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# The Effects of Hospital Information Systems on Nursing and Their Implications for Nursing Education

Lorraine Taran Singer

A Thesis

in

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# ABSTRACT

## The Effects of Hospital Information Systems on Nursing and Their Implications on Nursing Education.

Lorraine Taran Singer

By conducting a survey and analysis, the question of how nursing curricula need to be improved to take into account nursing education needs regarding computerization of hospital environments was explored. The ways in which nursing educators need to promote and support the development and integration of Nursing Information Systems (NIS) based on, and incorporating nursing knowledge and expertise were investigated.

A questionnaire (Nurse Respondent Profile) was designed for the purpose of developing an education/organization/system/attitudinal and personal profile of staff nurses working in general hospitals involved with Hospital Information Systems.

A total of 440 questionnaires were sent to four agencies: Toronto Western Hospital - 200 questionnaires, 115 were returned (57.5%); Credit Valley Hospital - 200 questionnaires, 109 were returned (54.5%); Baycrest Geriatric Centre - 20 questionnaires, 6 were returned (30%); and Urgence Santé - 20 questionnaires, 6 were returned (30%). The returns were completed January, 1988.

Relationships were drawn between the questionnaire data from these profiles and the data from the profile of nurses' perceptions/attitudes towards computers. New tasks and roles are identified for nursing educators and nursing education on the basis of the survey.

Recommendations for a course format for a Cybernetic Training System for Nurses for the systemic integration of computers into nursing curricula at the pre-service and in-service levels of education are proposed.

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TABLE OF CONTENTS

List of Tables .

## List of Figures

## List of Appendices

# INTRODUCTION

*Introduction to the Thesis Problem*

Hospital Information Systems (HIS) are being introduced to health care agencies. They change nurses' jobs and they change the opportunities for nursing students to study nursing on-line. Currently, nursing curricula do not specifically deal with these new opportunities and problems.

Today the amount of information is doubling approximately every ten years and the increase and complexity of information in hospitals is growing exponentially. The rapid introduction of computers into most aspects of individual and societal life has left us with little time to consider the impact of the changes which are taking place and the development of policies to take maximum advantage of them (IDE, 1980). The hope of some decision makers, is that computers will turn complex hospital environments into well oiled machines (CBC, 1987).

The increase of the use of computers in hospitals is stimulating the nursing profession to focus on what nursing knowledge is required for nurses to function in automated environments.

Educational technology is a way of thinking about and determining which educational goals are worth pursuing for particular learners in a given setting. It is a process that encourages us to consider alternative instructional strategies and media. It is a process that forces us to identify all functions and resources required to achieve particular educational goals, so that these activities and resources can be co-ordinated and managed in an effective and efficient manner (Kaufman, 1981). This project is an educational technology project in that the plan and design process attempts to integrate cultural values with instructional practices and resources in order to achieve educational results valued by society.

A 1987 survey of Canadian health care agencies identified approximately thirty

agencies where nurses use computers to assist with the delivery of nursing care (Infostat, 1987). In addition, the survey identified forty five agencies where, within a year nurses will be using hospital information systems to assist with the collection, storage, transmission and retrieval of patient information. It is reasonable to assume that within the next few years virtually all Canadian health care agencies will be implementing hospital information systems (HIS); almost all of which will have a nursing information component (NIS).

Despite the growing evidence of the value of these information systems to the profession and the potential value to nursing education in particular, little actual use of computers is incorporated into nursing education curricula. It is only in the last few years that computer literacy for health professionals has become an issue for discussion.

*The Need for Nursing Research.*

Lorine Besel, President of the Canadian Nurses Association, in her closing remarks to the International Symposium on 'Nursing Use of Computers and Information Science' held in Calgary, Alberta, in May, 1985 expressed concern about the "lack of published research, by Canadian nurses, to guide decision makers in the area of technology.'

Maureen Scholes, an international consultant on nursing informatics, emphasized in her book *The Impact of Computers on Nursing: An International Review* the "urgent need for research on the impact of computers on nursing" (Scholes, Bryant and Barber, 1983).

