EVALUATION OF AN AUTOMATED ON-LINE BEDSIDE NURSE DOCUMENTATION SYSTEM

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ABSTRACT

In recent years there has been an increased emphasis on source data capture, point-of-care systems or bedside computing in the health care industry. Many of those involved in health care have speculated that bedside computing could contribute to efficient, cost effective health care delivery.

The purpose of this quasi-experimental study was to evaluate the effect of a bedside automated on-line nurse documentation system using a methodology designed to overcome some of the difficulties of previous studies. The first of four objectives was to determine the effect of the automated system on nurse productivity. The second objective was to determine the effect of the system on some nursing behaviours that have been predictors of quality of care. The third objective of the study was to evaluate nurse satisfaction with on-line bedside computing. Evaluation of the acceptance of the bedside computer by the patients and their satisfaction with their care was the final objective.

The automated bedside-based nurse documentation system was implemented on a twenty-two bed Plastic Surgery unit in a quaternary care teaching hospital. The automated nurse documentation system was developed by the hospital over a three year period (1986-1989). Four bedside computers were placed in a four bed experimental room; a second four bed room was used as the control room. Two terminals with access to the bedside-based system were located at the nursing station. Sixteen full time registered nurses participated in the study. The nurses used the automated bedside system when documenting care for patients in the experimental room and the manual, nursing station based, paper system to document care for patients in the control room. Questionnaires and observations were used to collect data over the four months of the study (June through September, 1990).

The results showed no increase in nurse productivity. The quality of care results showed more immediate documentation of the nurses' observations and interventions and more time spent viewing patient data in the experimental state. There was no significant difference between the control and experimental state in the nurses' reported ability to provide individualized care. The nurses expressed a general level of dissatisfaction with the on-line bedside-based system and a general dissatisfaction with documenting at the patient bedside. The nurses found the manual system to be significantly more convenient than the automated system. In addition, the nurses found the presentation of patient data to be significantly better in the manual system. There was no significant difference between the reported satisfaction of patients with their care and their feelings and attitudes about the use of computers by nurses and in health care in the control and experimental rooms.

The results of the study lead the investigator to explore implications for implementation of bedside computing for nurses.

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CHAPTER I

BACKGROUND TO THE STUDY

Today hospital and nurse administrators are faced with demands to increase productivity while at the same time maintaining appropriate levels of patient care. Source data capture, bedside computing or point-of-care computer systems, are considered by some to be a possible tool to support the provision of efficient and cost effective health care services. Hospital and nursing administrators are beginning to ask whether capturing data on-line at source, the patient bedside, will provide both short and long term benefits.

Over the past five years, the technical forces of distributed processing, affordable computing power, improvements in data entry techniques and the ergonomic design of terminals have made bedside computing a possible alternative to paper record keeping. In addition, the imperatives of cost management, measurement and management of the quality of patient care, and the competition for skilled health care providers, particularly nurses, are fuelling the exploration of source data capture as a viable and valuable tool in the delivery of health care.

At a large quaternary care teaching hospital in the Pacific Northwest, the Division of Nursing is under pressure to provide additional, and more skilled, nursing care while at the same time there is a constant or decreasing supply of skilled nurses. The Division, faced with these challenges, decided to develop, in collaboration with the hospital Information Systems Department, a bedside-based,

point-of-care nurse documentation system and to evaluate the impact of that system on a surgical nursing unit.

In the spring of 1985 the Division of Nursing, in collaboration with the hospital's Information Systems department, began the Computerized Nursing Workstation (CNWS) Project. Capture of patient data at the bedside was the primary objective of the project. It was envisioned by Nursing Administration that electronic data capture at the patient bedside would improve the productivity of the nurses. In addition, it was envisioned that at source data capture would improve patient care by providing legible, consistent, integrated, timely and easily accessible patient data.

During the summer and fall of 1985, the Division of Nursing, in collaboration with the Information Systems Department and the Biomedical Engineering Department, began to develop a prototype of a portable electronic nurse documentation system capable of collecting clinical data, processing these data and displaying the information in both screen and print formats. It was felt that a hand-held, portable computerized workstation would best achieve the objective of the capture of patient data at the bedside. The objectives of Phase I of the project were to buy or build a hand held terminal that would meet nursing's needs; develop minimal software to demonstrate the use of the hand held terminal to nurses; and to demonstrate the portable terminal on several nursing units to gather feedback on the functionality and usefulness of a portable CNWS.

A prototype of a hand held terminal was built by the Biomedical Engineering Department. Software specifications, based on collecting and processing selected objective clinical data, were outlined by nursing. These clinical applications were developed by programmers from the hospital Information Systems department and demonstrated, including "hands-on" experience, to the nursing staff on

+several nursing units. Feedback was obtained from nurses regarding functionality and usefulness. Response from the nursing staff was very positive; the nurses who had the opportunity to use the CNWS were positive about its potential to assist them with their information processing functions.

Phase II of the project commenced in January 1986. It was determined that the portable technology that was envisioned would support nursing documentation at the bedside was under development by computer hardware vendors, and would soon be released. Software to support nursing documentation however, was minimal or nonexistent. The objective of Phase II was to develop software to support some of the nursing documentation and record keeping requirements for the Plastic Surgery unit. A prototyping system development methodology was used. Using this system development methodology, functional specifications were defined by nursing. Programmers from the Information Systems department then developed a prototype system from those specifications and the prototype was in turn reviewed by nursing. This process was repeated many times until nursing was satisfied that the program would meet their needs. Following extensive testing, the system was installed at the nursing station and all members of the nursing staff were trained. The system went live on the Plastic Surgery Unit with ten patient charts in August 1989.

The nurses accessed the system at the nursing station and used it to document their observations and interventions for ten patients who were randomly admitted to beds that were identified as "computer beds". These beds were located throughout the unit since the access to these patients automated nursing records was at the nursing station only.

In May 1990, the system was installed at the bedside in one four bed room on the nursing unit. Evaluation of the impact on the unit of the bedside-based system was Phase III of the project. This report describes that evaluation and its results.

CHAPTER II

LITERATURE REVIEW

Several terms are used to describe automated systems in a hospital environment. One of these terms, hospital information system (HIS) is used to describe a variety of types of computer systems in hospitals. For the purposes of this discussion, an HIS is an on-line computer system that processes and communicates data required to deliver care in a hospital. An HIS consists of hardware and software specifically designed to perform various hospital information management functions. A standard HIS consists of an Admission, Discharge, Transfer (ADT) system that manages demographic patient data and tracks the patients' location in the hospital and an Order Communication System that manages communication of clinical data between the nursing units and the diagnostic and therapeutic departments. Additional functions can be included such as nursing documentation and record keeping whereby nursing practice is enhanced through the use of automated data processing.

Many studies have been published describing the process of development and implementation of HIS' and their impact on administration (Albrecht & Lieske, 1985; Flett, 1983; McDermit, Bernstein & Harmer, 1983; Martin, Dahlstrom & Johnston, 1985; Ryan 1985; Ward, 1984). Reported benefits of computer systems to the practice of nursing can be broadly categorized as improvement in productivity, enhanced quality of care and nursing satisfaction with the use of computer systems. One of the most comprehensive studies to evaluate the impact of an HIS was conducted from 1971

to 1975 by the Battelle Columbus Laboratories for the (U.S.) National Center for Health Service Research (Barrett, 1976). This study was designed to evaluate the impact of the Technicon Medical Information System (TMIS) on the organization and administration of health care delivery at El Camino Hospital (ECH) in Mountain View, California. Findings of the study included: more readily available, complete and accurate patient information; better communication and co-ordination among nurses, doctors, and ancillary personnel; reduced time spent by nursing staff on clerical tasks; improved communication among nurses and between nurses and ancillary departments; better planning of patient care by nurses; containment or reduction of staffing levels; enhanced quality assurance mechanisms; and cost savings. The authors of the study reported that it was impossible to isolate the effects of TMIS on nursing activities from other changes in the hospital. They did report however, that TMIS had a favourable impact on clerical, reporting and planning activities of nurses. They reported no consistent change in direct patient care activities.

A review of the literature by Blum (1984) has shown that the installation and use of an HIS affects the quality of patient care by improving the timeliness of the information and the accuracy, legibility and accessibility of the information related to patient care. In addition, reduction in transcription and communication errors and reduction in turnaround time for routine laboratory tests have been reported (Blum, 1984). Furthermore, standardization of order entries has been shown to reduce medication errors (McDermit, et al, 1983; Milner, 1985).

Productivity improvements include reduction of nurse time in clerical work, reduction in telephone calls and an increase in time available to head nurses to manage their units (Blum, 1984; Grier, Ziomeck, McLean, & Kim, 1985). Benefits cited by Vandewal and associates (Vandewal, Wouters, and Daneels, 1985) included reduction in time spent on clerical work in the outpatient's department

and reduction in time spent by nursing units on clerical work. Vandewal and associates pointed out that although the implementation of an order communication system did not reduce nursing staff, it did provide nurses with more time for direct patient care. Viers (1983) reported on the findings of a study in which a reduction in charting time was seen after the introduction of an HIS (the reduction averaged 6 minutes per patient per chart). It was also found that overtime decreased from between 50 and 70 hours per unit per week to 10 to 15 hours per week (Hughes, 1980, cited by Viers, 1983).

Grier and associates carried out a study evaluating the impact of implementation of an HIS on nursing (Grier et al,1985). The study, based on subjective data and the attitudes and opinions of nurses, was designed to assess changes in coordination of care and the quality of care data after the implementation of an HIS. The authors reported that the computer system did not facilitate the documentation and use of physician orders. Moreover, contrary to the study by Hughes (1980), a significant increase in charting time was seen after 27 months of computer use (the time to chart increased 16 minutes per nurse per eight hour shift). Grier and associates concluded from their study that findings from studies relating to the impact of an HIS on nursing activities are conflicting. Many studies were found to be methodologically unsound and inadequately reported and little is reflected in the findings regarding the effect of an HIS on direct patient care activities.

Hendrickson and Kovner (1989) used the characterization of nursing proposed by McLure and Nelson (1982) as a framework to review the reported effects of computer systems on nurses in hospital settings. In this model the nurse functions as a care integrator and as a care provider. In their role as care integrators, nurses manage communications and co-ordination of activities of a host of professional health providers such as dietitians, physiotherapists, social workers and physicians. In this role the nurse ensures that services from different departments and health care providers are

available at the appropriate time for the benefit of the patient. Carrying out the role of care integrator involves many routine clerical tasks such as preparing requisitions or telephoning ancillary departments to clarify, convey or track down information. As care givers, nurses meet the physiological and psychological needs of the patient such as bathing, feeding, safety, medications, treatments, dressings, monitoring and educational needs.

Some computer systems are designed to help manage communication of information and relieve nurses of some of the routine aspects of the role of care integrator. They are designed to enable nurses to integrate patient care more effectively and accurately. Other computer systems, or components of computer systems, are designed to assist nurses in their role as care giver. Computers assist nurses in providing patient care through automated care planning, discharge planning, patient monitoring and through tracking patients' therapeutic, educational, comfort or other needs.

Hendrickson and Kovner pointed out that computer systems in hospitals differ markedly and may result in different effects on nurses depending on whether the system impacts on the care integrator role or on the care provider role. Although the literature provides an overview of the overall effects of various systems on nurses, according to Staggers the published reports do not always make it clear what nursing applications are in place (Staggers, 1988). The lack of description of the functions of the computer systems being evaluated makes it difficult for nursing administrators to apply the results of the studies to decision-making about appropriate selection and use of computer systems for nursing in any systematic and useful way.

Although many articles discussing the benefits and drawbacks of bedside computing are found in the popular computing and nursing journals, few studies have been conducted to evaluate the impact on nursing of point of care systems. Soontit (1987) reports many benefits to nursing one year after implementation of the MICRO Healthsystems Inc. bedside computing system on four nursing units. She reports a saving of 20 to 25 minutes of documentation time for each nursing practitioner per patient; decreased overtime costs; improved accuracy and legibility of documentation; and decreased unit clerks' work hours. In addition, immediate accessibility and availability of patient data, improved content of nurses' notes, efficient retrieval of data for quality assurance and risk management, increased patient compliance with medical and nursing care plans and improved nursing morale were cited as benefits accrued by nursing as a result of the implementation of the bedside computing system.

Soontit's article is purely anecdotal. The system was implemented on what the author describes as a 34-bed progressive care unit. There is no description of the methods used to collect the data reported nor is there any description of how the data were analyzed. The article does contain a brief description of the available nursing documentation but there is no information given about the nurses except that the staff was stable and experienced. In addition, it is not clear from the article whether there were terminals at each bedside. However, there was a P.C. and a printer located at the nursing station.

