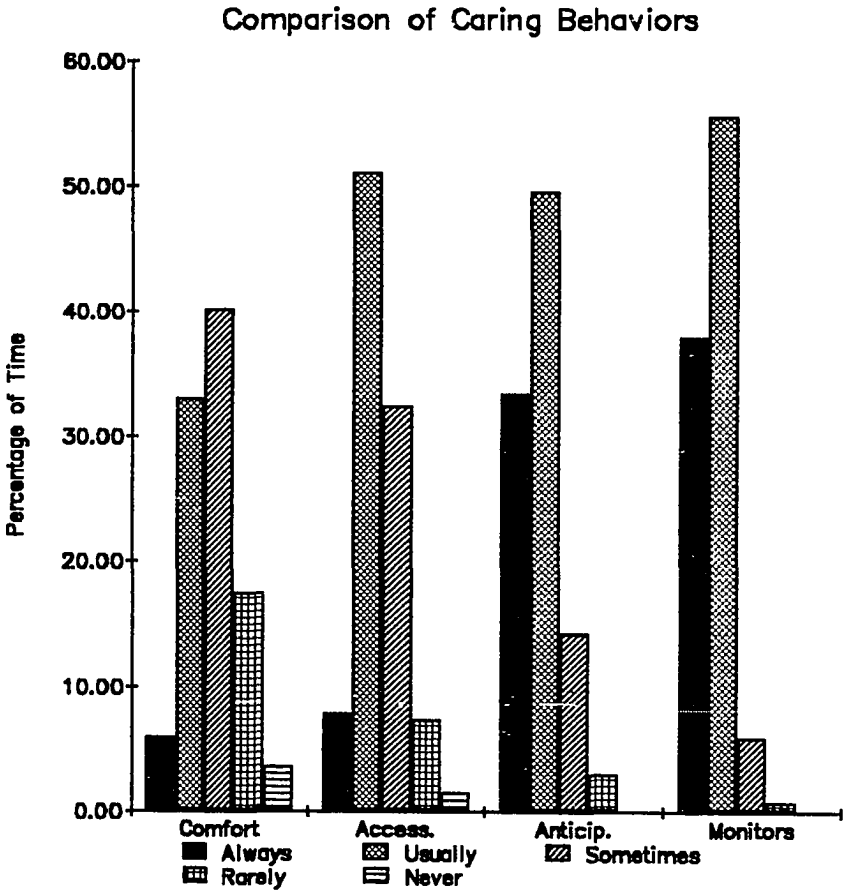


Figure 9

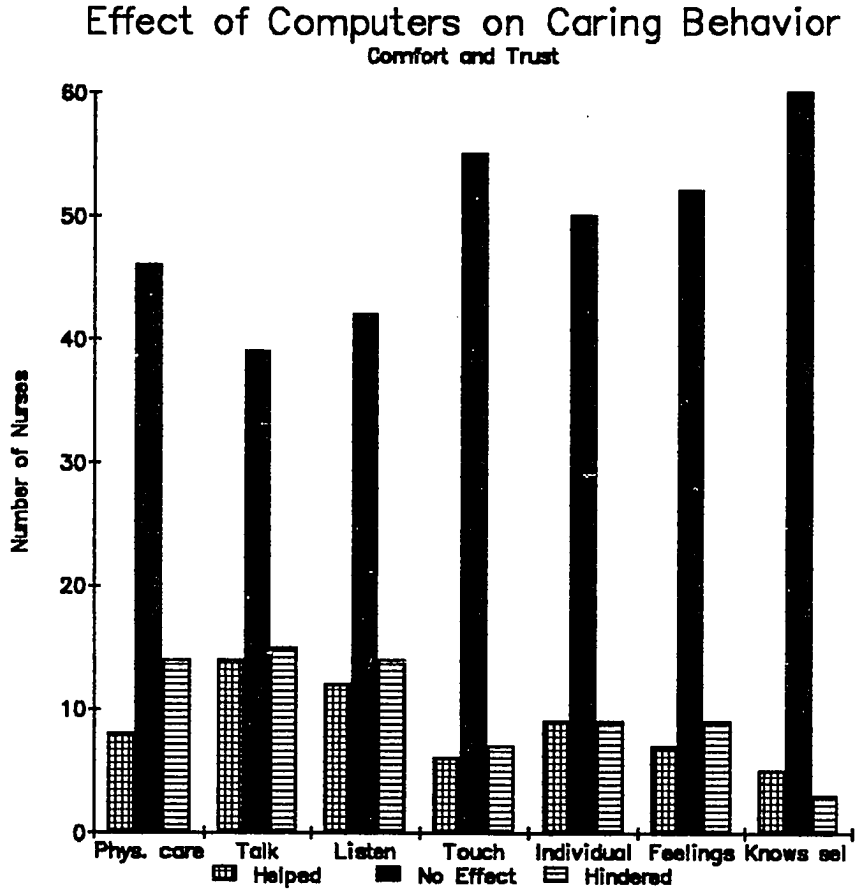


Figure 10

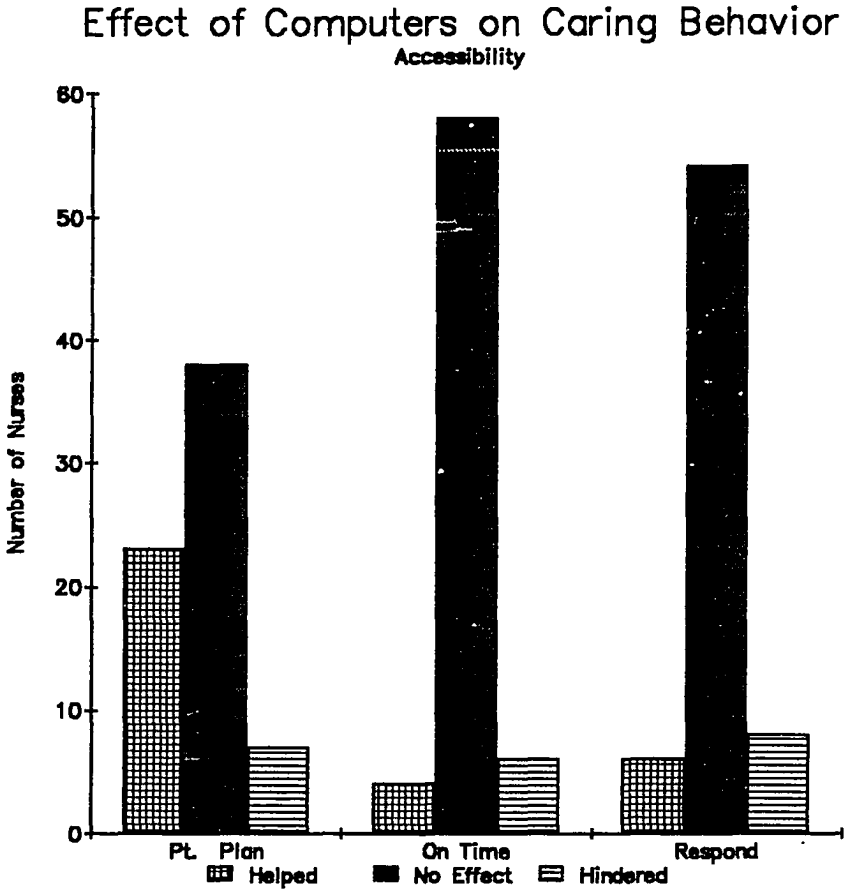


Figure 11

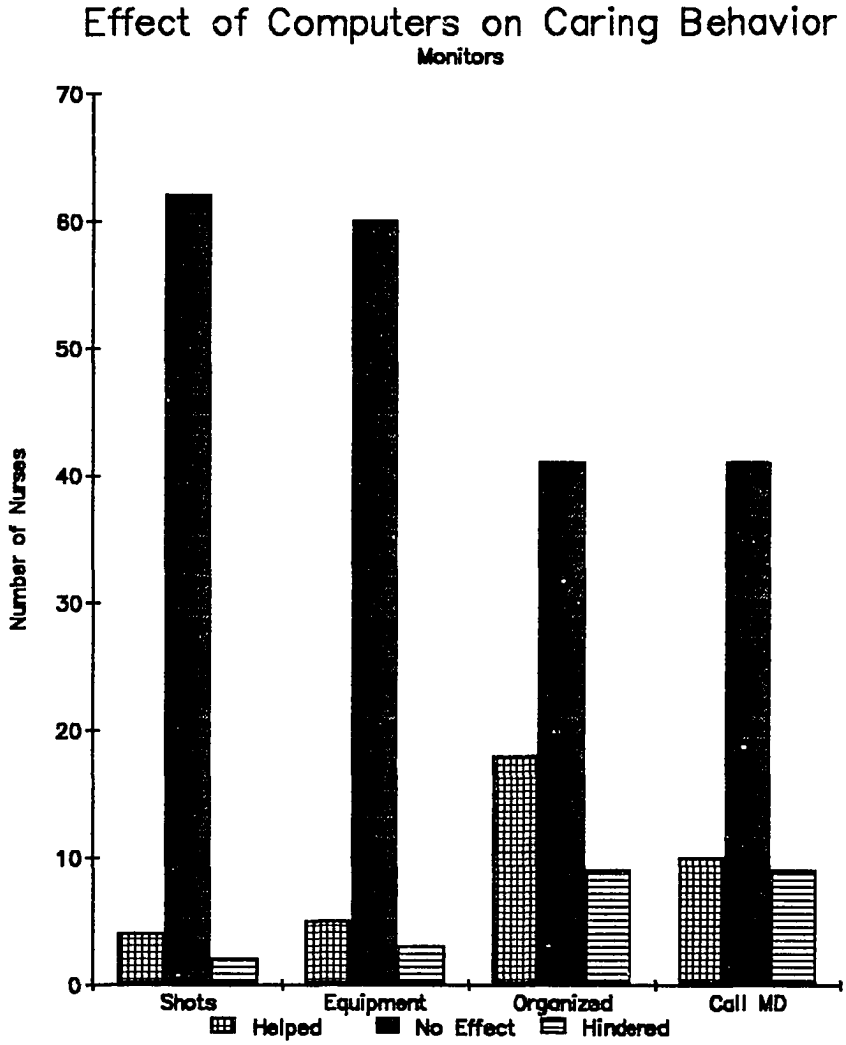
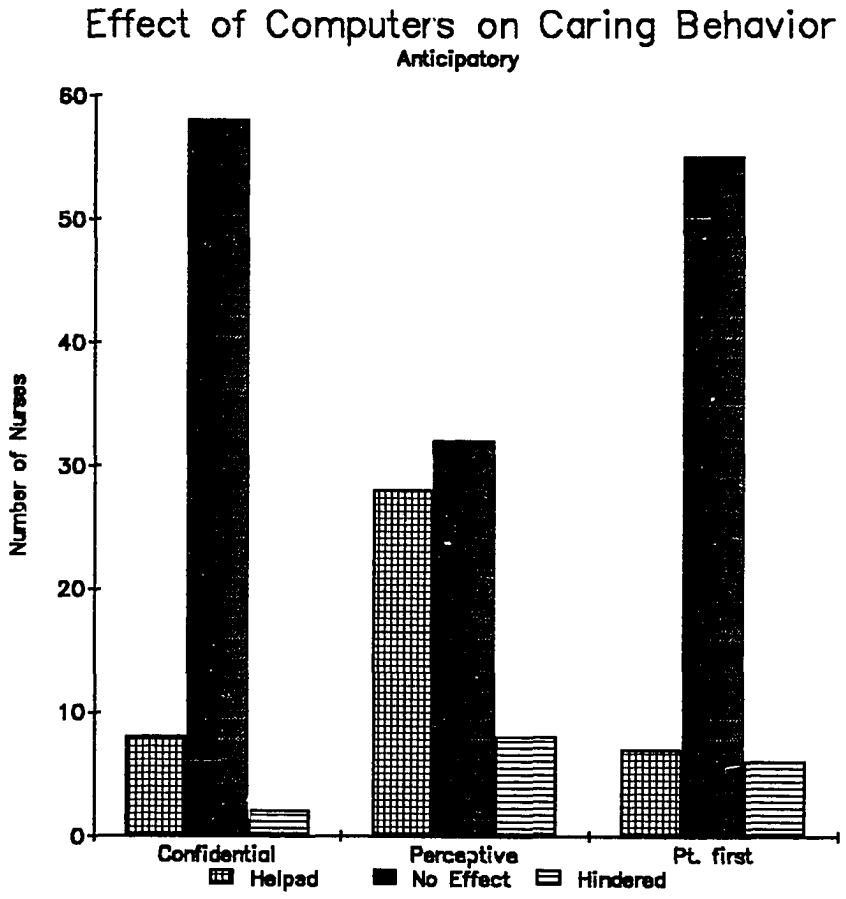


Figure 12



allow patients to express their feelings completely (see Figure 9).

There were also three behaviors that a significant number of nurses felt had been helped due to the use of computers in their work. Twenty-eight nurses (41%) felt that their ability to be perceptive of their patients needs and 21 nurses (34%) felt that their ability to include patients in their own plan of care were helped with the use of the computer. Approximately 27% (n=18) felt that they were better organized in their care because of the computer.

