Nurses' Attitudes Toward Computers Before

and Two Months After Training

E.J. Noble, RN, BScN

Department of Graduate and Undergraduate

Studies in Education

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Faculty of Education, Brock University

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Abstract

This study examined nurses' attitudes toward computers before training and 2 months after training.

A quantitative approach and a nonexperimental survey design were used in this study. Stronge and Brodt's (1985) instrument, Nurses' Attitudes Toward Computerization Questionnaire, was used to assess 27 nurses' attitudes prior to and 2 months after computer training. Demographic variables also were collected on the questionnaires.

The results of this study showed that, overall, nurses had positive attitudes towards computers in both questionnaires. The results of the first questionnaire were consistent with other studies. There were no studies that involved a follow-up questionnaire using Stronge and Brodt's (1985) instrument. Attitude scores of Questionnaire 2 were higher than attitude scores of Questionnaire 1. More time for nursing tasks, less time for quality patient care, and threat to job security questions were found to be statistically significant. This study found no statistical significance between attitudes and demographic variables. Younger nurses and nurses with fewer years of computer experience were most likely to exhibit positive attitudes.

Implications for practice and future research were discussed. Some limitations were identified and discussed.

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CHAPTER ONE: THE PROBLEM

Introduction

This was a study of nurses' attitudes toward computers before they received training and 2 months after this training.

Attitude has been defined as "a learned predisposition to respond in a consistently favourable or unfavourable manner with respect to given object" (Jayasuriya & Caputi, 1996, p.340). The individual's attitude can predict if the person will perform the behaviour in relation to the object. Nursing Management and Staff Development specialists must understand how nurses' attitudes toward computer technology may affect the implementation and use of computerized nursing programs (Negron, 1995). Nurses cannot be expected to welcome computer technology into nursing practice unless they feel comfortable.

The literature supports that it is important to know what the attitudes of the nurses are toward computers (Axford & Carter, 1996; Bongartz, 1988; Brodt & Stronge, 1986; Burkes, 1991; Cheatwood & Martin, 1988; Jayasuriya & Caputi, 1996; Kiat, 1999; Murphy, Maynard, & Morgan, 1994). Jayasuriya & Caputi (1996) believed that acceptance of computer technology can be facilitated or impeded by attitudes.

Background of the Problem

In the hospitals today, computers have been introduced or are being introduced in the patient care setting. The expectation for nurses by nursing management is to document patient care on computers, rather than on paper. The amount of documentation will vary from hospital to hospital. In one such hospital, the nurses are expected to document all patient care on the computer. The full documentation program has been instituted for 3 years. New nurses attend computer training classes to learn the hospital information system and the documentation program. Over the years, many nurses have gone through computer training classes. Some nurses were more comfortable than others with computers.

Statement of the Problem Situation

Nurses comprise the largest number of health professionals who will document in hospital information systems. To facilitate this process, it is important to assess the attitudes of nurses toward computers. Nurses' attitudes may affect the implementation and the use of computers.

Purpose of the Study

The purpose of this study was to determine the attitude of nurses toward computers before and 2 months after training.

Research Questions

The following questions were explored:

1. Was there a difference in the nurses' attitudes toward computers before and 2 months after training?

2. Did any demographic variables have an effect on attitudes toward computers?

Definition of Terms

Demographic data: include age, gender, educational preparation, and length of service in the nursing profession, and interaction and noninteraction with computers.

Documentation program: includes doctor's orders, assessment, plan of care, and nursing charting.

Hospital information system: stores a range of patient data.

Rationale

This topic should be investigated because nurses' attitudes may affect the implementation and the adoption of computers in hospitals. Not all nurses are comfortable with computers. According to Negron (1995), one of the most prevalent emotions experienced by an individual using computers is anxiety. Some reactions associated with anxiety are fear, apprehension, and uneasiness. Anxiety can cause physical symptoms ranging from sweaty palms to heart pounding (Negron). Jacobson, Holder and Dearner (1989)

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researched computer anxiety among a large, diverse sample of nurses which included nursing students, educators, staff nurses, and nurse managers. The results of the study showed that most nurses demonstrated mild computer anxiety. Jacobson et al. suggested that computer education and experience would decrease the anxiety. Wilson (1991) concurred with Jacobson et al. that successful interactions with computers would lessen the anxiety.

Negron (1995) reported that computer resistance is considered a negative attitude toward computer technology. Resistance to computers could lead to resistance to learning, because of the fear of failing and losing control. These negative reactions could inhibit nurses' level of performance, which in turn would affect productivity on the nursing unit.

<p style="text-align:center">Importance of the Study</p>

It is very important to determine and be aware of the attitudes of nurses starting in an organization that requires computer documentation. It is also very important to see how those attitudes have changed or not changed after being exposed to training and to the computers for a 2-month period. Other institutions implementing a computer documentation system would be interested in the results. As documentation is an integral part of patient care, then nursing practice would be affected. The literature supported

further investigation in the area of nurses' attitudes toward computers.

Scope and Limitations of the Study

Nurses' attitudes toward computers before and 2 months after training of new employees were investigated. The training program may or may not be an influence on the attitudes of nurses and acceptance of computers. This influence may be reflected in the 2-month evaluation of the nurses' attitudes. The training program was not evaluated in this study.

Outline of Subsequent Chapters

Chapter Two introduces the reader to a review of the literature in computer technology in nursing. This review includes the role of computer technology in nursing and nurses' attitudes toward computers.

Chapter Three presents the methodology of the study. The methodology includes research design, samples, instrument used, data collection, and analysis. Study limitations are identified.

Chapter Four discusses the research results and interpretation of the data from Questionnaire 1 and Questionnaire 2. Chapter Five contains the study summary and study recommendations.

CHAPTER TWO: REVIEW OF THE LITERATURE

Introduction

The first section of this literature review discusses the role of computer technology in nursing. The second section of the review focuses on nurses' attitudes toward computers.

The Role of Computer Technology in Nursing

In the past decade, there had been a tremendous change in every aspect of health care, especially in nursing practice. Computers had been used to facilitate the running of patient care equipment, such as intravenous pumps and heart monitors, in hospitals. Other uses of computers in hospitals were for administration and financial purposes. Today, some hospitals have instituted clinical information systems. Some other names for clinical information systems include patient care information systems, nursing information systems, medical information systems, and hospital information systems (Axford & Carter, 1996; Lewis, Carver, & Roberts, 1992). These computer systems were introduced into the clinical areas to record patient data that help the clinicians plan, implement and evaluate care, which ultimately improves the quality of patient care. Others (Getty, Ryan, & Ekins, 1999; Large, 1994; Schwirian, Malone, Stone, Nunley, & Francisco, 1989) believed that computers had the ability to help nurses fulfill their

multifaceted role and have enhanced the quality and efficiency of nursing practice. Computers have become an essential part of health care delivery. Walter, Cleary, and Rey (2000) stated that computers would improve patient care, would be integral to telemedicine, would improve linkages of health services, and would allow easy and rapid access to evidence-based information.

Happ (1983) asked two questions: "Should computers be used in the nursing care of patients?" and "Will computers help nurses and their patients-or dehumanize them?"(p. 31). Computers were already affecting education, administration, research, and practice. Happ stated that the "'computer age' may be the biggest social upheaval in recent history and may have become the dominant force in how we live and work in the next 5 to 10 years" (p. 31). Happ discussed two reasons why nurses were hesitant to use computers in their practice. The first reason cited was that the nurses sensed there was a wide gap between their current computer knowledge and the computer knowledge they should have to influence the way computers could be used in nursing practice. The second reason given was the nurses' unsureness about the morality of the computers and the privacy of the patients. Happ stated that once nurses understood that computers did have advantages for them, then they would be more likely to accept them.

Happ (1983) reported that the amount of data collected, used, and evaluated by nurses was tremendous. Happ suggested that the use of the computerized patient record would offer the nurses an efficient means of collecting and managing data for clinical evaluation and research. Happ concluded that the advantages of computerization to patient care outweighed the disadvantages. Happ stated, "with all their dazzling speed, capacity and apparent tireless efficiency, computers are only *tools*" (p. 34).

The use of the computerized patient record allowed access to current medical information and ultimately eliminated erroneous clinical interpretation from illegible handwriting (Burkes, 1991). Burkes reviewed the available literature and concluded that manual charting was not as efficient and systematic as computer changes. Computerized documentation simplified nurses' clinical tasks, ensured accuracy, improved documentation quality, and eliminated charting repetitions. Burkes reported that the use of computers eased tedious tasks of staffing and scheduling of nursing staff. The use of computers would reduce cost and improve quality of patient care (Burkes).

Ngin, Simms, and Erbin-Roesemann (1993) discussed how the computer would impact on health care. The authors reported that more hospitals were adopting computerized information systems for the purpose of reducing the high

cost of health care, improving quality assurance, and increasing health professionals' accountability. They found that all nurses regarded computerization as beneficial but also voiced concerns about it. Some of the issues were nursing skills becoming obsolete, nursing skills versus technical skills, threat to nursing role, and increased burnout among nurses. Ngin et al. suggested that these concerns should not "lead to a reactionary rejection of current and future technological innovations" (p. 127).

Adaskin, Hughes, McMullan, McLean, and McMorris (1994) studied how computerization affected the nurses and their coping strategies during this initiative, and made recommendations to assist hospitals in the future with computer implementations. The authors interviewed 10 staff nurses and 10 educators or administrators who were computer users and change agents. Adaskin et al. identified six broad themes from the impact of computerization. The themes were (a) time frame, (b) choice of software, (c) communication, (d) change process, (e) training, and (f) leadership. There was also an impact on the nurses personally and professionally.

Adaskin et al.'s (1994) findings showed: (a) staff nurses felt the stress of the time pressure; (b) the importance of good leadership helped nurses cope; (c) scheduled training time away from patient care was

important; (d) the importance of understanding chosen programs through hands-on use; (e) the importance of communicating the direction and rationale of computerization to nurses at the beginning; and (f) that having workshops for nurses on the change process was important. As for the personal impact on nurses, Adaskin et al. found that the nurses' "own values, expectations, and previous computer experience all appeared to make a difference in how computerization affected them" (p. 146). Overall, the nurses in this study expressed positively that the experience prepared them for the future (Adaskin et al.).

Pabst, Scherubel, and Minnick (1996) conducted a study to determine the impact of computerized documentation on the nurses' use of time, and whether the time of day, location, and quality of documentation were different between computerized and noncomputerized units. The authors used work-sampling studies for pretest and posttest computer implementation. Different documentation modules were evaluated at 3 and 6 months postimplementation. Because these work-sampling studies did not capture time of day, location and quality of documentation, observation of computerized and noncomputerized units was required. Pabst et al. reported that computerized care plans and progress notes online reduced the time spent on nursing documentation by one third from 13.2% to 9.1% after a

6-month period. Therefore, Pabst et al. found that time spent on direct patient care increased. It was also noted that computerized documentation assisted the nurse to comply with standards or care plans. The nurse still had to know the care outlined in the standards. Pabst et al.'s study gave some support that computerized documentation saved nurses' time.

Axford and Carter (1996) conducted a study on the impact of clinical information systems on nursing practice. The authors developed an evaluation tool to examine how clinical information systems affected nursing practice. Axford and Carter identified differences and similarities of system users and nonusers. Although some studies showed that attitude change was important to the implementation of clinical information systems, the researchers determined that it did not answer the question about its impact on nursing practice. They distributed, to a random sample of nurses in the state, a 62-statement survey. The results showed that there were a number of differences found between nurses who used the computer and those who did not. Some of the differences were related to health care costs, recruitment and retention, and computer impact on work itself. The results also showed that both groups agreed that computers would save time overall, patient care time would not increase, nursing satisfaction would increase, and

computers would improve professional status (Axford & Carter). Axford and Carter found that many of the nonusers did not answer the computer questions, as the nonusers suggested they were irrelevant.

Bowles (1997) discussed the barriers and benefits of nursing information systems. According to Bowles, nurses spent 50% of their time documenting patient information, and the author believed it was essential to have these tasks computerized. How documentation occurred was influenced by the current health care environment, which emphasized cost-effective methods.

The barriers to nursing information systems were a lack of a unified nursing language, and individual and organizational factors. Some examples of individual factors were level of education, computer anxiety, and attitude toward computerization. Some examples of organizational factors were staffing levels, workload, and type of nursing unit (Bowles, 1997).

The benefits mentioned in Bowles's (1997) article were improved efficiency and patient safety and satisfaction. The author concluded that nursing information systems continued to evolve. Furthermore, involvement of nurses in the design and installation of the systems was required to assure that elements of nursing process were represented. Further

research on nurses' attitudes, levels of expertise, and institutional barriers was recommended (Bowles).

Several authors (Ball, Snelbecker, & Schechter, 1985; Bryson, 1991; Scarpa, Smeltzer, & Jasion, 1992; Trick et al., 1999; Walter et al., 2000) believed that there was an awareness of the need for nurses to become computer literate. Ball et al. did a study where nurses attended a computer literacy lecture. Ball et al. distributed a questionnaire before and after the lecture and reported that the prelecture questionnaire showed the nurses had favourable attitudes towards the use of computers. The postlecture questionnaire showed that there was significant increased receptivity to the use of computers by the nurses. The researchers further stated that steps should be taken to foster greater receptivity to computer use (Ball et al.).

Trick et al. (1999) discussed some strategies that would develop computer literacy. The strategies included exposing nursing students to the technology through assignments using the Internet and the use of email. According to the researchers, nursing students were more proficient in the use of computer technology and the Internet than nurse academics. The article discussed 8 nursing students' assignments and their experiences in exploring community health issues in another country through the use of the Internet. The student nurses shared and

gained knowledge of different attitudes, cultures, mores, health beliefs, and practices of other countries (Trick et al.). The knowledge would not have been gained without the use of computerized email.

Nurses' Attitudes Toward Computers

An important part to the successful implementation of clinical information systems has been the attitudes of nurses. Three main instruments used to measure attitudes of nurses toward computers are discussed in the literature. Stronge and Brodt (1985) developed the first instrument, "Nurses' Attitudes Toward Computerization Questionnaire." This questionnaire was used and tested for reliability in other studies (e.g., Kiat, 1999; Scarpa et al., 1992; Schwirian et al., 1989; Stockton & Verhey, 1995).

Many researchers (Bongartz, 1988; Brodt & Stronge, 1986; Burkes, 1991; Cheatwood & Martin, 1988; Jayasuriya & Caputi, 1996; McBride & Nagle, 1996; Scarpa et al, 1992; Schwirian et al, 1989; Simpson & Kenrick, 1997; Stockton & Verhey, 1995) used or modified Stronge and Brodt's (1985) questionnaire in their studies to measure nurses' attitudes toward computerization. The sample population in all of these studies varied from nurses in computerized hospitals, nurses in noncomputerized hospitals, and student nurses. Some studies (e.g. Bongartz, 1988; Burkes, 1991; Cheatwood & Martin, 1988; Scarpa et al., 1992; Simpson & Kenrick, 1997;

Stockton & Verhey, 1995) investigated nurses' attitudes, while others (e.g. Brodt & Stronge, 1986; Jayasuriya & Caputi, 1996; McBride & Nagle, 1996; Schwirian et al., 1989) compared nurses' attitudes to student nurses' attitudes.