A study evaluating patient independent charting using terminals placed at the bedside was conducted by investigators at the Latter Day Saints (LDS) Hospital in Salt Lake City, Utah (Johnson, Burkes, Sittig, and Pryor, 1987). The investigators described patient independent charting as activities unrelated to specific patient problems: vital signs, intake and output, patient care activities, and

medication and intravenous therapy charting. Patient independent charting is part of the nursing information system, a subsystem of the HELP system. The HELP system is an HIS that has been developed and implemented for the last 20 years at LDS Hospital.

The purpose of the study was to investigate time distribution of nursing activities, nursing attitude towards computerization and compliance with charting standards pre- and post-implementation of the patient independent charting. The investigators hypothesized that after computerization, less time would be spent on paper work and communication and more time would be spent on patient care and computer usage; that nurses attitudes towards computers would be more positive with experience; and that the number of care plan actions documented in the nurses notes would increase after computerization. One unit was used as the study unit and one unit was used as the control. The subjects were the 50 full- and part-time nurses on the pilot unit where the system was implemented. The investigators developed eight nurse activity categories (patient care, paperwork, communication, supplies, computer, report, inservice, and miscellaneous) and then conducted a work sampling study two months pre-implementation and five months post implementation. Nurse attitudes towards computerization were measured through a questionnaire. Compliance with charting standards was measured by comparing the care plan actions (what should be performed for the patient) and nurses' charting (actions actually performed). The authors report a 7% decrease in patient care post-implementation; a 9% decrease in paper work and an increase of 15% in computer-use time post-implementation. A consistently positive attitude by the nurses, particularly with respect to motivation and satisfaction, was found. The result of the post-implementation chart audits showed a significant increase in care plan actions charted at six months post-implementation and a further increase at one year post-implementation.

Although the study design appears sound, there is no description of the reliability or validity of the data collection tools. The sample size on the study unit of 50 full- and part-time nurses appears adequate; however, the number of subjects in the control population is not known nor is there any data about the characteristics (age, education, etc.) of either the control or experimental subjects.

Halford, Pryor, Burkes (1987) conducted a six month study at LDS Hospital to examine using bedside terminals versus one terminal per four patients ("pod" terminals located in the hallway outside the patient rooms). Bedside terminals were installed in half of a 46 bed nursing unit and "pod" terminals were installed on the second half of the unit. The investigators report that in a subjective questionnaire completed by the nurses, preference for the bedside terminals was marked. The nurses felt that the charting was more accurate because it was entered immediately and none of the details lost. In addition, the nurses reported an increase in conversations with patients regarding their hospital and therapeutic regimen while using the bedside terminal. The investigators reported no difference in the time nurses spent documenting between the two types of terminals. Thirty-eight percent more of the bedside terminal charts were current and there was an overall increase in documentation of the nursing process. The investigators reported that 80% of the bedside terminal entries were made within 30 minutes; 75% of the pod terminals and 67% of handwritten entries were made within 30 minutes.

A study to evaluate the incremental improvement resulting from migrating terminals from the nurses' station to the bedside was completed in April 1988 by Peat Marwick Main and Company for TDS Healthcare Systems (Herring, D. 1988) The study was conducted at three sites where the TDS HIS had already been implemented at the nursing station. The number and location of bedside terminals varied among the study hospitals. Each of the three hospitals under study developed and

implemented what the author refers to as quality monitors. One of the study hospitals monitored the number of calls and repeated calls for nursing assistance, medication errors, patient falls, patient teaching documentation and patient compliance with teaching. Another study hospital monitored medication errors and patient falls. The third study hospital monitored falls, medication errors, procedural errors, equipment variances, security variances, and other incidents.

The study hospitals, using focus groups conducted by research assistants, projected productivity improvements in four categories: reduction in corridor time; reduction in terminal waiting time; elimination of manual recording at the bedside; and reduction in the documentation process. Corridor time savings were calculated by measuring the average walking time to and from the nursing station terminal from all the patient rooms on the control units. One nurse was observed for two days and the average for an 8-hour shift was determined. On the control unit at each site, the terminal waiting time was logged by the nurses for a two-week period and an average terminal waiting time was calculated. Direct observation for two twenty-four hour periods was used to determine the average time spent per shift per nurse taking manual notes at the bedside for future input into the system. System generated logs from both test and control terminals were used to compare the time required for the documentation process to occur in real time versus batch mode. Three days of data were used to calculate time savings.

Reported results of the study include both quality of care and productivity improvements. Quality of care improvements included a 34% reduction in medication errors, a 4% improvement in IV site assessment, a reduction in patient calls of 26% and an improvement of 14% in discharge teaching documentation. The study reported a time saving of 26.12 minutes per nurse per shift per day.

Productivity improvements ranged from 30 minutes in intensive care areas to 22 minutes in non-intensive care areas.

Herring's study was conducted in three different hospitals where the TDS HIS was already implemented at the nursing station. Although the date of initial implementation of the TDS system in each site was indicated (1974, 1982, 1986), no information about the length of time the system had been implemented on the test and control units was offered. In addition, the nursing care system functions that were available at each hospital under study varied. The combination and type of nursing staff (RN, LPN, Orderly, Unit Secretary) varied among the test sites; there is no information about the number of subjects nor any description of their characteristics. The author provides no information about the quality monitoring data collection tools used or any discussion about their reliability and validity. The productivity data were collected using extremely short observation times raising the question of possible Hawthorne[1] effects. It is also important to note that this study was conducted on behalf of TDS Healthcare Systems, a large hospital and nursing system software vendor.

In March 1989, the National Report on Computers & Health (Vol.10 No.6 March 20, 1989) reported "...it's difficult to get an exact count, it appears that fewer than 100 of the 6,000 U.S. hospitals have installed computers at bedside in even a single nursing unit". Canadian statistics are not available, however no hospital in British Columbia has implemented bedside-based systems at this time. The paucity of studies examining the benefits to, and the impact on nursing, of bedside-based nursing systems may contribute to the lack of systems in use. The few published studies report mixed

[1]The effect of being studied, even with no experimental intervention, that can cause a change in subjects' behaviour (Roberts & Burke, 1989).

benefits to nursing of bedside systems. According to Hendrickson & Kovner (1989), bedside computing is too new to have been subjected to careful research.

Staggers (1988) described two major limitations in studies reporting benefits to nursing of computer systems. First, little information is presented about the samples of nurses studied. Demographic information and education levels as well as job descriptions of the nurses involved in the studies are not provided. Studies also report little information about the nursing applications that were computerized, preventing readers from comparing functionalities adequately. In addition to the lack of information about the computer systems and the nurses affected by them, Staggers cited the lack of stated statistical reliability and validity assessments for instruments, and the lack of reliability assessments for observers, as major limitations.

Results reported from earlier studies and issues raised in the literature have given rise to this research. Issues of concern in the research include the lack of detailed description of the nursing applications in place, lack of description of nurse subjects and the lack of stated statistical reliability and validity assessments of the instruments.

CHAPTER III

METHOD

OBJECTIVES OF THE STUDY

The purpose of this study was to evaluate the effect of a bedside automated on-line nurse documentation system. One of the objectives was to determine the effect on nurse productivity. A second objective was to determine the effect on some nursing behaviours that have been predicted to affect the quality of care. A third objective of the study was to evaluate the nurses' satisfaction with on-line bedside computing. Evaluation of the acceptance of the bedside computer by the patients was a fourth objective. Based on the review of the literature, this study was designed to overcome some of the methodological difficulties of previous work by using a more rigorous approach.

It was hypothesized that the implementation of an automated bedside nurse documentation and record keeping system would result in an increase in productivity, quality of care, and nurse satisfaction with documentation methods, and that bedside computing would not adversely affect patient satisfaction with care.

DESIGN

The classic design for evaluation studies is the experimental design. In this design, people from the target population are assigned at random to a control or an experimental group. The experimental

group receives the intervention and the control group does not. Differences between the control group and the experimental group on outcomes of interest are then measured.

The essential requirements for a true experimental research design are the randomized selection and assignment of people to the control and experimental groups. Quasi-experimental designs are similar to experimental designs in that the researcher controls the intervention; however, some aspects of control that are part of an experimental design are omitted. Quasi-experimental designs are used when conducting research in natural settings where circumstances may not allow the use of control groups or randomization. Because full experimental control is lacking, quasi-experimental design studies do not provide the same assurance as true experiments in determining cause and effect between the independent and dependent variables (Cook and Campbell, 1979).

In this study it was not possible to randomly select and assign the nurse subjects. As a result, a within-subject quasi-experimental design was used. The primary advantage of this design is that it provides control for individual differences among the subjects in their responsiveness to the intervention (Harris, 1975). In this study each nurse subject was observed in both the experimental and the control state. A within-subject design was selected to control for the differences in the nurses' documentation style and behaviour. If a nurse subject was slow and methodical in her documentation, or had a tendency to refer to the patient chart frequently, or spend more time in the patient's room, these behaviours would be the same in the control and the experimental state. Thus, it is more likely that the differences between the experimental and control state may be reasonably attributed to the intervention, the presence of the CNWS.

SETTING

The setting for this study was a 22-bed plastic surgery unit consisting of four 4-bed rooms; two 2-bed rooms and two 1-bed rooms. At the time of the study the unit was staffed by one head nurse, twenty two Registered Nurses (17 full-time and 5 part-time), and four unit clerks (2 full-time and 2 part-time).

In August 1989 the CNWS was installed at the nursing station on the pilot unit. Ten of the units' beds were identified as computer beds and components of the patient record that had been automated in the CNWS system, were documented by the nurses on computer terminals located at the nursing station. The CNWS was designed to support source data capture and to be used by the nurses at the bedside. In May of 1990, one month prior to the start of the evaluation study, four of the terminals were moved to the patients bedsides in the four bed experimental room. Only the records of the patients in that room were kept on-line. A second four bed room was identified as the control room. Two terminals and two printers remained at the nursing station. Patients were assigned to the experimental or control room on a random basis by sex. The independent variable of interest was the presence or absence of the bedside terminal.

The type of plastic surgery carried out on this unit is listed in Appendix A. The average length of patient stay on the unit during the study months (June through September) was 4.3 days (standard deviation 8.8 days). The minimum stay was one day while the maximum stay was 132 days. The average occupancy rate of the unit for the same time period was 61.7%. Comparable figures for the same time period in the previous year (1989) were: average length of stay 4.1 days (standard deviation of 7.2 days); an average occupancy rate of 48.5%.

The staff nurses on the unit work twelve hour shifts (0700 - 1900 and 1900 - 0700). The unit clerks work 8 hour shifts (0730 - 1530 and 1530 - 2330) and the Head Nurse works 8 hour shifts (0700 - 1500).

SUBJECTS

The participants in this study were sixteen full-time staff nurses (see Appendix B for Registered Nurse Job Description). One full-time nurse was unavailable to participate in the study for five weeks and so was not included; the five part-time nurses were not included in the study because of the difficulty there would be in obtaining sufficient numbers of observations.

The average age of the nurse subjects was 37.3 years, ranging from 23 to 57 years. At the time of the study the mean age of the staff nurses in the hospital under study was 33.82 years (SD 9.51 years). The average length of service on the study unit prior to the commencement of the study was 2.35 years, ranging from 6 months to 6 years. The mean length of tenure of staff nurses at the hospital was 4 years. Of the sixteen nurses, six were graduates of the three year diploma nursing program run by the hospital and ten were nursing diploma graduates from hospitals outside of Canada. Eighty percent of the staff nurses employed at the hospital under study are diploma graduates; 17% have a BSN degree; and 3% are diploma graduates who have an undergraduate degree other than nursing. For many of the nurse subjects, English was their second language.

MEASURES

Variables used in this study were selected to measure changes in the productivity of the nurses, changes in nursing behaviours that have been predicted to affect the quality of care for patients, nurse satisfaction with bedside computing and patient satisfaction with care.

1. Productivity

In this study, improved nurse productivity is defined as a reduction or elimination of the time spent on documentation tasks. A measure of productivity improvement of the nurses was identified as important for several reasons. First, vendors of large bedside-based nursing software packages claim that the use of their bedside systems will reduce or eliminate the time spent by nurses on documentation tasks thus increasing the nurses productivity. Second, articles about bedside-based computing published in the popular nursing and computing journals refer to the potential of bedside systems to improve nurse productivity. Third, the few published studies on the use and outcomes of bedside-based nursing documentation systems, report various productivity findings.