In the previous section, various promised outcomes were analyzed by exploratory multiple regression with specific work conditions, nurse's attributes and assessments of computer usage to identify possibly significant predictors of these outcomes. In this section on caring and in the following section on job satisfaction, the overall concepts of caring and job satisfaction, as well as cluster themes for each concept, are further examined with a similar exploratory analysis to identify potential predictors in their outcomes. In addition to the specific variables that were used in the previous section (see Table 6--Summary of Variables Entered into Exploratory Multiple Regression Analysis of Work Experiences), the above outcome variables--time with patient, workload,decision-

making, influence on control, and status--were entered into the regression equations to identify what influence their outcomes had on the abilities to give caring and to feel satisfied with one's job (see Table 16).

The overall concept of caring was created in this model by combining all the individual caring variables/ behaviors that were used in the questionnaire. A Stepwise Multiple Regression Analysis (SAS) was run. From this exploratory analysis of caring with the work conditions and the nurses' assessments of the computer's effects, several qualities seemed to have significant influence on the nurses' ability to provide care to patients. The more control a nurse felt over her work (B=-3.4578 F=5.77 p<.05), the less often the computer was "down" (or not functioning) (B=-2.2344 F=2.68 p<.10), the accessibility of adequate numbers of computer terminals (B=2.3852 F=2.88 p<.10) and lack of effect on sense of autonomy (B=-1.9032 F=3.06 p<.10), the more the nurse felt she was able to provide caring behaviors.(R^2=.195 F=3.02 p<.05) (see Table 17).

Earlier it was reported that the nurse's assessment of the effect of the computer on her sense of autonomy was only affected by two significant variables: ease of computer use and prior computer experience. Now it seems that this perception of being able to carry out caring behaviors is dependent on the perception that the

Table 16

Summary of Variables Used in the Exploratory Multiple Regression Model of Caring and Job Satisfaction

Outcome/Dependent Variables	Potential Predictor variables
* Overall Caring	* Age
* Comfort & Trust	* Years experience as RN
* Monitoring Behaviors	* Years experience on unit
* Accessibility	* Degree of tiredness at end of shift
* Anticipatory	
* Overall Job Satisfaction	* Adequacy of nurses station size
* Intrinsic Satisfaction	
* Involvement Satisfaction	* Accessibility of nurses station
* Extrinsic Satisfaction	
* Interpersonal Satisfaction	* Adequacy of numbers of computer terminals
	* Computer terminal convenience in location
	* Prior experience with computers
	* Adequacy of computer training,
	* resource back-up,
	* and information;
	* Consistency of computer functioning
	* Ease of using computer
	* Perceptions of colleagues judgment of computer use
	* Effect on: *time with pts. *decision making *workload *autonomy *control *status

computer had no effect on the nurse's sense of autonomy. It would seem that this should be more dependent on the computer having increased a nurse's sense of autonomy, allowing the nurse more control over her own abilities to provide this "essence of nursing". Autonomy may mean something different to the nurses answering this questionnaire than was intended, although none of the open-ended questions revealed any clue to this unusual result.

The specific clusters of caring behaviors that indicate the importance of control and autonomy also appear when looking at the ability to provide both comfort and trust caring behaviors (R^2=.299 F=4.35 p<.001) and anticipatory caring behaviors (R^2=.286 F=4.08 p<.01) (see Tables 18 & 19). The behaviors that comprise the caring cluster of comfort and trust included 1) being able to give good physical care, 2) having time to talk and listen to patients, 3) knowing when to touch patients when needed, 4) having time to allow patients to express feelings completely and 5) ability to see patients as unique individuals. All of these behaviors seem to have the underlying requirement of having enough time available to provide these tasks. Thus it is not surprising to see that the more in control (B=-2.1065 F=5.59 p<.05), the less tired (B=1.9572 F=6.54 p<.05), and the more adequate the

number of accessible terminals (B=2.9513 F=11.20 p<.01), the more the nurse felt she was able to provide comfort and trust to her patients. But again the question arises here as to why the lack of effect on autonomy is a significant factor in this outcome (see Table 18).

In the anticipatory caring behaviors (maintaining confidentiality, putting the patient first and being perceptive of patient's needs), control (B=-.9696 F=8.54 p<.01) and the ease of using the computer (B=.1891 F=3.82 p<.05) were significant factors. In addition to the issue of autonomy, two other variables appear to be significant in influencing the ability to give anticipatory care: the less adequate the training (B=-0.4484 F=2.83 p<.10) and the more negative colleagues judge the computer (B=-.3274 F=3.51 p<.10). The adequacy of the training may be adjusted for by the greater ease of computer use, but the factor of the more negative judgment of others is harder to explain (Table 19).

The judgment of others also shows up in explaining the ability to provide the monitoring caring behaviors (B=-.4744 F=6.74 p<.05) and the accessibility behaviors (B=-.4508 F=5.18 p<.05). Perhaps in all of these caring behavior clusters the idea that others judge the computer negatively may influence the nurse to compensate for this negativity by being better able to

provide caring (see Table 22--Summary of Results). The accessibility caring cluster (including patient in own care, giving medications and treatments on time, and responding quickly to patient's call) also shows significant influence from the increased time with patients (B=.4279 F=3.33 p<.10), and the less often the computer is "down" (B=-.8814 F=5.78 p<.05) (see Table 21).

Table 17

Results of Exploratory Multiple Regression Analysis of Nurses' Perception of Computer Effect on Overall Caring

OVERALL CARING BEHAVIORS

R^2 = .1959

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	5	657.5466	131.5093	3.02**
ERROR	62	2698.1445	43.5184	
TOTAL	67	3355.6911		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	60.4613			
YEARS UNIT	-1.3714	.7325	152.5377	3.51*
ADEQ. TERM	2.3852	1.4052	125.3838	2.88*
COMP.DOWN	-2.2344	1.3654	116.5473	2.68
AUTONOMY	-1.9032	1.0884	133.0483	3.06*
CONTROL	-3.4578	1.4397	251.0278	5.77**

* p<.10
** p<.05

VARIABLE SCALES

CARING the lower the # the more often caring
YEARS ON UNIT the greater the # the longer on unit
ADEQUATE # TERMINALS the lower the # the more adequate

COMPUTER "DOWN" the higher the # the less often "down"
AUTONOMY the higher # then no effect on autonomy
CONTROL the higher the # the more control

Table 18

Results of Exploratory Multiple Regression Analysis of Nurses' Perception of Computer Effect on Comfort and Trust Behaviors

R^2 = .2998

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	6	437.2775	72.8795	4.35***
ERROR	61	1021.1929	16.7408	
TOTAL	67	1458.4705		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	18.7982			
AGE	- .1017	.0582	51.0711	3.05*
ADEQ. TERM	2.9513	.8817	187.5392	11.20***
AUTONOMY	-1.4858	.7134	72.6154	4.34**
TIRED	1.9572	.7652	109.5276	6.54**
CONTROL	-2.1065	.8906	93.6533	5.59**
EXPERIENCE	2.3761	1.2437	61.1021	3.65*

* p<.10
** p<.05
*** p<.01

VARIABLE SCALES

COMFORT & TRUST	the lower the # the more often able to provide comfort & trust
AGE	the higher the # the older the person
ADEQUATE # TERMINALS	the lower the # the more adequate
AUTONOMY	the higher # then no effect on sense of autonomy
TIRED	the lower the # the less tired end of shift
CONTROL	the higher the # the more control
PRIOR EXPERIENCE	the lower the # then had prior experience

Table 19

Results of Exploratory Multiple Regression Analysis of Nurses' Perception of Computer Effect on Anticipatory Behaviors

R^2 = .2865

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	6	55.0969	9.1828	4.08***
ERROR	61	137.1824	2.2488	
TOTAL	67	192.2794		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	11.8610			
YEARS UNIT	-.3751	.1552	13.1377	5.84**
ADEQ. TRAIN	-.4484	.2666	6.3614	2.83*
EASE COMP.	.1891	.0967	8.6013	3.82**
AUTONOMY	-.8006	.2626	20.8988	9.29***
OTHER JUDGE	-.3274	.1748	7.8889	3.51*
CONTROL	-.9696	.3318	19.2072	8.54***

* p<.10
** p<.05
*** p<.01

VARIABLE SCALES

ANTICIPATORY	the lower the # the more often able to anticipate needs
YEARS ON UNIT	the greater the # the longer on unit
ADEQUATE TRAINING	the higher the # the less adequate
EASE OF COMPUTER	the lower #s the easier the computers are to use
AUTONOMY	the higher # then no effect on sense of autonomy
OTHER JUDGE	the higher the # the more negative
CONTROL	the higher the # the more control felt

Table 20

Results of Exploratory Multiple Regression Analysis of Nurses' Perception of Computer Effect on Monitoring Behaviors

R^2 = .2109

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	4	42.9637	10.7409	4.21***
ERROR	63	160.7274	2.5512	
TOTAL	67	203.6911		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	7.4653			
YEARS RN	.3460	.1668	10.9692	4.30**
YEARS UNIT	-.5755	.1922	22.8692	8.96***
EASE COMP.	.1962	.0877	12.7658	5.00**
OTHER JUDGE	-.4744	.1827	17.2009	6.74**

* p<.10
** p<.05
*** p<.01

VARIABLE SCALES

MONITORING	the lower the # the more often able to monitor
YEARS RN	the lower the # the less experience RN
YEARS ON UNIT	the greater the # the longer on unit
EASE OF COMPUTER USE	the lower #s the easier the computers to use
OTHER JUDGE	the higher the # the more negative

Table 21

Results of Exploratory Multiple Regression Analysis of Nurses' Perception of Computer Effect on Accessibility Behaviors

R^2 = .2379

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	6	53.4192	8.9032	3.17***
ERROR	61	171.0954	2.8048	
TOTAL	67	224.5147		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	9.7849			
YEARS RN	.4154	.1783	15.2219	5.43**
YEARS UNIT	-.8586	.2333	37.9829	13.54***
COMP.DOWN	-.8814	.3665	16.2209	5.78**
AFF. TIMEPT.	.4279	.2344	9.3427	3.33*
INFLU. CONT.	.4125	.1976	12.2119	4.35**
OTHER JUDGE	-.4399	.1976	13.6037	4.85**

* p<.10
** p<.05
*** p<.01

	VARIABLE SCALES
ACCESSIBILITY	the lower the # the more often able to be accessible
YEARS RN	the lower the # the less experience RN
YEARS ON UNIT	the greater the # the longer on unit
COMPUTER "DOWN"	the higher the # the less often "down"
EFFECT ON TIME	the lower the # the greater the increase in time w/ patient's
INFLUENCE ON SENSE OF CONTROL	the lower the # the more influence
OTHER JUDGE	the higher the # the more negative

Table 22

Summary of Results from Exploratory Analysis Models with Caring Themes

INDEPENDENT VARIABLES	DEPENDENT VARIABLES				
	CARING	COMFORT & TRUST	MONITORING	ACCESSIBILITY	ANTICIPATORY
AGE	0	OLDER	0	0	0
RN EXPERIENCE	0	0	LESS	LESS	0
UNIT EXPERIENCE	LONGER	0	LONGER	LONGER	0
TIREDNESS	0	LESS	0	LESS	0
NURSES STATION	0	0	0	0	0
NS ACCESS TO PTS.	0	0	0	0	0
#S OF TERMINALS	MORE	MORE	0	0	0
CONVENIENCE OF TERMINALS	0	0	0	0	0
COMPUTER EXPERIENCE	0	YES	YES	0	0
TRAINING	0	0	0	0	LESS
INFORMATION	0	0	0	0	0
RESOURCE BACKUP	0	0	0	LESS	0
COMPUTER FUNCTIONING	UP	0	0	UP	0
EASE OF USE	0	0	EASY	0	EASY
OTHERS JUDGMENT	0	0	NEGATIVE	NEGATIVE	NEGATIVE
TIME W/ PATIENTS	0	0	0	INCREASED	0
DECISION MAKING	0	0	0	0	0
WORKLOAD	0	0	0	0	0
AUTONOMY	NO EFFECT	NO EFFECT	0	0	NO EFFECT
CONTROL	MORE	MORE	0	0	MORE
STATUS	0	0	0	0	0
INFLUENCE CONTROL	0	0	0	GREATER	0

JOB SATISFACTION

The instrument for measuring nursing job satisfaction was developed by Munson and Heda (1974). Three aspects are involved in scoring each question: (a) score = the response to part (a): "How much is there now?"; (b-a) score = the response to (a) subtracted from (b): "How much should there be?"; I(b-a) score = the (b-a) score multiplied by the rating of importance of the original question. The (b-a) score is a measurement of dissatisfaction; the higher the score the greater the dissatisfaction. In reporting the results, each score is subtracted from a constant ([b-a] scores from 10 and I[b-a] from 20) so that in the tables a higher score reflects a greater satisfaction. There are thirteen questions in all; twelve asking about specific job satisfaction characteristics and one that asks for an overall evaluation of job satisfaction. Each question/characteristic is measured on a 7 point scale from 1=none at all to 7=maximum i.e.

Scoring for Job Satisfaction

The opportunity to fully use my skills and abilities in my job:
A) How much is there now?
none 1 (2) 3 4 5 6 7 maximum
B) How much should there be?
none 1 2 3 4 (5) 6 7 maximum
RESULT: (10 - (B-A)) = (10 - (5-2))= 7
7 = Degree of satisfaction
Note. The higher the score the higher the satisfaction.