A number of other professionals who write about nursing informatics have expressed concern that while the necessary leadership and direction must be provided to ensure that computer technology is developed to its full potential for the benefit of patients and nurses, the relevant facts and figures to assist this process are not currently available, (Ashton, 1983; Barber, 1983; Berg, 1983; Hall, 1983, Silber, 1983) that is, the

effects and implications for nursing of hospital information systems (HIS) on nurses and patient care have yet to be systematically studied and therefore are unknown. (Ball and Hannah, 1984; DeCiosta, 1985; Bryant, and Barber, 1984; Krampf and Robinson, 1984).

In this era of automation, nurses and nurse educators will be challenged as never before, to define their distinctive contribution to health care and to develop ways of using technological advances in caring for patients more effectively and humanistically (Andreoli and Musser, 1985, p. 21).

*The Need in Nursing Education*

Kathryn Hannah, a leader in Canadian nursing informatics, in her book *Using Computers in Nursing* has identified "the need for nurses with interest and expertise in the use of information technology in the practice of nursing to become actively involved with all levels of nursing organizations." (Ball & Hannah, 1984).

McCormick (1984) argues that "all nurses need to be information specialists with skills including a basic understanding of what a computer is and how it works...how computers have been applied in nursing, what kinds of computers are in use in hospitals and community health programs...what kinds of software exists...and how to use computers for literate searches and instructional purposes (McCormick, 1984, p. 4).

During the 1950's, health care agencies used computerized systems primarily for administrative tasks. In the next decade, additional health care activities became automated and nurses recognized the potential of the computer to improve nursing practice and the quality of patient care with appropriate nursing education preparation. However, inspite of continual development and expansion of computerized hospital information systems (HIS), sometimes called Medical Information Systems (MIS), their successful applications are limited (Ronald, 1979). On the one hand, systems are often designed by computer specialists with limited understanding of health care needs, and on the other hand health care professionals know little of the uses and capabilities of computers.

Systems are sold by vendors to willing administrators often with very little if any nursing input.

Glass (1984) gave reference to the Canadian Nurses Association position taken in 1982 "that by the year 2000 minimal education requirements for entry to practice of nursing should be successful completion of a baccalaureate degree in nursing (CNA Assoc., 1982a)." Glass states further that "the move to identify master's and/or doctoral degree preparation as pre-requisites for clinical nurse specialists, nurse educators, administrators and researchers is another symptom of the need for increasing amounts and quality of education preparation in every aspect of nursing."

Ronald (1979) identified as early as 1970 that all nurses should have a general knowledge about computers and data processing and that this content should be part of the curricula of nursing schools. This is further supported by Feeg (1984) Hassett (1984) McCormick (1984) Mikan (1984) DeVries (1983) Sherman (1983) Meadows (1977) and Collart (1973).

In a survey published in November 1987 by the O. I.I.Q. - 77% of Quebec nurses felt their educational training has been inadequate (O.I.I.Q., 1987).

It is realistic to assume that by the year 2000 nursing knowledge/information will continue to increase, that computers will be commonplace in the teaching learning process, in schools, and in hospitals. It will require leadership by nurse educators who can visualize the benefits of computerization for nursing education and the Health Care System by preparing now for the future..

*Introduction of Computers Into Nursing Education*

The use of computers in nursing education has developed slowly lagging behind the general education. The first report appeared in the 1960's (Bitzer, 1966) but it was not until the late 1970's that discussion of the use of computers and their advantages began to appear in the literature more consistently (Cheung, 1979; Porter, 1978; Mead-

ows, 1977; Franz, 1976; Levine & Wiener, 1975). Considerable data continues to support the achievement of computer usage in the learning process. Grobe (1984); Kulik 1983; Ronald, 1979; Hannah (1976); Collart (1973); Bitzer (1969); and Suppes (1966).

In the same period, nursing education in Canada moved from hospital service based (3 year) apprenticeships to the more academically oriented college and university setting.

The transition in educational orientation and the pre-occupation with developing curricula may have contributed to the lag regarding the use of computers in nursing education. In addition, the lack of knowledge about computers as well as the fear that the technology would take over legitimate teaching functions created resistance to experimentation with computers (Ackerman, 1982; Frantz, 1976).