Two process measures of productivity were selected for measurement.

a) Documentation Time: The research assistants observed and recorded how long the nurses took to document nursing observations, treatments and assessments in both the control and experimental rooms.

b) Nurse Travel Time: During the observations, the research assistants counted the number of trips the subjects made from the experimental or control room to the nursing station. Only direct trips to the nursing station from the experimental or control room for the purposes of accessing patient data were counted. This specific definition of trips was necessary because nurses often travel around the unit for a number of reasons (linen, equipment, medication, etc.) and often refer to the patient chart at some point in that trip. It was important, therefore, to consider only trips made to the nursing station for the

specific purpose of referring to the patient chart in determining productivity effects of bedside computing.

2. Quality of care

In this study, improvement in quality of patient care is predicted as an outcome of changes in specific nurse behaviours. A measure of quality of care improvement was identified as important because the vendors of bedside-based documentation systems as well as the popular journal articles and the reported evaluation studies of bedside systems all refer to improvements in quality of patient care as a result of implementing bedside systems.

Four process measures of quality of care were selected for measurement.

a) Immediacy of Documentation: The number of seconds elapsed from completion of the nursing action to commencement of documentation of that action, was observed and recorded by the research assistants. If an action was observed and not documented during the three hour observation time, it was assumed to have been recorded at a time more than 30 minutes (1800 seconds) after the action and was not considered immediate.

b) Frequency and Duration of Chart Access: The nurses were observed for the number of times, and the length of time, they accessed the patient's chart for the purposes of reviewing data.

c) Accuracy and Completeness of Documentation: A random sample of twenty charts of patients in the experimental room and twenty charts of patients in the control room were to be audited following the patients' discharge for compliance with the charting standards

established for the Division of Nursing. Several procedural and administrative factors, however, made the planned audit impossible. When a patient is admitted to the hospital for elective surgery, the admitting department prepares a standard manual chart that is sent to the nursing unit with the patient when she/he is admitted. These manual charts were sent to the study unit with all patients including those who were admitted to the experimental room where their chart would be kept on line. The presence of the familiar paper forms on the chart acted as a trigger for the nurse to begin manual documentation for those patients in the experimental room whose record was to be kept on the CNWS. As a result, many of the charts that had been randomly selected for audit had both manual and computer documentation, making them impossible to audit as computer generated charts.

Since the nursing care planning function was not part of the on-line system, care planning for patients in the experimental room was done manually and the identified patient problems entered into the on-line system. This method was not very user friendly; the nursing process flows from the initial nursing assessment (not included in the CNWS), to the patient care plan (not included in the CNWS), to the documentation of observations and interventions by the nurse (the function of the CNWS) and to the review of the care plan. The on-line system introduced a break in documentation of the nursing process that was not present in the manual system. The break in documentation of the nursing process coupled with the presence of the manual documentation forms on the charts of the patients in the experimental room resulted in many of the experimental charts containing mixed methods of documentation. After the completion of the study it was discovered that these two factors made it impossible to do a valid chart audit. A

review of automated charts, however, revealed an obvious improvement in legibility as well as an increase in the level of detail of the patient data.

d) Individualized Care: The extent to which nurses individualized care was assessed using the Individualized Care Index (IC) (Van Servillen, 1988) (see Appendix C). The questionnaire was completed anonymously by the nurses at the completion of each of the four months of the study. Of the four questionnaires completed by each nurse subject, two were completed while the nurse subject was in the experimental state and two were completed while the nurse subject was in the control state. A measure of internal consistency of items using Cronbach's alpha[2] was undertaken. Cronbach's alpha for this index was .93, indicating good reliability.

3. Nursing Satisfaction with Bedside Computing

Using a Likert scale, a three part questionnaire assessing the nurses' satisfaction with on-line documentation compared to the manual documentation system, their feeling about using the bedside monitor, and their assessment of the functionality of the software and the physical aspects of the computer system (ie: the hardware) was developed by the investigator (see Appendix D). This was pilot tested for clarity and content on a random sample of staff nurses on the test unit. Reliability was assessed using Cronbachs' coefficient alpha, all subscales had a Cronbach Alpha of greater than .70 which is adequate considering the number of items (5 to 7) in each of the subscales.

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[2]Coefficient alpha developed by Cronbach is the basis for determining internal consistency or reliability. Internal consistency refers to the extent to which all items on a scale measure the same construct; Cronbach's alpha measures the average correlation among items within a scale.

4. Patient Acceptance of the Bedside Monitor

A questionnaire currently used by the Division of Nursing to measure patient satisfaction with nursing care was modified and questions added (see Appendix E). The questionnaire contained twenty-five items in three subscales measuring the patients' perception of the nurses' professionalism, the nurses' level of patient teaching and the nurses' ability to relate to the patient (Risser, 1975). Eight additional questions about the patients' attitude toward computers in health care were added. The *professional subscale* was made up of eight questions about behaviours of the nurse that fulfil instrumental or goal achievement functions (e.g., nurse knowledge, physical care for the patient, expertise in implementing medical care). Seven questions relating to the nurses' level of patient teaching (e.g., answering questions, explaining, demonstrating) comprised the *patient teaching subscale.* The *ability to relate to the patient subscale* (verbal and non-verbal communication, measures such as interest in patient, sensitivity to people and their feelings, listening to patient problems) consisted of 10 questions. *Patients' attitudes toward computer subscale* (e.g., feelings about the use of bedside terminals, attitudes about the use of computers in health care) consisted of eight questions. Reliability was assessed using Cronbach coefficient of alpha. All subscales had a Cronbach alpha of greater than .74.

PROCEDURE

In August 1989, the on-line automated nursing documentation and record keeping system that had been developed by the Division of Nursing, in collaboration with the Information Systems Department, was implemented on the unit. The Computerized Nursing Workstation (CNWS) supports nursing documentation of vital signs; intake and output; medications; neurological assessment; neurovascular assessment; skin graft temperatures; wound, skin and treatment assessment

and interventions; activities of daily living and nurses' notes. The system is interfaced to the Admission, Discharge, Transfer System from which patient demographic data are downloaded. In addition, the CNWS is interfaced to the hospital laboratory systems and the Pharmacy system (see Appendix F for a full description of the system). System response time was within user acceptable limits, usually within 2 to 3 seconds, although between the hours of 1200 and 1400, the response slowed to approximately 5 to 10 seconds due to heavy use of another system that shared a computer with the CNWS system.

All of the nurses and unit clerks working on the unit received four hours of individual training on the system followed by informal inservice sessions held at the nursing station.

Although the system was developed to be used at the bedside, it was decided that the initial installation would be at the nursing station. There were two reasons for this decision. First, it was felt that the nurses would become comfortable with the system more quickly if they had support and assistance from each other as well as the system trainer. Assistance from other staff nurses would be more readily available at the nursing station where the nurses tended to gather. The second reason for installing the CNWS at the nursing station before going to the bedside was so that the nurses could become familiar with the system and comfortable using it for all their documentation without the additional stress of having their patients watch them while they learned. During this phase of the implementation, up to ten patient records were kept on-line.

At the start of this study, a computer terminal was placed at each of four patient bedsides in the four bed experimental room. The nurse assigned to care for the patients in the experimental room documented all care for those patients on the automated system. Nurses caring for patients in the

four bed control room documented all care for those patients on the manual chart. Two laser printers, located at the nursing station, were used to print shift end reports from the automated system for the paper record.

Two terminals with access to the CNWS remained at the nursing station. This was deemed necessary first because facility had to be made for documenting on the on-line system in the middle of the night when it would not be in the best interest of the patient for the nurses to use the bedside terminal. It was felt that prolonged presence of the nurse at the terminal and the glare from the screen when in use would unnecessarily disrupt the patients' sleep. In addition, the nurses found it difficult to visualize the keyboard in the dark room. Secondly, there had to be a way of documenting on the on-line chart when, because of the content of the data, the nurse would be uncomfortable documenting in front of the patient. Some patients admitted to the plastic surgery unit have severe emotional problems that the nurses document in the patients' records. It was this type of documentation requirement, coupled with nighttime charting, that resulted in the decision to allow the nurses to document on the CNWS at the nursing station. The extent to which this nursing station documentation facility was used during the study is not known.

Using observations, the research assistants collected the productivity measures and some of the quality of care measures. The observation data collection forms (see Appendix G) and the chart audit forms (see Appendix H) were developed by the investigator and tested by the research assistants.

Each of the sixteen nurse subjects was observed sixteen times over the course of the study. All observations were for three hours (0900 - 1200 and 1900 - 2200). Observations were conducted

during the most active hours on the unit. The nurses were observed on both shifts to facilitate getting an adequate number of observations for each nurse over the time of the study. Half of the observations were done while the subject was providing care for the patients in the control room and half while providing care for patients in the experimental room. The observations were equally divided between the day and night shift for each subject. There were a total of 768 hours of observation, 384 in each room, 192 hours on each of the day shift and the night shift.

Direct observation of behaviour reduces the inferential leap required to generalize performance characteristics from indirect assessment methods such as questionnaires. The major concern with direct observations however, is that they are obtrusive. The problem with obtrusive assessment is that it may be reactive, that is, it may influence the performance of subjects in the situation (Kazdin, 1982).

Relatively little is known about the nature of reactive effects and the factors that dictate their appearance. One explanation is that subjects can select different strategies of responding. One role commonly adopted is based on evaluation apprehension; that is that their performance will be used to evaluate abilities or personal characteristics (Kazdin, 1982).

Prior to the start of this study, several staff meetings were held to explain to the nurse subjects that they would be observed throughout the study. They were assured that the research assistants would not be observing the quality of their nursing care (whether it was appropriate, correct, timely, effective etc.) and that the observational data would be confidential and would not affect their employment or evaluation. The staff nurses had actively participated on the team that designed the

CNWS. Involvement of the nurses at all levels was seen by nursing administration as important in encouraging the nurses to "take ownership" of the system.

Reactive effects may be transient with subjects adapting to conditions over time (Haynes, 1978). It may be possible to control for reactivity by introducing observers on a preliminary basis to allow subjects to adapt to the presence of the observer before formal data collection begins. In addition, uncertainty about when the formal data collection begins may reduce evaluation apprehension.

In this study, the research assistants were introduced to the unit one month before the commencement of the observations. The subjects were told that the study had commenced; however the research assistants were testing the data collection tools and establishing inter-rater reliability. None of the data collected in the preliminary month were used.

Inter-rater reliability between the two research assistant observers was tested for the variables documentation time, number of trips to the nursing station, immediacy of documentation, documentation time and view access and duration. Inter-rater reliability was assessed before the start of the study and at the start of each month of observations. Inter-rater reliability correlations were greater than 80% on all occasions assessed.

Nurses

All seventeen full-time staff nurses were invited to participate in the study. One full-time nurse was to be away for five weeks during the study and was, therefore, not included. Sixteen full-time nurses signed a consent to participate in the study (see Appendix I). The RN rotation was not altered and participants continued to work the rotating shift schedule established on the

unit. There was no change made in the way in which the Head Nurse (or the Charge Nurse in the absence of the Head Nurse) determined patient assignment except that no nurse was assigned patients in both the experimental and control rooms on the same shift. Nurses were assigned patient load depending on the competency level of the nurse, the subjectively determined acuity level of the patients and adherence to the unit philosophy that continuity of care is most appropriately met by the same nurse providing care to the patient over a block of shifts. Since all of the nurses were equally trained and competent on the system, the presence or absence of the system did not affect the patient assignment. In addition, a modified primary care nursing model in which one nurse provides total care for that patient for that shift, was maintained on the unit.

At the completion of the first month of the study and again at the completion of the fourth month of the study, the nurses participating in the study completed a Likert scale questionnaire developed by the investigator about their satisfaction with the automated bedside system. A second questionnaire about their perception of their ability to individualize the care they were able to provide patients in the experimental room and the control room was completed at the end of each month of the study.

Patients

Hospital policy does not allow male and female patients to share a room. Throughout the study patients were assigned within gender on a first come first served basis to the experimental room or the control room. The acuity of the patients in the control and experimental rooms could not be controlled for during the study. Statistical methods used to

control for possible confounding of the data due to differing activity levels in each condition will be discussed in detail in the Results section of this report.

At discharge, patients in both the experimental and the control rooms were asked to complete an anonymous questionnaire about their satisfaction with the care they had received on the unit. In an accompanying letter the patients were asked to complete the questionnaire and return it in a stamped, self-addressed envelope to the nursing unit clerk or to mail it to the investigator.