The Munson/Heda (1974) instrument divides job characteristics into four indices measuring job satisfaction:

> Intrinsic task satisfaction:Closest to a satisfier of self-actualizing needs. Direct connection between task and satisfaction.
> Involvement satisfaction: Closest to a satisfier of ego needs as shown in a desire for power with or over others;
> Interpersonal satisfaction: Closest to a satisfier of belongingness needs as shown in a desire for warmth in personal relations;
> Extrinsic satisfaction: Indirectly related to many needs, but directly reflecting the satisfaction with employment as a device for satisfying such needs off the job; (p. 161)

Combining all of the variables together to get the overall concept of job satisfaction, an exploratory multiple regression analysis was run to see which variables significantly influence the outcome of positive job satisfaction. In the Stepwise (SAS) Equation with job satisfaction as the outcome (dependent) variable, specific characteristics of the nurse (age, years of experience as a nurse and at the hospital and nursing unit, fatigue level at end of

shifts and the nurses prior experience with computers), specific work conditions (adequacy and location of the nursing work spaces, computer terminal location and numbers, adequacy of the training and backup of computer usage and the ease of using the computers), the nurse's perception of how her colleagues felt about the computer, computer effect on time with patients, decision making ability, workload, sense of control over work, sense of autonomy and status were explored to identify their degree of influence on job satisfaction (see Table 16).

The factors having a significant influence on job satisfaction were a greater number of years of nursing experience as an RN (B=2.9725 F=8.33 p<.01), fewer years on the unit (B=-2.4120 F=4.06 p<.05), the more adequate the computer training (B=-3.5021 F=3.94 p<.10), the greater the adequacy of the back-up information (B=-5.5005 F=7.83 p<.01), the lesser effect of the computer on decision making ability (B=-6.0642 F=9.35 p<.01) and the more positively colleagues judged the computer (B=-3.2044 F=7.91 p<.01) (see Table 23).

The means for the four job satisfaction indexes were very similar. The Interpersonal Satisfaction index scored highest with a mean of 8.6 (range from 4 to 14). The satisfaction scale usually runs from one to ten, thus any index that has a range of higher than ten can

Table 23

Results of Exploratory Multiple Regression Analysis of Nurses' Perception of Computer Effect on Overall Job Satisfaction

R^2 = .3806

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	6	3620.9631	603.4938	6.25****
ERROR	61	5892.2574	96.5943	
TOTAL	67	9513.2205		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	149.2750			
YEARS RN	2.9725	1.0299	804.6553	8.33***
YEARS UNIT	-2.4120	1.1964	392.5737	4.06**
ADEQ.TRAIN	-3.5021	1.7646	380.4513	3.94*
ADEQ. BACK	-5.5005	1.9663	755.8593	7.83***
DECISION	-6.0642	1.9833	903.0596	9.35***
OTHER JUDGE	-3.2044	1.1395	763.8045	7.91***

* p<.10
** p<.05
*** p<.01
**** p<.0001

VARIABLE SCALES

JOB SATISFACTION	the higher the # the more satisfaction
YEARS RN	the higher the # the longer as RN
YEARS ON UNIT	the lower the # the shorter time on unit
ADEQUATE TRAINING	the lower the # the more adequate
ADEQUATE BACKUP	the lower # the more adequate the backup help for the computer
DECISION-MAKING ABILITY	the lower # then no effect on ability to make decisions
OTHER JUDGE	the lower the # the more positive

be interpreted as demonstrating an exceptionally high level of satisfaction. Of all the individual items asked about, the nurses felt most satisfied with the opportunity to work with likable people and the sense of job security at this hospital.

The Interpersonal Satisfaction index was the job satisfaction theme that scored the highest mean of satisfaction from these nurses. This index included the following needs: 1) the opportunity in my job to work closely with likable people ($\underline{x}$=8.9), 2) the understanding of others on my unit of problems and difficulties in my job ($\underline{x}$=8.6), 3) the opportunity in my hospital job to give help to other people ($\underline{x}$=8.3).

Stepwise Multiple Regression (SAS) was used to examine the relationship between variables describing working conditions and the nurse's assessment of the computer as they affected interpersonal satisfaction. The nurses who felt most satisfied were those who had been RN's longest ($\underline{B}$=.4410 $\underline{F}$=3.44 $\underline{p}$<.10), were more satisfied with the quality of the training for using the computer ($\underline{B}$=-1.6584 $\underline{F}$=15.62 $\underline{p}$<.001), felt the computer had greater influence over one's sense of control ($\underline{B}$=-.6810 $\underline{F}$=4.95 $\underline{p}$<.05), felt that the computer had less effect on their decision-making ability ($\underline{B}$=-1.2395 $\underline{F}$=5.52 $\underline{p}$<.05) and that others felt more positively about the computer ($\underline{B}$=-.6822 $\underline{F}$=4.91 $\underline{p}$<.05) (see Table 24).

Table 24

Results of Exploratory Multiple Regression Analysis of Nurses' Perception of Computer Effect on Interpersonal Satisfaction Index

R^2 = .3237

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	5	214.2954	42.8590	5.94****
ERROR	62	447.5868	7.2191	
TOTAL	67	661.8823		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	35.4823			
YEARS RN	.4410	.2378	24.8252	3.44*
ADEQ.TRAIN	-1.6584	.4195	112.7953	15.62****
INFLU.CON.	- .6810	.3062	35.7006	4.95**
DECISION	-1.2395	.5273	39.8802	5.52**
OTHER JUDGE	- .6822	.3079	35.4345	4.91**

* p<.10
** p<.05
*** p<.01
**** p<.001

VARIABLE SCALES	
INTERPERSONAL	the higher the # the more satisfied
YEARS RN	the higher the # the longer as RN
ADEQUATE TRAINING	the lower the # the more adequate
INFLUENCE ON SENSE OF CONTROL	the lower the # the more influence
DECISION-MAKING ABILITY	the lower # no effect on ability to make decisions
OTHER JUDGE	the lower the # the more positive

The Extrinsic Satisfaction index had the next highest degree of satisfaction ($\underline{x}$=8.3). This index included the following needs: 1) the fairness of working conditions that go along with my job ($\underline{x}$=8.2), 2) the job security in my job ($\underline{x}$=9.0), 3) the

financial rewards of my job ($\underline{x}$=7.7). An exploratory multiple regression revealed that the nurses who scored highest in this index were those who felt most control over their work ($\underline{B}$=1.4502 $\underline{F}$=4.50 $\underline{p}$<.05), felt less tired at the end of each shift ($\underline{B}$=-1.1137 $\underline{F}$=3.67 $\underline{p}$<.10), felt that the computer had increased their time with patients ($\underline{B}$=-.8073 $\underline{F}$=3.80 $\underline{p}$<.10) and yet had no effect on their sense of autonomy in their work ($\underline{B}$=1.1658 $\underline{F}$=4.70 $\underline{p}$<.05) (see Table 25).

The Involvement Satisfaction index had an overall mean of 8.2 with little variation among the individual items: 1) the authority to direct others connected with my hospital job ($\underline{x}$=8.2),2) the opportunity in my hospital job to share in the determination of methods and procedures ($\underline{x}$=8.0), 3) the opportunity in my hospital job to share in the setting of goals ($\underline{x}$=8.2). The nurses who were most satisfied with their involvement (using a Stepwise Multiple Regression Analysis) were those who felt more positively about the adequacy of the training ($\underline{B}$=-.9860 $\underline{F}$=3.78 $\underline{p}$<.10) and informational back-up ($\underline{B}$=-1.3504 $\underline{F}$=5.58 $\underline{p}$<.05), that the computer had no effect on their decision-making ability ($\underline{B}$=-2.2572 $\underline{F}$=15.23 $\underline{p}$<.001) and that others felt more positive in their judgment of the computer ($\underline{B}$=-.6955 $\underline{F}$=4.39 $\underline{p}$<.05) (see Table 26).

Table 25

Results of Exploratory Multiple Regression Analysis of Nurses' Perception of Computer Effect on Extrinsic Satisfaction Index

R^2 = .1960

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	4	148.8330	37.2082	3.84***
ERROR	63	610.3875	9.6886	
TOTAL	67	759.2205		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	25.8479			
AFF.TIMEPT.-	.8073	.4142	36.8036	3.80*
AUTONOMY	1.1658	.5377	45.5340	4.70**
TIRED	-1.1137	.5817	35.5132	3.67*
CONTROL	1.4502	.6834	43.6313	4.50**

* p<.10
** p<.05
*** p<.01

	VARIABLE SCALES
EXTRINSIC SATISF.	the higher the # the more satisfied
EFFECT ON TIME W/ PTS.	the lower the # the more it increased time
AUTONOMY	the higher # no effect on the sense of autonomy
TIRED	the lower the # the less tired end of shift
CONTROL	the higher the # the more control

Table 26

Results of Exploratory Multiple Regression Analysis of Nurses' Perception of Computer Effect on Involvement Satisfaction Index

R^2 = .3047

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	4	227.5811	56.8952	6.90****
ERROR	63	519.2864	8.2426	
TOTAL	67	746.8676		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	38.0871			
ADEQ. TRAIN	-.9860	.5072	31.1493	3.78*
ADEQ. BACK	-1.3504	.5717	45.9795	5.58**
DECISION	-2.2575	.5784	125.5261	15.23****
OTHER JUDGE	-.6955	.3320	36.1785	4.39**

* p<.10
** p<.05
*** p<.01
**** p<.001

VARIABLE SCALES

INVOLVEMENT SATISF.	the higher the # the greater satisfaction
ADEQUATE TRAINING	the lower the # the more adequate
ADEQUATE BACKUP	the lower # the more adequate the backup help for the computer
DECISION-MAKING	the lower # no effect on ability to make decisions
OTHER JUDGE	the lower the # the more positive

The Intrinsic Task Satisfaction, the index representing the most direct connection between job tasks and job satisfaction, had the lowest score (mean=7.9). This index included the need expectations that they had: 1) the opportunity to fully use my skills and abilities in my hospital job ($\underline{x}$=7.9), 2) the opportunity to do important and worthwhile things in my job ($\underline{x}$=8.0), 3) the self-fulfillment a person gets from being in my hospital job ($\underline{x}$=7.9). The nurses who felt most positive on this index (using an exploratory Stepwise equation) were older ($\underline{B}$=.1171 $\underline{F}$=6.33 $\underline{p}$<.05), felt the computer was less often "down" ($\underline{B}$=1.6091 $\underline{F}$=5.78 $\underline{p}$<.05), felt more satisfied with the size of the nurses station ($\underline{B}$=-.6284 $\underline{F}$=4.22 $\underline{p}$<.05) and the quality of the informational back-up on changes and updates ($\underline{B}$=-2.0420 $\underline{F}$=11.64 $\underline{p}$<.001) (see Table 27).

It is significant that nurses who felt most satisfied with Interpersonal, Involvement and overall Job Satisfaction felt that the computer had no effect on their decision-making ability and in the Extrinsic Satisfaction index were nurses who felt the computer had no effect on their sense of autonomy in their work. A sense of the computer having no effect on decision-making ability and that it had no real effect on their sense of autonomy as factors that significantly contributed to increased job satisfaction seems to go

Table 27

Results of Exploratory Multiple Regression Analysis of Nurses' Perception of Computer Effect on Intrinsic Task Satisfaction Index

R^2 = .3076

	DF	SUM OF SQUARES	MEAN SQUARE	F
REGRESSION	4	344.8944	86.2236	7.00****
ERROR	63	776.2231	12.3210	
TOTAL	67	1121.1176		

	B VALUE	STD ERROR	TYPE II SS	F
INTERCEPT	20.2817			
AGE	.1171	.0465	77.9453	6.33**
COMPDOWN	1.6091	.6690	71.2713	5.78**
ADEQ. BACK	-2.0420	.5984	143.4569	11.64**
NS. SIZE	-.6284	.3059	51.9889	4.22**

* p<.10
** p<.05
**** p<.001

VARIABLE SCALES

INTRINSIC TASKS	the higher the # the greater satisfaction
AGE	the higher the # the older the person
COMPUTER "DOWN"	the higher the # the less often "down"
ADEQUATE BACKUP	the lower # the more adequate the backup help for the computer
NURSES STATION SIZE	the lower the # the more adequate

against what one had expected.

Since the computer is an instrument of information, it has always been asserted that it would increase the user's access to information and thus increase the user's ability to make decisions and thereby increase one's sense of autonomy. In this sample that outcome does not seem to hold true. Forty-six of these nurses (67%) felt that the computer had no effect on their decision-making ability and while only 15 (22%) felt it had increased it. If the computer has less of an effect on decision-making, the nurses seemed to feel that the computer was merely a tool and that their personal decision-making power was preserved. This made them feel more satisfied with their work perhaps because they feel confident in their own decision-making ability.

This is also true as it relates to the nurses' perception of the impact of the computer on their sense of autonomy. Forty (59%) of the nurses felt the computer had no effect on their sense of autonomy while twenty-one (31%) felt that it had increased it. Here again the findings are surprising. One would expect that the nurses who felt the computer had increased their sense of autonomy would feel more satisfied with their work, yet in this sample the opposite is true: the nurses who felt the computer had no effect on their

sense of autonomy were more satisfied in the Extrinsic Satisfaction index. There are a number of interpretations of these data. One interpretation may be that since a majority of the nurses perceive their colleagues as feeling negatively about the use of the computer in their work, the perception that this "unwelcomed" technology has no effect on two significant aspects of their work (decision-making and autonomy) is actually a positive outcome.