In the 1970's, several factors contributed to the search for and the implementation of alternative methods of nursing instruction. The continuing shortage of nurses in the health care system and the growing complexity of health care needs created a demand for increasing number of qualified nurses. At the same time the cost of the teacher student ratio for clinical instruction was questioned as it appeared that the expense of the programs was greater than the education system could support.

As the cost of implementing computer technology reduced, and the demands on faculty increased, alternative methods of instruction were explored. Computer assisted learning (CAL) could be used to introduce new concepts, practice decision making and the application of knowledge without hazard to actual patients (MIRIN, 1981). The development of simulations could relieve stress on already overcrowded areas in the hospitals used for student *stage*, (clinical experience) and provide practice on simulated clients, purposely choosing incorrect instruction to learn from (Frantz, 1976). In addition, research on CAL, in general education lent support to its increasing application in nursing (Belfry, 1984).

*The Applications of Computers in Nursing Education*

CAL has been used at all levels of nursing education - diploma, baccalaureate, graduate, refresher programs (pre-service education) as well as for hospital orientations (in-service education) and continuing education. Computers have been applied to everything from the management of the instructional environment (grades, schedules, exams, etc.) to initial instruction, practice with concepts, patient simulations, and the testing of knowledge. At the same time research in/on nursing practice, administration and nursing education has been facilitated by the introduction of computers (Meadows, 1977).

Individual applications of CAL in nursing education has covered a wide variety of topics; i.e., psychiatric nursing (Kamp & Burnside, 1974); midwifery (Naber, 1975); epidemiology (Donebedian , 1976); pharmacology (Timpke & Janney, 1981); immobility (Hannah, 1978); post-operative nursing (Conklin, 1983; Kirchhoff & Holzener, 1979; Collart, 1973); decision making (Taylor, 1980; Brennan 1971); psychomotor skills (Larson, 1981); med-surg-nursing ( Sweeney, O'Malley & Freeman, 1982; Hackabay, Anderson, Holm & Lee, 1979; Hoffer, Mathewson, Herbert, Loughsey & Barnett, 1975; Valish & Boyd, 1975); computer literacy and awareness (Hannah, 1983b; Ronald, 1983).

The growing body of systematic research indicates that applications of CAL in nursing have similar outcomes to those found at the college and university level in general education. In undergraduate nursing education, primary and adjunct CAL are claimed to be as effective as traditional instruction in terms of student achievement in exams ( Kulik, Bangert & Williams, 1983; Conklin, 1983; Larson, 1982; Kirchhoff & Holzemer, 1979; Hannah, 1978; Bitzer & Boudreaux, 1969; ).

In addition, the nursing literature reveals the following:

- computers' use in nursing education settings (Grobe, Ronald & Tymachyshyn, 1986; Thomas, 1985)
- sample course content and nursing curricula recommendations

(Ronald & Skiba, 1986; Heller, Romano, Damrosch & Parks, 1985; Grobe, 1984b; Hannah, 1983; Ronald, 1979)

- creative teaching approaches for using computers in continuing education ( Skiba & Hardin, 1983; Pogue, 1982); computer learning centres (Holzemer, 1985); multidisciplinary courses (Shockley, 1985; Feeg, 1984); and computer skills laboratories ( Holzemer, Slichter, Slaughter, Stotts, Chambers & Schultz, 1985; Romano, 1985; Schultz, 1984);
- the role of a computer coordinator in a school of nursing (Schockley, 1985);
- cost effectiveness of computer assisted instruction (CAI) (Edwards, 1985; Jenkins, 1985; Larson, 1981);
- database management applications for clinical laboratory and statistical analysis in clinical practice and in under graduate and graduate education (Kline, 1986; Grobe, 1985; McCormick, 1985);
- computer assisted instruction software availability (Hales, 1986);
- learner attitudes toward CAI and the use of computer-based technology (Morin, 1983; Ronald, 1979);
- factors related to adaptation and change processes in clinical or educational settings during technology's adoption (Gerdin-Jelger & Peterson, 1985);
- what experts believe practicing nurses need to know about computers (Armstrong, 1986; Bentley, 1984; Berg, 1983; Walker, 1981; Edwards, 1980).
- CAI effectiveness especially when compared with traditional teaching methods (Conklin, 1983; Kulik, Bangert & Williams, 1983; Bitzer & Boudreaux, 1969).