CHAPTER IV

RESULTS

For the purposes of analysis, the data for each nurse were aggregated. Each nurse was observed eight times in each of the two types of rooms. Data from the observation periods were aggregated and an average for each variable for each nurse was calculated. For example, in order to arrive at the average documentation time for a particular nurse in the experimental condition, the documentation times in each of the observation periods were summed and this sum was divided by the number of observation periods to yield the average documentation time. Each nurse subject's data from the experimental room was paired with similar data from the control condition. The major statistical techniques used were single and paired t-tests[3]. An alpha level of .05 was used to differentiate between significant and nonsignificant results.

Nursing documentation activity is directly related to the number of treatments and observations for the patient. The number of treatments and observations relates to the acuity level of the patients. The higher the acuity level, the more nursing observations and interventions and the more nursing documentation. Thus, the number of treatments for patients in each room involved in the study may have been a confounding variable. The research assistants recorded significantly more interventions in the control room than in the experimental room [$t(16) = 3.44$ $p < .0004$]. Analysis of covariance using treatments as the covariate was conducted on the productivity process measures of trips to the

[3]t-tests are used to see if there is a statistically significant difference between two independent group means. A paired t-test is used to test the difference between two correlated or related means.

nursing station to review the patient chart, frequency of chart viewing, length of time viewing the chart, and the quality of care process measure of immediacy of documentation. There were no statistically significant differences between the experimental and control results obtained. Therefore, one may assume that the number of treatments did not have an impact on these process measures.

PRODUCTIVITY

The data were examined using paired t tests to ascertain whether the nurses spent less time documenting their observations and interventions when caring for patients in the experimental room in which the bedside system was installed at each patient bedside. Comparison of the amount of time taken to chart using the automated system and the manual system revealed a significant difference [$t(15) = -4.80$ $p < .0004$]. The nurses took more time to document their actions using the automated system than they did to document their actions using the manual system.

Using paired t tests, the data were examined to ascertain whether when caring for patients in the experimental room, the nurses made fewer trips to the nursing station to review patient charts. There was no significant difference in the number of trips taken to and from the experimental room and the control room to the nursing station for the purposes of reviewing patient charts [$t(15) = 1.61$ $p > .1$]. See Table I for means and standard deviations of these data.

TABLE I

MEANS AND STANDARD DEVIATIONS FOR THE PRODUCTIVITY MEASURES

	Experimental		Control		P
	$\bar{X}$	SD	$\bar{X}$	SD	
AVERAGE DOCUMENTATION TIME IN MINUTES FOR ALL OBSERVATION PERIODS	8.5	4.1	3.1	1.8	.000
AVERAGE NUMBER OF TRIPS TO NURSING STATION TO VIEW PATIENT CHART FOR ALL OBSERVATION PERIODS	1.49	.44	1.69	.48	.128

QUALITY OF CARE

Paired t tests were used to examine the data to ascertain whether the nurses documented their observations and interventions more immediately and referred to the patients' chart more frequently and for a longer period. In addition, the data were examined to determine whether the nurses reported an increased ability to individualize care for patients in the experimental room.

The nurse subjects charted more immediately in the experimental room than in the control room. This difference was significant [$t(15)=-4.93$ $p<.0004$]. In addition, while working in the experimental room, the nurse subjects spent longer viewing the automated chart. This was significant [$t(15)=-3.25$ $p<.006$]. However, there was no significant difference in the frequency of viewing charts [$t(15)=-0.91$ $p>.4$]. See Table II for means and standard deviations of these data.

In order to protect the anonymity of the nurse subjects, the nurses did not put their names on the completed Individualized Care Index. Therefore, it was not possible to match responses across administrations. For this reason, all responses in the control condition were treated as independent data points. The same was done for the experimental condition responses. T-tests were conducted on the total number of responses in each condition. There was no significant difference in the ability of the nurse subjects to individualize care [$t(52) = -0.70$ $p > .490$]. See Table II for the means and standard deviations of these data.

TABLE II

MEANS AND STANDARD DEVIATIONS FOR THE QUALITY OF CARE MEASURES

	Experimental		Control		P
	$\bar{X}$	SD	$\bar{X}$	SD	
AVERAGE PERCENT IMMEDIACY (< 30 MINUTES) TO DOCUMENTATION FOR ALL OBSERVATION PERIODS	37.7	14.1	20.5	13.0	.000
AVERAGE TIME IN SECONDS SPENT VIEWING PATIENT CHART FOR ALL OBSERVATION PERIODS	47.19	30.51	20.07	17.18	.005
AVERAGE FREQUENCY OF VIEWING PATIENT CHART FOR ALL OBSERVATION PERIODS	2.3	1.51	2.0	1.15	.380
INDIVIDUALIZATION OF PATIENT CARE	169.04	4.6	164.44	4.8	.490

NURSE SATISFACTION

There were no significant differences between the first and the second administration of the questionnaire in the nurses' responses to the general questions about the use of computers, the system functions or the system hardware.

The nurses found the manual system to be significantly more convenient than the automated system [$t(11)=8.51$ $p<.0004$]. In addition, they found the presentation of patient data to be significantly better in the manual system than in the automated system [$t(12)=2.76$ $p<.02$].

PATIENT SATISFACTION

There was no significant difference in the reported satisfaction of patients with their care or in their feelings and beliefs about the use of computers by nurses or in health care in the control and experimental rooms (professionalism subscale [$t(36)=.47$ $p>.63$]; education subscale [$t(31)=1.53$ $p>.13$]; relation to patient subscale [$t(31)=.23$ $p>.82$]; attitude toward computer subscale [$t(26)=.20$ $p>.82$]). See Table III for means and standard deviations of these data.

TABLE III

MEANS AND STANDARD DEVIATIONS FOR THE SATISFACTION MEASURES
(N=38)

	Experimental		Control		P
	$\bar{X}$	SD	$\bar{X}$	SD	
PATIENT SATISFACTION					
Professionalism subscale	33.35	4.9	34.0	3.5	.64
Educational subscale	27.6	4.4	29.7	3.4	.14
Relation to patients' subscale	42.25	6.8	42.71	4.6	.82
Attitude toward computer subscale	27.11	5.6	27.5	3.8	.85
NURSE SATISFACTION WITH CONVENIENCE OF DOCUMENTATION SYSTEMS	8.33	3.5	20.92	2.2	.000
NURSE SATISFACTION WITH PRESENTATION OF PATIENT DATA	16.31	3.88	19.62	2.33	.017

CHAPTER V

DISCUSSION

The major purpose of this study was to identify the advantages and disadvantages to the nursing unit, the Division of Nursing, the patient and the hospital of the bedside-based on-line nurse documentation system.

'Bedside-based computing', 'point of care systems', or 'source data capture' is seen by many health care administrators as a way to improve productivity and enhance quality of patient care. Indeed, computer software vendors specializing in healthcare systems often market their bedside-based products on the grounds of increasing nurse productivity and quality of patient care.

It was hypothesized that the implementation of the automated bedside-based nurse documentation system would result in benefits to the organization and to the administration of nursing care on the experimental unit. These hypothesized benefits included an increase in nurse productivity and an improvement in the quality of care. In addition, it was hypothesized that nursing satisfaction with documentation methods would be enhanced and bedside computing would not adversely affect patient satisfaction with their care.

The findings of this study are inconsistent with the reported findings of most of the previously published empirical studies. This study found no increase in productivity of the nurses and only some of the nurses' behaviours predicted to affect quality of care, showed a positive effect. In

addition, the nurses indicated a general dissatisfaction with the automated bedside system. Finally, the presence or absence of a bedside terminal did not affect patient satisfaction with their care or their opinions or beliefs about the use of computers in health care.

PRODUCTIVITY

It was hypothesized that in the experimental condition, the nurses would spend less time on documentation and in travelling around the unit. This hypothesis was not supported. Indeed, to the contrary, the nurses spent more time documenting their interventions and observations while using the automated documentation system than while using the manual documentation system. Furthermore, there was no significant difference between the number of trips the nurses made to and from the nursing station to review patient data.

The CNWS was designed to capture detailed data about the patient. Most of the data fields are "filled in" by the nurse selecting the correct term from a list of the most frequently used terms or the nurse may choose to use "free text" by typing in a term that does not appear on the list. Selection from lists of most frequently used terms is a common computer program design principle. This design principle supports the recording of required data while at the same time allowing the user to record the data quickly and accurately by selecting from a pre-determined list. The majority of the data fields in the CNWS are required fields. This means that the nurse cannot move to the next data field in the system until she "fills in" that field. This, too, is a common computer program design principle. The result is that the nurses are forced to document details about the patient's condition, some of which she may choose not to document in a manual system. This increased level

of documentation detail means that the patient record is more complete and as such may support better clinical decision making. It may also mean that the nurses require more time to document.

There may be other explanations for the lack of productivity improvement. The automated system was implemented on a nursing unit that had, until the CNWS was implemented, no computer systems in place and second, none of the nursing staff had had exposure to computers prior to their introduction to the CNWS. This contrasts markedly with other reported studies. In the two studies conducted at LDS hospital, bedside charting was introduced to nursing units where other computer systems were already in use (nursing care plans, patient acuity, staff scheduling and order entry). In the Peat Marwick/TDS study, the TDS HIS had already been fully implemented at the nursing station and was used by the nurses to document their care. The terminals, with the same functions, were moved from the nursing station to the bedside and the resultant increase in productivity of the nurses was measured.

This lack of experience with other computer applications in the hospital under study may have contributed to the lack of change in the productivity of the nurses.

Johnson et al. (1987) reported that "...it takes approximately a year for the nurses to fully learn this method of charting and to change their charting behaviour to real-time data entry". The CNWS was implemented at the nursing station approximately eight months prior to being moved to the bedside for evaluation. During that time ten patient records were kept on line. All nurses working on the unit documented using the CNWS when caring for these patients. The nurses were required to document using either the manual or automated system, depending on their patient assignment. In neither case was the documentation being done in real-time; that is, as soon as the intervention or

observation was made. It was not until the terminals were at the bedside that the real-time, on-line use of the system required incorporation into the nurses' behaviour and then only when caring for patients in the experimental room. The on-again off-again use of the CNWS extended the learning curve and the nurses were probably still on the upward slope of the learning curve with the system when it was moved to the bedside.

Another explanation for the lack of productivity improvement was the fact that for several of the subjects, English was not their first language. Any part of the system that required free text entry presented a challenge to some of these individuals as spelling and phrasing difficulties were more obvious on the computer generated reports. This may have contributed to the increase in the amount of time that the nurses spent documenting on the on-line system.

On the study unit, English was the second language of approximately half of the nurses. Data on the number of registered nurses working in the hospital for whom English is a second language, were not available. However, data were available from the professional nurses' association. Of the practising registered nurses in the hospital district, 19.9% graduated from non-Canadian schools with graduates from Asia representing 5.65% overall (Cavalier, Kerluke, Wood, 1990). Extrapolating from these data, there were more nurses with a first language other than English working on the study unit than one would expect from the hospital district data. When planning for nursing automation where there is evidence of a large number of nurses using English as a second language, implications for the design of computer systems, as well as implementation and training strategies, need to be seriously considered.

The average age of the nurse subjects was 37.3 years, 3.5 years older than the average for registered nurses practising at the study hospital. This has implications for acceptance of change as well as exposure to computer technology. The method of educating nurses has changed dramatically over the past 10 years with hospital-based schools of nursing closing and the responsibility for educating nurses shifting to the colleges and universities. This shift has resulted in increased likelihood of the student nurses being exposed to computer technology such as word processing, and thus having some familiarity with the technology. None of the study subjects indicated any exposure to computers prior to the implementation of the CNWS on the unit. Young people are more likely to accept and adapt to change than older people. Use of computer technology to document their observations and interventions represented a major change for these nurses under study.

Two additional characteristics of the study subjects need to be discussed. The average tenure on the unit at the time of the study was 2.35 years, compared to an average tenure for registered nurses in the study hospital of 4 years. This somewhat shorter tenure for the RNs on the test unit may have resulted in the nurse subjects having less of a commitment to the test unit and perhaps to the hospital. This may have affected the productivity outcomes. The second characteristic of the subjects that may have affected the study outcomes was their level of education. Twenty percent of the nurses practising at the study hospital hold an undergraduate degree; however, none of the nurses on the test unit had a degree. It is reasonable to assume that the combination of English as a second language for half the nurses, the shorter than average tenure, and no nurses with undergraduate or graduate degrees, may have affected the study results.