Another possibility of understanding the confusing outcome with autonomy is in how autonomy is defined. There may a difference between this researcher's intended definition of autonomy and the nurses' who participated in the study interpreted this concept. When discussing this with some of the nurses after the completion of the study, several of them felt that autonomy is a concept that this hospital emphasizes as a unit ideal rather than an individual attribute (as represented in the questionnaire). Perhaps some of the nurses were reflecting their perception that the computer has no effect on the unit's sense of autonomy, i.e. sense of control of the unit's work process, and thus many of the nurses see this as a positive outcome. This explanation does not fully respond to the confusion of the outcomes but rather raises the issue that the concept of autonomy needs to be explored in future

research and needs to be more carefully defined (see Table 28--Summary of Results of Exploratory Analysis with the Job Satisfaction Themes).

COMPARISON OF JOURNAL ANALYSIS WITH HOSPITAL ANALYSIS

The original intent of this third phase of analysis was to compare the results of the nursing literature analysis empirically with the hospital study analysis through the use of statistical analyses of the scaled results. It became apparent, however, that there was little variation in the expectations and outcomes asseted by various authors in the articles and studies. Because of this lack of variation, it was not possible to use these results in statistical analysis. Instead the thematic analysis of the literature can be compared qualitatively to the results of the nurses' experiences in using computers. The two sets of findings can be organized into seven major themes: 1) location, 2) time in documentation, 3) time with patients, 4) productivity/ efficiency, 5) quality of care, 6) status and 7) caring. Each of these themes will be discussed comparing how the literature describes the expectations with how the nurses at the sampled hospital reported their experiences.

Table 28

Summary of Results from Exploratory Analysis Models with Job Satisfaction Themes

INDEPENDENT VARIABLES	DEPENDENT VARIABLES				
	JOB SATISFACTION	INTERPERSONAL	EXTRINSIC	INVOLVEMENT	INTRINSIC
AGE	0	0	0	0	OLDER
RN EXPERIENCE	LONGER	LONGER	0	0	LONGER
UNIT EXPERIENCE	SHORTER	0	0	0	LONGER
TIREDNESS	0	0	LESS	0	0
NURSES STATION	0	0	0	0	MORE
NS ACCESS TO PTS.	0	0	0	0	0
#S OF TERMINALS	0	0	0	0	0
CONVENIENCE OF TERMINALS	0	0	0	0	0
COMPUTER EXPERIENCE	0	0	0	0	0
TRAINING	MORE	MORE	0	MORE	0
INFORMATION	0	0	0	0	0
RESOURCE BACKUP	MORE	0	0	MORE	MORE
COMPUTER FUNCTIONING	0	0	0	0	0
EASE OF USE	0	0	0	0	0
OTHERS JUDGMENT	POSITIVE	POSITIVE	0	POSITIVE	0
TIME W/ PATIENTS	0	0	INCREASED	0	0
DECISION MAKING	NO EFFECT	NO EFFECT	0	NO EFFECT	0
WORKLOAD	0	0	0	0	0
AUTONOMY	0	0	NO EFFECT	0	0
CONTROL	0	0	MORE	0	0
STATUS	0	0	0	0	0
INFLUENCE CONTROL	0	MORE	0	0	0

Location

Over the past twenty years , only about a quarter of the authors specifically discussed the physical placement of the computer on the nursing unit and it was even harder to find any discussion of the implications of the physical location as a factor in the potential or actual impact on work experiences. Some authors mentioned in passing that computer terminals were located at the nurses station, and some noted that they were placed at the bedside. However, only those authors who discussed bedside computers considered the role of location and its impact on nurses' work. Moreover, it was always asserted that having computer terminals at the bedside, the point of direct care, had only positive outcomes.

Examination of the reports from this sample of nurses who use computers, one sees a more complicated picture of the role that terminal location plays in affecting various work outcomes. Both convenience and number of computers turned out to be significant in the nurses' perception of the ways in which computer use had affected their workload. At this hospital the number of available terminals and the convenience of their location contributed to the perception by the nurses that they affected workload. It was important that there were enough terminals available when needed. But,

it was also important that the terminals at the bedsides sometimes created the expectation that nurses should use them frequently thus making this convenience less desirable.

Having the terminals in patient rooms proved to be both beneficial but also a hindrance to nurses' work. Several nurses felt that the location of the bedside computer contributed to their sense of being isolated from their colleagues and often left them feeling that they were working alone for much of a shift. By locating everything at the bedside, the nurse/patient contact is reinforced as being the only significant role of the nurse. Perhaps this location assumes that the communication between the nurse and the computer is the only essential support that the nurse needs. If computer location at the bedside convey this message of the priority of nurse patient contact, the perhaps unintended consequence may involve the invalidation of the legitimacy of fact to face contact with other nurses and other staff members. Bedside location then may be based on the underlying assumption that it is enough to have the nurse physically in contact with the patient aided by the direct support of the information systems at her side which are sufficient to support her work. Interpersonal support from other colleagues (for example, sharing information and problem solving) is

ignored, as is the fact that this interpersonal support is essential to the development of competent nurses and the quality of patient care.

Time

More than half of the journal articles and conference papers involved comments on the impacts that computers have on the time taken to document care. The majority of the authors suggested that the use of information systems by nurses significantly decreases the amount of time it takes to do the clerical tasks needed to document the activities of nursing shifts. Although few authors documented the amount of time that nurses have traditionally spent in clerical tasks, most promised or asserted that time would be decreased with the aid of computers. Of the studies that reported the amounts of time nurses spent in documentation, the range in the percentage the time was between 30% to 40% when nurses do not use computers in documentation (Goldstein & Farlee, 1972; Nathanson, 1983; Romano, et al., 1985; Staggers, 1988).

In this study however, the nurses reported that they spend an average of 22% of their time in informational processing with the computer. This is a decrease in the usual time nurses spend in documentation without computers to assist them that is reported in

nursing literature. Unfortunately, these nurses were not asked if they felt that this was more or less than what they used to spend in these tasks prior to the use of the computer, but one can get some idea as to their assessment of this through their open-ended statements. Many of the nurses reported that the computer was often very cumbersome and slow. They also said that some of the documentation functions were slower to use than writing the same information by hand. They also felt frustrated with the time spent in making their reports because of computer sluggishness at peak times as well as the slowness of going through screens or menus to get to specific sections. Although, as the literature asserts, computer systems have the ability to manage information more quickly than a manual system, there is much that can affect the speed of this processing: the memory capability of the specific computer system, the function of the specific programs used, the accessibility of terminals and the backup of the systems in case of power interruptions. Although when functioning at optimal levels, computer technology has the capability of doing many things more rapidly than manual systems. This ideal is not often realized because the information system programs and the size and number of the systems vary greatly. The only authors who did discuss these factors were those who described the

process of computer installation at a specific hospital. But even then they did not go on to analyze the complex impact of system variability on work content.

Time with patients

Journal articles and conference proceedings often contain claims that, as the time used to document information decreased, nurses would find that their time with patients would increase. Only four authors reported a decrease in time with patients, suggesting that the increase in available time was lost because of other responsibilities rather than direct contact with patients. Very few authors discussed any other factors that could affect the use of this time. Some speculated that as the time spent in clerical responsibilities decreased staffing could also be reduced due to the ability of the computer to process information rapidly. These authors assumed that, instead of using the increased time available with patients, priority should be given to decrease expenses through staff reductions since fewer people would be needed to maintain the same level of care.

The nurse's in this study took care of an average of eight patients per shift. This is significantly higher than other hospitals. The usual number of patients assigned is four to six patients per

nurse. The experience of the nurses in this study suggested that the computer contributed to the feeling that time with patients had decreased rather than increased. It is significant to note that the nurses also felt that their workload had increased as a result of computer use. Part of the explanation for this may be that with everything available at the patient's bedside it is assumed that the nurse does not have to walk to get either supplies or information to do her work and can therefore take care of more patients in the same amount of time. Thus, having to take care of more patients would also contribute to a feeling that there was less time to spend with patients. This needs to be explored further.

Productivity

Many of the articles over the past twenty years included an expectation that productivity or efficiency would increase with the use of new communication technologies in nursing work. Although productivity is never defined, mention is often made of the money to be saved through increased documentation speed, greater efficiency and organization, and less time required in indirect patient care. Moreover a connection is often made between increased patient load and higher quality care. Productivity seems to be measured in time-motion

factors rather than in the quality of the nurses' experience and it seems to have more to do with financial outcomes than quality of on-the-job experience.

The underlying assumption in this study was that the impact of the computer on nurses' work should be measured by the quality or degree of satisfaction nurses felt and their ability to provide caring in their role. Thus, questions were asked about the nurses' ability to provide care to their patients, stress levels, and perceptions of workload.

The majority of nurses reported that they felt that their workload had increased as a result of computer use and that there was no significant change in their ability to make decisions or in their sense of autonomy. The majority of nurses also felt that computer use had contributed to a decrease in time spent with their patients. Although some nurses felt that the computer had helped them organize their work better, they did not report any significant impact on their ability to provide more quality caring to their patients. Some nurses felt that the computer had hindered their ability to listen or spend time talking to their patients. This obviously conflicts with the assertion by some authors that the computer can enhance the art of nursing, the caring part of nursing that is

so essential to nurses' work.

Quality of care

Although there is no specific discussion of how the quality of care with patients will increase or how this is measured, many authors suggest that computer use will contribute to an increase in the quality of patient care. This assumption is based on the belief that information technology will make accurate information available more quickly and in more complete, organized, and useful formats. With these new data will come better patient care.

The quality of care given to patients was not measured in this study. Rather nurses were asked about their perceived ability to engage in various caring behaviors. Again, the overwhelming response was that the computer had no effect on their caring abilities. They felt only that it had contributed to their sense of increased workload, decreased time with patients. Many nurses did comment that progress notes were more legible and complete but did not connect this with an increased ability to provide better care to their patients.

Status

Experience in other work settings that have been automated has shown some effect on the status of the

worker using the computer. In some settings there has been a redefinition of work roles, often explained as a deskilling of tasks and ultimately a decrease in worker status. Even where there has been no work role deskilling, the status of workers who have adjusted their work tasks through the incorporation of computers in their work has not increased. The nursing literature review showed that although there was no study that actually attempted to measure status as an outcome of computer use, several authors expressed the fear that automation would contribute to a decrease in nursing status because of the computer's potential to duplicate nursing work and thus eliminate the need for nurses. If the computer can provide accurate and instructional information it is speculated that a technician-type of person can perform the required tasks and there is no need for a specially trained individual--a nurse. Two authors suggested that computer use would not have an impact on the status of nurses.

In this study, 17 of the nurses felt that the computer had contributed to an increase in their status. The majority (50) however felt that there had been no change in their status as nurses. Status is a phenomenon that must be assessed over time and evaluated through more detailed analysis within the larger context of the hospital system (i.e. role in policy making,

financial benefits and security, and professional criteria). In this study, nurses reported very high levels of satisfaction (on a scale of 1 to 10, with 10 being the highest) with their work at this hospital--specifically their satisfaction with working conditions, financial rewards, and job security. Longitudinal studies of workplaces are needed to assess accurately any change in status for nurses using computers. At this point one can only assume a lack of change in status for these nurses.

Caring

Although many editorials and articles by nursing leaders have discussed the importance of the "art" of nursing and have suggested that computers cannot duplicate this aspect of nursing, or take it away from nurses, no research has been reported of the impact of computers on caring. A few authors mentioned the direct outcome of having more "high touch" aspects of nursing available but did not explain what this would entail. It was assumed that if computers had the capability to save nurses' time in clerical or routine tasks, then there would be more time available to provide hands on care, "high touch".

In this study no increase in the nurses' perceived ability to provide care to their patients was

found. The nurses actually reported a perception that they felt their time with patients had decreased even though they felt that they were still able to provide a high level of caring most of the time to their patients.

Summary

The review of twenty years of nursing literature revealed a fair agreement in perception of the impact of computers on nursing. It was assumed to be positive especially if nurses took an active role in its development. These perceptions were often based on assumptions and predictions rather that actual studies of hospital settings that had integrated computers into nurse's work.

However, comparing the actual experiences of this sample of nurses who had been using computers for a significant period of time, one sees a more complex picture of the role computers have in affecting change in nurses' work. These nurses did feel that careplans and notes were more legible and complete in general but that their workload had increased, their time with patients had decreased and that there had been no significant change in their ability to make decisions or to feel more autonomous in their work. The nursing literature seemed to have attributed a great deal of power to the computer as the direct factor in affecting

positive changes in the stressful work of nurses. Most authors did not discuss any of the complex factors of the larger health care picture in this society or that computers would be only one tool in this complex system, to be manipulated in many diverse ways. Furthermore, few distinctions in the literature were made among the many functions that contribute to the computer's usefulness as a tool--ease of program use, location and accessibility, capability of the computer to manage the volume and tasks of a given site, etc.. Few authors discussed specific aspects of the information system and even those that did made the assumption that once the "bugs" of a specific system were worked out, the outcomes for the nurses would be positive. This study has raised some questions as to what are the influences of the work outcomes for nurses who use computers. Even as a small sample, important questions are raised as to what role the computer plays in the changes that are seen in the computerized work setting.