Despite the growing body of literature on the application(s) and implication(s) of computers in nursing education, to date, there is no course requirement for computer awareness or literacy for nurses in nursing curricula. It is apparent that the literature supports the notion that nursing can benefit from computers and that nursing educators should become more involved in a systematic way in incorporating this knowledge about computers into nursing curricula in a systematic way as a basic requirement.

*Computers in Health Care Settings (Nursing Practice)*

In addition the literature tells us a great deal about the computer's use in health care settings and these uses' implication for nursing. For example:

- what the history of computer technology's use in health care has been (NCHSR, 1980);
- what nursing administration applications have been used (McHugh, 1986; Giavonnetti, 1985; Simmons, 1981; Zielstorff, 1981);
- how information processing impacts on planning and documenting of nursing care (Romano, 1985; Grier, 1984; Light, 1984; Cook, 1982);
- how technological research affects professional practice (Abbey & Close, 1982);
- what nurses need to know to plan for effective use of computerized systems for practice/research, ( Berg, 1983; Reider & Houser, 1983; McCormick, 1981; Walker, 1981);
- what the ethical issues associated with automating clinical functions are in terms of data security and integrity (Greisser, 1985).

As the number of research studies grow it becomes increasingly difficult to identify whether the results are limited to the situation and the population on which the studies were conducted or if and how the findings are generalizable to nursing practice

and nursing education. Many outcome measures have been used to reach the reported conclusions. To date there has been no systematic review of research findings to draw conclusions and identify specific generalizable directions regarding the use of computers in nursing practice and the consequent educational needs.

*Implications for Nursing Education, Practice, Research*

Grobe (1986) suggests that some inferences and generalizations drawn from the literature about computer use in nursing education, practice and research, can be made to begin to guide us in preparing professional nurses for a computer based future. These principles are:

a) nursing practice and education are increasingly "data driven";

b) adoption of computer systems which is accompanied by a degree of standardization might standardize course content, clinical simulation, procedures, protocols and provide a mechanism for collecting data about professional accountability;

c) in those systems where nurses' involvement was instrumental in design ing systems to improve nursing service and nursing science effective professional tools have resulted;

d) nurses are central to the information handling functions in most health care settings. If computer systems are designed mainly to relieve nurses of clerical functions (order entry, ADT, and patient acuity) then the system should be considered to be only marginally a nursing tool;

e) using computers in instruction is at least as effective as traditional teaching methods and requires one-third less time for acquiring the same content; and

f) nursing education studies generally confirm the cost effective nature of CAI.

Happ (1986) states that "economizing on operations has become a dominant force in shaping our national health future. Consequently, nursing administrators are pressed to increase nursing productivity and accountability. With shrinking resources and new legal constraints, they must keep up with technology and provide expert nursing care to an increasingly *aged and sicker* clientelle. At the same time, hospital stays are shortened and discharge planning and home health care extended. In such an environment, using computer technology is inevitably essential." What is not so apparent, suggest Grobe is how to select, design, and structure learning content and specific computer based experiences which will prepare nursing practitioners effectively for full participation in the age of informatics. Other researchers pose the following questions:

- What types of educational experiences are necessary, reasonable, realistic, pragmatic for health care professionals? (Ronald & Skiba, 1986)
- What expertise will be required of future users (nurses) of HIS? (Crecine, 1986)
- How does one foster a professional practitioner's understanding of the unpredictable role changes associated with automation, since we don't know what those changes might be? (Gerdin-Jelger & Peterson, 1985; Schneider, 1985; Shires, 1985)
- How to effectively prepare and continually update nurses for performing logical analysis procedures and system design functions, since these may be a function of constantly learning new computer-based languages, protocols or software enhancements (Zielstorff, 1985); and
- How to cope with and benefit from the constancy of change and ethical implications inherent in the implementation of computer based technology and hospital information systems since their impact on organization structure in our constantly shifting health care economy is so uncertain (Shires, 1985).