Another explanation for the lack of productivity improvement relates to the fact that the programs for charting intake and output and medications were inefficient and not user friendly, making these

system functions more difficult for the nurses to use. Although the functions were extensively pretested in a laboratory setting, when used on a busy nursing unit, they were not sufficiently user friendly. In addition, decisions about the CNWS hardware and programming environment were made in 1986 and by the time the system was implemented on the test unit in 1990, the CNWS was old technology. Technological constraints meant that some of the requirements identified by nursing could not be met. This may have contributed to them taking more time to document using the automated system.

QUALITY OF CARE

It was hypothesized that nurses' behaviours that had been predicted to affect the quality of patient care would be positively affected by the presence of a bedside-based, real-time automated nurse documentation system. These nursing behaviours were immediacy of documentation, frequency and duration of chart access and the ability of the nurses to individualize care. Two of the four behaviours identified, immediacy of documentation and time spent reviewing patient data, were positively affected by the automated system.

The patient chart is the tool used by all members of the health care team to communicate the patients' plan of care and her/his response to that care. The policy of the Division of Nursing is that nursing observations and interventions are documented within thirty minutes. In practice however, the nurses "batch chart" throughout the shift and at the end of the shift. The result of this behaviour is that the manual patient chart is frequently not up-to-date and as such does not reflect the current patient status. As hypothesized, the nurse subjects documented immediately after their treatment or observation more frequently in the experimental room than in the control room. The on-line current patient chart provided an up to the minute picture of the patients' response to care. The availability

of current patient information at the bedside, where treatment is commonly determined, would enhance clinical care planning and decision making.

There was no difference in the frequency of access to the on-line patient chart. However, the length of time the nurses spent reviewing the patient data on the on-line chart was longer than on the manual chart. With no difference in the frequency of access to the on-line chart and the manual chart, the reason for the increase in duration of access of the on-line chart needs to be explored. Three factors help to explain the difference in duration of access. First, the on-line chart contained more detailed information than the manual chart. Second, the way in which the information was displayed in the on-line chart was different from the manual chart and thus less familiar to the nurse subjects. Third, the moving back and forth between the two types of documentation methods would make it difficult for the nurses to become as familiar with the on-line system as they were with the manual system that they were used to using.

An additional hypothesis related to the quality of patient care was that with the patient chart on-line, the nurses would take less time to document their observations and interventions, and therefore would feel that they were able to provide more individualized care for their patients. The nurses took more time to document using the on-line system and therefore did not have the predicted additional time to individualize care for their patients. Furthermore, the nurses were assigned back and forth between the experimental room and the control room. This movement between the experimental and control state may have made the nurses ambivalent about the automated system and thus it was difficult for them to discern any difference in their ability to provide more individualized care for their patients.

NURSE SATISFACTION

The nurses expressed a general dissatisfaction with the bedside system. During their professional careers, the nurses had always documented their actions and observations on a paper chart. Familiarity with the paper chart and an extended learning curve for the on-line system, coupled with the need to use two systems for documentation, contributed to the general dissatisfaction with the on-line bedside system.

The work of Lewin and his colleagues provides some insight into the phenomenon of change. The process of successful group change (Lewin, 1947, cited by Lippett, Watson & Westley, 1958) includes three aspects: unfreezing the present level, moving to a new level, and freezing group life on the new level. One of the major difficulties with this study was that the subjects moved back and forth between the experimental state and the control state; between the present level and the new level. The process of unfreezing the present level and moving to a new level was disrupted. The nurses could not unfreeze the present level of batch documenting on the paper record and move to the new level of using the computer to document in real time because they were constantly moving back and forth between the two levels using the automated system when caring for patients in the experimental room and using the manual system when caring for patients in the control room.

There were four other factors that may have contributed to the dissatisfaction with the system. First, the on-line system had some technical problems that were not resolved during the study. A program bug that appeared randomly, caused a problem with the printing of reports. This occurred both at shift end and when the nurse was preparing the record to send with the patient to the OR or other diagnostic areas. Although the "bug" appeared infrequently, the level of disruption for the nurse was very high when it did occur. Computer operators/programmers had to be called to fix the bug,

resulting in delays for the patient, the nurse, the doctor and other care providers who required the paper record. In addition, some of the function programs were inefficient and not user friendly. It seems reasonable to assume that the frustration that the nurses felt about both of these technical problems would lead them to express a general dissatisfaction with the bedside system.

Second, all of the functions on the CNWS were accessed using menus. Menus guide the user to select the function required from a list of options. When people are learning to use an automated system, using menus to get to specific places in the system supports an intuitive learning process about how the system "fits together". Once a person clearly understands how the system functions "fit together", a more direct method of moving around in the system can be learned. Menus are very helpful for new users of a computer system; however their use can be frustrating once a user becomes familiar with the system, since to get to the part of the program the user wants often requires going through several levels of menus. The use of layers of menus may have contributed to the general level of dissatisfaction with the bedside system.

The third reason for dissatisfaction with the system was that a terminal was placed beside each of the four beds in the experimental room. The test unit, although recently renovated, was located in an old part of the hospital. The patient rooms were already crowded with equipment and furniture. Each bedhead in the experimental room had an oxygen outlet, a suction outlet, a television, nurse call equipment, a bedside table and electrical outlets. In addition, there was a privacy curtain around each of the beds. Many of the patients had additional medical equipment (alternating mattress, wound suction equipment etc.) located around the bed. The addition of another piece of equipment at the patient bedside made the already crowded area more crowded. This crowding may have contributed to the nurses' general dissatisfaction with the bedside system.

Finally, the nurses were aware that the results of the study would influence the direction of computerization within the Division of Nursing. It is reasonable to consider that nurses concerned with their ongoing performance with the CNWS would tend to express dissatisfaction with the bedside system if they had any doubts about their ability to work with computers generally.

During post study interviews conducted with the nurses a general theme of discomfort with documenting on-line at the bedside was expressed. Some of the nurses expressed a desire to document while seated. The CNWS was on a stand that could be adjusted to accommodate sitting or standing; however the nurses did not adjust the height.

Although the system training package included a module about how the bedside computer could be used as a patient teaching tool to encourage participation by the patient in their care and discussion about the patients' right to information about their care, the nurses expressed a reluctance to share what they were documenting with the patient. This reluctance to share information with the patient has a long history in both the medical and nursing professions. For many generations, doctors and nurses have been trained/socialized to not share information about the plan of care with their patients. In a purely manual system of documentation, the patient record is kept at the nursing station. Moving the automated patient record to the bedside brings with it implications for sharing information about the plan of care with the patient; physician and nurse care providers will have to learn to incorporate discussions about the plans for care with their patients into their practice. The longstanding reluctance to share information about their care with patients will be further challenged if voice activated computer technology becomes available at the bedside.

Of interest were the general comments of the nurses about wanting to "get away" from the patients and not wanting to document in the patient room. One nurse expressed it "I need to get away from them. After I have been in there giving care for an hour, I need a break; I don't want to document in the room." Furthermore, the nurses commented that whenever they were in the room documenting on the on-line system, the patients would continually interrupt, asking the nurses to do things for them. This contributed to the nurses' discomfort with documenting at the patient bedside.

It is interesting to note that all of the nurse subjects indicated an interest in participating in future evaluations of computer systems for nurses. Also of interest were the responses to a question about any expanded use of computers by the nurses, since their exposure to computers in the workplace. None of the nurses indicated an increase in the use of computers outside the work place.

PATIENT SATISFACTION

It was hypothesized that the patients in the experimental room would be more satisfied with their care than the patients in the control room. The additional presence of the nurse in the experimental room would result in the patient feeling that the nurse had spent more time with her/him and would lead her/him to feel more satisfaction with the care she/he received. The hypothesis of improved satisfaction with care was not supported. The investigator was led to hypothesize an increase in patient satisfaction with care based on the belief that the nurses would spend more time in the patient's room using the bedside computer. Although the nurses documented some of their observations and interventions at the bedside, they also documented on-line at the nursing station. It is reasonable to conclude that the additional time the nurses spent in the experimental room did not affect the patients' perception of care.

The patients in the experimental room responded to the bedside computer as anticipated, accepting the bedside computer as another piece of medical equipment.

LIMITATIONS

This study was limited by its quasi-experimental design; the use of obtrusive, direct observations to collect some of the data; and by the use of two systems for documentation, outdated computer technology, and access to the bedside system at the nursing station.

Since random selection and assignment of nurse subjects to the control or experimental group was not possible, a within-subject, quasi-experimental design was used. This design helps to control for differences in the nurse subjects' documentation style and behaviour. However, the cause and effect relationship between the presence of the CNWS and the results obtained cannot be assumed with total assurance.

For all of the productivity and some of the quality of care measures, direct observations were used to collect the data. Effort was made to control for possible reactive effects of direct observation; however, since little is known about the nature of reactive effects, interpretation of the results and generalizability will be limited.

There were three program-specific limitations to this study. One of the major limitations in this study was that the nurse subjects were required to use the automated system or the manual system to document their interventions and observations depending on their patient assignment. This meant moving back and forth between two methods of documentation. The same nurses were studied in both the experimental and control conditions; this constant transfer between two documentation

behaviours resulted in the nurses developing ambivalent feelings about the automated system. The nurses were being asked to change their documentation behaviour and use a new tool without the new tool being fully implemented to support the change process. The investigator could do nothing about this program limitation as hospital budgetary restraints made cabling to each bedhead and locating a computer terminal at each bedside on the unit impossible.

The second program limitation was the ability to access the CNWS at the nursing station. This ability to access the system at the nursing station may have influenced the nurses' willingness to use the system at the bedside in the way it was intended. At the hospital under study, in non-critical nursing areas the nurses do not document at the bedside. The presence of terminals at the nursing station may have encouraged the nurses to continue their batch, nursing station based documentation behaviour.

Decisions about the hardware and software environment for the CNWS were made in 1986; however, the system was not implemented until 1990. Advances in computer technology since 1986 had been dramatic. The hospital, however, was not in a financial position to take advantage of those advances for the CNWS project. The system was old technology by the time it was implemented on the study unit. The constraints of the old technology meant that some of the requirements for documentation that had been identified by nursing were not able to be met. This lack of ability to meet nursing's requirements totally due to old technology may have affected the study outcomes.

CONCLUSION

The results of this study contrast with other published studies on the effects of bedside computing on nurses. In this study, some nurse behaviours that have been predicted to impact on quality of

care were positively affected by bedside computing; however, no productivity improvements were demonstrated and nurse satisfaction with bedside computing was low. In addition, there was no difference in the nurses' perception of their ability to individualize patient care in the room where the bedside terminals were installed or in the patients' satisfaction with their care.

The outcome of this study has several important implications for designing and implementing on-line documentation systems for nurses as well as bedside computing systems. Based on the results of this study, it is concluded that in order to achieve productivity and quality of care improvements through the implementation of automated systems, exposure to basic concepts of computing should be provided to nurses. Ideally, this exposure should be provided during the post-secondary nursing eduction process. For nurses currently practising, inservice eduction that introduces the basic concepts of computing should be provided prior to installation of any computer systems that will be used by nurses.

The investigator recommends that further evaluation of bedside computing be conducted in critical patient care areas. In most critical care areas, the general duty nurses have some familiarity with manual bedside documentation systems. In addition, patients being cared for in these areas tend to be restricted to bed and are less alert than patients in non-critical care areas and usually require more nursing care which results in more, and more detailed, documentation requirements. These three factors might result in increased productivity and quality of care outcomes.

Automated real time bedside computing represents a major change in behaviour for nurses. First, using computers rather than pen and paper to document nursing observations and interventions and second, moving the documentation activity away from the nursing station to the bedside. These two

behaviours are deeply imbedded in the social norms of the profession of nursing. It is suggested that these two changes in behaviour should be introduced sequentially with the one behaviour change fully integrated before the second change is introduced.

A further implication arising from this study is the appropriate management of the nurses' time. The practice in a manual documentation system is to "batch" document at points in the day and/or at the end of the shift. All documentation is done while sitting at the nursing station. The nurses are familiar with managing their time in order to accommodate this behaviour. If on-line documentation and bedside computing are implemented, the nurses will need to learn to manage their time differently. Responsibility for identifying how the nurses will organize their behaviour and reorganize their time must be assumed by Nursing Administration if anticipated quality of care and productivity benefits are to be realized.

Finally, it is reasonable to conclude that approximately 20% of the general duty nurses working in hospitals will have English as a second language. Vendors of nursing documentation software need to consider this when designing nursing documentation systems. Furthermore, those responsible for computer system training and implementation in hospitals should identify the percentage of nursing staff who use English as their second language. Training and implementation strategies must be developed addressing the special needs of this group.