The computer is often attributed with complex capabilities that have the power to enhance the role of the nurse and be a significant help in her work. It is usually assumed that computers are here to stay and that, generally, they will improve nursing as long as nurses take an active role in their development. Information documentation and transference is seen as a

primary factor in improving nurses' work and it is assumed that computers have the capability of improving this task.

Rarely does anyone ask why computer technology is needed in the first place nor what the priorities should be for improving nursing. The results of this study begin to raise various possibilities as to why changes are occurring and some ideas as to the complexity of reasons for this change. Perhaps not all of the change is due to the computer but rather the computer is becoming the facilitator for some more powerful sources of influence.

CHAPTER V

DISCUSSION

The initial goal of this study was to examine the experience of nurses using computers in a specific hospital system and within the context of the health care environment as a whole. It is important to analyze this experience recognizing both the micro and macro contexts in which the computer was introduced and to understand the complexity of forces that continue to influence the impact of this technology.

As the literature review demonstrated, very few articles have studied the impact of computers in the nurses' work setting. Only recently have studies looked at the contents of the work experience as perceived by nurses and the effect of the computer (Harris, 1990). Prior to this, various nursing leaders speculated about the organizational impact that computerization might have in nursing (Birckhead, 1975; Farlee, 1978; Giebink & Hurst, 1975; Romano et al., 1985; Zielstorff, 1981). A study in 1975 of a computerized work environment

reported that there had been significant changes in the work duties of nurses, in staffing composition and in the various responsibilities assigned to nurses due to the use of a computerized information system (Giebink & Hurst, 1975). Yet it has only been in the past year or two that new studies have begun to look beyond the documentation benefits of speed and legibility to the more substantial changes in nurses' work content.

The underlying assumptions in this study are that while computer technology does not in itself determine change, this technology is neither neutral nor value free; it is a tool and thus reflects the larger power structure of the system in which it is used. When an organization decides to incorporate computers into its system of functioning, there are goals and objectives for its use. The development of programs within the automated system are structured in specific ways (ie. standardized careplans, standardized categories of care, limited sections for free narrative) to fulfill these goals and objectives. To understand the influence of the computer in a specific work setting one must look at the context in which it is introduced and understand the outcomes as a reflection of the larger needs of that system.

Often people are seduced into believing that technology is the principal cause of social change.

Since the beginning of the industrial revolution, attempts been made through popular media to socialize the general public to believe in this technological determinism (Weizenbaum, 1976). This love affair with science and technology has at times influenced people to attribute many powers to the computer that often surpass reality. Winner (1991) labels this as "mythinformation" ,

> the almost religious conviction that a widespread adoption of computers and communication systems, along with broad access to electronic information, will automatically produce a better world for humanity. (p. 164)

Winner goes on to say that this "mythinformation" is based on four assumptions: "1) people are bereft of information; 2) information is knowledge; 3) knowledge is power; and 4) increased access to information enhances democracy and equalizes social power" (p. 166).

The underlying assumptions that contribute to this "mythinformation" have been present in the nursing literature since the advent of computer information systems into nursing more than twenty years ago. The belief has been pervasive that a significant part of patient care by nurses consists of the production, interpretation and documentation of information. It is assumed that the use of computers can facilitate this

process and thereby relieve many of the stressors that nurses deal with on a daily basis. The argument goes on to conclude that if nurses have access to accurate information quickly, then they will be able to make more accurate decisions, to document the results of these decisions and thus work more efficiently and productively. Ultimately this will earn nurses more recognition by the health care hierarchy for their contributions. This expectation is consistent with the scientific management philosophy begun in nursing in the 1920's and it is now being integrated into this information age.

With the significant changes in health care delivery finances over the past twenty years, nursing has been even more coopted in this "mythinformation" by extending these assumptions further in the definition of the role and responsibilities of nurses. In a capitalist society, value and power are often scaled in direct proportion to revenue production. At the same time that computers are more available for nursing to document the work performed more quickly and consistently, nursing is also being pressured to develop more creative cost-effective practices. This is in response to the increasing rise in the cost of health care delivery and the resulting fiscal crisis in hospital management. For example, responding to this

pressure and the availability of technological abilities, the rationalization in nursing has been that specific functions of nursing can now be itemized and documented for reimbursement; no longer should the "cost" of nursing work be part of the general room rate of patients but be reimbursed as other services are.

This study has attempted to look at the interwoven history of the social adaptation of nursing to computers through an overview and analysis of the nursing literature over a twenty year period and a comparison to the actual experience of nurses in a specific setting using computers in their daily work. The interpretation of this comparison takes into consideration the significant trends in U.S. health care delivery over the same period. Much of the early literature introducing nurses to the potential of computerization presents the goal of this computerization as the means to relieve the nurse of the excessive time and stress of documentation. This time in documentation has traditionally been thought to be what prevented nurses from involvement in the "essence" of nursing, from caring.

This study originally asked five questions that can be used to interpret the social and political context in which computerization is introduced into hospital worksettings and the changes it brings about. These questions are:

1- What changes have there been in national health care policies over this twenty year period and how have these changes affected the role of the nurse?

2- What themes can be identified regarding the impact of computerization on nursing?

3- How are computers discussed and used with regard to their role within the nursing unit, their effects on nursing functions, and patient care?

4- Have authors identified specific locations on the nursing unit as the ideal place for the computer--at the nurses station, at a separate work station or at the patient bedside? Are these locations influenced by or related to specific nursing functions?

5- How is caring defined as it relates to nursing and how is it considered when discussing the use of computers in nursing?

The specific, on-site study described in this paper provides some answers to these questions. Each will be reviewed in turn here.

1) Health Care Policy:

A) Economic Factors

Throughout the twenty year period in which computers were being introduced into hospitals, many significant changes in the delivery of health care

affected the way nursing is performed today. During the 1970's, the cost of health care delivery escalated out of control to the point that private and public insurance groups called for a review of the way reimbursements were being made for health delivery. In the early 1980's, in response to the need to find more cost-effective methods of delivering health care, the Center for Health Service Research at Yale University developed a method of prospective payment that identified payments relative to specific diagnostic categories (referred to as Diagnostic Related Groups--DRG). This system was tried out and developed in New Jersey and in 1983 was adopted as the method of reimbursement by Medicare at the Federal level. Nursing leaders attempted to relieve some of the anxiety felt by nursing administrators facing the task of cutting costs by suggesting that this path towards itemizing out nursing costs could actually increase the power for nursing. Prior to this prospective payment system, nursing costs were hidden in the hospital room rate. Nursing leaders suspected that the invisibility of the monetary value of nursing tasks contributed to the general historical devaluation of nursing in the health care hierarchy. Nursing approached this challenge in a variety of ways, one of which was to identify measurable standards of nursing care by "pricing its product

thereby increasing control over nursing practice." (Johnson, 1988, p. 36)

These arguments are reminiscent of the 1920's when nursing was turning towards scientific management and the standardization of functions to assess nursing effectiveness (Reverby, 1987). This was also similar to the response that nurses had during the initial anxiety over the introduction of computers into nursing practice. Originally the computer was introduced as a extraordinary tool that would answer many problems in health care delivery, causing some nurses to fear that computers might actually be used to replace nurses. The argument from many nurses was that nursing could control this change if they took an active role in the development of the information systems (Henderson, 1985; Zielstorff, 1977) because nursing could identify the qualities of nursing work that comprised both the science and art of nursing through measurable concepts (Dunlop, 1986; Johnson, 1988; Larson, 1981; Watson, 1979). If nurses controlled this innovation, then nursing would benefit from automation by the enhancement of these nursing qualities. In addition to identifying the specific tasks and responsibilities that contribute to efficient and productive nursing care, these tasks were being linked to a monetary reimbursement. These assumptions ignored the power of the larger hospital

system goal to increase productivity in revenues.

B) Nursing Shortage

In addition to the crisis over financial reimbursement of nursing services, nursing was also facing a severe shortage of staff which worsened in the past ten years. As the DRGs increased the acuity level of patients in hospitals and decreased patient's lengths of stay, there were also fewer nurses available to take care of these sicker patients. Thus in addition to finding the most efficient method of care, in the past ten years hospitals were also faced with maintaining a high quality of patient care with fewer nurses. Nursing administrators rationalized that the most cost effective and efficient way to maintain the quality of patient care was to have an all RN (registered nurse) staff. Many believed that RN's could do all that the other skilled nursing assistants (aides & LPNs--Licenced Practical Nurses) could do in addition to managing and interpreting the newly generated information. Yet the shortage of registered nurses further pressured nursing administrators to find additional new methods of nursing delivery. It was projected that by the year 2000 only 50% of the needed nurses would be available to provide skilled care in health care (Gross, 1989) In a report commissioned by the U.S. Department of Health and Human Services, a task force reported that hospital management

> must focus on utilizing advanced information system technologies such as artificial intelligence and expert systems to aid in making decisions for maintaining profitable operations, defining and measuring quality, and attracting and retaining skilled personnel. (Gross, 1989, p. 32)

Although it was nowhere specifically mentioned that the computer would replace nursing staff, the implication here was that with the information this technological system was capable of storing it would provide the knowledge and information needed for fewer staff to provide the skilled care need. This is consistent with Winner's (1991) "mythinformation" assumptions that information is knowledge and that knowledge is power. Thus computers are now being linked as a positive solution for dealing with the crisis caused by the nursing shortage.

C) Hospital Information Systems

At the time when the pressure to itemize nursing services for reimbursement increased and the sting of the nursing shortage was being felt, the majority of U.S. hospitals began to have the capability of the computer to document and categorize these services. Although the original expectation was that the computer would relieve the nurse of the time spent in clerical or documentation tasks and allow for more time to be with

patients, nurses were faced with a nursing shortage and pressure to be more cost effective. Computer advocates and some nursing administrators suggested that computers could actually cut the cost of health care delivery by enabling them to cut staff (Blum, 1984; Nathanson, 1986).

In a 1983 editorial in the first edition of the new journal Computers and Nursing, it was reported that the new expectation of computerized information systems in nursing was to "save money by cutting down on the personnel needed and the time required to complete clerical procedures related to financial, administrative and clinical activities" (Edmunds, 1983, p.2). Coupled with the nursing shortage was the hospitals' concern about the cost effectiveness of having installed the computer in the first place. Now the computer became a mechanism for fulfilling a complexity of needs: 1) the cost efficiency goals of the larger system demanded more accurate reimbursement guidelines, 2) there was a need to justify computer expenditures, and to increase productivity and efficiency within all its delivery services, 3) it was expected to assist nurses in providing patient care with a limited staff, and 4) the original hope persisted that nursing information systems would enhance the "essence" of nursing, the hands on patient care by relieving nurses of redundant tasks.

This was welcome advice in the face of the nursing shortage.

As it became more evident that the computer could assist nurses in caring for a greater number of sicker patients, the placement of the computer within the nursing unit began to be seen as yet another way to save the nurse time in the completion of her tasks. The physical placement of the computer at the patient bedside was now suggested as a way to even further decrease the time needed in indirect care activities by reducing the travel time required to access or document information (Winslow & Drazen, 1989).

2) The Impact of Computerization on Hospital Design

The physical design of the hospital has long been seen as factor in influencing the effectiveness of health delivery within hospitals. As the economic push for more productive and efficient care was emphasized in hospital management, the physical environment also became a source of cost effectiveness. More emphasis was put on bringing the work to the patient bedside and thus decreasing the amount of time spent walking between tasks. Moreover, this was seen as a way to increase the accessibility of information at the point where the contact with the patient took place (Gross, 1989; James & Tatton-Brown, 1986; Nathanson, 1986; Soonit, 1987; Winslow & Drazen, 1989). As Lucille Joel, the president

of the American Nurses Association predicted in 1987,

> the survival of nursing under DRGs was dependent upon carrying out a philosophy of cost-efficiency at the bedside; fine-tuning unit routine, personnel utilization, and clinical programs to maximize the use of increasingly limited resources; creating and managing internal data to document the change in nursing intensity and nursing's contribution to hospital financial solvency; and costing out nursing resource consumption case by case. (cited in Johnson, 1988, p.39)

Here the momentum for increasing nursing productivity and efficiency was clearly connected to a physical dimension, although many designers, nursing administrators and computer system developers had previously recognized the role of the physical location of the nurse's work station to be significant in the administration of patient care and the transmission of information. Again, history seems to repeat itself. Studies of hospital design and the scientific management in nursing in the 1920's also looked at the spatial arrangements of hospital units through time-motion studies. However, here the connection of efficiency and productivity to monetary reimbursement was not as clearly stated (Reverby, 1987).

The reality of hospitals putting in bedside

computers has been slow in coming due to the burdensome expense of physical redesign in some hospitals and the expense of the additional terminals needed at the bedside (Winslow & Drazen, 1989). Yet even with these added expenses, nursing leaders and computer advocates assert that bedside computers would further relieve the strain caused by fewer nurses caring for sicker patients by providing the tools (terminals) at the bedside (Nathanson, 1986; Soonit, 1987; Winslow & Drazen, 1989).