The aim of nursing curricula of preparing professional nurses, is to prepare nurses as active participants in a world of change associated with planning for adopting and using computer based technology systems as tools for professional practice and for nursing science (Grobe,1986).

A variety of different teaching/learning approachs are necessary. Some structured hands-on experience with the principles of database management and analysis using realistic nursing data are essential to achieve this aim. Exercises and experiences to be included at the minimum are the following:

- exercises and experiences that relate to nurses' gaining skill in use of nursing practice data;
- experiences that illustrate the concepts of data-identification, definition, data-base management and data analysis procedures;
- exercises and experiences that encourage nurses to examine the ethical, legal and quality of care issues related to technology adoption and use;
- experiences that foster development of personal and professional sensitivity to continual knowledge acquisition and information society advancements;
- experiences that encourage, as second nature, a desire to stay updated, undaunted by change, curious about the future, in control of one's professional destiny and not afraid to question. (Grobe, 1986; Ronald & Skiba, 1986)

*The Professional Associations and the Union Groups*

Canadian trade unions, in contrast to their European counterparts have not yet developed policies regarding computer technology and its effect and implications on nursing and the health care system. The union movement, without an understanding of

the implications of new technology, will be in a reactive rather than a proactive position with regard to technology clauses for their membership. The majority of nurses in Canada are public sector employees and members of Provincial Nurses Unions. All Canadian Registered Nurses are members of a Provincial Registered Nurses Association and most are members of the National Association (CNA). Currently, neither the Provincial Professional Associations, nor the National Association has a policy on technology.

The Science Council of Canada, in its March 1982 report, recommended that major unions, perhaps in conjunction with the Canadian Labour Congress, establish centres of science technology policy with the following aims:

- to inform workers about new technologies, taking into consideration both threats and opportunities;
- to promote understanding of new employment opportunities;
- to provide capable knowledgeable individuals for meetings; conventions, educational programs, in order to present the labor position in a creative and constructive way; and
- to aid in the policy and decision process at all levels of government. (p. 60-61)

Common approaches and collaboration between the union groups and professional associations at the provincial and national level whose raison d'etre is nurses, and nursing as it effects patient care, could provide a broader policy framework to identify specific nursing education needs with regard to Hospital Information System technology

Currently the volume of research literature to guide nursing decision makers is sparse. Schwirian states that further research is required to identify relationships between and among information, user/context, computer systems and goal (Schwirian, 1986). Authors like Ryan (1985) argue that "holistic and humanistic care will be en-

hanced by coupling touch with technology." Menzies (1981) is concerned that nursing "jobs will be lost" while Birkhead (1982) puts forward the concern that nurses will face more ethical dilemmas as a result of using computerized patient information management systems and Romano (1985) states that individual's rights to dignity and privacy will be threatened.

It is the aim of this study to clarify some of these factors systematically.

# METHOD

*Study Design*

Educational technology involves the interplay of scientific advances with educational needs. Schmid (1987) proposes that educational technology is the interaction between the human and his/her environment and the communication links between the two of them.

Educational technology is on the cutting edge in trying to determine how to help the system adapt to change.

The thesis method is to use a survey questionnaire (Nurse Respondent Profile) to provide necessary information about the educational needs of nurses by nurses from hospital environments where Hospital Information Systems are being introduced.

*Research Question*

What changes are occuring in hospital environments which are about to or have implemented Hospital Information Systems (HIS) and Nursing Information Systems (NIS) which impact on nursing education?

What/How do nurses think/feel about these changes?

What are the implications for developing nursing education curricula (pre-service/in-service)?

It is proposed that this survey study be undertaken to:

*The Global Objective* — 1) identify the relationships among education and organizational; computer system; and personal factors, with the effects of computers on nurses, nursing, and patient care;

*Sub-Objectives* — 2) quantify from the registered nurses perspective, the effects of hospital information systems (HIS) on nurses, nursing and patient care; 3) to provide a nursing research database to clarify current and future nursing education goals so that informed curricula revision decisions may be made; 4) to utilize the Kaufman (1982)

needs assessment systems model to illuminate Schwirian's (1986) nursing informatics pyramid using Singer's research design regarding the types and kinds of nursing informatics activities, which promote quality patient care; 5) to illustrate and, sensitize nurses to nursing informatics issues; 6) to develop an effective instrument to measure the types and extent of nursing informatics.