BIBLIOGRAPHY

Albrecht, C. A. & Lieske, A. M. (1985). Automating patient care planning, Nursing Management, 16 (7), 21 - 26.

Barrett, James P. (1976). Evaluation of a medical information system in a community hospital. Evaluation report on El Camino Hospital, Mountainview, California to Battelle Memorial Institute, Columbus, Ohio. NSCHSR: 77 - 87 (September, 1976) 27 pages.

Blum, B. I. (1984). Information systems for patient care. In B.I. Blum (Ed), Information Systems for Patient Care, (pp. 3 - 190), New York: Springer -Verlag.

Cavalier, Sharon, Kerluke, Kerry & Wood, Laura (1990). Place of Graduation for Selected Health Occupations - 1989. Health Manpower Research Unit, Division of Health Services Research and Development, University of British Columbia, Vancouver, Canada.

Cook, Thomas D. & Campbell, Donald T. (1979). Quasi-Experimentation Design and Analysis Issues for Field Settings. Boston: Houghton Mifflin Company.

Flett, S. M. (1983). Evaluating computer systems aids future planning. Dimension, March, 28 - 30.

Grier, M. R., Ziomeck, R. R., MacLean, S. L. & Kim, K. K. (1985). Evaluation of a computerized nursing information system. In K. J. Hannah, E. J. Guillemin, & D. N. Conklin (Eds), Nursing Uses of Computers and Information Science, North-Holland: Elsevier Science Publishing Company Inc.

Grobe, S. J. (1984). The Computer Primer and Resource Guide for Nurses. New York: J. B. Lippincott.

Halford, G., Burkes, M., & Pryor, T. A. (1989). Measuring the impact of bedside terminals. Nursing Management 20(7), 41-42, 44-45.

Harris, Richard J. (1975). A Primer of Multivariate Statistics. New York: Academic Press Inc.

Haynes, S. N. (1978). Principles of Behaviour Assessment. New York: Gardner Press.

Hendrickson, G. & Kovner, C. T., (1989). Effect of Various Components of Computer Systems on Nurses. Proceedings of the Thirteenth Annual Symposium on Computer Applications in Health Care.

Hendrickson, G. & Kovner, C. T., (1990). Effects of computers on nursing resource use. Computers in Nursing, 8(1) 16 - 22.

Herring, D., Rochman, R. (1988). A Closer Look at Bedside Terminals. Nursing Management 21(7).

Hughes, S. J. (1980). Installing a computer based patient information system. Journal of Nursing Administration, 10, 7 - 10.

Johnson, D. S., Burkes, M., Sittig, D., Hinson, D. and Pryor, T. A. (1987). Evaluation of the Effects of Computerized Nurse Charting. Proceedings of the Eleventh Annual Symposium on Computer Applications in Medical Care, 529 - 535.

Kazdin, Alan E. (1982). Observer Effects: Reactivity of Direct Observation. In Hartmann, Donald P. (Ed), Using Observers to Study Behaviour, San Francisco: Jossey-Bass Inc., Publishers 1982.

Lewin, Kurt (1947). Frontiers in Group Dynamics. Human Relations, 1, 5-41.

Lippett, Ronald, Watson, Jeanne, Westley, Bruce (1958). The Dynamics of Planned Change. New York: Harcourt, Brace & World Inc.

McClure, Margaret L. & Nelson, M. Janice (Aiken, L. & Gartner, S.R. eds.) (1982). Trends in Hospital Nursing. Nursing in the 1980's: Crisis, Opportunities, Challenges, Toronto: J.B. Lippencott Co.

McDermit, R. E., Bernstein, M. & Harmer, E. (1983). UBC Hospital: a computer in every corner. Dimensions, August, 13 - 15.

Martin, J. B., Dahlstrom, G. A. & Johnston, C. M. (1985). Impact of Administrative Technology on Acute Care Bed Need. Health Services Research, 20 (1), 63 - 81.

Milner, M. (1985). A Medical Information System: impact of nursing administration and nursing practice. In K. J. Hannah, E. J. Guillemin & D. N. Conklin (Eds). Nursing Uses of Computers and Information Science, North-Holland: Elsevier Science Publishing Company Inc.

National Report on Computers in Health Care, (vol. 10, no. 6, March 20, 1989).

Risser, N.L. (1975). Development of an instrument to measure patient satisfaction with nurses and nursing care in primary settings. Nursing Research, 24 (1), 45-52.

Roberts, Carol A. & Burke, Sharon Ogden (1989). Nursing Research A Quantitative and Qualitative Approach. Boston: Jones and Bartlett Publishers.

Ryan, S. A. (1985). An Expert System for Nursing Practice: clinical decision support. Computers in Nursing, 3 (2), 77 - 84.

Soonit, Elena (1985). Installing the First Operational Bedside Nursing Computer System. Nursing Management, 18(7) 23-25.

Staggers, N. (1988). Using Computers in Nursing. Computers in Nursing, 6(4) 164-70.

Vandewal, Denis, Wouters, Jos, Daneels, Frans (1985). The Effectiveness of an Integrated Information System for Nursing Services in Hannah, K.J., Guillemin, E.J. & Conklin, D.N. (eds) Nursing Uses of Computers and Information Science. Amsterdam: Elsevier Science Publishers B.V.

vanServellen, G. (1988). Individualized Care Index in C. F. Waltz, & O. L. Strickland (eds) Measurement of Nursing Outcomes. Springer Publishing Company, New York, New York.

Viers, V. M. (1983). Introducing Nurses to Computers. Nursing Management, 14 (7), 24 - 25.

Ward, E. F. (1984). Implementing a Computer System. Computers in Nursing, 2 (5), 171 - 174.

APPENDIX A

DEPARTMENT OF PLASTIC SURGERY

OPERATIVE PROCEDURE LIST

Procedure by Service Report

Procedure Name	Code
LENGTHENING OF COLLUMELLA/COLLUMELLA RECONSTRUCTION	P009
LEVATOR RESECTION	P116
MAJOR BURN DEBRIDEMENT	P088
MAJOR BURN DEBRIDEMENT & HARVEST SPLIT THICKNESS SKIN GRAFT	P087
MANDIBULAR OSTEOTOMY (INTRA-ORAL)	P031
MANDIBULAR OSTEOTOMY WITH SCREW FIXATION	P094
MASTOPEXY	P048
MAXILLARY OSTEOTOMY (INTRA-ORAL)	P032
MINOR BURN DEBRIDEMENT	P086
MINOR BURN DEBRIDEMENT & HARVEST SPLIT THICKNESS SKIN GRAFT	P085
NASAL REFRACTURE	P017
NERVE GRAFT	P057
NERVE REPAIR (DIGITAL,MEDIAN,ULNAR)	P056
OPEN REDUCTION OF FRACTURED MANDIBLE	P038
OPEN REDUCTION OF FRACTURED MAXILLA	P041
ORBITAL & MAXILLARY OSTEOTOMY - FOREHEAD APPROACH	P096
ORBITAL HYPERTELORISM	P097
OSTEOTOMY OF HAND/FINGERS	P060
OTOPLASTY	P007
PAROTIDECTOMY	P025
PARTIAL GLOSSECTOMY	P093
PERIOSTEAL GRAFT TO MAXILLA(CLEFT PALATE REPAIR USING PERIOSTEAL GRAFT	P130
PHARYNGOPLASTY	P023
FOLLICIZATION	P062
PRE-MAXILLARY SET-BACK	P019
RAISE ABDOMINAL TUBE PEDICLE TO ARM.	P072
RECONSTRUCTION OF AREOLA	P050
RECONSTRUCTION OF EAR USING RIB CARTILAGE	P074
RECONSTRUCTION OF LIGAMENT OF FINGER OR THUMB JOINT	P061
RECONSTRUCTION OF MANDIBLE WITH FREE VASCULAR TISSUE & BONE GRAFT	P100
RECONSTRUCTION OF ORBIT & ZYGOMA WITH BONE GRAFT	P079
REDUCTION MAMMOPLASTY	P047
REDUCTION OF FRACTURED NOSE (PRIMARY)	P040
REMOVAL OF MANDIBULAR INTERNAL FIXATION (PLATES & SCREWS)	P128
REPAIR OF LACRIMAL DUCT	P013
REPAIR OF MALLET FINGER	P033
REVISION OF CLEFT LIP	P008
REVISION OF CLEFT PALATE, PALATOPLASTY, CLOSURE OF PALATAL FISTULA	P021
RHINOPLASTY	P014
RHYNOPHIMA EXCISION	P006
RHYTIDECTOMY,MELOPLASTY,RHYTIDOPLASTY, FACE LIFT	P001
RIB CARTILAGE GRAFT TO NOSE	P103
RIB GRAFT TO CLEFT PALATE	P078
RIB GRAFT TO MANDIBLE/MAXILLA	P077
RIB GRAFT TO NOSE	P07
ROTATION FLAP TO BUTTOCK	P
SEPTOPLASTY	P
SILASTIC IMPLANT TO NOSE	P
SILASTIC IMPLANT TO ORBIT	
SKOOG ARTHROPLASTY	

Procedure by Service Report

Procedure Name	Code
SPLIT RIB GRAFT TO MAXILLA	P078
SUB-MAXILLARY GLAND EXCISION	P026
SUBCUTANEOUS MASTECTOMY	P049
SUTURING OF LACERATED FACE	P002
TEMPORALIS FASCIA GRAFT USING RUBIN'S TECHNIQUE	P115
TENDON GRAFT/TRANSFER	P055
TENDON REPAIR OF FINGERS & HAND-PRIMARY	P054
TO RAISE TUBE PEDICLE FIRST STAGE	P068
TOE TO THUMB TRANSPLANT (DOUBLE SET UP)	P090
TRANSFER OF PEDICLE FLAP (TUBE)(MIDDLE STAGE)	P069
WILKIE PROCEDURE	P027
WIRING OF TEETH	P039
WIRING OF ZYGOMA	P037

APPENDIX B

JOB DESCRIPTION - STAFF NURSE

JOB DESCRIPTION

POSITION TITLE: Staff Nurse	CLASSIFICATION: Staff Nurse
DEPARTMENT: Various	JOB CLASS: 0400
DIVISION: Nursing	LOCATION: Various
SUPERVISOR'S TITLE: Head Nurse	BARGAINING UNIT: BCNU
SUPERVISES:	EFFECTIVE DATE: February 1, 1991

JOB SUMMARY

Within the organizational framework of nursing, is responsible and accountable for the nursing care of an assigned group of patients and their families. Provides guidance and leadership to peers and non-professional nursing staff. Works closely with colleagues, unit staff, students and members of related health disciplines.

EXAMPLES OF DUTIES AND RESPONSIBILITIES

Nursing Practice

1. Assesses individual patients/families or groups of patients/families and identifies health related requirements, problems and their inter-relationships.

2. Individualizes patient care within established standards and guidelines, and reorganizes priorities as warranted by changes in patient condition or changes in overall unit workload.

3. Implements nursing care plan to assist patients to meet physical, psychological, social and spiritual needs and to ensure prevention and/or early detection of anticipated problems.

4. Initiates referral to hospital and community resources in implementation of patient care and discharge planning, e.g., clinical nurse specialist, social worker, chaplain, dietician, or community agency.

5. Assesses patients' and families' learning needs and readiness and ability to learn.

Job Description - Staff Nurse

6. Teaches patients and families, consulting with other health team members and using available learning resources as required.

7. Evaluates patient outcomes, and revises care plan as required.

Leadership

1. Coordinates unit activities to ensure patient care standards are achieved.

2. Uses decision making process independently to problem solve for patients and unit involving multidisciplinary personnel.

3. Assists in resolution of moral and ethical issues on the unit.

4. Participates in unit or divisional management and patient care committees, including revision of unit philosophy and objectives.

5. Acts as a role model and resource nurse for new staff, students, co-workers and health team members.

6. Fulfills role responsibilities of charge nurse as required.

7. Participates in Quality Assurance activities.

8. Participates in evaluation of own job performance, formulates and sets measurable goals, and ensures goals are met in designated time frames.

9. Provides input into performance appraisal of others as requested by head nurse.

Policies and Procedures

1. Follows and assists others to follow established policies, procedures and protocols.

2. Contributes to development, evaluation and revision of policies, procedures and protocols.

3. Initiates preventative action in potential emergency situations in accordance with established policies and procedures.