3) Nursing Literature

This study and other similar studies of the nursing literature identified only a limited number of benefits of computer use in nursing [see Tables 1 through 4 for frequencies of results for this study] and reveal that most of these have been based on assumptions and not grounded in empirical data (Staggers, 1988). In the literature that used on-site studies to document outcomes, the results have been mixed (Kjerulff, 1988; Packer, 1986 & 1987). The majority of the articles and studies focused on the documentation and communication abilities of the computer (i.e. increased legibility of notes, more complete charts, and decreased time in documentation due to the standardization of the formats) and emphasized the productivity and efficiency of the nurses. Although productivity and efficiency were

rarely defined in any of the studies, it was usually assumed that if nurses were spending less time on indirect patient care, they could be using that time in more direct care tasks and thus taking care of patients more effectively, being more productive.

Only recently has a study looked at the professional qualities of the work of nurses in an automated work setting, identifying the issues of control and autonomy of practice as significant areas of to be studied (Harris, 1990). Prior to this, the emphasis of most of the published discussions about the impact of automation was on need to increase nurses' knowledge and acceptance of this new technology. Many articles and studies looked at ways to teach computer technology in nursing educational settings. Others looked at ways to improve nurses attitudes towards computers in hospitals. All of these articles had the goal of facilitating the acceptance and integration of computers into the nursing setting.

4) Location of Terminals

Very few articles that discussed computers in nursing identified the placement of computers within the physical setting of the nursing unit. It was not until the issue of the bedside terminal became a reality that the placement of computers became a common factor of

discussion. Yet even in settings where the computer was at the nurses station or at a separate work station, no analysis was done of the use of this spatial dimension in any of the nursing literature that was reviewed. Only one article focused on the "ergonomic" features of the computer system and then only in the context of an educational environment discussing the ideal placement and design features of the terminal (Armstrong, 1984). Only one article discussed the connection between the physical environment, technology and caring (Murphy, 1984).

This is a very surprising omission in light of the awareness of the ways in which the dynamics of the physical space of the nursing unit contribute to the stress levels of nurses work. The power in the belief that the computer can correct major ills in the hospital settings overshadows the role of the physical dimensions for the majority of people. In this age of information, the assumption that access to information becomes knowledge and thus creates power takes on a critical position in the hierarchy of solutions to the ills in health care delivery. Few people question the way that the information is developed or the format it is transmitted in and how that influences work content except to say that it is important for nurses to do the developing. But information is not value free, neither

in its content nor in its structure, whether it is produced by nurses or other disciplines. Research questions must go beyond the quantity and efficiency of information as data to gain a greater understanding of the longterm effects of computers in nursing. This study found that the placement of the computer at the bedside had complicated results to the work processes of the nurses. These results will be discussed further later in this chapter.

5) Caring

It is through the discussion of the art of nursing in contrast to the science of nursing that one becomes aware of the need to broaden our understanding of information beyond the notion of information as simply data. Although many articles discussed the "essence" of nursing as being the humanistic quality of nursing, no article ever attempted to analyze the impact of the computer on this quality of nursing work. The only issue that was assumed to connect to the caring aspect of nursing was the time traditionally spent in documentation because it took away from time with patients. Most of the studies that found that the use of the computer decreased the time nurses spent in documentation only assumed that this added time was spent with patients. But as Kjerulff (1988) reported in

her review of these studies, the investigations that looked at the resulting time with patients found that there was no increased time spent with patients and that this "free" time was actually spent over a wide range of indirect care activities. Other studies found that the reduced time necessary for documentation resulted in a decrease in overtime costs (Gross, 1989; Hughes, 1980; Viers, 1983). Some authors reported a decrease in the time spent with patients (Birckhead, 1978) and an increase in time spent in documentation (Grier et al., 1985; Tamarisk, 1982). Yet even as these mixed results became more widely recognized and raised questions about the universally accepted belief that computers would automatically save nurses time, no one followed up with the next step to see if there was any effect on the "art" of nursing or on the humanistic quality of nursing work. This study found that although the time in documentation seemed to have decreased, nurses did not have more time to be with their patients but rather had more patients to be with. Overall it was also significant to find that the nurses in this study did not connect this decreased documentation time as necessarily a positive outcome, neither in their satisfaction with their work nor in their ability to provide caring to their patients. The majority of the nurses felt that the computer had no significant effect

on their caring abilities.

Conclusion

A number of intriguing conclusions are suggested by the comparison of the site-specific results with the nursing literature. First, the issues that have been stressed over the past twenty years have lead the way in the introduction of computers into nursing work. This overview has identified several important criteria that nurses have found to contribute to the successful implementation of the computer in nursing units: 1) nurses must be involved in the development and implementation of computer systems in order to maintain control of computer's usefulness to nursing, 2) nurses must have adequate training and preparation in computer use, 3) there must be an adequate number of terminals available and accessible for nurses' use, and 4) the information system must be flexible and integrated within a larger hospital information system.

The hospital studied here fulfilled all of these requirements: 1) nurses were instrumental in all phases of the planning and adoption of the computer system and nurses continue to be the significant staff in ongoing training and upgrading; 2) in this study the nurses reported a high degree of satisfaction with the quality of training to the computers; 3) the nurses reported

adequate numbers and easy accessibility of terminals with bedside computers on all units plus terminals at other work areas; 4) the Nursing Information System is part of a larger Hospital Information System that is gradually being integrated into all the hospital departments.

Yet even with all these important criteria met, the results of this study of the actual experiences of the nurses showed a complicated picture of problems and benefits. The hospital studied here is a major teaching hospital and a well-recognized medical center for high quality health care delivery. Moreover, the nurses themselves reported a relatively high ability to provide care to their patients. Although this study did not look at specific measurements of quality of patient care, the nurses were asked about their own ability to provide a variety of caring behaviors that ranged from various skill abilities to more subjective comforting behaviors. The majority of nurses reported a high degree of ability to provide all of these behaviors "most of the time." The difference in the frequencies of abilities were clustered in those behaviors that required more open-ended time to fulfill. The nurses reported having most difficulty providing the comforting and trust behaviors (having time to listen, talk and comfort the patient). This result is significant

because these nurses reported that they felt the use of the computer had actually increased their workload and decreased their time with patients.

It is important to interpret these results in a broad context and to view them as not totally the result of computer use. As noted in the description of the research site, the design of this hospital originally followed the philosophy that decentralization of the communication and task stations to the patient bedside would facilitate patient care. This philosophy was compatible with the prevailing assertion that bedside computers would further improve productivity and efficiency. But the analysis of the nurses' own perception of the placement and use of the computer in each of the nursing units reveals a more complicated range of factors. The degree of convenience of the location of the terminals was significantly correlated with how much the nurses perceived their workload had increased. The less convenient the terminals were assessed to be, the more the nurses reported a minimal (or no) increase in their workload. Yet the more adequate the number of terminals, the more the nurses felt they were able to provide caring to their patients. One interpretation of this apparently contradictory result is that the convenience of the computer actually contributes to a perceived increase in workload. If the

computer is physically present, nurses may feel pressure to work at it. From these results, one begins to question the assumption that the placement of the computer terminal at the bedside contributes to the ability to provide caring behaviors. Perhaps it is more important to have sufficient numbers of terminals available at accessible and adequately sized work stations than at the patient bedside. It may also be that the bedside placement of the terminal actually interferes with the nurse-patient interaction; the nurse may feel pressure to work at the computer because of the increased emphasis on documentation in nurses' performance today. When confronted with the choice of talking with the patient or "talking" with the computer, the nurse may feel that the latter is "more important."

The perception that their workload had increased significantly because of the computer may be due in part to the rationalized outcome alluded to earlier in the discussion of the influence of the nursing shortage and the push towards cost-efficiency in this computer era. It is assumed that if the nurse spends less time documenting and traveling between tasks, then she will be able to use this extra time to take care of more patients. As we have seen, hospital managements have greatly increased both the number of patients assigned to each nurse and the shift to DRGs for reimbursement

has ensured that patients illness are more acute. Thus, the perceived increased workload and decreased time with patients may only partly be due to the presence of the computer. It may also be that, as more emphasis is put on the need for nurses to document information in standardized formats, there is a greater amount of information that must be documented. In the hospital studied here, the nurses are required to use two kinds of charts--the computerized version on the screen and a paper chart, consisting of the computer print-outs and the hand written documents from the departments not yet "on-line." This need for double charts is temporary until all departments are on-line. Yet this probably contributes some to a perceived increase in workload brought about by the computer.

Another hope was that as nurses' control over the development of computer systems increased, they would see an enhancement of the caring aspects of nurses work. It was reported earlier that the nurses felt that even though their time with patients had decreased, they also felt that the computer had no significant effect on their caring abilities; they further reported a relatively high degree of satisfaction with their work.

Even though the nurses reported a high degree of satisfaction, some reported that they felt the computer contributed to their feeling of isolation from coworkers

and that the documentation did not always reflect the quality of the interactions they had with patients. In looking at the specific satisfaction factors of these nurses, it is interesting to note that the perception of their colleagues' judgment of the computer had a significant role in affecting their own satisfaction both with interpersonal and involvement tasks and with their overall job. The nurses who were most satisfied with their work were those who felt that their colleagues felt more positive about the use of the computer on the unit.

Nursing is very much a people oriented profession, not just in its service to patients but in its dependence on collegiate support. This is an important factor that must be addressed in studying the longterm impact that computers will have on nursing: how group opinion affects the integration of the computer into the work setting and how the computer affects the quality of the interactions among the nursing staff. If it is understood that only if people take an active role in defining and implementing the computer in their work, will they have the benefits of controlling their own practice. This active role is not an individual role but requires a collective involvement and some degree of group cohesiveness.

In the nursing literature reviewed for this study,

the articles about nurses' attitudes towards computers only dealt with the individual's own perceptions and not with the attitudes of colleagues. It is obvious that peer opinion plays a major role here. Future studies need to look further at both the group interaction of the nurses within automated settings and the effect of their opinions on each other.

Several authors have speculated about the potential of the computer to undermine the richness of nursing work because of its reliance on the standardization of vocabulary and its tendency to increase the amount of data for which nurses would be responsible (Birckhead, 1978; Tamarisk, 1982; Zielstorff, 1981). Yet no studies evaluated these qualities in assessing the impact of the computer in nursing work. Recently a published study reported that a sample of nurses actually felt a loss of quality and richness in their work (Harris, 1990). In this study, nurses reported in the open-ended responses that they felt a loss in the quality of their documentation while also reporting some feelings of isolation, less time with patients and less time with other staff.

Some researchers have also speculated about the potential of the computer to enhance the nurse's sense of autonomy and control through improved decision making ability. On this issue, this study again found

contradictory results. The majority of nurses did not feel that the computer had any effect on either their sense of autonomy or on their decision making ability. The nurses reported that they felt they had a great deal of control over their work and that the computer had significantly effected this sense of control. Unfortunately they were not asked to described how they felt it had effected their sense of control. The nurses who felt there had been no change in their sense of autonomy felt that they were better able to provide overall caring and specifically better able to provide anticipatory and comfort and trust caring behaviors. One would have expected that an increase in autonomy would improve a nurse's ability to provide caring to their patients. Yet nurses reported an ability to provide this level of care without any reference to the computer.

The findings about autonomy here remain ambiguous. The study referred to earlier of nurses who use computers for development of patient care plans found that the computer contributed to a loss of autonomy, a loss of individualization of care and a loss of nursing expertise (Harris, 1990). This loss is suspected to have been due to the increased standardization of care in nursing work, leaving little planning of the individualized care to the nurse. The nurses in the

Harris study felt that they were rewarded more for having documented careplans than for having given quality care. Although it is difficult to make comparisons between these two groups since there are many factors within each system that affect nursing practice, the open-ended responses by nurses in this study revealed that there was some concern about the loss of richness in documentation and the increase in emphasis on the use of standardized notes versus open text notes. If the documentation is loosing the richness or quality of the caring that the nurses are giving, how will this affect their perception of the value of this caring over time? This change may also have significant implications for the nurse's sense of autonomy.

Even though there were several nurses who voiced concern about the standardization of documentation in this system, they still did not report a decrease in autonomy or decision making ability. What they did report was frustration that the notes often did not reflect the care they had provided or the quality of the status of the patient. The nurses also reported a significant degree of dissatisfaction with the program functions within the system that produce these standardized careplans. Since this system has only been functioning for two years, some of the longterm effects

will not have surfaced. As charts are converted more and more to computer generated reports, will the nurses rely more on standardized forms and less on a commitment to individualized care and documentation? Will increased workload push nurses to turn to standardized language thus contributing to a loss of interpersonal relationships, individual creativity and critical analysis--a loss of care?

There is an underlying assumption that all the support a nurse needs to carry out her work is the power of the information that can be produced by the computer. With the placement of the computer close to the point-of-care, the nurse should feel that everything she needs for providing good patient care is accessible to her. Yet nurses in this study reported concern about the increased sense of isolation they sometimes feel with everything being at the bedside. As one nurse stated "I can often go for much of a shift without seeing another nurse." In addition to the refocus of the communication and documentation system on the computer, the design of this hospital has also decentralized support by deemphasizing the nurses station. Moreover, these nurses did not feel that the computer enabled them to increase their decision-making ability. In light of the recent work of Benner and Wrubel (1989) in identifying the significant role of mentoring in developing expert

decision-making ability, it is especially important that the impact of automation be evaluated as to its influence not only on group development but also on quality and style of decision-making among nurses. Group interaction and discussion may prove to have as much or more influence on patient care than the amount or accessibility of information retrievable from the computer.