*Theoretical Base and Assumptions*

The theoretical approach is based on a combination of Schwirian's model of nursing informatics and Kaufman's model of needs assessment.

The needs assessment model espoused by Kaufman (1982) is directed towards systematically finding gaps between expected and actual outcomes as they are related specifically to inputs, process, products. In Roger Kaufman's taxonomy (1979), where the validity and utility of a system's goals are assumed, existing or beta needs assessment models are based on identifying gaps between actual and desired outcomes and prioritizing the discrepancies to be dealt with by subsequent reforms. Kaufman argues that the appropriate needs analysis tools, techniques and strategies can improve educational success. Schwirian's Nursing Informatics Pyramid looks at the relationship among and between the user context, computer system, nursing information and goal (Figure 1 on following page).

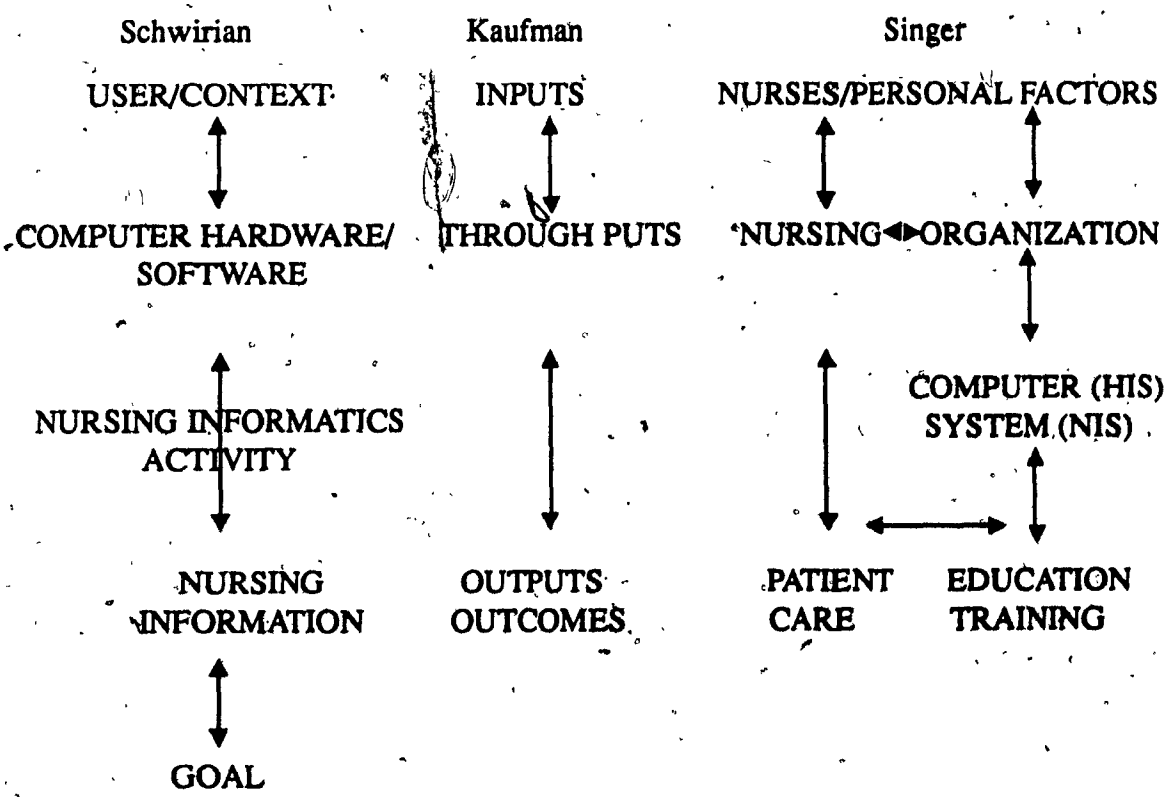
Figure 1 sketches Schwirian's nursing informatics pyramid, Kaufman's systematic needs assessment model and Singer's research design, based on a combination of the two which was used to design the Nurse Respondent Profile Questinnaire for data collection for this survey study.