Cheatwood and Martin (1988) examined nurses' attitudes toward computers in a hospital that was implementing a second-generation computer system. Stronge and Brodt's (1985) questionnaire was used and distributed to nurses before training on the new system and 3 months after the system was implemented. The researchers compared nurses' attitudes toward the second-generation system with nurses' attitudes from previous studies; nurses' attitudes before implementation with nurses' attitudes after implementation; and attitudes of the same nurses grouped by breakdown of some of the sociodemographic variables such as age, education, length of time in nursing, job, and length of time working in present facility.

Cheatwood and Martin (1988) found that the nurses in this study were more positive than in Brodt and Stronge's (1986) study, but less positive after implementation than before implementation. The authors (Cheatwood & Martin) agreed with Brodt and Stronge (1986) that nursing specialty and education made a significant difference in attitudes. Cheatwood and Martin found that Masters-prepared nurses were significantly more positive than any other educational

level. The researchers (Cheatwood & Martin) also found that nurses employed in nursing administration were significantly more positive in this study and in Brodt and Stronge's (1986) study. Critical care nurses were very positive, second to those working in administration. Other groups were found to have positive attitudes but not to the same extent as found by Brodt and Stronge (1986). Nurses' attitudes were not determined by the job itself, but were influenced by the attitudes of coworkers, friends, and managers, in addition to nursing specialty and education (Cheatwood & Martin, 1988).

Prophet et al. (1998) studied the impact of computerization on the users' perceptions, documentation compliance and completeness, and documentation time. Prophet et al. defined user perceptions as staff attitudes, behaviours, and satisfaction. The researchers (Prophet et al.) developed a tool for evaluating users' perceptions that included 12 items from Stronge and Brodt's (1985) questionnaire and other statements regarding computer skill level and documentation experiences. Two other tools, a compliance tool and The Task Observation Tool, were used to assess documentation compliance and completeness and documentation time. The tools were distributed preimplementation and again 6 to 10 weeks postimplementation. The results revealed no significant

difference for user characteristics between the pre- and postimplementation groups (Prophet et al.). Prophet et al. reported that the users were positive in attitudes and satisfaction and spent more time in patients' rooms.

Kiat (1999) studied computer attitudes and computer anxiety of nurses in a Singapore hospital through a case study approach. Kiat used two instruments, Computer Anxiety Index and Nurses' Attitudes Towards Computerization Questionnaire. Kiat modified Stronge and Brodt's (1985) questionnaire to reflect language and environment of the nurses in Singapore. Kiat subsequently tested the questionnaire with the result of the Cronbach's alpha reliability coefficient to be .89. Kiat reported this finding to indicate "satisfactory internal consistency of the instrument" (1999, p. 33). This result was comparable to other studies (e.g. McBride & Nagle, 1996; Scarpa et al., 1992; Schwirian et al., 1989; Stockton & Verhey, 1995; Stronge & Brodt, 1985). Kiat's study revealed that the nurses were not anxious towards computers and the nurses were slightly positive in attitudes towards computers. The author (Kiat) reported that there was a strong relationship between computer anxiety and attitudes toward computerization. According to Kiat, these findings were consistent with other studies (e.g. Bongartz, 1988; McBride & Nagle, 1996; Scarpa et al., 1992). Several reasons cited

for this correlation were an increase in use of computers in everyday life, popularity and affordability of computers, computer experience of nurses from other health care facilities, and increased exposure to computers in school. Kiat reported no significant relationship between computer attitudes and some the demographic characteristics studied which included professional preparation, job appointment and computer familiarity. However, Kiat identified age and gender as "significant predictors for nurses' attitudes towards computerisation" (p. 66).

Throughout the literature, several variables were found to influence nurses' attitudes toward computers. These variables included age, prior use, education, and years of nursing experience. These variables were included on the questionnaires used in all of the studies. Brodt and Stronge (1986) originally discovered that only three factors, length of nursing service, educational preparation, and type of nursing unit, affected nurses' attitudes. The higher the level of education and the more experience nurses had, the more positive their attitude became (Brodt & Stronge). Not all researchers (e.g. Bongartz, 1988; Burkes, 1991; Getty et al., 1999; Kiat, 1999; Murphy et al., 1994; Scarpa et al., 1992; Schwirian et al., 1989) agreed with Brodt and Stronge.

Scarpa et al. (1992) found that previous experience with computers was the only factor that contributed to a positive attitude. Getty et al. (1999) found that the degree of previous computer experience was the only factor that influenced the attitudes of nonusers in regard to the use of computerized care plans. In the user group, previous experience had no influence on attitudes (Getty et al.). Getty et al. suggested that previous experience would be beneficial but that it did not necessarily result in positive attitudes toward computerized care planning.

Schwirian et al. (1989) compared attitudes of nurses and nursing students and factors that contributed to their attitudes. The researchers (Schwirian et al.) found that the nursing students had a more positive attitude than did the nurses. Schwirian et al. explained that the reason for this was that nursing students were exposed to computers at home and in their working environment. Bongartz (1988), in her study, compared attitudes of nurses in computerized and noncomputerized hospitals. The results of Bongartz's (1988) research indicated that nonusers had a more positive attitude than did the user group. The other significant difference compared to all other studies was that the nonusers were young and less experienced in nursing (Bongartz, 1988). Murphy et al. (1994) corroborated the findings from Bongartz's study. Some researchers (Burkes,

1991; Sultana, 1990) did not find any relationship between demographic variables or computer experience and attitudes (Getty et al., 1999; Kiat, 1999; McBride & Nagle, 1996).

These previous studies did not examine the psychometric properties of the Stronge and Brodt (1985) questionnaire. Some researchers (McBride & Nagle, 1996; Scarpa et al., 1992; Schwirian et al., 1989; Stockton & Verhey, 1995) investigated these properties to test construct validity because the findings in the studies on nurses' attitudes were inconsistent. The psychometric factors investigated in factor analysis were computers and patient care, computers and personal security, and general attitude. Schwirian et al. (1989) found three factors accounted for 62% of the variance, whereas Scarpa et al. (1992) accounted for five factors as 63% of the variance. Scarpa et al.'s findings were nursing efficiency, computer inefficiency, agency and societal impact, limitations of computers, and patient confidentiality. Stockton and Verhey (1995) discovered in their findings that there were three factors. After McBride and Nagle (1996) conducted their research, the investigators concluded that there was a lack of support for construct validity of the Stronge and Brodt (1985) questionnaire, since there were differences reported in the psychometric analysis studies. The inconsistency in the findings for validity of the instrument was not well established.

However, tests for reliability of the instrument found that the instrument was satisfactory in ascertaining the general status of nurses' attitudes toward computerization.

The second instrument, Attitudes Toward Computing in Nursing, was developed by Thomas (1988). This instrument consisted of two parallel forms which measured changes in nurses' attitudes towards computers. The promotion of positive attitudes had been a goal for the education and practice settings. In hospitals and educational settings, nurses and nursing students had not appreciated the role of computers in various areas of nursing. Thomas reported that this instrument should be used to test the attitudes of nurses and student nurses in education and clinical settings. Thomas theorized that if nurses and nursing students were to optimally use computers in the educational and practical settings, then the promotion of positive attitudes towards computers was essential.

Burkes (1991) developed the third instrument: "Nurses' Computer-Use Attitude Questionnaire." The questionnaire was to incorporate concepts from Vroom's expectancy model (Marasovic, Kenney, Elliott, & Sindhusake, 1997). This model had three constructs: (a) attitude satisfaction, (b) expectancy, and (c) motivation (Marasovic et al.). According to Marasovic et al.), "Vroom described how a person's preference for an outcome (satisfaction) and their belief

that performing the act would result in that preferred outcome (expectancy) motivated the person to perform the act (motivation)" (pp. 92-93). Burkes (1991) modified this model as a framework for the questionnaire. According to Lacey (1993), an adapted version of Stronge and Brodt's (1985) questionnaire was part of Burkes's data collection tool. This tool was used and tested for content validity in other studies (e.g., Liu, Pothiban, Lu, & Khamphonsiri, 2000; Marasovic et al., 1997).

Marasovic et al. (1997) used Burkes's (1991) questionnaire for their research. The questions for their study were:

1. Do demographic data influence nurse's satisfaction, motivation, and beliefs regarding the use of clinical information systems?

2. Is there a positive correlation between knowledge, satisfaction, beliefs, years of experience, and motivation as predicted by Burkes' modified Vroom's expectancy model? (Marasovic et al., 1997, p. 93)

The researchers used a cross-sectional design to test the presence and strength of demographic data with satisfaction, beliefs, and motivation of the users of the clinical information systems. A cross-sectional design was used to examine groups of subjects in various stages of development simultaneously with intent of inferring trends over time.

The collection of data involved one point in time (Burns &
Grove, 1987). Marasovic et al.'s (1997) study design
involved a survey being sent over a 2-week period to all
intensive care nursing staff within a large metropolitan
hospital in Australia. The survey included demographic data,
nursing experience, years of ICU experience, beliefs,
satisfaction, and motivation of the users of the hospital
information system (Marasovic et al.). Modifications to
Burkes's (1991) questionnaire were made. The question
regarding the number of terminals was deleted, and questions
related to job classification and educational qualifications
were changed to reflect the Australian environment
(Marasovic et al.).

The results of the study showed that only the variable
of the number of years of nursing experience (in the
demographic data) had a significant effect on motivation to
use the clinical information systems. Less experienced
nurses were motivated to use the computer, whereas, the more
experienced nurses appeared to be resistant to the change in
working practices (Marasovic et al., 1997). Marasovic et al.
also found that there was a strong association among the
three constructs of an attitude.

Liu et al. (2000) examined the nurses' computer
knowledge, attitudes, and skills. The first Chinese hospital
information system was developed and piloted at the People's

Hospital of Beijing Medical University in 1995. This Hospital was the setting for the study. Liu et al. looked at the three main instruments, which were developed by Thomas (1988), Stronge and Brodt (1985), and Burkes (1991). After thorough investigation of these tools, Liu et al. decided to adopt Burkes's attitudes framework, used selected appropriate items from other instruments, and then modified the instrument to reflect the Chinese nurses' background. According to Liu et al., "Chinese nurses have a lower educational level than nurses in developed countries and computers are not easily and frequently accessible to most Chinese nurses" (p. 199).

The attitude scores of this study showed that motivation was the highest mean score, followed by beliefs, and then satisfaction, which was the lowest score. Most of the nurses were willing to use and learn more about computer technology even though the nurses had little exposure to computers (Liu et al., 2000). Other results showed that "nurses' computer skills were significant positively correlated with both computer knowledge. . . and computer attitudes" (Liu et al., p. 204). Liu et al. found no correlation between computer knowledge and computer attitudes. The authors (Liu et al.) found that age and number of years of working were two significant factors that influenced computer knowledge. The younger nurses had

greater computer knowledge than the older nurses. Liu et al. suggested that younger nurses had more computer experience because of the recent introduction of computers in public schools, at home, and in the community.

There have been other tools used in other studies (e.g., Getty et al., 1999; Kim & Kim, 1996; Large, 1994; Lewis, et al., 1992; McConnell, O'Shea, & Kirchhoff, 1989; Murphy et al., 1994; Paulino, 1998; Sleutel & Guinn, 1999; Walter et al., 2000) that have assessed nurses' attitudes towards computers and computerization. Kim and Kim studied the relationship between the willingness to adopt an innovation and attitudes toward computers. The authors (Kim & Kim) looked at three levels: individual, nursing unit, and organizational. Kim and Kim found that at the individual level, personality traits or demographic variables were significantly associated with willingness to use computers. At the nursing unit level, some of the major factors that affected the adoption of an innovation were interpersonal networks, size, group norms, and leadership. At the organizational level, structural variability, authority system, decision strategy, and contextual variables were found to influence the adoption of technology in hospitals (Kim & Kim).

Kim and Kim's (1996) findings showed a positive relationship between the willingness to adopt an innovation

and the efficiency and cooperation at the individual and nursing levels. Nurses on the same nursing unit had a similar degree of self-efficiency and willingness to adopt an innovation (Kim & Kim). Therefore, efficiency and willingness probably reflected the nursing unit's efficiency and willingness (Kim & Kim). Kim and Kim discovered that cooperation was associated positively with willingness to adopt at the individual level only.

Large (1994) investigated the attitudes of intensive care nurses towards computers with regard to patient care and whether computers for routine tasks would save time. Thirty Intensive Care nurses were randomly selected. Large developed a questionnaire which consisted of three positive statements, and the scoring was a 3-point Likert scale. Findings from the three statements indicated that nurses felt that computers could indirectly enhance care given to patients (Large).

Lewis et al. (1992) discussed the introduction of nursing care planning in a hospital. The hospital employed an external consultant to administer a staff-based questionnaire and to evaluate documentation of care planning pre- and postimplementation (Lewis et al.). The results showed more effective patient care as a result of patient data analysis, and complete and accurate documentation (Lewis et al.). Time was saved in the areas of assessment,

care planning, evaluation, and updating records postimplementation. Staff attitudes changed after the introduction of the computer system from being apprehensive and antagonistic to strong positive feelings towards the computer system (Lewis et al.).

Getty et al. (1999) investigated nurses' attitudes toward the use of computerized care plans in the clinical setting and the identification of factors that influenced the nurses' attitudes. The researchers developed a tool which had three sections. The sections consisted of (a) questions about demographic information, (b) 12 attitudinal statements and a modified version of a Likert scale developed by Lowry (1994), and (c) questions to assess nurses' confidence using computers and preferred teaching methods (Getty et al.). A convenience sample consisted of nurses from two nursing units: a noncomputerized unit and a computerized unit. The results of Getty et al.'s study showed that both groups had favourable attitudes towards computerized care planning. These findings were consistent with a number of other studies (e.g., Bongartz, 1988; McConnell et al., 1989; Scarpa et al., 1992).