Job Description - Staff Nurse

Communication

1. Uses effective interpersonal skills to establish therapeutic relationships with patients and families.

2. Communicate effectively with co-workers and other health team members.

3. Assists others to develop effective interpersonal skills.

4. Consults and confers with physicians and other health team members in collaboration with patients and families as a patient advocate.

5. Uses established methods and channels of communication within the hospital.

6. Documents according to established standards.

Education and Research

1. Maintains clinical competence to achieve nursing practice standards.

2. Participates in nursing staff educational programs, including provision of input into program planning.

3. Guides clinical learning experience of new nursing staff and students as a preceptor.

4. Identifies areas for clinical nursing research.

5. Participates in approved research projects in a variety of ways including conducting literature review, data collection, evaluation of research findings and application of findings into practice.

Management of Human and Material Resources

1. Initiates consultations to appropriate resource personnel in accordance with patient needs.

2. Selects appropriate supplies and equipment, considering cost, availability, and care requirements.

3. Consults with appropriate hospital personnel to operate equipment and to problem solve equipment malfunctions.

4. Manages time independently and effectively to provide care to selected patient population, and assists others when needed.

Job Description - Staff Nurse

QUALIFICATIONS

1. Registered (or eligible for registration) with the Registered Nurses Association of British Columbia.

2. In certain specialty areas, incumbents are required to have Baccalaureate degree and/or one to two years prior experience.

3. Demonstrated ability to communicate effectively orally and in writing.

4. Demonstrated physical ability to perform duties of the position.

APPENDIX C

INDIVIDUALIZED CARE INDEX

RFORMANCE OF NURSING ACTIONS.

Considering your patients over the last month, for each of the activities listed below please indicate the number of your patients with whom you engage in the activity listed. Please note that this is not an evaluation of your ability to care for patients. For each activity, there may be many reasons why you do, or do not, engage in the activity. For each item please circle the number between 1 and 5 that best describes your situation.

1 = with none of my patients
2 = with a few of my patients
3 = with some of my patients
4 = with most of my patients
5 = with all of my patients

	with none	with a few	with some	with most	with all
1) Discuss with the family what role they would like to assume in providing care for the patient while she/he is in the hospital	1	2	3	4	5
2) Give patients an opportunity to explain their feelings	1	2	3	4	5
3) Meet with the oncoming shift to discuss the patient's problems	1	2	3	4	5
4) Sit down with patients to discuss their care	1	2	3	4	5
5) Make sure patients know what roles physicians will play in their care	1	2	3	4	5
6) Allow the patients time to talk about their fears or concerns	1	2	3	4	5
7) Meet patient's daily hygiene needs for cleanliness and acceptable appearance	1	2	3	4	5
8) Discuss with patients the care that is planned for them while they are in hospital	1	2	3	4	5
9) After completing the nursing assessment, validate with the patient what you have identified as her/his problem	1	2	3	4	5
10) Discuss with the dietitian the diet plan for the patient	1	2	3	4	5
11) Allow patients to assume as much responsibility for their own care as they can	1	2	3	4	5
12) Make sure patients understand who will be taking care of them	1	2	3	4	5
13) Ask patients what they would like to know about their illness	1	2	3	4	5
14) Ask patients if they have any preferences about any aspect of their care	1	2	3	4	5
15) Allow patients to set the times for their activities and treatments as much as possible; e.g., baths, medications, bedtimes	1	2	3	4	5
16) Help patients accept dependence/independence (as appropriate to their condition)	1	2	3	4	5
17) Find out if the patient has ever talked with anyone who has the same illness	1	2	3	4	5
18) Participate in conferences concerning your patients' care	1	2	3	4	5
19) Take action to meet the patient's need for adequate hydration and elimination	1	2	3	4	5
20) Adapt expected patient activities to the physical and mental capabilities of the patient.	1	2	3	4	5
21) Make sure patients know the names of the persons responsible for specific procedures and/or treatments	1	2	3	4	5

	with none	with a few	with some	with most	with all
22) Include the patient's family in planning the patient's care upon discharge	1	2	3	4	5
23) Make sure patients understand about their medications, such as reasons why and side effects	1	2	3	4	5
24) Write nursing interventions for the patient on the care plan	1	2	3	4	5
25) Support patients in learning about their care	1	2	3	4	5
26) Talk with patients about what they know about their illness	1	2	3	4	5
27) Review the information that you gave the patient to be sure that she/he understood	1	2	3	4	5
28) Carry out medical and surgical asepsis during treatments and special procedures	1	2	3	4	5
29) Approach patients in a kind, gentle, and friendly manner	1	2	3	4	5
30) Discuss with the patient the impact their hospitalization will have on their lives and families	1	2	3	4	5
31) Complete all "hands on" nursing procedures for the patient with skill and sensitivity to patient needs	1	2	3	4	5
32) Keep informed of your patients' condition and whereabouts during your assigned shifts	1	2	3	4	5
33) Ask patients what their usual daily activities are, such as work, hobbies, and recreation	1	2	3	4	5
34) Report the pertinent incidents of the patient's behaviour during interaction with other staff	1	2	3	4	5
35) Protect patients' sensitivities and rights to privacy	1	2	3	4	5
36) Through talking with patients and/or their families, determine what nursing care needs the patient has that are different from the expected or anticipated needs	1	2	3	4	5
37) Inform the doctor that you are the patient's nurse	1	2	3	4	5
38) Ask patients if they have any questions about their care	1	2	3	4	5
39) Give patients explanations and verbal reassurances when needed	1	2	3	4	5
40) Ask patients if they understood all the things that their physician has told them	1	2	3	4	5
41) Communicate clearly ideas, facts, and concepts about the patient in charting	1	2	3	4	5
42) Make sure that changes in care and the care plans for your patients reflect the continuous evaluation of nursing care given	1	2	3	4	5
43) Make decisions that reflect knowledge of facts and good judgment	1	2	3	4	5
44) Assess the patient's emotional state frequently	1	2	3	4	5
45) Discuss with patients how their illness will affect them and their family	1	2	3	4	5

APPENDIX D

COMPUTERIZED NURSING WORKSTATION QUESTIONNAIRE

COMPUTERIZED NURSING WORKSTATION (CNWS) EVALUATION

On the following pages are questions about the automated documentation system you have been using. You'll find the questionnaire has been divided into different sections. Each section deals with different aspects of the evaluation project. We appreciate your taking the time to fill out all sections of this questionnaire.

Section I

We would like you to compare the two methods of documenting your patient care, the manual system and the automated system.

Please circle the number that reflects your level of agreement with the following statements. Please note that "1" refers to strong disagreement while "5" refers to strong agreement with the statement.

I find the following methods:

1. Convenient for charting patient data in the record.

Manual	1	2	3	4	5
Automated	1	2	3	4	5

2. Convenient for looking up patient data in the record.

Manual	1	2	3	4	5
Automated	1	2	3	4	5

3. Convenient for accessing the patient record throughout my shift.

Manual	1	2	3	4	5
Automated	1	2	3	4	5

4. Require an excessive amount of time to record patient data.

Manual	1	2	3	4	5
Automated	1	2	3	4	5

5. Require an excessive amount of time to find patient data.

Manual	1	2	3	4	5
Automated	1	2	3	4	5

6. Provide a complete patient record.

	Manual	1	2	3	4	5
	Automated	1	2	3	4	5
7. Provide a legible patient record.						
	Manual	1	2	3	4	5
	Automated	1	2	3	4	5
8. Provide consistent patient data.						
	Manual	1	2	3	4	5
	Automated	1	2	3	4	5
9. Provide clear patient data.						
	Manual	1	2	3	4	5
	Automated	1	2	3	4	5
10. I like the presentation of the patient data.						
	Manual	1	2	3	4	5
	Automated	1	2	3	4	5

Section II

In this next section are general questions about how you feel about using a computer. Again, please indicate your level of agreement with the following statements (1 = strongly disagree, 5 = strongly agree).

1. The hospital is a good place for computers to be used.	1	2	3	4	5
2. I don't think computers have a place in patient care.	1	2	3	4	5
3. I think I spend too much time figuring out the computer instead of caring for patients.	1	2	3	4	5

4.	The use of computers gives me more time to spend with my patients.	1	2	3	4	5
5.	I use the computer to teach my patients about their health.	1	2	3	4	5
6.	I am uncomfortable having a computer at the bedside.	1	2	3	4	5
7.	I am uncomfortable knowing that patient data is stored on a computer.	1	2	3	4	5

Section III

The following section refers specifically to the automated system (CNWS) that you have been using. We would like to find out how satisfied you are with it.

A. Functions

Please indicate your level of agreement with the following statements (1 = strongly disagree, 5 = strongly agree).

1.	I am able to accurately chart my observations using the lists of choices provided by the CNWS.	1	2	3	4	5
2.	The amount of typing required to use the CNWS is excessive.	1	2	3	4	5
3.	The sign-on procedure for the CNWS is efficient.	1	2	3	4	5
4.	The function keys (eg. PF2, PF4,...) are useful.	1	2	3	4	5
5.	The sequence of the input screens is logical.	1	2	3	4	5
6.	The layout of each input screen is logical.	1	2	3	4	5

7. The view screens are effective in conveying patient information. 1 2 3 4 5

8. It is easy to find specific information about a patient. 1 2 3 4 5

B. Physical Components (Hardware)

Please indicate your level of agreement with the following statements (1 = strongly disagree, 5 = strongly agree).

1. I like the size of the keyboard. 1 2 3 4 5

2. I like the keyboard layout. 1 2 3 4 5

3. I like the size of the screen. 1 2 3 4 5

4. I like the use of colour. 1 2 3 4 5

5. The location of the computer in the room is convenient. 1 2 3 4 5

6. It is easy to move the computer out of the way when necessary (if you have never had to do this, please circle "N/A"). N/A 1 2 3 4 5

7. The CNWS responds quickly to my input commands. 1 2 3 4 5

8. Please indicate the approximate number of seconds it takes for the CNWS to respond to your input commands. 1 2 3 4 5 6 or more seconds

We are interested in your comments on specific aspects of the CNWS (eg. functions available, physical components). Please write down your suggestions here.

Functions (content and capabilities of the system):

Hardware (keyboard, screen, stand, printer, etc.):

Please indicate your overall satisfaction with the CNWS by marking an "X" beneath the picture that reflects your feelings.

APPENDIX E

PATIENT SATISFACTION QUESTIONNAIRE

PATIENT SATISFACTION SURVEY

Dear Sir/Madam:

One of the ways we evaluate our nursing care is to ask our patients about the care they received while hospitalized. This information is used to identify some of our strengths as well as where we can improve the quality of nursing care. We would also like to know how you feel about the use of computers in the hospital. Will you please assist us by completing the attached survey?

When you have finished, please place this questionnaire in the envelope provided, seal the envelope and return it to the unit clerk or leave it by the bedside when you leave. If you are unable to complete the questionnaire before you leave the hospital, please mail it to me in the pre-paid, self addressed envelope provided.

If you have any questions about the survey do not hesitate to call me

Thank you for assisting us in this survey.

Sincerely,

Carol Robinson
Director of Nursing

PATIENT SATISFACTION SURVEY

DIRECTIONS: A number of statements which patients have used to describe nursing care are given below. Read each statement and then circle the number to the right of the statement to indicate how you feel about the nursing care you received when hospitalized.