These nurses provide clues that too much is being expected of the computer. Several authors have discussed the need for personal contact with others both in jobs and in social settings to provide buffers for work related stressors (Baum, Singer & Baum, 1982; Benner & Wrubel, 1989; Benton & White, 1972). It has even been suggested that with the escalating sense of isolation in our society today, contact with the computer is actually being used as a replacement for a feeling of companionship (Easterbrook, 1991). In their study of the development of the expert nurse, Benner and Wrubel (1989) found that mentoring by other nurses is important in developing expert thinking and that this thinking is non-linear, unlike the linear reasoning of computers. Here too these results suggest that the bedside workstations may actually decrease staff support and cohesiveness because of their isolation in patient rooms. Moreover, with the increase in nurse/patient

ratios, nurses are required to spend even more time in patient rooms. This interference in staff support and modeling may also contribute to a decrease in the development of expert thinking among nurses.

In their evaluation of their level of fatigue, the nurses felt that they were extremely tired at the end of the shift and that there was really no adequate space on the unit to get some relief during the day. The assumed increase in energy due to the reduction of time needed to do clerical tasks that had been promised with computerization have never materialized. The nurse is still faced with a highly stressed, intensive work shift with no adequate physical supports to relieve these stressors.

The more one looks at the results of this study and the discussions in nursing literature, the more the significance of communication or relating to other people becomes. It is almost as if the movement of our society into an information era has blinded us to the basic question of how information contributes to interpersonal contact. Without a broad and complex analysis of how people communicate and how communication affects interpersonal interactions, technological innovations that manage the manipulation and transmission of information are studied in a very narrow context. The definition put forth by the Study Group on

Nursing Information Systems assumed that the information managed within the computer system is simply data that are needed for a nurse to fulfill a certain role. But clearly the format of this data or information will have an impact on how the person reading it uses it and thus communicates with others.

The emphasis in nursing has been on standardization for a variety of reasons discussed in detail in this study: the fiscal pressures on health care delivery, the nursing shortage, the emphasis towards increased productivity and efficiency related to cost cutting needs, and the capabilities of the computer to provide the technology to chart nursing tasks for revenue producing results. In no way does this account for the interactive process of communication nor the myriad of individual decisions that go into patient care. In the past the outcome assessing quality and productivity of computer use had been measured by the number and completeness of documentation (Staggers, 1988) or by the number of patients admitted and discharged (Goldstein & Farlee, 1972) but rarely by the satisfaction of the nurses to control their own practice or by the quality of the interactions between nurses and patients within the automated environment. Concern about the standardization of documentation has been raised in the past by several authors (Harris, 1990; Tamarisk, 1982;

Zielstorff, 1981). It has also been shown that nurses spend more time tending to the new technology instead of spending the increased time in direct contact with patients (Birckhead, 1978; Desborough, 1987; Tamarisk, 1982; Zielstorff, 1981). Perhaps what is happening is that nursing's first priority is becoming documentation rather than human interaction.

Has anything really changed for nurses with the introduction of computers as far as increasing the power or value of nursing within the healthcare delivery hierarchy? In the 1920's it was suggested that

> 'scientific management of tasks improves the spirit of the workers.' The introduction of standardization techniques, time and motion studies and more theory in nursing education was, it was hoped, to make it possible to restore dignity to nursing, rekindle its ideals, and upgrade its status. (Reverby, 1987, p. 155)

Today with prospective payment systems (DRGs), computers and the nursing shortage, nursing management suggest that computer information systems

> may well be the means to establish power for nurses if they accept the change, plan for the future, and identify their value [through costing out nursing services] to the DRG world. (cited in Johnson, 1988, p. 31)

The hope after seventy years is still to increase the power and status of nursing through the standardization of nursing tasks. This standardization is still expected to elevate nursing within the scientific community through the incorporation of scientific methodology in the field.

In the past seventy years, nursing has definitely changed in its standards of education and income level but relative to achieving any clarification or enhancement of what has long been termed the art of nursing, i.e. caring, there has been little change. Studies that have looked at computers and social change in other environments have found that what was actually produced was an "increase in power by those who already have a great deal of power, an enhanced centralization of control by those already in control, and an augmentation of wealth by the already wealthy" (Winner, 1991, p. 165). The effect that computerization is having and will have over time on the status of nursing, the essence of nursing or the content of nursing processes, must be studied in a broad context. The standardization of nursing language is part of the process of nursing interaction and must be analyzed as to its effect on the nursing profession, the sense of self-control over nursing practice, decision making ability and expert reasoning.

This study has shown that although the computer has brought several benefits in the quantity and legibility of the documentation abilities of nurses, little has changed to relieve them of the stress associated with high intensity work or to enable them to spend more time in interactions with patients or peers. The computer is becoming a metaphorical companion to nurses to supply informational support and reasoning as well as interaction. As experience progresses with the adaptability of the nurses to work in high intensity settings, standards will change and expectations of productivity and efficiency will be redefined. But there is more to human interaction and nursing than productivity and efficiency measured in economic terms. Future research must look at the qualities of the work content. These assessments must also take into consideration the full environment of the work experience, analyzing the complex interactions of the physical (spatial and object materials) with the person. In trying to find supports for enhancing the quality of work life for nurses, the processes of workplace interaction must be fully understood.

Critique of Methodology

The methodology used to answer the questions in this study and for future studies is critical in

understanding the outcomes. In this study, closed-ended questions in the form of a survey questionnaire were the primary method of gaining information. But this standardization of results limits the richness of the scope of information and relies on structured scales of responses. Many of the clarifying interpretations of these scales came from the open ended responses that the nurses wrote but these were limited because of the questionnaire format. Interpretive clarification came through the researcher and not from the source. Individual variations had to be suppressed. Ultimately, since interpersonal relations and individual responses are not straightforward or objective processes, the use of standardized methods of measurement--whether by nursing or in other research--can suggest only a small part of the picture. This confirms the finding of this study: while computers can play a significant role, they should be viewed as only one tool among many, facilitating the communication of data but never replacing the distinctive richness of human relationships.

The interpretation of these somewhat contradictory results must be complex. These issues are very complicated concepts that do not lend themselves easily to being operationalized into measurable issues. More open-ended interviews with nurses are needed to

identify the richness and complexities of these concepts: caring, autonomy, and decision-making. Several authors have identified the complexity of expert thinking and demonstrated the non-linear process of this kind of reasoning (Benner & Wrubel 1989; Dreyfus & Dreyfus 1986). Operationalizing concepts assumes a linear process, but semi-structured interviews would allow for the discovery of the more intuitive qualities of these processes and thus identify changes perceived by the nurses. Future research should also explore these caring behaviors through observational methods as well.

One reason for the contradictory result discussed earlier about autonomy may be a confusion about definitions of autonomy since no definition was provided in the questionnaire. In open discussions with the nursing management at the hospital, there appeared to be consensus with this researcher about the broad concept of autonomy. However, while this researcher hoped to focus on the individual's sense of autonomy, these administrators emphasized a philosophy within the hospital of unit autonomy, i.e. control over practice and patient care on each unit. The responses of individual nurses were no doubt colored by this ambiguity. This ambiguity may have been clarified if there had been more access to open-ended dialogue

between the nurse and researcher. It is the complexity of these concepts that need to be tapped to truly understand the complexity of the automated nursing environment.

Questions for Future Research

Several questions are posed for future research:

1) As the redesign of nursing units brings physical materials closer to the patient bedside, decentralizing work stations, how can nurses make contact with peers or other support persons?

2) Standardization of documented information may improve information sharing through its uniformity of meaning and improved legibility but how does this standardization affect creative and critical thinking that is essential to expert reasoning?

3) In geographic settings where the fiscal crisis and staffing shortages are not as great as in the Eastern areas of the United States, is the computer being rationalized as a means to increase nurse/patient ratios? Are there changes in the staffing and job descriptions in hospitals that have resulted from nursing information systems?

4) Why is it that many nurses perceive that their time with patients has decreased as a result of computerization? Through observational and interview

methods, nurses work processes with the computer need to be further understood. Comparative studies of settings with computers located in different places and non-computer settings are needed.

5) How has the computer affected nurses' ability to work in groups and as individuals? Is autonomy desirable either for nurses as workers or for increased quality of patient care?

6) How has the linear processing of information by the computer affected the non-linear processing of information of human beings within nursing reasoning? How are complex decisions made in automated compared to non-automated settings?

This study has raised more questions than answers. It is evident from reports of the nurses in this hospital that computers have not enhanced their work as is frequently suggested in the literature. But it has also been demonstrated that there is not a direct cause-effect process happening with this change to computer information systems. Nursing environments are complex systems that have been influenced by a long history and continue to be influenced by complex factors today. The introduction of information technology into these environments will share in the complexity of the influences with all the other factors affecting nursing today. Only through recognizing these multi-dimensional

interactions will one begin to understand the role that computers are playing in nursing today.

APPENDIX 1

CODING SHEET FOR ARTICLES

Analysis of Journals/Conference Proceedings

Date: _____ Title: _____

Journal: 1968-1989 Conference:

___ Amer.J Nursing ___ NIH Comp. Tech. & Nursing

___ Comp. in Nursing 1981 & 1982

___ J of Nursing Admin. ___ SCAMC 1981-1989

___ N A Q

___ Nurising Outlook

___ Nursing Management

___ Nursing Research

___ J of Professional Nursing

Article:		Author:		Setting:	
research	_____	nurse	_____	hospital	____
theoretical	_____	MD	_____	regional	____
opinion or		computer	_____	n. unit	____
prediction	_____	other	_____	location	____
combination	____			(on unit)	
evaluation	____				
descriptive	____				

Content:

* hardware____ software ____ * HIS/MIS_____ NIS ____
* location : _____ not mentioned
  - NS ____ (1) inconv. (2) neither (3) conv.
  - bedside____ (1) inconv. (2) neither (3) conv.
  - other ____ (1) inconv. (2) neither (3) conv.
* evaluation: software ____ (1) ineff. (2) nei. (3) eff.
  - computer usage ____ (1) ineff. (2) nei. (3) eff.
  - unit ____ (1) ineff. (2) nei. (3) eff.

* impact: nurses/pts (1)neg effect (2)mixed (3)pos effect
  - nurses (1)neg effect (2)mixed (3)pos effect
  - admin. (1)neg effect (2)mixed (3)pos effect
  - financial (1)neg effect (2)mixed (3)pos effect
  - communication (1)neg effect(2) mixed (3)pos

* Kind:

time	(1) dec	(2) no change	(3) inc
n/p contact	(1) dec	(2) no change	(3) inc
productivity/efficiency	(1) dec	(2) no change	(3) inc
job sat.	(1) dec	(2) no change	(3) inc
caring	(1) dec	(2) no change	(3) inc
staff	(1) dec	(2) no change	(3) inc
workload	(1) dec	(2) no change	(3) inc
N. status	(1) dec	(2) no change	(3) inc
quality	(1) dec	(2) no change	(3) inc

* Nursing functions:

essence	____	define_____
hi-touch	____	"_____
caring	____	"_____
other	____	"_____

Primary focus_____ Secondary focus_____

JOURNALS

American Journal of Nursing
Computers in Nursing
Journal of Nursing Administrators
Nursing Administration Quarterly
Nursing Outlook
Nursing Management
Nursing Research
Journal of Professional Nursing

CONFERENCES

Computer Technology and Nursing -National Conf. NIH
Symposium on Computer Applications in Medical Care
(SCAMC)

APPENDIX 2

LETTER OF INTRODUCTION AND CONSENT FORM

Dear Colleague:

I am a nurse and a PhD. candidate at The Graduate School of the City University of New York. Currently I am engaged in dissertation research on the impact of computerization on the work environment of nurses. The results of this study will identify and clarify how computers have affected the daily working experience of nurses regarding the use of physical spaces, perceptions of job satisfaction and abilities to provide nursing care.

Your participation in this study is completely voluntary. Your acceptance or refusal to participate in this study will not affect your employment at this hospital in any way. All data collected will be held confidential and anonymity of all participants will be strictly maintained.

Data will be collected by each nurse answering a questionnaire that will take approximately 30 minutes to complete. I will be the only person to see the completed questionnaires. There will be no identifying information on the questionnaire to directly link the responses to any participant. There is no potential risk involved in participating in this study.

The results of this study will be summarized in a report and shared with your hospital nursing department. If you would like a copy for your own review, please write to me giving me your name and address. Do not include your name or address with your questionnaire.

Please read and sign the attached Consent Form and return to me.

Thank you for your consideration of this request. Please feel free to contact me or my thesis advisor, Dr. Gary Winkel at CUNY, with any questions concerning any part of this research.

Sincerely,

Lena Sorensen R.N. M.S.
Environmental Psychology
Graduate Center- CUNY
33 West 42nd Street
New York, New York 10036
212-642-2575

CONSENT FORM

I _____, have been invited to participate in a study on the impact of computerization on the work environment of nurses under the direction of Lena Sorensen from the Graduate School of the City University of New York.

I understand that my participation in this project is completely voluntary and that I may terminate at any time. My acceptance or refusal to participate in this study will not affect my employment at this hospital in any way. I understand that all data collected will be held confidential and anonymity will be strictly maintained.