After Murphy et al. (1994) reviewed the literature on nurses' attitudes towards computers, the authors decided to do a more focused assessment of the attitudes of nurses

about specific systems. Murphy et al. "assessed nurses'
attitudes toward patient information systems in a
pretest/post-test design" (p. 240). The questionnaire was
based on Fishbein and Ajzen's (1975) assessment of
attitudes, which evaluated the characteristics of specific
computerized systems. The questionnaire was distributed
prior to computer-based training and after using the system
on the units for 3 months. Murphy et al.'s study showed the
same results found by Scarpa et al. (1992) in regard to
demographic correlations to computer attitudes. Other
results indicated that the overall attitudes for pretest and
posttest questionnaires were positive, but the posttest
scores were less positive after using the system for 3
months. Murphy et al.'s results were similar to Bongartz's
(1988) results. The nurses in Murphy et al.'s study had less
ambivalent attitudes than nurses in McConnell et al.'s
(1989) study, but narrative comments showed that there
needed to be further investigation into the real impact of
computers on nursing practice.

McConnell et al. (1989) used a hospital that had been
using an online computer information system for 2 ½ years.
The authors (McConnell et al.) studied the degree of
computer usage by different nursing staff, the relationship
between demographic factors and computer use, and the
staff's attitudes towards computers. McConnell et al. used

the Startsman and Robinson (1972) questionnaire and six new statements to assess the nurses' attitudes. A 5-point Likert scale was used. The questionnaire was tested for reliability and the Cronbach's alpha coefficient was 0.67 using only the Registered Nurses.

McConnell et al.'s (1989) results showed that the majority of the attitude statement means fell in the "undecided range" (p. 39), which indicated that the nurses were undecided about their attitudes toward computers. Other results showed that the nurses with more hospital experience agreed that computers would improve the quality of patient care, but still felt that computers dehumanized patient care. Nurses with more work experience on the same unit perceived the use of computers as a positive effect on the nurse's role (McConnell et al.). McConnell et al. were of the opinion that the weak correlation between attributes and attitudes could be related to the age of the Startsman and Robinson (1972) statements and the ambiguity of some of the statements. The statements were made in the 1960s and early '70s. In the computer world, computer applications in nursing and health care have changed dramatically since this tool was developed. Therefore, the tool's validity needs to be reassessed (McConnell et al.).

Walter et al. (2000) investigated the patterns of use, attitudes, and expectations of mental health staff before

and after implementation of computer training. The questionnaire was developed by Walter et al. and distributed prior to computer training and 6 months after the computer training. According to Walter et al., this published study was the first to include multidisciplinary staff from a mental health service regarding attitudes to computer use. Walter et al. found that the majority of the staff had positive attitudes towards computers and believed that computers were useful in a range of areas. Walter et al. recommended that computer training and the equipment must be made available to the staff. Failure to provide these items could contribute to disillusionment, which would explain why staff were not optimistic about computers (Walter et al.).

Paulino (1998) investigated military nurses' attitudes toward computers and computer-assisted instruction. Paulino used Morris's (1987) Computer Orientation Scale, which contained eight items related to computer attitudes. This instrument was modified to include questions regarding computer-assisted instruction. Paulino's results showed that there was no statistical correlation between age and computer attitudes. Paulino stated that "military administrators and educators should not assume that new commissioned military nurses will be more or less willing to use computers for work and education" (p. 5). The author (Paulino) also reported that there was a positive change in

the attitudes of military nurses towards computers. Paulino surmised that this positive outlook toward the use of computers in hospitals dispels the theory that nurses are the most resistant health care professionals.

Sleutel and Guinn (1999) examined nursing staff perceptions before, 1 month after, and 6 months after implementation of a health care information system. Sleutel and Guinn used a questionnaire that was developed by Murphy et al. (1994). The authors (Sleutel & Guinn) found that the nurses in this study had attitude scores lower than originally obtained by Murphy et al.. The nurses' attitudes became less positive over time after using the computer system (Sleutel & Guinn). Sleutel and Guinn, (1999) reported that the trend toward less positive attitudes continued after 6 months. Sluetel and Guinn cited several reasons for this decline. Some of the reasons for the nurses' negative perceptions were jeopardizing of patient confidentiality, increased paper flow from the computer system, decreased accuracy of patient information, and a less efficient system for documenting medication and treatments (Sleutel & Guinn). Sleutel and Guinn reported no relationships between nurses' attitudes and age or nurses' attitudes and computer experience.

Conclusion

This review of the literature demonstrates that the role of the computer in nursing is an important aspect of patient care. The literature also showed that the knowledge of nurses' attitudes towards computers provides valuable information when considering the implementation of computer documentation programs.

Most of the studies presented in the literature were conducted in the United States. Investigations into the role of computers in nursing and health care and nurses' attitudes toward computers also have occurred in other countries around the world. These countries included Great Britain and Northern Ireland, Australia, and Canada. Asian countries have recently produced research studies in the areas of nurses' and nursing students' attitudes towards computers and adoption of computerization. The countries involved in this research are South Korea, China, and Singapore.

CHAPTER THREE: METHODOLOGY AND PROCEDURES

Overview

This chapter describes the research design, the sample population, instrumentation, and methodology.

Research Approach and Design

This study used a quantitative approach and a nonexperimental survey design. In this study, assessments were made of nurses' attitudes prior to and 2 months after computer training by using an identical questionnaire at both time periods.

Quantitative research designs are concerned with numbers, statistics, and structure, and experimenter control. The different types of quantitative designs depend on the degree of control or structure by the researcher (McMillan & Schumacher, 1993). There are two major types of quantitative research designs: experimental and nonexperimental.

Because this study was based on obtaining nurses' attitudes, a nonexperimental design was used. A nonexperimental approach examines relationships between variables without suggesting a cause-and-effect relationship. However, there are times when the nonexperimental approach will be used to investigate cause-and-effect (McMillan & Schumacher, 1993). There are four types of nonexperimental designs: descriptive,

correlational, survey, and ex post facto. Survey design is used to describe attitudes, beliefs, opinions and other type of information. Besides being descriptive, surveys are used "to explore relationships between different variables or in an explanatory way" (McMillan & Schumacher, p. 279).

Null Hypotheses

1. There is no significant difference in nurses' attitudes toward computers before and 2 months after training.

2. There is no significant effect on attitudes towards computers by demographic variables.

Instrumentation

The instrument used was Stronge and Brodt's (1985) Nurses' Attitudes Toward Computerization Questionnaire as seen in Appendix A. On receipt of letter and payment, Dr.J.H. Stronge granted permission to use this questionnaire and scoring guide (see Appendix B). The instrument was a 20-statement questionnaire using a Likert-type scale (Stronge & Brodt, 1985). The questionnaire contained 6 positively worded and 14 negatively worded items. There were six categories identified on the questionnaire: (a) benefit to the institution, (b) quality of patient care, (c) superior capability of computers, (d) legal ramifications, (e) employee willingness to use computers, and (f) threat to employment (Stronge & Brodt). Stronge and Brodt (1985)

identified through the literature these items in relation to computers in nursing.

The demographic variables collected included age, gender, experience working with computers, number of years worked with computers, job title, highest degree obtained in nursing, date of recent degree, position status and number of shifts worked. The demographic data section was modified to include: the Canadian nursing designation RPN instead of LPN; removal of RN Associate Degree which was not available in Canada; removal of years worked in this hospital which was not applicable as the participants were new employees; and addition of number of shifts worked in last 2 months on Questionnaire 2.

Reliability and Validity of the Questionnaire

According to Scarpa et al. (1992), Stronge and Brodt (1985) presented evidence of content validity of the questionnaire, which was based on literature review. These researchers identified the six categories mentioned in the previous section (Stronge & Brodt, 1985). Nineteen statements had an index of discrimination above .50, which was considered to be acceptable for inclusion in the questionnaire. Stronge and Brodt added another item related to job security to the questionnaire. This item's index of discrimination score (.48) was slightly below .50.

Stronge and Brodt (1985) submitted 19 statements to an evaluation of content validity. The content of the statements was compared with the previous six categories related to computerization and nursing tasks (Stronge & Brodt). The evaluation for content validity of the statements "revealed that the items were fairly evenly distributed over most of the identified topics" (Stronge & Brodt, p. 158).

Stronge and Brodt (1985) used the Spearman-Brown prophesy formula to determine internal consistency of the questionnaire. "The resulting split-half reliability coefficient was r = .90" (Stronge & Brodt, p. 158). This result indicates a reliable and internally consistent questionnaire (Bongartz, 1988). Several researchers (Bongartz, 1988; Brodt & Stronge, 1986; Kiat, 1999; McBride & Nagle, 1996; Scarpa et al., 1992; Schwirian et al., 1989; Stockton & Verhey, 1995) have used this questionnaire and found it to be reliable in assessing nurses' attitudes towards computers as claimed by the developers of the questionnaire.

Selection of Study Participants

A nonprobability (also known as convenience or availability) sample was used. Convenience sampling means that whatever groups of subjects are available to the

researcher are used (McMillan & Schumacher, 1993). The subjects were new employees in a community non-teaching hospital in a Metropolitan city in Southern Ontario. In order to assess attitudes toward computers among new staff, a questionnaire was distributed prior to any training provided. As part of orientation to hospital, computer training is usually scheduled once every month. This schedule allowed access to future participants. The study sample consisted of Registered Nurses and Registered Practical Nurses. The newly hired employees were approached the first day of computer training for information and recruitment to the study.

Data Collection and Recording

The method of data collection and recording was conducted in the following way:

1. Once a month during this study period, the researcher attended the first day of computer training for new nurses.

2. Prior to any training, the informed consent and Questionnaire 1 was distributed to the new employees by the researcher.

3. The researcher provided a verbal explanation of the research purpose and method of the study.

4. After providing informed consent, the potential

participants were instructed to circle a response to each statement on the questionnaire. It was essential that there was no coercion of the employees. In order to achieve no coercion, this was the only explanation offered to complete the questionnaire; the researcher offered neither possible answers nor answers from prior clinical groups; the background of the literature was not discussed; and interpretation of the questions was not given.

5. The researcher waited in the same room as the potential participants while the consents and questionnaires were completed, which took approximately 10 to 15 minutes.

6. The researcher collected the consents and questionnaires and thanked everyone for their participation; upon collection of the questionnaires and consents, it was observed that some of the new employees chose not to participate.

7. After completion of the consents and questionnaires, the new employees were provided with 4 half-days of computer training on the documentation system.

8. The researcher separated the completed consents and questionnaires from the ones that were not completed.

9. The researcher numbered the consents and questionnaires.

10. The researcher kept a record of the participants and the date the first questionnaire was completed.

11. Two months after the date of the first completed questionnaire, a second questionnaire, with an accompanying letter and a self-addressed envelope, was sent to the participants on their designated hospital units.

12. An electronic message was sent to the participants informing them that the second questionnaire package had been sent (see Appendix D).

13. If the researcher did not receive the second questionnaire back within 3 weeks, another electronic message was sent, reminding the participants about Questionnaire 2 and asking if another questionnaire was needed.

The researcher was originally to collect data over a 6-month period, that is, September 1999 to February 2000. The researcher followed this design outlined above from September to December 1999. In January 2000, the researcher was unable to attend the first day of computer training because of illness. A third party was asked to fill in for the researcher. The researcher provided written and verbal instructions on the research purpose and method of the study to the third party. Due to the length of the researcher's illness, the study period was extended to June 2000. The third party followed steps 1 to 6 mentioned above from January to June 2000. The third party gave the consents and

questionnaires to the researcher each month. The researcher continued with steps 8 to 13 until the end of the study.

Data Processing and Analysis

A total of 77 consents and Questionnaires 1 were distributed to new employees, of which 53 were returned completed, yielding a response rate of 68.8%. For the second questionnaire, 11 participants left the organization within 1 to 2 months after the first day of training; 14 participants did not return Questionnaire 2; and 1 participant did not complete questionnaire 2. Thus, the number of participants who completed both questionnaires was 27 or 51% of the responding participants who completed both questionnaires.

The participants' responses were scored using the same system used by Stronge and Brodt (1985). The assigned values were as follows: 1 = strongly disagree; 2 = disagree; 3 = uncertain; 4 = agree; and 5 = strongly agree. The assigned values were inverted for negative statements according to Stronge & Brodt (1985) and Scarpa et al. (1992). This coding provided a range in scores of 1 to 5 for each question. All 20 questions were summarized to provide a total score between 20 and 100. These data were used to analyze differences in both questionnaire scores and attitude scores.

The data for each questionnaire were transcribed into separate Excel spreadsheets to be imported into the Statistical Program for Social Studies (SPSS) for analysis. There were a total of three spreadsheets: Questionnaire 1 Total Results (N = 53), Questionnaire 1 Results (N = 27) and Questionnaire 2 Results (N = 27). Data were missing for one to two items on 6 questionnaires in the Questionnaire 1 Total Results group (N = 53), 3 questionnaires in the Questionnaire 1 Results group (N = 27), and 2 questionnaires in the Questionnaire 2 Results group (N = 27). Because of the small sample size, missing data were replaced by the group mean for that question. This procedure was based on the methodology used by Scarpa et al. (1992). Scarpa et al. replaced the missing responses to any of the 20 items with the mean for that item. Scarpa et al compared "subjects who responded to all 20 items, those with missing data, and those with missing data replaced by the mean" (p. 75). Scarpa et al. reported no significant differences in the mean scores.

Of the eight demographic variables, complete data were obtained for only two of these areas among the 27 participants who completed both questionnaires, shown in Table 1. These areas were gender and highest degree obtained in nursing. All of the participants were female. The participants (n = 25) ranged in age from 23 to 60 years.

Twenty-six participants had a Registered Nurse diploma and 1 participant had a Baccalaureate degree in nursing as the highest degree obtained in nursing. Seventeen participants provided the date of recent degree obtained, ranging from 1977 to 1999. The number of years worked with computers ranged from 1 to 15 years (n = 21). Four participants had no computer experience and 1 participant did not answer the question. The employee position status of the participants was distributed as follows: 6 full time, 15 part time, 5 casual, and 1 did not answer the question. The participants' job titles were 22 Registered Nurses, 2 Managers, and 3 did not answer the question. The number of shifts worked in the last 2 months was asked in Questionnaire 2. The answers (n = 19) to this question ranged from four to forty 8-hour shifts and two to twenty 12-hour shifts. Four participants marked the question with a question mark instead of a numerical value. Staff worked either 8-hour or 12-hour or both shifts, depending on the unit or department. The question was framed to allow this choice of response.

The data were analyzed using Microsoft Excel 97 and Statistical Program for Social Studies (SPSS) 10.0 software. Descriptive statistics were used to describe the scores on Questionnaire 1 Total Results (N = 53). The tests included mean, median, standard deviation, range, minimum and

Table 1

Demographic data of the participants (N = 27)

Variable	Frequency
Gender Female	27
Age (years) (*n* = 25)	
20-30	15
31+	10
No response	2
Highest degree (*n* = 27)	
Diploma	26
Bachelor	1
Date of highest degree (*n* = 17)	
1970-1999	17
No response	10
Computer experience (*n* = 26)	
Yes	22
No	4
No response	1
Years of computer experience (*n* = 21)	
1-8	16
9+	5
No response	6
Position status (*n* = 26)	
Full time	6
Part time	15
Casual	5
No response	1
Job title (n = 24)	
RN	22
Manager	2
No response	3

maximum. A frequency distribution was conducted for total score of attitudes.