1 = Strongly Disagree
2 = Disagree
3 = Neither Agree nor Disagree
4 = Agree
5 = Strongly Agree

Section I General Evaluation

		Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1.	The nurses did things to make me feel comfortable.	1	2	3	4	5
2.	The nurses knew what they were talking about.	1	2	3	4	5
3.	The nurses were too slow to do things for me.	1	2	3	4	5
4.	The nurses were understanding in listening to me about my problems.	1	2	3	4	5
5.	The nurses seemed to understand how I felt.	1	2	3	4	5
6.	I felt free to ask the nurses questions.	1	2	3	4	5
7.	The nurses were not patient enough with me.	1	2	3	4	5
8.	The nurses told me their names.	1	2	3	4	5
9.	The nurses seemed to know what I needed before I asked for it.	1	2	3	4	5
10.	I had confidence in the nurses.	1	2	3	4	5
11.	I didn't see the nurses often enough.	1	2	3	4	5
12.	The nurses treated me with respect.	1	2	3	4	5
13.	I felt that the nurses on the ward worked as a team to help me get well.	1	2	3	4	5

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
14. I talked to the nurses about my illness.	1	2	3	4	5
15. When I needed medicine for pain, the nurses brought it quickly.	1	2	3	4	5
16. The nurses caring for me were informed about my care.	1	2	3	4	5
17. The nurses knew how to use the equipment needed for my care.	1	2	3	4	5
18. I felt that the nurses wanted me to do too much for myself.	1	2	3	4	5
19. The nurses gave directions at just the right speed.	1	2	3	4	5
20. The nurses explained things in simple language.	1	2	3	4	5
21. It was always easy to understand what the nurses were telling me.	1	2	3	4	5
22. The nurses gave enough information about the tests that were ordered for me.	1	2	3	4	5
23. The nursing staff told me what they were going to do before they did it (baths, dressing changes, temperatures, and/or blood pressures, etc).	1	2	3	4	5
24. The nurses explained to me how to care for myself at home.	1	2	3	4	5
25. Talking to the nurses made me feel better.	1	2	3	4	5

Section II Computers in the Hospital	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1. The hospital is a good place for computers to be used.	1	2	3	4	5
2. I don't think that computers have a place in my care.	1	2	3	4	5
3. I think the nurses spend too much time figuring out the computer instead of caring for me.	1	2	3	4	5
4. The use of computers gives the nurses more time to spend with me.	1	2	3	4	5
5. The nurse used the computer to teach me about my health.	1	2	3	4	5
6. I am uncomfortable having a computer at my bedside.	1	2	3	4	5
7. The nurses did not explain the use of the computer to me.	1	2	3	4	5
8. I am comfortable knowing that information about my care was stored on a computer.	1	2	3	4	5

APPENDIX F

COMPUTERIZED NURSING WORKSTATION DESCRIPTION

COMPUTERIZED NURSING WORKSTATION (CNWS)

Nursing activities can be classified under four headings: 1) direct patient care; 2) indirect patient care; 3) administrative; and 4) personal time. The functions of the nursing documentation and record keeping system developed at the hospital are related to direct patient care activities. Indirect and administrative functions, many relating to an Order Entry and Communication System, were considered outside the scope of the nursing documentation system.

A detailed specifications document was prepared by the Nursing Division and the Information Systems Department with the objective of automating all the nursing documentation requirements of the Plastic Surgery unit. Automation of nursing care plans is currently under development and will not be part of the study.

The automated nursing workstation system is integrated into the hospital computer environment. A Local Area Network based on the Ethernet protocol has been in operation at the hospital for four years. The network has facilitated the installation and inter-connection of a wide variety of computers, terminals, and printers throughout the hospital. The nursing system receives information via the network from the ADT system, the laboratory system, chemistry system, and the Pharmacy system.

The nursing workstation software runs on a Data General MV-10000, a 32 bit mini-computer. This machine has two mega-bytes of memory, and 400 mega-bytes disk space. A second 400 mega-byte disk drive is used for nightly back-ups. In its present configuration the MV-10000 can comfortably handle between 50 and 100 users simultaneously.

The nursing workstation software is written in a language called MIIS, which is a dialect of MUMPS. MIIS has widespread use in the health care industry; it runs on the MV-10000, and a variety of other computers, in "native" mode. MIIS is both the language and the operating system. IT is an interpretive language which results in very fast software development. A major factor in the success of MIIS is the exceptionally powerful, flexible, and efficient database capabilities inherent in the language itself.

The Nursing Workstation automates nursing documentation of eight records that comprise a portion of the patient's chart.

Medication:	documents all information pertaining to a patient's medication intake. It displays a summary of mediation orders and their administration, as well as a profile of all active medications.
Clinical Chart:	documents vital signs, body measurements, and puncture site status. It displays 3 days of data in graph format and as exact values, and provides access to Laboratory Results.
Skin	documents skin flap (graft/wound) temperatures. It displays

Temperature: a graph of recorded skin temperatures for a specific graft/wound site for a 3 day period.

Intake-Output: documents intake/output activity. It displays fluid balance summaries and I/O activity summaries for any time period up to24 hours.

Patient Care Flowsheet: documents the patient's nutrition, hygiene, activity level, sleep pattern, elimination, and use of sensory devices and oxygen. It is also used to record nursing activities related to skin care and safety measures. It displays a summary of previous Flowsheet entries.

Neurological Chart: documents the level of consciousness and focal neurological signs. It displays this data in graph format.

Wound Care: documents the condition of a wound and related nursing care.It displays a summary of previous documentation on each wound site.

Neurovascular: documents capillary refill, colour, warmth, movement, and sensation. It displays a summary of previous neurovascular entries.

Nurses' Notes: documents problems and related nursing interventions not already specified. It displays a list of current patient problems, as well as previous annotations for each specific problem.

The nursing workstation software is menu driven with a direct command option for access to any function in the system. Enter, view, and cancel options are independent with the exception of the Clinical Chart enter screen which displays the eight previous entries in the top half of the screen for viewing and comparison.

Data entry is field by field and help screens are available throughout the system. Nurses Notes are entered from anywhere in the system and are free text. In addition, an option to enter an event marker of "flag" anywhere in the system is available in the nurses' notes function. The event marker is used to signal the user viewing data anywhere in the system that there is additional documentation on the nurses' notes.

The system makes extensive use of function keys and single number and single letter key strokes for data entry. The nurses' can document easily with two finger typing. Entry in the nurses notes is free text. However, the structured data entry screens make extensive use of lists of descriptive terms and very little documentation is required on the nurses' notes.

The screens are uncluttered and easy to read. The order of data input closely parallels the previous manual system, and the reports were designed with input from nurses, physicians, unit clerks, and other health care professionals who require access to the data.

The nursing system has been evaluated and tested for user acceptability. Screen design, ease of data entry, response time, and functionality have been evaluated and accepted by the nursing staff on the test unit.

APPENDIX G

DATA COLLECTION FORMS

DIVISION OF NURSING

Research Assistant: _____

Nurse: _____ Date: _____ Shift (D/E): _____ Group (C/Ex): _____ Room Time: _____

Treatment/Assessment				Documentation			Information Viewed				Nurse Travel
Descriptio Code	Description	Treatment Ended	Immediacy (Seconds)	Charting Starts	Charting Ends	Seconds	Section	Time Started	Time Ended	Seconds	# of Trips

APPENDIX H

CHART AUDIT FORMS

"EXPERIMENTAL"

VANCOUVER GENERAL HOSPITAL

(* = Choice Items)

AUDIT FORM

Wound Care Record

UNIT: _____

PATIENT'S UNIT #: _____

AUDITED BY: _____

DATE OF SURGERY: _____

DATE OF WOUND CARE RECORD: _____

COL. NO.
1-4
5-12
13
14-19
20-25

Chart Review	Comments	Yes (1)	No (2)	N/A (9)	
1. For all entries, the following are recorded:					
(a) Date of Entry					26
(b) Time of Entry					27
(c) Full name of RN responsible for the care.					28
2. On top of each page of Wound Care Record, the following are recorded:					
(a) Specific Wound Location					29
(b) Wound position					30
(c) Wound type					31
(d) Presence/Absence of Drain : Type of drain					32
: Position of drain					33
: If drain is removed.					34
I. OLD DRESSING/WOUND DRAINAGE					
3. For all the wounds, the following are recorded:					
(a) Status of Wound					35

Wound Care Record (cont'd)

Chart Review	Comments	Yes (1)	No (2)	N/A (9)	Col. No.
(b) Drainage Amount					36
(c) Drainage Appearance					37
(d) Drainage Color					38
(e) Drainage Odor					39
(f) Dressing removed (yes?no?)					40
(g) Wound Description					41
II. WOUND DESCRIPTION					
4. For all wound descriptions, the following are recorded:					
(a) Wound Description					42
* (b) Specific Wound Description					43
(c) Wound Color					44
III. DRAIN DRAINAGE					
5. When there is drain drainage, the following are recorded:					45
(a) Drains are numbered (e.g. #1, #2).					
(b) Each Drain Type					46
* (c) Drain Position					47
(d) Drain Drainage Amount					48
(e) Drainage Appearance					49
(f) Drainage Color					50
(g) Drainage Odor					51
* (h) If Suction present, indicate: : Activity of Suction					52
: Amount of Suction					53
: Flow of Suction					54

Wound Care Record (cont'd)

Chart Review	Comments	Yes (1)	No (2)	N/A (9)	Col. No.
IV. INTERVENTIONS 6. Nursing Intervention for particular type indicated.					55
A. INCISION/WOUND 7. Nursing Interventions indicated : (a) Inspected					56
(b) Cleansed/Treated * : Wound Care Solution used					57
(c) Irrigated * : Wound Care Solution used					58
(d) Aspirated : Aspirated Amount					59
: Aspirate Appearance					60
(e) Pressure Applied					61
(f) Protected					62
(g) Rolled : Rolled Amount					63
: Rolled Drainage Appearance					64
(h) Specimen collected : Specimen type					65
(i) Trimmed					66
B. DRAINS 8. When drains are present, the following are recorded: (a) Drain Number indicated					67
(b) Nursing Actions: (i) Inspected					68
(ii) Shortened * Shortened by cm ----					69
(iii) If drain is removed, indicate beside drain					70

Wound Care Record (cont'd)

Chart Review	Comments	Yes (1)	No (2)	N/A (9)	Col. No.
C. PACKING					
9. If packing present, the following are recorded:					
(a) Inspected					71
(b) Shortened					72
* Length shortened					
(c) Removed					73
(d) Inserted					
* Packing material					74
D. SUTURES					
10. If sutures present, the following are recorded:					
(a) Inspected					75
(b) Cleansed/treated					76
* Wound care solution used					
(c) Completely removed					77
(d) Alternately removed					78
E. STAPLES					
11. If staples present, the following are recorded:					
(a) Inspected					79
(b) Cleansed/treated					80
* Wound care solution					
(c) Completely removed					81
(d) Alternately removed.					82
IV NEW DRESSING					
12. For all new dressing put on, following are recorded:					
(a) Dressing materials					83
* (b) Type of tape used					84

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VANCOUVER GENERAL HOSPITAL

AUDIT FORM (Control)

TREATMENT FLOW SHEET

UNIT: _____

PATIENT'S UNIT #: _____

AUDITED BY: _____

DATE OF AUDIT: _____

DATE OF TREATMENT FLOW SHEET: _____

COL. NO.
1-4
5-12
13
14-19
20-25

Chart Review	Comments	Yes (1)	No (2)	N/A (9)	Col. No.
1. Each column in the Treatment Flow Sheet: a) is dated; b) includes the span of time the nurse was responsible for the care of the patient; c) is initialled.					26
					27
					28
2. Description: 2.1 The type and location of each wound, incision or drain is described beside the title "Description".	Examples:				29
2.2 For every wound, incision or drain entered on the Flow Sheet there is a description of the care required in the Patient Care Plan.	Indicate which are missing from PCP.				30
2.3 Only **ONE** wound, incision or drain is described in each description.					31
2.4 Assessment of appearance is indicated with a check or **NN** notation is made.					32

Chart Review	Comments	Yes (1)	No (2)	N/A (9)	COL. NO.
3. Drainage: 3.1 The amount of drainage is recorded according to the legend of S=small, M=moderate and L=large. An NN is entered for a change in amount or character from last assessment.					33
3.2 "Other" drainage other than serous, sanguinous, or purulent is identified, entered and checked, or a NN notation is made.					34
4. Care completed: 4.1 The number of times that the wound/incision/drain care was completed is					35

APPENDIX I

CONSENT TO PARTICIPATE IN THE STUDY

Vancouver General Hospital
British Columbia's Health Sciences Centre

CONSENT FORM

I, _____, agree to participate in the evaluation on HP, A3 of an automated on-line bedside nursing documentation system project conducted by Carol Robinson and Inge Schamborzki at Vancouver General Hospital. The purpose of the study has been explained to me.

I understand that it is not the quality or technique of my work being evaluated; rather, it is the effect and impact of a bedside automated on-line nursing documentation system that is being evaluated. I understand that, during the 4 month data collection period, I will be observed approximately 16 times, 8 in the experimental room and 8 in the control room. Each observation will be 3 hours long. I further understand that I will be completing questionnaires on satisfaction with the system and my perception of the quality of patient care.

I understand that my name will not appear on any materials related to this work, and that my identity will be protected. I understand that only aggregate data will be released and reported. Furthermore, only the investigators and the research assistants will have access to the original documents. I further understand that, my participation in this study will not, in any way, jeopardize my rights as an employee of VGH and that I can withdraw from the study at any time without penalty.

I consent to participate in this study.

Signature: _____

Date: _____

Witness: _____

Should you have any questions regarding this study, please contact Carol Robinson

A teaching hospital affiliated with the University of British Columbia