The aim of this, exploratory, formative, descriptive survey study is to illuminate the phenomena which correlate significantly in the actual environment; and to obtain demographic data about behaviour, beliefs, attitudes, opinions, interest and facts about computerization from approximately 400 registered nurses working in Canadian hospitals; and to provide data to nursing administration who must prioritize goals

amongst competing needs in an everchanging environment, so that educational curricula both at the pre-service/in-service levels may be designed to meet the needs of nurses working in the context of the hospital environment.

Kaufman's needs assessment model is a systematic process for determining gaps between present and desired outcomes/outputs. He proposes that educational personnel learn to define problems clearly before jumping to solutions. His model aims at assisting in defining curricular problems and thereby increasing the effectiveness of planning. He suggests data must come from learners, educators and the community. Schwirian argues the need for nursing research to clarify nursing informatics activity.

Figure 1. Conceptual Models Used



*Definition of Terms*

To date in Canada, and to varying degrees throughout the world, nursing input into the design, development, implementation and evaluation of hospital information systems (HIS) and nursing information systems (NIS) has been minimal (Grobe, 1986; Gerdin-Jelger, 1984; Kiley et al, 1983).

Nurses, the largest professional group in the health care system are educated in a variety of settings/programs including the following: Hospital schools, community colleges, university programs, ranging from 2-5 years in duration.

Nurse in this study refers to a licensed practitioner.

To be a licensed practitioner, upon completion of the particular curriculum, the candidate must successfully complete a national licensing exam and is then eligible to be registered with the Provincial Professional Associations. With this Registered nurses license (R.N.) the nurse is able to practice nursing throughout Canada. There are additional jurisdictional requirements (i.e., language skills) which are specific to particular provinces. The R.N. exam may be written after completing a 2-3 year hospital/community college program, after a Bachelor of Nursing/Science program, or a Master of Nursing/Science Program. In addition ad hoc Canadian Doctoral Programs are currently being developed.

Nursing Canada's 236,993 Registered Nurses (Statistics Canada, 1986) are directly accountable for the:

- promotion, maintenance and restoration of health
- prevention of illness
- alleviation of suffering
- and for ensuring a peaceful death where life can no longer be sustained. (Nursing O.I.I.Q, 1984)

In the process of nursing, nurses collect data about patients in the context of their family, the hospital environment, and they formulate a nursing diagnosis about the

problem. Nurses make decisions about nursing actions, based on nursing knowledge, provide care and evaluate the process for its quality/effectiveness.

Nursing informatics refers to those collected informational technologies which concern themselves with the patient care decision making process performed by nurses.

Hospital information systems, sometimes called Medical Information Systems, (MIS) or Computerized Patient Information Management Systems (CPIMS) are those systems which collect, transmit, store and retrieve information about patient descriptions, interventions and outcomes and staff work performance.

Nursing information systems applies to the management of patient information used to plan, provide, document, evaluate the nursing process as well as to manage information necessary to maintain the nursing care delivery system, i.e., staffing, monitoring practice, (Kiley et al,1983).

A needs assessment "harvests" (Kaufman, 1981) the gaps from all the partners in the system, places gaps in priority order, and selects the highest priority gap for closure. This model would systematically illuminate what the linkage is between each set of factors; educational; organizational; computer system; and personal factors and the relationship between instructional strategy and desired outcomes to increase the potential for successful goal achievement, quality patient care. This system's approach is empirical, replicable, cost-efficient in human and dollar resources.

*Population/Sampling*

The primary source of data for this deductive study is a questionnaire (see Appendix I). A total of 440 nurses from four Canadian hospitals who are working in agencies which anticipate implementing or have implemented computers for the management of patient information were asked to participate in the study on a voluntary convenience sample basis. Group and culture studies often use samples based on

convenience (Agar, 1980). Agar points out that it is not only people but events and processes which are sampled. Four hospitals at two stages of development were sampled.