The questions were grouped according to the six categories: (a) benefit to institution, (b) patient care, (c) superior capabilities of computers, (d) willingness to use computers, (e) legal ramifications, and (f) threat to employment. The Scoring Guide provided by Dr. Stronge had each question assigned to one of the categories as seen in Appendix B. Questions assigned to the same category were clustered together.

The categories and assigned questions are as follows: (a) benefit to institution, which included questions 1, 2, 4, and 16; (b) patient care included 3, 8, 10, 15, 17, and 19; (c) superior capabilities of computers included questions 7, 13, and 14; (d) legal ramifications included questions 8, 9, and 20; (e) employee willingness to use computers included questions 11 and 12; and (f) threat to employment included question 18. The researcher totalled the responses for a summary score and then conducted descriptive statistics on these scores.

According to the Stronge and Brodt (1985) Scoring Guide, question 5 was assigned two categories: superior capabilities and willingness to use computers. This study chose not to use this question in the analysis of the categories only because of the possibility of tainting the

findings. There was no discussion in Stronge and Brodt's (1985) article about how the data from this question were to be analyzed.

Several new variables were created in order to analyze the data. Adding the scores for all the questions for each participant on Questionnaire 1 and Questionnaire 2 formed two new variables called *Q1Attitude* and *Q2Attitude*. Scores for each question ranged from 1 to 5, and therefore, attitude scores could range from 20 to 100 points. According to Simpson and Kenrick (1997), scores of 60 or below were interpreted as negative attitudes and 61 or more were interpreted as positive attitudes. These interpretations were used as a reference guide when analyzing the participants' attitudes.

Descriptive statistics were used to describe the scores of Questionnaire 1 Results (*N* = 27) and Questionnaire 2 Results (*N* = 27). The analysis included tests of the scores for each question and each subject on both questionnaires. Descriptive statistics were used to describe the attitudinal difference between Questionnaire 2 (*N* = 27) and Questionnaire 1 (*N* = 27). The current study conducted a frequency distribution on the attitudinal scores from Questionnaire 1 Results and Questionnaire 2 Results.

A new variable called *diffscore* was created based on the raw differences in the subjects' attitudes between

Questionnaire 2 and Questionnaire 1. The diffscore variable was added to the demographic data in the SPSS 10.0 Program. Diffscore was further subdivided into two categories: low, which included all participants with a score difference of -13 to +2, and high which, included all participants with a score difference of 3+. This new variable was called *newscore*.

Other new variables were created in the SPSS program in order to conduct additional analyses. The researcher compiled the participants' ages into a new variable called *agegroup*. The two categories formed were 20 to 30 years of age and 31+ years of age. The participants' position status was arranged into three groups: full time, part time, and casual. For number of years worked with computers, the data were compiled into two groups: 0 to 8 and 9+. Highest degree in nursing, date of most recent degree, job title, and number of shifts worked were not analyzed due to large proportions of missing data.

The chi-square test, which measured subject difference, was conducted to determine if there was a relationship between score differences and each of age, status, and years of computer experience. The same test was conducted to study attitude and each of age, status, and years of computer experience. Participants who did not complete any one of

these categories were eliminated for analysis of that particular variable.

A paired *t* test on the difference of attitudinal scores for Questionnaire 1 and Questionnaire 2 was conducted. In order to determine which questions contributed most to the differences in nurses' scores, paired *t* tests were conducted on those questions with high score differences between Questionnaire 1 and Questionnaire 2. By looking at the data, high was defined as score differences between 11 and 24. These questions included: Question 1, increased cost (score difference of 19.12); Question 3, more time for nursing tasks (score difference of 13.56); Question 5, time spent using computer (score difference of 16.65); Question 10, less time for quality patient care (score difference of 11); and Question 18, threat to job security (score difference of 23.88). Paired *t* tests were conducted on questions with negative difference scores between Questionnaire 1 and Questionnaire 2. These questions included Question 15, longer orientation (score difference of -5) and Question 20, nurses face more lawsuits (score difference of -5).

Limitations

1. The researcher was on sick leave during the study, and a third party was involved. The third party was not as familiar with the research.

2. The strength of this research depended upon the

number of returned completed questionnaires. The lag time of 2 months and the inconsistent work schedules of the participants may have contributed to the low return rate of Questionnaire 2.

3. The use of email reminders to the participants instead of personal contact by the researcher may have contributed to the low number of completed Questionnaire 2 survey.

4. A second Questionnaire 2 package might have contributed to an increased rate of response for that Questionnaire.

5. The participants were not a consistent group of full time staff but representative of a variety of status positions, which may have contributed to a low number of completed Questionnaire 2 surveys.

6. Although it was not asked, English may not have been the first language for some participants. The possibility of a language barrier may have contributed to unanswered questions.

<div align="center">Ethical Considerations</div>

One of the issues in research is confidentiality. To ensure confidentiality, the following steps were taken:

1. The participants were assigned numbers as identifiers, and no names appeared on the questionnaires.

2. The written informed consent form stated that all

personal data and information would be kept confidential and names would not be used in study (see Appendix C).

3. A verbal statement of confidentiality was also issued prior to obtaining consent.

4. The consent stated that only the researcher would have access to the data.

This research was not expected to cause the participants mental or psychological harm. The issue was addressed by identifying on the written consent form that the study was voluntary and the participant could withdraw at any time without penalty.

There were no ethical issues surrounding deception or withholding information. The research purpose and method were fully disclosed to the participants before participating in the study.

Formal steps were taken to address ethical issues, and included obtaining permission from Brock University to conduct research on human subjects, gaining research approval from the research committee from the participating hospital, and having each participant sign an informed consent form as seen in Appendix C.

The purpose of this study was to determine the attitude of nurses toward computers before and 2 months after training.

CHAPTER FOUR: FINDINGS

Overview

·This chapter discusses the research questions. The research findings from the Nurses' Attitudes Toward Computerization Questionnaire are identified and discussed.

Findings

Was There a Difference in the Nurses' Attitudes Toward Computers Before and Two Months After Training?

The overall results for the 53 participants who completed Questionnaire 1 were reviewed, but in-depth analyses were provided for the 27 participants who completed both Questionnaire 1 and Questionnaire 2. Scores for each question ranged from 1 to 5, and therefore, attitude scores ranged from 20 to 100 points.

Questionnaire 1 Total Results (N = 53)

Results of the descriptive statistics for Questionnaire 1 Total Results ($N = 53$) are seen in Table 2. The question mean score for Questionnaire 1 Total Results ($N = 53$) ranged from 3.02 to 4.34, with a median score of 3 to 4. The minimum and maximum scores ranged from 1 to 4 for 13 questions and 2 to 5 for 7 questions. The standard deviation for Questionnaire 1 Total Results ($N = 53$) ranged from 0.75 to 1.15. Across the 20 questions, the mean score was 3.59 ($SD = 1.13$). The total mean score for this sample was 71.59 ($SD = 11.03$).

Table 2

Descriptive statistics for Questionnaire 1 Total Results

(N = 53)

N	M	SD	Median	Minimum & maximum (ranges)	M for 20 questions	Total M For Sample
53	3.02 to 4.34	0.75 to 1.15	3 to 4	1 to 4 for 13 questions 2 to 5 for 7 questions	3.59 ± 1.13	71.59 ± 11.03

Attitude scores for Questionnaire 1 Total Results
(*N* = 53) ranged from 46 to 99. Breakdown of these scores
showed that 11 participants or 20.8% had negative attitudes
and 42 participants or 79.2% had positive attitudes.

Questionnaire 1 Results (N = 27)

Results of the descriptive statistics for Questionnaire
1 Results (*N* = 27) are seen in Table 3. The question mean
score for Questionnaire 1 Results (*N* = 27) ranged from 2.89
to 4.19, and the question median for Questionnaire 1 Results
(*N* = 27) ranged from 2 to 4. The minimum and maximum scores
ranged from 1 to 4 for 1 question, 2 to 5 for 11 questions,
and 1 to 5 for 8 questions. The standard deviation for
Questionnaire 1 Results (*N* = 27) ranged from 0.75 to 1.12.
Across the 20 questions for Questionnaire 1 Results (*N* =
27), scores ranged from 2.00 to 4.00. The minimum and
maximum scores ranged from 1 to 4 for 1 question, 2 to 5 for
11 questions, and 1 to 5 for 8 questions. The standard
deviation for Questionnaire 1 Results (*N* = 27) ranged from
0.75 to 1.12. Across the 20 questions, the mean score was
3.47 (*SD* = 0.83). The total mean score for this sample was
70.01 (*SD* = 9.66).

Attitude scores for Questionnaire 1 Results (*N* = 27)
ranged from 54 to 91 (see Table 20). Breakdown of these
scores showed that 7 participants or 25.9% had negative

Table 3

Descriptive statistics for Questionnaire 1 Results (N = 27)

N	M	SD	Median	Minimum & maximum (ranges)	M for 20 questions	Total M for sample
27	2.89 to 4.19	0.75 to 1.12	2 to 4	1 to 4 for 1 question 2 to 5 for 11 questions 1 to 5 for 8 questions	3.47 ± 0.83	70.01 ± 9.66

attitudes and 20 participants or 74.1% had positive attitudes.

Questionnaire 2 Results (N = 27)

Results of the descriptive statistics for Questionnaire 2 Results (*N* = 27) are seen in Table 4. The question mean score for Questionnaire 2 Results (*N* = 27) ranged from 3.15 to 4.30, and the median score for Questionnaire 2 Results (*N* = 27) ranged from 3 to 4. The minimum and maximum scores ranged from 1 to 5 for 2 questions, 2 to 5 for 14 questions, 1 to 4 for 1 question, and 3 to 5 for 1 question. The standard deviation for Questionnaire 2 Results (*N* = 27) ranged from 0.54 to 1.06. Across the 20 questions, the mean score was 3.63 (*SD* = 0.84). The mean total score for this sample was 72.60 (*SD* = 9.64).

Attitude scores for Questionnaire 2 Results ranged from 52 to 94 (refer to Table 20). Breakdown of these scores showed 4 participants or 14.8% had negative attitudes and 23 participants or 85.2% had positive attitudes.

Categories

The six categories were discussed under the Instrumentation section in Chapter Three. The descriptive statistics for these categories for Questionnaire 1 and Questionnaire 2 are seen in Table 5. The results were as follows:

Table 4

Descriptive statistics for Questionnaire 2 Results (N = 27)

N	M	SD	Median	Minimum & Maximum (ranges)	M for 20 questions	Total M For Sample
27	3.15 to 4.30	0.54 to 1.06	3 to 4	1 to 5 for 2 questions 2 to 5 for 14 questions 1 to 4 for 1 question 3 to 5 for 1 question	3.63 $\pm$ 0.84	72.60 $\pm$ 9.64

Table 5

Descriptive statistics for the six categories for Questionnaire 1 and Questionnaire 2 (N = 27)

Categories	M	Median	SD	Minimum	Maximum
Benefit to institution (1, 2, 4, 16)					
Questionnaire 1	14.11	14	2.36	9	19
Questionnaire 2	14.54	14	2.28	10	19
Quality of patient care (3, 8, 10, 15, 17, 19)					
Questionnaire 1	20.26	21	3.81	13	26
Questionnaire 2	21.28	22	3.79	10	27
Superior capabilities of computers (7, 13, 14)					
Questionnaire 1	10.04	10	2.23	6	15
Questionnaire 2	10.41	10	1.67	7	14
Legal ramifications (8, 9, 20)					
Questionnaire 1	10.85	11	1.99	7	14
Questionnaire 2	10.67	12	2.24	6	15
Employee willingness to use computers (11, 12)					
Questionnaire 1	8.30	8	1.51	5	10
Questionnaire 2	8.56	8	1.15	5	10
Threat to employment (18)					
Questionnaire 1	3.12	3	1.12	1	5
Questionnaire 2	3.59	4	0.84	2	5

Benefit to institution (questions 1, 2, 4, 16). For the category benefit to institution, the possible score ranged from 4 to 20. The mean score for Questionnaire 1 was 14.11 and for Questionnaire 2 was 14.54. The median scores for both questionnaires were 14. The standard deviation for Questionnaire 1 was 2.36 and for Questionnaire 2 was 2.28. The minimum scores were 9 in Questionnaire 1 and 10 in Questionnaire 2. The maximum scores for both Questionnaires were 19.

Quality of patient care (questions 3, 8, 10, 15, 17, 19). For the category quality of patient care, the possible score ranged from 6 to 30. The mean score for Questionnaire 1 was 20.26 and for Questionnaire 2 was 21.28. The median scores for Questionnaire 1 and Questionnaire 2 were 21 and 22 respectively. The standard deviation for Questionnaire 1 was 3.81 and for Questionnaire 2 was 3.79. The minimum scores for Questionnaire 1 and for Questionnaire 2 were 13 and 10 respectively. The maximum scores for Questionnaire 1 and for Questionnaire 2 were 26 and 27 respectively.

Superior capabilities of computers (questions 7, 13, 14). For the category superior capabilities of computers, the possible score ranged from 3 to 15. The mean scores for Questionnaire 1 and for Questionnaire 2 were 10.04 and 10.41 respectively. The median scores for both

questionnaires were 10. The standard deviation for Questionnaire 1 was 2.23 and for Questionnaire 2 was 1.67. The minimum scores for Questionnaire 1 and Questionnaire 2 were 6 and 7 respectively. The maximum scores for Questionnaire 1 and Questionnaire 2 were 15 and 14 respectively.

Legal ramifications (questions 8, 9, 20). For the category legal ramifications, the possible score ranged from 3 to 15. The mean scores for Questionnaire 1 and Questionnaire 2 were 10.85 and 10.67 respectively. The median scores for Questionnaire 1 and for Questionnaire 2 were 11 and 12 respectively. The standard deviations for Questionnaire 1 and Questionnaire 2 were 1.99 and 2.24 respectively. The minimum and maximum scores for Questionnaire 1 and Questionnaire 2 were 14 and 15 respectively.

Employee willingness to use computers

(questions 11,12). For the category employee willingness to use computers, the possible score ranged from 2 to 10. The mean score for Questionnaire 1 was 8.30 and for Questionnaire 2 was 8.56. The median scores for both Questionnaires were 8. The standard deviations for Questionnaire 1 and Questionnaire 2 were 1.51 and 1.15 respectively. The minimum scores for both questionnaires were 5. The maximum scores for both questionnaires were 10.