I understand that there are no potential risks or benefits in participating in this study. I have read and understand all written materials which have been provided to me further describing the study.

I voluntarily consent to participate in this research project.

_____ _____

Volunteer's Signature Date

APPENDIX 3

NURSES, COMPUTERS AND WORK SATISFACTION QUESTIONNAIRE

In the past decade there has been an increase in the utilization of computers in the hospital's direct health care areas. Although computer technology has long been incorporated in other areas of the hospital (hospital information systems for cost/product control), nursing information systems (NIS) are now rapidly being developed for direct use by nurses in the day-to-day care of patients. Computer technology is becoming more and more an integral part of nursing and medical care.

To date very little research has been done to identify the impact this computerization is having on the nursing profession and more specifically the effect it is having on the work environment of nurses. This study is an attempt to identify and clarify how computers have affected the daily working experience of nurses as to the use of physical spaces, perceptions of job satisfaction and abilities to provide nursing care.

This questionnaire should take approximately 30 minutes of your time to complete. Please do not put your name on the questionnaire. All information included on this questionnaire will be completely confidential and your anonymity will be strictly maintained.

Please answer the questionnaire without group discussion. I want this to represent your own perceptions. Once all those participating in this study have completed the questionnaire, please feel free to discuss it with your colleagues.

Please answer all the questions. Circle the numbered choice directly after each question that best represents your view. You may write any additional comments in the right hand margin.

Please return the questionnaire in the enclosed envelope and seal it. Then deposit it in the designated box at the Nursing Office.

Thank you very much for your time and interest in this study. Please feel free to contact me if you have any questions or additional comments. A summary of the results of this study will be distributed to all nursing staff through your nursing department.

Lena Sorensen RN MS
6 Perry Street
Cambridge, Ma. 02139
617-491-2491

NURSES, COMPUTERS AND WORK SATISFACTION QUESTIONNAIRE

SECTION I: Background information. Please check the appropriate box or fill in the answer.

Nursing Unit:_____ Date:_____ CODE: _____

Age:_____ Sex: ☐ Female ☐ Male

Do you work: ☐ Full-time ☐ Part-time

Which shift do you usually work?

☐ days ☐ nights

☐ evenings ☐ rotate ⇨ Which shift?

What is your highest degree in nursing:

☐ Diploma ☐ Masters degree

☐ Associate Degree ☐ Other ⇨ Please specify:

☐ Bachelor Degree

How many years have you been actively working as an RN?_____

Please give the date that you began work on this unit._____(month)_____(year)

Please give the date that you began work at this hospital. _____(month)_____(year)

SECTION II: Characteristics of your nursing unit.

The next questions deal with some specific characteristics of the nursing unit you work on. Please answer every question.

Number of patient beds on this unit? _____

How many patients were you assigned to care for today?_____

Is this the usual number of patients that you are assigned?

☐ more than usual ☐ less than usual ☐ the usual number

Where is the nurses station located on your unit?

☐ center station on a circular unit
☐ center of corridor
☐ center of T corridor
☐ end of corridor
☐ other ⇨ Please describe:

How many people, on the average, use the nurses station at a given time? _____

Think about the size of the nurses station and your ability to do your work at the nurses station. Is it:

☐ very adequate
☐ somewhat adequate
☐ neither adequate nor inadequate
☐ somewhat inadequate
☐ very inadequate

How accessible is the location of the nurses station to patient rooms:

☐ very accessible
☐ somewhate accessible
☐ neither accessible nor inaccessible
☐ somewhat inaccessible
☐ very inaccessible

Is there enough privacy at the nurses station to:

1. do your work: ☐ yes ☐ no Explain:
2. talk to staff: ☐ yes ☐ no Explain:
3. talk on phone: ☐ yes ☐ no Explain:

Is there a nurse's lounge on your unit?

☐ No ⇨ Skip next FOUR questions (Page 4)

☐ Yes ⇨ Where is it located?

- ☐ behind the nurses station.
- ☐ on the unit but not at nurses station.
- ☐ off the unit.
- ☐ other: describe:_____

Is this location convenient for you to use?

☐ Yes ☐ No ⇨ Why not?

How often do you use the nurse's lounge?

- ☐ every day
- ☐ several times a week
- ☐ once a week
- ☐ a few times a month
- ☐ rarely
- ☐ never

Who uses the nurse's lounge? **[check all that apply]**

- ☐ nurses
- ☐ doctors
- ☐ nurses aides
- ☐ others: Describe:

What is the nurse's lounge used for: **[check all that apply]**

- ☐ to rest/ socialize
- ☐ team meetings/conferences
- ☐ meetings with patients & families
- ☐ to do written work/ read records
- ☐ other Describe:

How tired are you at the end of your shift?

- ☐ Very tired
- ☐ somewhat tired
- ☐ neither tired nor refreshed
- ☐ somewhat refreshed
- ☐ very refreshed

SECTION III: Computer Systems

Now I am going to ask a number of questions that deal with the location and use of the computer systems on your unit.

How many terminals are there on your unit?_____

Is this an adequate number of terminals?

- ☐ very adequate
- ☐ somewhate adequate
- ☐ neither adequate nor inadequate
- ☐ somewhat inadequate
- ☐ very inadequate

Where is the computer terminal located on your unit?

- ☐ at the nurses station
- ☐ in patient rooms (bedside)
- ☐ at a special work station
- ☐ other Specify:

Are the terminals conveniently located for you to enter/retrieve information?

- ☐ very convenient
- ☐ somewhat convenient
- ☐ neither convenient nor inconvenient
- ☐ somewhat inconvenient
- ☐ very inconvenient

Who uses the terminals on your unit? **[check all that apply]**

- ☐ nurses
- ☐ doctors
- ☐ ward clerks
- ☐ others Specify:

Is the keyboard the primary mechanism for entering data into the computer? 225

☐ yes ☐ no: How?

The next three questions are related to the level of ease or difficulty you may have with the use of the computer. Please circle your level of ease/difficulty using the following scale:

1	2	3	4	5
Very Easy	Somewhat Easy	Neither easy nor difficult	Somewhat Difficult	Very Difficult

Level of ease/difficulty:

Use of computer	1	2	3	4	5
Entering information	1	2	3	4	5
Retrieving information	1	2	3	4	5

Does the response time of the computer create problems for you?

☐ no ☐ yes ⇨ please explain:

Where is the printer located?

☐ with the terminal

☐ in a different room than the terminal- on the unit

☐ other Describe:

Is the location of the printer convenient for you?

☐ very convenient

☐ somewhat convenient

☐ neither convenient nor inconvenient

☐ somewhat inconvenient

☐ very inconvenient

To what extent does the sound of the printer create a problem for you while you are working?

☐ always a problem ☐ sometimes ☐ not a problem

How often is the computer "down" or not operating?

☐ very often ☐ occasionally

☐ somewhat often ☐ rarely

SECTION IV: Computer use, satisfaction & training.

In this section, you will be asked questions about your use of the computer, how satisfied you are with these uses and lastly your feelings about computer training. The first questions ask about the various ways you may use the computer and how satisfactory these functions are. Read each function, first determine whether or not you use the function. Circle either 1 for use or 2 for not used. Second, please circle your level of satisfaction with this function. Circle 1 for satisfactory and 2 for unsatisfactory.

	Usage		**Satisfaction**	
	1	2	1	2
	Use	Not Used	Satisfactory	Unsatisfactory
1. ordering tests/equipment	1	2	1	2
2. sending messages	1	2	1	2
3. receiving test results	1	2	1	2
4. care planning	1	2	1	2
5. charting medications	1	2	1	2
6. nursing documentation	1	2	1	2
7. scheduling/staffing	1	2	1	2
8. to get information (ie. drugs, diagnosis)	1	2	1	2
9. other:specify( )	1	2	1	2

Do you feel that you have had adequate training in how to use the computer?

- ☐ very adequate
- ☐ somewhat adequate
- ☐ somewhat inadequate
- ☐ very inadequate

Do you feel that you have adequate backup for answering questions about the computer when they arise?

- ☐ very adequate
- ☐ somewhat adequate
- ☐ somewhat inadequate
- ☐ very inadequate

Do you feel that you are given adequate information on any changes (updates, policies) that relate to the computer?

☐ yes ☐ no ⇨ Please explain:

Prior to using the computer in this hospital, where have you had experience using computers? **[check all that apply]**

- ☐ at home
- ☐ at another hospital job
- ☐ no previous experience
- ☐ at school
- ☐ at another job (non-nursing)
- ☐ other: describe:

What percentage of your working day is used working with the computer?_____%

SECTION V: Impact of computer on nursing 228

Now I would like to ask you some questions about your perceptions of how the **computer has affected your nursing work.** In thinking about how the computer has affected your work, think about how it is in comparison to how the same work would be if you did not have the use of the computer systems.

To what extent does the presence of the computer affect the amount of time you spend with patients? My time with patients is:

- ☐ greatly decreased
- ☐ somewhat decreased
- ☐ neither decreased nor increased
- ☐ somewhat increased
- ☐ greatly increased

How much control do you feel you have over you work:

- ☐ a great deal of control
- ☐ some control
- ☐ no control

To what extent does the presence of the computer influence the amount of control you feel you have over your work:

- ☐ greatly influences
- ☐ somewhat influences
- ☐ slightly influences
- ☐ no influence

To what extent do you feel your workload is affected by your use of the computer?

- ☐ greatly increases it
- ☐ somewhat increases it
- ☐ no effect
- ☐ somewhat decreases it
- ☐ greatly decreases it

To what extent do you feel that your prestige or status as a nurse has changed as a result of the your use of the computer in your work?

- ☐ greatly increased
- ☐ somewhat increased
- ☐ no change in status
- ☐ somewhat decreased
- ☐ greatly decreased

To what extent do you feel the use of the computer affects your sense of autonomy in your work?

- ☐ much greater autonomy
- ☐ somewhat greater autonomy
- ☐ no effect
- ☐ somewhat less autonomy
- ☐ much less autonomy

To what extent does the use of the computer affect your decision-making ability?

- ☐ greatly increases it
- ☐ somewhat increases it
- ☐ no effect
- ☐ somewhat decreases it
- ☐ greatly decreases it

From your conversations with co-workers, how do they judge the use of the computer for their work as nurses?

- ☐ very positively
- ☐ somewhat positively
- ☐ neither positive nor negative
- ☐ somewhat negatively
- ☐ very negatively

In your overall evaluation of the computer system, please list its 3 (three) best and the 3 (three) worst features:

BEST	WORST
1.	1.
2.	2.
3.	3.

Now if you could add any functions or capabilities to the system what would you wish for: [list three]

1.

2.

3.

SECTION VI:Nursing Care

Now I want to move on to questions concerning more specific aspects of your nursing work on this unit.

The next questions deal with your perception of your ability to provide nursing care to patients on your unit. Please answer each question on a scale from 1 to 5 [from "all the time" to "never"] as it best represents your perception of the care you give. Circle your response.

	1 all the time	2 usually	3 sometimes	4 rarely	5 never
How often do you feel you:					
* are able to give good physical care to patients?	1	2	3	4	5
* give medications and treatments on time?	1	2	3	4	5
* have time to talk with patients?	1	2	3	4	5
* have time to listen to the patient?	1	2	3	4	5
* can touch a patient when he/she needs comforting?	1	2	3	4	5
* respond quickly to a patient's call?	1	2	3	4	5
* are able to get to know the patient as an individual?	1	2	3	4	5
* allow the patient to express feelings fully about his/her disease and treatment fully?	1	2	3	4	5
* treat information the patient tells you confidentially?	1	2	3	4	5
* are certain that a patient knows him/herself best?	1	2	3	4	5

	1 all the time	2 usually	3 sometimes	4 rarely	5 never
How often do you feel you:					
* include your patient in the planning and management of his/her care?	1	2	3	4	5
* are able to give shots, IVs, etc. well?	1	2	3	4	5
* are able to manage the various treatment equipment well?	1	2	3	4	5
* are perceptive of a patient's needs and plan care accordingly?	1	2	3	4	5
* put the patient first no matter what else happens?	1	2	3	4	5
* are well organized?	1	2	3	4	5
* know when to call the doctor for a patient?	1	2	3	4	5

In the list below are the same characteristics that you have just used to rate your ability to provide nursing care. Now please rate each one in terms of the extent to which the use of the computer has affected each characteristic. Please circle your response.

Ability or time to:	1 HELPED	2 NO EFFECT	3 HINDERED
* give good physical care to patients?	1	2	3
* give medications &treatments on time	1	2	3
* talk with patients?	1	2	3
* listen to the patient?	1	2	3
* touch a patient when he/she needs comforting?	1	2	3
* respond quickly to a patient's call?	1	2	3
* get to know the patient as an individual?	1	2	3
* allow the patient to express feelings fully about his/her disease & treatment?	1	2	3
* treat information the patient tells you confidentially?	1	2	3
* be certain that a patient knows him/herself best?	1	2	3
* include your patient in the planning & management of his/her care?	1	2	3
* give shots, IVs, etc. well?	1	2	3
* manage the various treatment/equipment well?	1	2	3
* be perceptive of a patient's needs & plan care accordingly?	1	2	3
* put the patient first no matter what else happens?	1	2	3
* be well organized?	1	2	3
* know when to call the doctor for a patient?	1	2	3

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