Threat to employment (question 18). For the category threat to employment, the possible score ranged from 1 to 5. The mean scores for Questionnaire 1 and Questionnaire 2 were 3.12 and 3.59 respectively. The median scores for Questionnaire 1 and Questionnaire 2 were 3 and 4 respectively. The standard deviation for Questionnaire 1 was 1.12 and for Questionnaire 2 was 0.84. The minimum scores for Questionnaire 1 and Questionnaire 2 were 1 and 2 respectively. The maximum scores for both Questionnaires were 5.

Diffscore (Questionnaire 2-Questionnaire 1)

The diffscore mean and median scores were 2.59 and 2 respectively. The standard deviation score for diffscore was 7.92. The minimum and maximum scores for diffscore were -12.42 and 23.00 respectively. Specific questions with large score differences (refer to Table 20) are discussed in detail in the Interpretation of Findings section of this chapter.

Did any Demographic Variables Have an Effect on Attitudes Toward Computers?

Newscore and Agegroup (n = 25)

Results of the cross tabulations and the Pearson chi-square test for newscore and agegroup (*n* = 25) are seen in Table 6. Twenty-five of the 27 participants completed the age question in the demographic data section in both

Table 6

Cross tabulations and Pearson chi-square test for newscore and agegroup (n = 25)

Crosstab

| | | Newscore | | |
		-13 to +2	3+	Total
Agegroup (years)	20-30	7	8	15
	31+	7	3	10
Total		14	11	25

Pearson chi-square test

	value	*df*	*p*
Pearson chi-square	1.326	1	.250
n of valid cases	25		

Questionnaires. Cross tabulations for newscore and agegroup showed that there were 15 participants who were 20 to 30 years of age and 10 participants who were 31+ years of age. Of the fifteen 20- to 30-year-olds, 7 participants fell into the newscore category of -13 to +2 and 8 participants fell into the newscore category of 3+. Of the 10 participants who were 31+ years of age, 7 participants fell into the newscore category of -13 to +2 and 3 participants fell into the newscore category of 3+. The Pearson chi-square (1, n = 25) value was 1.326 with a probability value of .250.

Newscore and Years of Computer Experience (n = 21)

Results of the cross tabulations and Pearson chi-square test for newscore and years of computer experience (n = 21) are seen in Table 7. Twenty-one of the 27 participants completed the years of computer experience question in the demographic data section on both Questionnaires. Cross tabulations for newscore and years of computer experience showed that there were 16 participants with 1 to 8 years of computer experience and 5 participants with 9+ years of computer experience. Of the 16 participants with 1 to 8 years of computer experience, 7 participants fell into the newscore category of -13 to +2 and 9 participants fell into the newscore category of 3+. Of the 5 participants with 9+ years of experience, 3 participants fell into the newscore category of -13 to +2 and 2 participants fell into the

Table 7

Cross tabulations and Pearson chi-square test for newscore and years of computer experience (n = 21)

Crosstab

		Newscore		
		-13 to +2	3+	Total
Computer years Experience	1-8	7	9	16
	9+	3	2	5
Total		10	11	21

Pearson chi-square Test

	value	*df*	*p*
Pearson chi-square	0.403	1	.525
n of valid cases	21		

Table 8

Cross tabulations and Pearson chi-square test for newscore and status (n = 26)

Crosstab

		Newscore		
		-13 to +2	3+	Total
Status	Full time	2	4	6
	Part time	8	7	15
	Casual	3	2	5
Total		13	13	26

Pearson chi-square Test

	value	df	p
Pearson chi-square	0.933	2	.627
n of valid cases	26		

newscore category of 3+. The Pearson chi-square (1, n = 21) value was 0.403 with a probability of .525.

Newscore and Status (n = 26)

Results of the cross tabulations and Pearson chi-square test for newscore and status (n = 26) are seen in Table 8. Twenty-six of the 27 participants completed the status question in the demographic data section on both Questionnaires. Cross tabulations for newscore and position status showed that there were 6 participants who were in the full-time position status category, 15 participants who were in the part-time position status category, and 5 participants who were in the casual position status category. Of the 6 participants who worked full time, 2 participants fell into the newscore category of -13 to +2 and 4 participants fell into the newscore category of 3+. Of the 15 participants who worked part time, 8 participants fell into the newscore category of -13 to +2 and 7 subjects fell into the newscore category of 3+. Of the 5 participants whose work was casual, 3 participants fell into the newscore category of -13 to +2 and 2 participants fell into the newscore category of 3+. The Pearson chi-square (2, n = 26) value was 0.933 with a probability of .627.

Attitude and Agegroup (n = 25)

Q1Attitude and agegroup (n = 25). Results of the cross tabulations and Pearson chi-square test for Questionnaire 1

Table 9

Cross tabulations and Pearson chi-square tests for

Questionnaire 1 (Q1) attitude scores and agegroup (n = 25)

Crosstab

		Q1Attitude		
		< or = 60 (negative)	>60 (positive)	Total
Agegroup (years)	20-30	4	11	15
	31+	2	8	10
Total		6	19	25

Pearson chi-square test

	value	*df*	*p*
Pearson chi-square	0.146	1	.702
n of valid cases	25		

(Q1) attitude scores and agegroup (n = 25) are seen in Table 9. Cross tabulations for Q1Attitude and agegroup showed that there were 15 participants who were 20 to 30 years of age and 10 participants who were 31+ years of age for Questionnaire 1. Of the fifteen 20- to 30-year-olds, 4 participants fell into the $\leq$60-attitude scores group and 11 participants fell into the >60-attitude scores group. Of the 10 participants who were 31+ years of age, 2 participants fell into the $\leq$60-attitude scores group and 8 participants fell into the >60-attitude scores group. The Pearson chi-square (1, n = 25) value was 0.146 with a probability of .702.

Q2Attitude and agegroup (n = 25). Results of the cross tabulations and Pearson chi-square test for Questionnaire 2 (Q2) attitude scores and agegroup (n = 25) are seen in Table 10. Cross tabulation tests for Q2Attitude and agegroup showed that there are 15 participants who were 20 to 30 years of age and 10 participants who were 31+ years of age for Questionnaire 2. Of the fifteen 20- to 30-year-olds, 1 participant fell into the $\leq$60-attitude scores group and 14 participants fell into the >60-attitude scores group. Of the 10 participants who were 31+ years of age, 3 participants fell into the $\leq$60-attitude scores group and 7 participants

Table 10

Cross tabulations and Pearson chi-square test for

Questionnaire 2 (Q2) attitude scores and agegroup (n = 25)

Crosstab

		Q2Attitude		
		< or = 60	>60	Total
		(negative)	(positive)	
Agegroup (years)	20-30	1	14	15
	31+	3	7	10
Total		4	21	25

Pearson chi-square test

	value	df	p
Pearson chi-square	2.431	1	.119
n of valid cases	25		

Table 11

Cross tabulations and Pearson chi-square test for Questionnaire 1 (Q1) attitude scores and years of computer experience (n = 21)

Crosstab

		Q1Attitude		
		< or = 60 (negative)	>60 (positive)	Total
Computer years experience	1-8	6	11	17
	9+		4	4
Total		6	15	21

Pearson chi-square test

	value	*df*	*p*
Pearson chi-square	1.976	1	.16
n of valid cases	21		

fell into the >60-attitude scores group. The Pearson chi-square (1, $n = 25$) value was 2.431 with a probability of .119.

Attitude and Years of Computer Experience ($n = 21$)

Q1Attitude and years of computer experience ($n = 21$). Results of the cross tabulations and Pearson chi-square test for Questionnaire 1 (Q1) attitude scores and years of computer experience ($n = 21$) are seen in Table 11.

Cross tabulations for Q1Attitude and years of computer experience showed that there were 17 participants with 1 to 8 years of computer experience and 4 participants with 9+ years of computer experience for Questionnaire 1. Of the 17 participants with 1 to 8 years of computer experience, 6 participants fell into ≤ 60 attitudes group and 11 participants fell into >60-attitude scores group. Of the 4 participants with 9+ years of computer experience, 4 participants fell into the >60-attitude scores group. There were no participants with ≤ 60 attitudes for the group with 9+ years of computer experience for Questionnaire 1. The Pearson chi-square (1, $n = 21$) value for Questionnaire 1 was 1.976 with a probability of .110.

Q2Attitude and years of computer experience ($n = 21$). Results of the cross tabulations and Pearson chi-square test for Questionnaire 2 (Q2) attitude scores and years of computer experience ($n = 21$) are seen in Table 12. Twenty-

Table 12

Cross tabulations and Pearson chi-square test for Questionnaire 2 (Q2) attitude scores and years of computer experience (n = 21)

Crosstab

| | | Q2Attitude | | |
		< or = 60 (negative)	>60 (positive)	Total
Computer years experience	1-8	3	14	17
	9+		4	4
Total		3	18	21

Pearson chi-square test

	value	df	p
Pearson chi-square	0.824	1	0.364
n of valid cases	21		

one participants completed Questionnaire 2. Cross tabulations for Q2Attitude and years of computer experience showed that there were 17 subjects with 1 to 8 years of computer experience and 4 subjects with 9+ years of computer experience for Questionnaire 2. Of the 17 subjects with 1 to 8 years of computer experience, 3 subjects fell into the $\leq$60-attitude scores group and 14 subjects fell into the >60-attitude scores group. Of the 4 subjects with 9+ years of computer experience, 4 subjects fell into the >60-attitude scores group. There were no subjects with 9+ years of computer experience who fell into the $\leq$60-attitude scores group. The Pearson chi-square (1, n = 21) value for Questionnaire 2 was 0.824 with a probability of .364.

Attitude and Status (n = 26)

Q1Attitude and status (n = 26). Results of the cross tabulations and Pearson chi-square test for Questionnaire 1 attitude scores and status (n = 26) are seen in Table 13. Cross tabulations for Q1Attitude and status showed that there were 6 participants who were in the full-time position status category, 15 participants who were in the part-time position status category, and 5 who were in the casual position category for Questionnaire 1. Of the 6 participants who were in the full-time position status category, 2 participants fell into the $\leq$60-attitude scores group and 4 participants fell into the >60-attitude scores group. Of the

Table 13

Cross tabulations and Pearson chi-square test

Questionnaire 1 (Q1) attitude scores and status (n = 26)

Crosstab

		Q1Attitude		
		< or = 60 (negative)	>60 (positive)	Total
Status	Full-time	2	4	6
	Part-time	4	11	15
	Casual	1	4	5
Total		7	19	26

Pearson chi-square test

	value	*df*	*p*
Pearson chi-square	0.248	2	0.884
n of valid cases	26		

15 participants who were in the part-time position status category, 4 participants fell into the $\leq$60-attitude scores group and 11 participants fell into the >60-attitude scores group. Of the 5 participants who were in the casual position status category, 1 participant fell into the $\leq$60-attitude scores group and 4 participants fell into the >60-attitude score group. The Pearson chi-square (2, $n = 26$) value for Questionnaire 1 was 0.248 with a probability of .884.

Q2Attitude and status ($n = 26$). Results of the cross tabulations and Pearson chi-square test for Questionnaire 2 attitude scores and status ($n = 26$) are seen in Table 14. Crosstabulations for Q2Attitude and status showed that there are 6 participants who were in the full-time position status category, 15 participants who were in the part-time position status category, and 5 participants who were in the casual position status category for Questionnaire 2. Of the 6 participants who were in the full-time position status category, 6 participants fell into the >60-attitude scores group. There were no participants who were in the full-time position status category who fell into the $\leq$60-attitude scores group. Of the 15 participants who were in the part-time position status category, 4 participants fell into the $\leq$60-attitude scores group and 11 participants fell into the >60-attitude scores group. Of the 5 participants who were in

the casual position status category, 5 participants fell into the >60-attitude scores group. There were no participants in the casual position status category who fell into the ≤60-attitude scores group. The Pearson chi-square (2, n = 26) value for Questionnaire 2 was 3.467 with a probability of .177.

Paired t Tests

Results of the paired t tests of attitude score totals and questions 1, 3, 5, 10, 15, 18, and 20 for Questionnaire 1 and Questionnaire 2 (N = 27) are seen in Table 15.

Q1Attitude totals-Q2Attitude totals (n = 27). Paired *t* test analysis was conducted on the total attitude scores for Questionnaire 1 and Questionnaire 2. The values were as follows: the mean difference was −3.08 (*SD* = 7.970) and the *t* value was −2.000, *p* = .055. Paired *t* tests conducted on specific questions to determine impact on score differences were as follows:

Increased costs (question 1). The mean difference value was −0.27 (*SD* = 1.030) and the *t* value was −1.336, *p* = .193.

More time for nursing tasks (question 3). The mean difference value was −0.540 (*SD* = 1.200) and the *t* value was −2.343, *p* = .027.

Table 14

Cross tabulations and Pearson chi-square test for

Questionnaire 2 (Q2) attitude scores and status (n = 26)

Crosstab

		Q2Attitude		
		< or = 60 (negative)	>60 (positive)	Total
Status	Full time		6	6
	Part time	4	11	15
	Casual		5	5
Total		4	21	26

Pearson chi-square test

	value	df	p
Pearson chi-square	3.467	2	0.177
n of valid cases	26		

Time spent using computers (question 5). The mean difference value was -0.210 (*SD* = 1.140) and the *t* value was -0.956, *p* = .348.

Less time for quality patient care (question 10). The mean difference value was -0.410 (*SD* = 1.010) and the *t* value was -2.096, *p* = .046.

Longer orientation (question 15). The mean difference value was 0.190 (*SD* = 0.880) and the *t* value was 1.095, *p* = .284.

Threat to job security (question 18). The mean difference value was -0.480 (*SD* = 1.160) and the *t* value was -2.133, *p* = .043.

Nurses face more lawsuits (question 20). The mean difference value was 0.190 (*SD* = 0.790) and the *t* value was 1.224, *p* = .232.

Interpretation of Findings

Findings of this study relative to findings of other studies will be discussed. However, the differences in sample sizes of these studies should be kept in mind. For the purposes of comparison with other studies, the current study will be referred to as Noble (2002). *Questionnaire 1 Total Results (N = 53), Questionnaire 1 Results (N = 27), and Questionnaire 2 Results (N = 27)* The mean scores for 20 questions, subject and total

Table 15

Paired t tests of attitude score totals and questions (Q) 1, 3, 5, 10, 15, 18, and 20 for Questionnaire 1 (Q1) and Questionnaire 2 (Q2) (N = 27)

	M	SD	t	p
Q1Total – Q2Total	-3.080	7.970	-2.000	.055
Q1Q1 – Q1Q2	-0.270	1.030	-1.336	.193
Q3Q1 – Q3Q2	-0.540	1.200	-2.343	.027*
Q5Q1 – Q5Q2	-0.210	1.140	-0.956	.348
Q10Q1 – Q10Q2	-0.410	1.010	-2.096	.046*
Q15Q1 – Q15Q2	0.190	0.880	1.095	.284
Q18Q1 – Q18Q2	-0.480	1.160	-2.133	.043*
Q20Q1 – Q20Q2	0.190	0.790	1.224	.232

*p <.05

mean scores for Questionnaire 1 and Questionnaire 2 are seen in Table 16. The mean scores for each of the 20 questions were as follows: for Questionnaire 1 Total Results ($M = 3.59$, $SD = 1.13$), Questionnaire 1 Results ($M = 3.47$, $SD = 0.94$), and Questionnaire 2 Results ($M = 3.63$, $SD = 0.84$). The mean scores for the 27 subjects were for Questionnaire 1 Results ($M = 3.50$, $SD = 0.83$) and Questionnaire 2 ($M = 3.64$, $SD = 0.68$). The total mean scores for Questionnaire 1 Total Results ($N = 53$), Questionnaire 1 Results ($N = 27$), and Questionnaire 2 Results ($N = 27$) were 71.59, 70.01, and 72.60 respectively. Noble's (2002) and Scarpa et al.'s (1992) findings for question mean scores and total mean scores are seen in Table 17. Noble's findings for question mean scores were as follows: for Questionnaire 1 Total Results $M = 3.6$ ($SD = 1.1$), for Questionnaire 1 Results $M = 3.5$ ($SD = 0.8$) and for Questionnaire 2 $M = 3.6$ ($SD = 0.84$). Scarpa et al.'s finding for question mean score was $M = 3.6$ ($SD = 0.5$). Noble's findings for total mean were as follows: for Questionnaire 1 Total Results $M = 71.6$ ($SD = 11.0$), for Questionnaire 1 Results $M = 70.0$ ($SD = 9.7$), and for Questionnaire 2 Results $M = 72.6$ ($SD = 9.6$). Scarpa et al.'s finding for total mean score was $M = 71.5$ ($SD = 10.9$). Both studies had similar findings in that nurses had positive attitudes towards computers.

Table 16

Mean scores for 20 questions, participants and total mean scores for Questionnaire 1 and Questionnaire 2

	Mean scores for 20 questions	Mean scores for participants	Total mean scores
Questionnaire 1 total results ($N = 53$)	3.59 $\pm$ 1.13		71.59
Questionnaire 1 results ($N = 27$)	3.47 $\pm$ 0.83	3.50 $\pm$ 0.83	70.01
Questionnaire 2 results ($N = 27$)	3.63 $\pm$ 0.84	3.64 $\pm$ 0.68	72.60

Table 17

Findings for mean and total mean scores for Noble (2002)

and Scarpa et al. (1992) studies

	Question mean scores	Total mean scores
Noble (2002)		
Questionnaire 1 total		
Results (N = 53)	3.6 ± 1.1	71.6 ± 11.0
Questionnaire 1		
Results (N = 27)	3.5 ± 0.8	70.0 ± 9.7
Questionnaire 2		
Results (N = 27)	3.6 ± 0.8	72.6 ± 9.6
Scarpa et al. (1994)	3.6 ± 0.5	71.5 ± 10.9

Categories

The results of this study showed the question mean scores for the six categories were in the positive range for both Questionnaires. The six categories were: benefit to institution, quality of patient care, superior capabilities of computers, threat to employment, employee willingness to use computers, and legal ramifications. Four categories showed a minimal positive change (0.26 to 0.47) in the follow-up mean scores in Questionnaire 2 from already positive baseline mean scores in Questionnaire 1. The four categories were: benefit to institution, superior capabilities of computers, willingness to use computers, and threat to employment. One category, quality of patient care, showed a considerable positive change (1.02) in the follow-up mean score in Questionnaire 2 from an already positive baseline mean score in Questionnaire 1. One category, legal ramifications, showed a minimal decrease in the follow-up positive mean score (0.18) in Questionnaire 2 from a positive baseline mean score in Questionnaire 1. This change was still within the positive range.

The mean scores from both Questionnaires in Noble's (2002) study and the mean scores in Bongartz's (1988) study are seen in Table 18. Bongartz was the only researcher who reported mean scores of computer users and computer nonusers for each of the six categories. The results of Noble's study

showed nurses' attitudes were more positive in five of the six categories in Questionnaire 2. However, the nurses' attitudes became less positive in the willingness to use computers category. Bongartz reported that the nonuser group had a more positive attitude than the user group in two of the categories: improve patient care and superior capabilities of computers. Bongartz also reported that there was no difference between the users' and the nonusers' attitudes in three of the categories: benefit to institution, willingness to use computers, and legal ramifications. Bongartz noted that the nonusers perceived computers as a possible threat to job security.

Attitude Scores

The sample total mean scores for Questionnaire 1 Results ($M = 70.01$, $SD = 9.66$) and for Questionnaire 2 Results ($M = 72.60$, $SD = 9.64$) differed by 2.59. These results implied that, overall, the participants had positive attitudes toward computers at the baseline and in the follow-up. Of the 27 participants who completed Questionnaire 1, 74.1% had positive attitudes and 25.9% had negative attitudes (see Figure 1). Of the 27 participants who completed Questionnaire 2, 85.2% had positive attitudes and 14.8% had negative attitudes toward computers (see Figure 1). There was an increase of 11.1% in positive

Table 18

Results of mean scores for Noble (2002) and Bongartz (1988) studies

	Noble (2002)		Bongartz (1988)	
Categories	Questionnaire 1 (N = 27)	Questionnaire 2 (N = 27)	Users (N = 440)	Nonusers (N = 273)
Benefit to institution	14.1 ± 2.4	14.5 ± 2.3	10.8 ± 2.3	10.9 ± 2.3
Patient care	20.3 ± 3.8	21.3 ± 3.79	19.8 ± 4.8	22.0 ± 4.0
Superior capabilities of computers	10.0 ± 2.2	10.4 ± 1.7	13.8 ± 1.5	13.6 ± 2.8
Willingness to use computers	8.3 ± 1.5	8.6 ± 1.2	12.0 ± 2.3	11.7 ± 2.5
Legal ramifications	10.9 ± 2.0	10.7 ± 2.2	10.4 ± 2.3	10.5 ± 2.2
Job threat	3.1 ± 1.1	3.6 ± 0.8	3.8 ± 0.7	3.4 ± 0.9

attitudes from Questionnaire 1 to Questionnaire 2. Simpson and Kenrick (1997) reported that 54.3% (n = 113) subjects had positive attitudes and 45.7% (n = 95) subjects had negative attitudes. Kiat (1999) reported 76.9% (n = 195) nurses had positive attitudes.

The attitude scores in this study showed a similar trend to those in previous studies, as seen in Table 19. Bongartz (1988) compared computer users (n = 440) and computer nonusers (n = 273) and the mean scores were 70.1 (SD = 13.1) and 72.2 (SD = 12.8) respectively. Brodt and Stronge (1986) reported the mean score as 70.8 (N = 185). Scarpa et al. (1992) reported the mean score as 71.4 (SD =10.9, N = 136). Kiat (1999) reported the mean score as 68.1 (SD = 10.8). Noble's (2002) reported mean scores as 70.0 (SD = 9.7) and 72.6 (SD = 9.6) for Questionnaire 1 (Q1) and Questionnaire 2 (Q2) respectively.

Diffscore

Table 20 shows the differences in attitude scores between Questionnaire 1 and Questionnaire 2 (N = 27). Some participants (n = 7) showed a positive increase in attitudes from Questionnaire 1 to Questionnaire 2. One participant's total attitude score decreased from 73 (Questionnaire 1) to 60.6 (Questionnaire 2), a difference of -13. Another participant's total attitude score increased from 55 (Questionnaire 1) to 78 (Questionnaire 2), a difference of
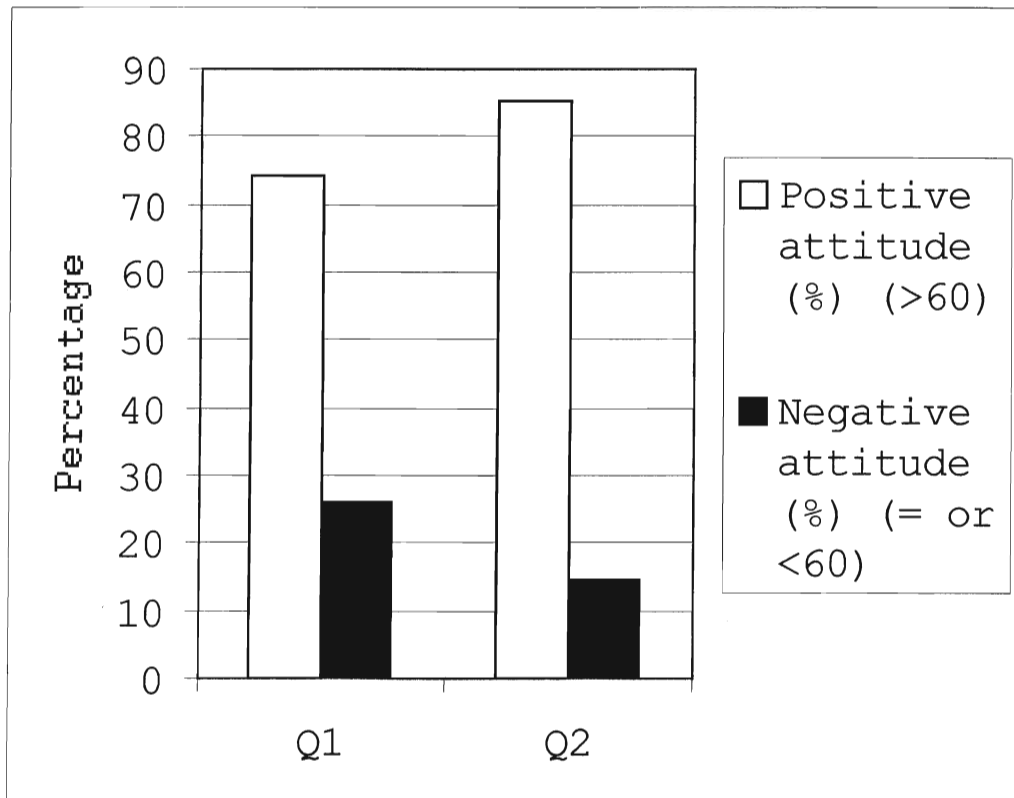
Figure 1. Attitude total scores for questionnaire 1 (Q1) and questionnaire 2 (Q2). (N = 27)

Table 19

Comparison of attitude mean scores for Bongartz (1988), Brodt and Stronge (1986), Scarpa et al. (1992), Kiat (1999), and Noble (2002) studies

	Bongartz Users (n = 440)	Nonusers (n = 273)	Brodt & Stronge (N = 185)	Kiat (N = 195)	Scarpa et al. (N = 136)	Noble Q1 results (N = 27)	Q2 Results (N = 27)
M	70.1	72.2	70.8	68.1	71.4	70.0	72.6
SD	13.1	12.8		10.8	10.9	9.7	9.6

23. Overall, the majority of the participants (n = 17) demonstrated a positive change in attitudes toward computers.

The other participants (n = 10) demonstrated a negative change in attitudes toward computers. These 10 participants who showed a negative shift in attitude scores between Questionnaire 1 and Questionnaire 2 had concerns about the areas cited in the questions in two of the categories, legal ramifications and quality of patient care. Three of the six questions in the patient care category showed that 5 to 6 participants' attitude scores shifted negatively from Questionnaire 1 to Questionnaire 2, indicating that computers could interfere with nursing function and documentation on computers could not improve patient care. Two questions in the legal ramifications category showed that 5 to 6 participants' attitude scores shifted negatively from Questionnaire 1 to Questionnaire 2, indicating that computers could lead to breach of patient privacy and more lawsuits. Of the 10 participants who had negative differences in attitude scores between Questionnaire 1 and Questionnaire 2, 5 participants were in the 20 to 30 years of age group and 5 participants were in the 31+ years of age group. Of the 9 participants who had negative shifts in attitude scores, 1 participant was in the full-time position status category, 1 participant was in the

Table 20

Difference in attitude scores between Questionnaire 2 (Q2) and Questionnaire 1 (Q1) (N = 27)

Subject identity	Q2 attitude scores	Q1 attitude scores	Diffscore
1	76	77	-1
2	71	70	1
3	72	74	-2
5	75	72	3
6	62	60	2
7	69	65	4
8	78	55	23
9	77	68	9
12	68	65	3
13	61	73	-13
15	74	71	3
16	83	73	10
17	78	71	7
20	75	73	2
21	71	54	17
29	81	84	-3
33	59	58	1
34	82	85	-3
36	84	72	12
38	60	67	-7
41	94	91	3
42	56	59	-3
44	79	75	4
46	52	59	-7
50	73	58	15
52	70	76	-6
56	81	85	-4

casual position status category, 7 participants were in the part-time position status category, and 1 participant did not answer the position status question. Of the 10 participants who had negative attitudes toward computers, 5 participants had 1 to 8 years of computer experience, 3 participants had 9+ years of computer experience, and 2 participants had no computer experience. Overall, the patient care category showed a positive shift in attitudes of the 27 participants.

Impact of Specific Questions on Attitudes

The results of the paired t tests on the questions with high score differences between Questionnaire 1 and Questionnaire 2 indicated statistical significance for question 3 (p = .027), question 10 (p = .046), and question 18 (p = .043). The other questions (1, 5, 15, and 20) did not demonstrate statistical significance.

The participants' attitudes shifted positively toward computers in the patient care area as shown in question 3, allowing nurses to spend time on trained professional tasks. The participants' attitudes shifted positively toward computers as shown in question 10, allowing more time for patient care. The participants' attitudes shifted positively toward computers as shown in question 18, indicating a belief that computers were not a threat to job security.

In the literature, there were no findings reported on individual questions, except for Bongartz (1988) who discussed question 18, the only question under the category threat to employment (see Table 21). Bongartz's findings for this question showed: the mean scores were 3.77 ($SD = 0.73$) and 3.37 ($SD = 0.93$) for computer users and computer nonusers respectively. Noble's (2002) findings for this question showed: the mean scores are 3.12 ($SD = 1.12$) and 3.59 ($SD = 0.84$) for Questionnaire 1 and Questionnaire 2 respectively. Bongartz found a significant difference in the mean scores ($p = 0.000$) between computer users and computer nonusers. While Noble (2002) did not compare users and nonusers, Noble found a significant difference in mean scores ($p = 0.043$) between Questionnaire 1 and Questionnaire 2. Bongartz concluded that the computer nonusers perceived the computer as a threat to job security. Noble noticed a positive shift in the participants' attitudes from Questionnaire 1 to Questionnaire 2, concluding that the participants perceived the computer was not a threat to job security.

Newscore and Agegroup, Years of Computer Experience and Status

There was no statistical significance between newscore and agegroup. However, the results were noteworthy of

Table 21

Bongartz's (1988) and Noble's (2002) findings related to threat to employment category (question 18)

	M	SD	
Bongartz (1988)			t test: p = 0.000**
Users	3.77	0.73	
Nonusers	3.37	0.93	
Noble (2002)			Paired t test: p = 0.043*
Questionnaire 1	3.12	1.12	
Questionnaire 2	3.59	0.84	

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

mention. There were attitudinal score differences that ranged from -13 to 23, and these differences (newscore) were classified into two categories, -13 to +2, and 3+. The results of this study showed that 14 of the attitudinal score differences were in the -13 to +2 category and 11 of the attitudinal score differences were in the 3+ category. Eight participants in the 20 to 30 years of age group had attitudinal score differences in the 3+ category and 7 participants in the 20 to 30 years of age group had attitudinal score differences in the -13 to +2 category. As for the difference in the 31+ years of age group, 7 of the attitudinal score differences were in the -13 to +2 category and 3 attitudinal score differences were in the 3+ category. The results did show that the younger nurses' attitudinal score differences were in the positive range. The results showed that the older nurses' attitudinal score differences were not as positive as the younger nurses'. The participants' exposure to computers for the 2 months could have influenced the changes in attitudinal score differences, especially among those who had not been previously exposed to computers.

There was no statistical significance between newscore and years of computer experience. However, the results were worth noting. The results showed 11 of the attitudinal score differences were in the 3+ category and 10 of the

attitudinal score differences were in the -13 to +2 category. The attitudinal score differences of 7 participants with 1 to 8 years of computer experience were in the -13 to +2 category and the attitudinal score differences of 9 participants with 1 to 8 years of computer experience were in the 3+ category. The attitudinal score differences of 3 participants with 9+ years of computer experience were in the -13 to +2 category and the attitudinal score differences of 2 participants with 9+ years of computer experience were in the 3+ category. The results did show that the attitudinal score differences of the nurses with 1 to 8 years of computer experience were in the positive range, whereas the attitudinal score differences of nurses with 9+ years of computer experience were not as positive. Exposure to computers for documentation could have contributed to the attitudinal score differences around the nursing questions.

The results between newscore and status were not statistically significant. The findings were noteworthy of mention. The results showed that the attitudinal score differences of all three status categories were evenly split into the 2 categories, -13 to +2 (13) and 3+ (13). The majority of the full-time nurses showed attitudinal score differences in the positive range of 3+ (4) and 2 full-time nurses' attitudinal score differences were in the -13 to +2

range. The part-time nurses showed attitudinal score
differences in both categories of -13 to +2 (8) and 3+ (7).
The casual status category showed attitudinal score
differences in both categories of -13 to +2 (3) and 3+ (2).
Some reasons for the differences could be exposure to
computers in the participants' working environment,
additional peer training and support on the nursing units,
use of computers for purposes other than patient care, and
more familiarity with computers was encouraged by home use.

Attitudes and Agegroup, Years of Computer Experience and

Status

There was no statistical significance between attitudes
and agegroup. However, the results were worth reporting.
There was a shift in attitudinal scores between
Questionnaire 1 and Questionnaire 2 for a few participants
(n = 4). Two participants who were in the 20 to 30 years of
age group moved from negative attitude scores on
Questionnaire 1 to positive attitude scores on Questionnaire
2. One of the participants who was in the 31+ years of age
group moved from a positive attitude score on Questionnaire
1 to a negative attitude score on Questionnaire 2. The
majority of the participants (76.6%) in Questionnaire 1 had
positive attitudes, the younger ones (57.9%) more so. The
same pattern was seen in Questionnaire 2, where 84% of

participants had positive attitudes and, once again, the younger participants (66.7%) account for most of this.

There was no statistical significance between attitudes and years of computer experience. The results were noteworthy of mention. There was a shift in attitudinal scores in the 1 to 8 years of computer experience group. Three participants with 1 to 8 years of computer experience moved from the negative attitude group to the positive attitude group. There was no change in the 9+ years of computer experience group. Overall, the nurses in both groups had positive attitudes towards computers. The nurses with 1 to 8 years of computer experience were more positive (52.4% Questionnaire 1, 66.7% Questionnaire 2) than the nurses with 9+ years of computer experience (19% Questionnaire 1, 19% Questionnaire 2).

There was no statistical significance between attitudes and status. Changes in attitudes in two of the position status categories were worth reporting. Two participants who were in the full-time position status category moved from the negative attitude group to the positive attitude group. One participant who was in the casual position status category moved from the negative attitude group to the positive attitude group. There were no attitudinal changes among the participants in the part-time position status

category. The majority of the participants, no matter what position status, had positive attitudes towards computers.

When compared to the other studies (Bongartz, 1988; Brodt & Stronge, 1986; Cheatwood & Martin, 1988; Kiat, 1999; Scarpa et al., 1992; Simpson & Kenrick, 1997), this researcher was the only one who studied the number of years of computer experience. In Scarpa et al.'s study, previous experience with computers was found to be related to positive attitudes towards computers; however, these researchers did not study length of time of computer experience. Brodt and Stronge found that there are differences in attitudes towards computers by years of nursing experience and education level. Brodt and Stronge found a difference in attitudes between managers and other nurses; the managers had more positive attitudes than the staff nurses. Noble (2002) did not study these areas.

Summary of the Findings

Stronge and Brodt's (1985) instrument allowed for the identification of nurses' attitudes and factors that could influence those attitudes. Although attitudinal differences were not statistically significant overall, further examination of questions with large score differences did demonstrate statistical significance. The belief that computers allowed more time for professional tasks (question 3) implied that nurses found computers as time savers in

their practice. Somewhat more negative attitudes were shifted over time to positive, as demonstrated by questions 10 and 18, in that nurses found that computers did not take time away from giving patient care and that computers were not a threat to job security. Two other questions with large positive score differences were as follows: question 1, increased cost, had a mean score difference of 19.12; and question 5, time spent using computers, had a mean score difference of 16.65. The mean score of the total attitude score between Questionnaire 1 and Questionnaire 2 was -3.08. Although not statistically significant, the trends seen between questionnaires were important to report.

There were 10 nurses who had lower mean scores than the other 17 nurses. These mean score differences between Questionnaire 2 and Questionnaire 1 ranged from -1 to -13. Six of the 10 nurses showed a decrease in mean score differences in question 19 in a negative way, indicating that increased computer usage could not allow more time to give patient care. Three of the 20 questions related to patient care indicated a negative shift in nurses' attitudes toward computers. These nurses could have concerns regarding the time involved with computers instead of patient care, and using computers for documentation.

Although the influence on attitudes by age had no statistical significance, two thirds of the nurses 20 to 30

years of age exhibited positive attitude scores and one third who were 31+ years exhibited positive attitude scores. The participants' exposure to computers during training and for the 2 months working on the units could have influenced the positive changes in attitudes, especially among those who had not been previously exposed to computers. The 20- to 30-year-old nurses were exposed to computers more today than their older counterparts, implying that these nurses were more comfortable with the role of computers in the provision of health care.

Although the influence on attitudes by years of computer experience had no statistical significance, three quarters of nurses with 1 to 8 years of computer experience exhibited positive attitude scores and one quarter of the nurses with 9+ years of computer experience presented positive attitude scores. This difference implied that nurses with less computer experience were willing to learn more about the use of computers in nursing practice. Perhaps this difference demonstrated that nurses with more computer experience were comfortable with computers, and this area would need further research.

Although the influence on attitudes by status had no statistical significance, nurses who were full-time and were casual showed a positive shift in attitudes towards computers after being exposed to the computers during

training and working on the units. Part-time nurses'
attitudes did not change from Questionnaire 1 to
Questionnaire 2. The majority of nurses, no matter what
position status, had positive attitudes toward computers.

CHAPTER FIVE: SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Summary

Attitude is an important predictor of how an individual would behave towards an object (Jayasuriya & Caputi, 1996). For the purpose of this study, the objects were computers in nursing practice. Nurses' attitudes must be taken into consideration when implementing computer technology in health care facilities.

The literature supported the importance of studying nurses' attitudes with regards to computer technology. Acceptance of computer technology could be facilitated or impeded by attitudes. Several researchers had investigated whether nurses' attitudes toward computers and or demographic information had an effect on those attitudes. The results of these studies, including this study, were consistent in that nurses generally had positive attitudes toward computers. The degree of positivity varied from study to study. The purpose of this study was to determine the attitude of nurses toward computers before (Questionnaire 1) and 2 months after (Questionnaire 2) computer training. Stronge and Brodt's (1985) instrument, Nurses' Attitudes Toward Computerization Questionnaire, was used as a basis for Questionnaire 1 and Questionnaire 2. Numerous researchers had used Nurses' Attitudes Toward Computerization Questionnaire as a reliable tool in

assessing the general status of computer attitudes of nurses.

The researcher distributed Questionnaire 1 to the new employees prior to any training provided. The new employees had 4 half-days of computer training. Two months after the first date of the first completed questionnaire, a second questionnaire was sent to the participants. The participants were to circle a response to each statement. The participants were to complete the demographic information on each questionnaire.

The following questions were explored in this study.

1. Was there a difference in the nurses' attitudes toward computers before and 2 months after training?

2. Did any demographic variables have an effect on attitudes toward computers?
These questions are discussed in this summary.

The differences in attitude scores between the two Questionnaires showed that there are positive changes in nurses' attitudes toward computers. The baseline scores in this study were similar to those in previous studies. No other studies were found in the literature which involved a follow-up questionnaire using Stronge and Brodt's (1985) tool. Several questions relating to patient care, time performing nursing tasks, and job security showed a more

positive change in the participants' attitudes toward computers.

Several demographic areas, such as age, years of computer experience, and position status, were studied to determine whether these factors influenced nurses' attitudes. The findings in this study showed no statistically significant relationship between attitudes and demographic variables. However, some of the results showed that 20- to 30-year old nurses, and nurses with 1 to 8 years of computer experience were most likely to exhibit positive attitudes. All nurses who were of full-time and casual employment status showed a change in attitudes from negative to positive; this did not hold true for the part-time status nurses. This group's attitudes did not change but stayed positive in both questionnaires.

Discussion

The findings of this study indicated that nurses had a favourable attitude toward computers. Questionnaire 1 findings were consistent with other studies (Bongartz, 1988; Brodt & Stronge, 1986; Cheatwood & Martin, 1988; Kiat, 1999; Scarpa et al., 1992; Simpson & Kenrick, 1997) that nurses have positive attitudes toward computers. In Noble's (2002) study, the participants' attitude scores in Questionnaire 2 were higher than in Questionnaire 1.

The difference in data from Questionnaire 1 to Questionnaire 2 for questions 3, 10, and 18 showed statistical significance. A consistent trend was observed: For question 3, more time for nursing tasks, the difference in attitude from Questionnaire 1 to Questionnaire 2 was favourable toward computers. For question 10, less time for quality patient care, there was a positive difference in attitudes from Questionnaire 1 to Questionnaire 2. For question 18, threat to job security, there was a large positive shift in attitude from Questionnaire 1 to Questionnaire 2. There was a significant difference in nurses' attitudes toward computers from Questionnaire 1 to Questionnaire 2 for three questions.

There was no statistical significance between attitudes and demographic variables. Some findings of this study were noteworthy of mention. The findings on age showed that younger nurses were the most likely group to exhibit positive attitudes toward computer technology. Simpson and Kenrick (1997) and Kiat (1999) did support this concept by reporting that age was associated significantly with computer-related attitudes. Other researchers (Brodt & Stronge, 1986; Scarpa et al., 1992) did not find that age affected attitudes toward computers.

The findings on position status in this study showed that there was a slight shift in attitudes positively toward

computers for the full-time and casual nurses. There was no shift in attitudes for the part-time status nurses. Overall, the majority of nurses in this study had a positive attitude toward information technology. No other researchers studied position status and attitudes. Brodt and Stronge (1986) did study attitudes and the shift hours that nurses worked and found that there was no significant difference.

The findings on years of computer experience showed that nurses with 1 to 8 years were the group most likely to present positive attitudes towards computers. Scarpa et al. (1992) also found that nurses with previous computer experience had positive attitudes toward computers. Other researchers did not study computer experience or years of computer experience.

The results of this study show that (a) the first null hypothesis (H_0), there was no significant difference in the nurses' attitudes toward computers before and 2 months after training, is rejected and (b) the second null hypothesis (H_0), there is no significant effect on attitudes toward computers by demographic variables, is accepted.

<center>Conclusions</center>

The 21st century is considered the age of advanced technology. The Ontario government has mandated that all health care facilities must have full electronic health records within the next decade, thereby eliminating the

paper system. To facilitate this goal, it is critical to look at the effect of computerization on health professionals, especially nurses.

This study found, overall, nurses had positive attitudes toward computers and computerization. Several findings were consistent on both questionnaires. One finding was that younger nurses had positive attitudes towards computers. Another result showed that nurses with fewer years of computer experience were most likely to have positive attitudes. A third result showed that nurses who worked part time had positive attitudes towards computerization.

With the current hospital environment and the shortage of nurses, it is crucial that strategies be developed to help nurses embrace computerization and enhance these positive attitudes. Nurses also need a common or shared vision of the role of computers in patient care and in nursing practice. Documentation is a nursing standard and an integral part of patient care. Today, nurses are required to document online. Many health care facilities have the infrastructures to support computerized documentation. Nurses need the knowledge and the skill to utilize the computer to its fullest potential.

To assist nurses, their learning needs must be assessed before any training occurs. Once these needs are known,

training programs must be developed for the different levels of computer experience. These training programs must be mandatory for nurses, no matter what their level of computer experience. Computer-experienced nurses must be mentors to those nurses who are uncomfortable using computers or have no computer experience. Peer support is crucial to the development of nurses with little or no computer experience, as well as those with computer experience. Ongoing education is critical today, as is seen in the literature and this study. Exposure and ongoing use of computers enhance positive attitudes.

Health care facilities must capitalize on the enthusiasm of younger nurses, as they are the future of the health care system. These younger nurses must be role models for the older nurses by showing them how beneficial or practical computers are to patient care documentation. Some of the young nurses with less computer experience see computer documentation as a learning opportunity for future skills and advancement in nursing. More computer experienced nurses act as preceptors to new employees and nursing students and assist them in enhancing their computer skills. All nurses with computer experience must share the responsibility of helping others with computer documentation. The shortage of nurses has put a strain on the health care system and ultimately affects the existing

full-time nurses' work load and attitudes. The part-time nurses do have the opportunity to attend extra training classes in order to improve their skill in computer documentation. The casual nurses have little exposure to computers unless they are employed at facilities that use computers in clinical settings. However, these nurses are willing to improve their computer skills and documentation by attending additional computer training.

Nurses must appreciate the value of computers, using them as communication tools that allow easy and quick access to accurate data regarding the patient's health status, research information on evidence-based practice, and information on drug interactions. Computers are used to communicate between members of the health care team and between health care facilities. Wireless technology is rapidly being produced to assist nurses and other health care professionals with the requirements of their job. Some of the requirements of the nurse professionals, other than bedside care, are to teach, counsel, coordinate, act as an advocate for the patient, and involve the family or significant other in the care of the patient. Comprehensive tracking of patients is integral for social and spiritual concerns, and computers will assist in this area. Computers in health care facilities help the nurses to lead in reaching the ultimate goal of maximizing patient care.

Implications

Implications for Practice

Nurses' attitudes toward computers are important when introducing computers into the workplace. Management and Educators should be aware of these attitudes when planning computer training or before being exposed to computers. It is an opportunity for managers and educators to create a training program that will make nurses feel comfortable with computers and dispel any misconceptions about computers. Administrators and educators of colleges and universities should include in the nursing courses the benefits of computers in the clinical setting.

After completion of this study and report, this researcher will be providing feedback to the participating hospital. It may be that the computer training program could give enough time for some nurses to be comfortable with computers if they have not had previous exposure. This researcher will be able to suggest changes to this program, using the results of this study to support those changes. Some of this researcher's recommendations for changing the training program could include the following:

1. A checklist for new employees to assess their computer knowledge and skill.

2. Keyboarding classes for those new employees who have

not been exposed to a keyboard or nurses who have difficulty using a keyboard prior to any computer exposure.

3. Split the new employees into two training groups, computer users and computer nonusers. At the present, both users and nonusers are in the same classes and they are expected to perform the same lessons in the same time frame. By splitting the employees into two groups, the nonusers could learn to document online at their ability levels.

4. The amount and detail of information provided in training to users and nonusers could be different.

5. There could be one educator with the users' group and two educators with the nonusers group, allowing more time for coaching, especially for the nonusers.

There are issues or problems that may affect acceptance of computers in nursing practice. These issues include cost and amount of equipment needed, cost and time of training in the classroom and at the bedside, time to learn, and strategies to motivate nurses in accepting computers in the workplace.

Institutions can take advantage of opportunities to change nurses' attitudes positively toward computers. The nurses who have positive attitudes could be used as part of a formal peer support group for both new employees and established nurses. Other suggestions are involving nurses in creating and building the documentation system and as

chart auditors. When nurses are involved, the implementation of computers may have less or little resistance.

One of the concerns that nurses have about computers is the time spent away from patient care. Institutions need to acknowledge nurses' attitudes when planning to implement computers at the bedside. Nurses' attitudes may change to more positive ones as a result of the availability and accessibility of computer devices. The nurses should be involved in choosing the type of device to be used and where to locate these devices. Involving nurses in the planning phase may show that their attitudes and opinions regarding computers are valuable.

Changing nurses' behaviour or attitudes toward computerization will not happen quickly, but it needs to be fostered over time. The time to introduce the positive aspects of computers in nursing practice is in the education of new nurses in the colleges and universities. Now is the time to start to change the attitudes of these students toward computers, for these new graduates will be the future ambassadors of computerization in health care.

Nurses must be reminded that documentation is an integral component of patient care. It is crucial that nurses function within an information framework in the provision of quality patient care. With the advent of the hospital electronic chart, which is imminent, it is

imperative that nurses understand their role in the provision of patient information which will link with other areas in order to provide quality patient care. Fostering positive attitudes toward computerized documentation will encourage nurses to provide the highest quality of care. As they recognize the value of use of computers, it ultimately provides them with additional time to perform professional tasks for which they are trained.

Implications for Further Research

Further research should be conducted on nurses' attitudes toward computers. A longer study time period would provide more concise data. A study involving a control group in this area could provide more in-depth results, since the controlled trial is the most rigorous of study designs.

One of the limitations in this study is the sample size. There are many factors that affected that number, including methods of communication, time frame, and staff work schedules. Another limitation in this study is the use of email instead of personal contact. Email communication is an adequate way of contacting participants who do shift work. However, personal contact would have helped with participation and eliminating this limitation.

Limitations two and four really have to do with the low return rate of Questionnaire 2. Limitation two is the effect on the return of Questionnaire 2 of the 2-month span from

Questionnaire 1 to Questionnaire 2 and the inconsistent work schedules of the participants. Limitation four is that a second Questionnaire package was not sent out to the participants. Sending a second questionnaire, whether needed or not, would have helped in the number of returned questionnaires and could have eliminated this limitation. Both of these limitations ultimately have to do with retention of participants. Some of the problems with retention may be nurses leaving the institution; nurses' lack of interest in completing questionnaires; poor computer skills, indicating that nurses maybe unable to read email; and difficulty comprehending the questions.

Limitation five is that the participants were not a consistent group of full-time staff. The method of recruiting potential participants on the first day of computer training has advantages because there is always a large group of individuals together in one place for recruitment. Several advantages of this recruiting method are that the potential participants receive consistent instructions and the consents are signed while the researcher is present and is able to answer any questions. The disadvantage of this recruiting method is that there is no guarantee that the sample is representative of the various status positions, age, and experience.

Limitation six is the possibility of a language barrier in some of the participants. At this time, there is a shortage of nurses to work in hospitals. The hospitals have been recruiting and hiring nurses from different areas of health care and from around the world. English may not be the first language for some of the new employees, which could lead to a problem in understanding the questions in both questionnaires. In future research studies, the researcher must ensure that questions are worded in a way that is easily understood, and this may eliminate this limitation. Researchers also must ensure that the demographic questions are understandable and detailed, allowing for completion of all questions. It is impossible to conduct analyses of areas with missing data. In this area, this researcher found difficulty comparing data.

Future research studies should continue to examine nurses' attitudes and ways to improve those attitudes, which may include the different teaching methods to instruct and orient nurses to computers. There should also be studies that examine the relationship between the nurses' computer knowledge, nurses' attitudes, and nurses' skills. Studies conducted on other hospital employees' attitudes toward computers could help to determine the appropriate training needs for all hospital staff. Future research designs should incorporate all these considerations in order to provide

salient and accurate data, and this will ultimately result in the linkage of high quality documentation in hospitals.

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Appendix A

Nurses' Attitudes Toward Computerization Questionnaire

Copyright to Dr. James H. Stronge, 1985

Instructions: It should not take longer than 10 minutes to complete the questionnaire. Do not omit any item. Read each statement carefully then select one of the five responses. Give your first reaction and response to the statement. Circle only one answer for each statement.

SA=Strongly Agree   A=Agree   U=Uncertain   D=Disagree
SD=Strongly Disagree

1. A computer increases the costs by
   increasing the nurses workload.   SA A U D SD

2. Computers cause a decrease in
   communication between hospital
   departments.   SA A U D SD

3. Computers will allow the nurse more
   time for the professional tasks for
   which he/she is trained.   SA A U D SD

4. Part of the increase in costs of
   health care is because of computers.   SA A U D SD

5. The time spent using a computer is
   out of proportion to the benefits.   SA A U D SD

6. Computers represent a violation of
   patient privacy.   SA A U D SD

7. Only one person at a time can use a
   computer terminal, therefore, staff
   efficiency is inhibited.   SA A U D SD

8. Computerization of nursing data
   offers nurses a remarkable
   opportunity to improve patient care.   SA A U D SD

9. Computers contain too much personal
   data to be used in an area as open
   as a nursing station.   SA A U D SD

10. Computers cause nurses to give less
    time to quality patient care.   SA A U D SD

11. If I had my way, nurses would not
    ever have to use computers.   SA A U D SD

12. Computers should only be used in
    the financial department.   SA A U D SD

13. Computers make nurses' jobs easier.   SA A U D SD

14. Paperwork for nurses has been
    greatly reduced by the use of
    computers.   SA A U D SD

15. Orientation for new employees takes
    longer because of computers and,
    therefore, unnecessary work delays
    occur.   SA A U D SD

16. Nursing data does not lend itself
    to computers.   SA A U D SD

17. Computers save steps and allow the
    nursing staff to become more
    efficient.   SA A U D SD

18. The more computers in an institution,
    the less number of jobs for
    employees.   SA A U D SD

19. Increased computer usage will allow
    nurses more time to give patient
    care.   SA A U D SD

20. Because of computers, nurses will
    face more lawsuits.   SA A U D SD

Additional Comments:

_____

_____

Demographic Data

Age: _____   Sex: _____Male   _____Female

Highest degree obtained in Nursing:
_____RPN
_____RN, Diploma
_____RN, Baccalaureate
_____RN, Masters
_____Other

Date of most recent degree: _____

Have you had experience working with computers?
_____Yes _____No

Number of years worked with computers: _____

Job title: _____

Position Status: _____Full-time _____Part-time _____Casual

Thank you for taking the time to complete this questionnaire.

Appendix B

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┌─────────────────────────────────────────────────────────────┐
│                      Scoring Guide                           │
│                                                              │
│                                                              │
│  Nurses' Attitudes Toward Computerization Questionnaire      │
│                                                              │
│          Copyright to Dr. James H. Stronge, 1985            │
│                                                              │
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Instructions: It should not take longer than 10 minutes to complete the questionnaire. Do not omit any item. Read each statement carefully then select one of the five responses. Give your first reaction and response to the statement. Circle only one answer for each statement.

Positive Statements +3, 8, 13, 14, 17, 19
Negative Statements -1, 2, 4, 5, 6, 7, 9, 10, 11, 12 15, 16, 18, 20

SA=Strongly Agree   A=Agree   U=Uncertain
D=Disagree   SD=Strongly Disagree

-1. A computer increases the costs by
    increasing the nurses workload.
    (Benefit to Institution)   SA A U D SD

-2. Computers cause a decrease in
    communication between hospital
    departments. (Benefit to Institution)   SA A U D SD

+3. Computers will allow the nurse more
    time for the professional tasks for
    which he/she is trained. (Patient Care)   SA A U D SD

-4. Part of the increase in costs of
    health care is because of computers.
    (Benefit to Institution)   SA A U D SD

-5. The time spent using a computer is
    out of proportion to the benefits.
    (Superior Capabilities of Computers and Willingness to
    Use Computers)   SA A U D SD

-6. Computers represent a violation of
    patient privacy. (Legal)   SA A U D SD

-7. Only one person at a time can use a
computer terminal, therefore, staff
efficiency is inhibited.
(Superior Capabilities)   SA   A   U   D SD

+8. Computerization of nursing data
offers nurses a remarkable
opportunity to improve patient
care. (Patient Care)   SA   A   U   D SD

-9. Computers contain too much personal
data to be used in an area as open
as a nursing station. (Legal)   SA   A   U   D SD

-10. Computers cause nurses to give less
time to quality patient care.
(Patient Care)   SA   A   U   D SD

-11. If I had my way, nurses would not
ever have to use computers.
(Willingness to Use Computers)   SA   A   U   D SD

-12. Computers should only be used in
the financial department.
(Willingness to Use Computers)   SA   A   U   D SD

+13. Computers make nurses' jobs easier.
(Superior Capabilities)   SA   A   U   D SD

+14. Paperwork for nurses has been greatly
reduced by the use of computers.
(Superior Capabilities)   SA   A   U   D SD

-15. Orientation for new employees takes
longer because of computers and,
therefore, unnecessary work delays
occur. (Patient Care)   SA   A   U   D SD

-16. Nursing data does not lend itself to
computers. (Benefit to Institution)   SA   A   U   D SD

+17. Computers save steps and allow the
nursing staff to become more
efficient. (Patient Care)   SA   A   U   D SD

-18. The more computers in an institution,
     the less number of jobs for employees.
     (Threat to Employment)   SA   A   U   D SD

+19. Increased computer usage will allow
     nurses more time to give patient
     care.(Patient Care)   SA   A   U   D SD

-20. Because of computers, nurses will
     face more lawsuits. (Legal)   SA   A   U   D SD

Additional Comments:

_____

_____

Demographic Data

Age: _____ Sex: _____Male _____Female

Highest degree obtained in Nursing:
_____RPN
_____RN, Diploma
_____RN, Baccalaureate
_____RN, Masters
_____Other

Date of most recent degree: _____

Have you had experience working with computers?
_____Yes   _____No

Number of years worked with computers: _____

Job title: _____

Position Status: ____Full-time ____Part-time ____Casual

Thank you for taking the time to complete this questionnaire.

Appendix C

Brock University

Faculty of Education	St Catharines, Ontario	Telephone (905) 688-5550 Ext. 3340
Graduate and Undergraduate Studies	Canada L2S 3A1	Fax (905) 688-0544

Informed Consent Form

Title of Study: Nurses' Attitudes Toward Computerization Before
and Two Months After Training

Researcher: Elizabeth Noble

Name of Participant: (Please print) _____

I understand that this study in which I have agreed to participate will
involve completing two questionnaires, one before computer training and
one two months after computer training. The questionnaire has two parts.
The first part involves twenty questions about computers and the second
part focuses on demographic information about me, the participant.

I understand that I will be given a questionnaire to complete on the first
day of computer classes, prior to training. I understand that a second
questionnaire for me to complete will be given or sent to me two months
after computer training.

I understand that my participation in this study is voluntary and that I
may withdraw from the study at any time and for any reason without
penalty.

I understand that there is no obligation to answer any
question/participate in any aspect of this project that I consider
invasive.

I understand that all personal data and information will be kept strictly
confidential and that my name will not be used in the study. I understand
that only the researcher named above will have access to the data.

Participant Signature_____

Date_____

If you have any questions or concerns about your participation in the
study, you can contact Elizabeth Noble at (416) 651-6111 extension 3260 or
pager number 329-2708.
Feedback about the use of data collected will be available during the
month of
January, 2000.

Thank you for your help!
                                    ***
I have fully explained the procedures of this study to the above
volunteer.

Researcher Signature_____

Date_____

Appendix D

Reminder Memorandum

To: Research Participants

From: Elizabeth Noble, Researcher

It has been 2 months since your computer training. As I
mentioned to you on your first day of training, I would be
sending you a second questionnaire for you to complete. I
have enclosed this questionnaire.

Please complete the questionnaire as soon as you receive
it and return it in the envelope provided.

If you do not want to participate, please send back the
questionnaire in the envelope provided.

Thank you for your participation in my study.

Appendix E

Brock University

FROM: Linda Rose Krasnor, Acting Chair/Robert
Ogilvie, Chair
Standing Subcommittee on Research with
Human Participants

TO: Dr. Jim Kerr, Faculty of Education

FILE: **98/198 Elizabeth Noble**

DATE: **June 7, 1999**

The Brock University Standing Subcommittee on
Research with Human Participants has reviewed the
research proposal:

**Nurses Attitudes Toward Computerization Before and
Two Months After Training**

The Subcommittee finds that your revised proposal
conforms to the Brock University guidelines set
out for ethical research.

DB/ml