Designated field sites were *mapped* to identify a representative sample. Data were analyzed to identify significant classes, their properties, and links among them.

The following agencies are the sites where the data for this study was collected:

Credit Valley Hospital is a 235 bed general hospital offering a full range of health care services in suburban Toronto, Mississauga, Ontario. It was opened three years ago with a hospital information system (HIS) in place. This hospital was sent 200 questionnaires.

Toronto Western Hospital, an established institution in downtown Toronto offering a full range of health care services was sent 200 questionnaires. TWH is scheduled to implement a hospital information system (HIS) with a nursing information system (NIS) component in the near future.

Baycrest Geriatric Centre is a specialized psycho-geriatric centre in downtown Toronto, which has a hospital information system (HIS), with a nursing information system (NIS) component in place; currently being used by the nursing staff. This agency was sent 20 questionnaires

Urgence Santé is the emergency service offered to citizens of Montreal, Quebec. They have a computerized system on site. Urgence Santé was sent 20 questionnaires.

Given that the study involved human subjects, the researcher met with institutional requirements i.e., ethics committee review, research committee protocols, in order to access the population of nurses, letters were sent to the agencies requesting access to the subjects, meetings were held with research committees to present the proposal for review and acceptance.

The Nurse Respondent Profile Questionnaires with a consent form (Appendix A) was distributed randomly to all levels of nursing staff on all shifts in each of the settings sampled.

*Instrumentation*

Phillips (1983) states that questionnaires are probably the most common form of evaluation instrument since they can be used to obtain subjective information about participant's feelings as well as to document measurable results. Because of their versatility and popularity, questionnaires should be designed to avoid the principle problems of improper wording and faulty interpretation.

*Development of the Instrument*

Development of the pre-survey instrument included:

1) Review of the literature on needs assessment (Kaufman, 1981; Kaufman & Meyer, 1981);
2) Review of the literature regarding computers in traditional education, nursing education and health care settings; and
3) Review of the literature of computerization impact on job roles.

The researcher, designed, developed, field tested and redesigned a questionnaire (Nurse Respondent Profile) in consultation with specialists, i.e., education technologists, questionnaire specialists, content specialists, coders, page designers, statisticians and researchers. The questionnaires that were developed were geared towards soliciting information on a general level from registered nurses in order to build specific profiles. The Nurse Respondent Profile was field tested at the Montreal General Hospital which has had a HIS for 5 years, in Montreal, Quebec. Nurses working in three units completed the questionnaire and offered comments which were incorporated with the current questionnaire in Appendix B.

A presentation of the Nurse Respondent Profile was made to the research committee at the TWH. Adjustments to the tense of verbs was made to items to reflect

anticipated views of the nurses at TWH where the hospital information system will be operational within this next year (Appendix A).

The questionnaire has been divided into several sections; educational profile; organizational profile; system profile and personal profile, perceived effects on nurses, nursing and patient care to facilitate and reflect the quantification of the relationship between/among these factors.

Educational factors in this context, included in the questionnaire are the highest level of educational preparation completed; computer training courses taken; curriculum design of the computer training provided by the employer; participation in computer courses which are not job related; exposure to hospital information systems outside the current work envirionment, and typing and keyboarding skills.

Organizational factors in this context, include the jurisdiction of Canada where the nurses are working; the type of agency; the current speciality; employment status; working schedule; whether the agency is unionized; the involvement in the design, development; change of the system; the adequacy of policies and procedures related to the security of information; the availability of 'help' to work with the hospital information system (HIS).

System factors in this context include the make of hardware/software; the number and location of terminals; the 'user friendliness' of the system; the 'ease' with which data can be entered; who the most frequent 'users' are; the primary input mechanism; the response time; down-time; dependability of the system; the clinical (nursing and non-clinical (secretarial) applications of the system, the disciplinary actions related to ethical/confidential issues.

Personal factors in this context include the age, sex, current position, length of time in the current position; the length of time the nurse has been using the computer; the frequency of use; the employement status, the shift worked, and the attitude towards computers.

The effects on the nurse that are included in this context are changes in communi-

cation patterns; job satisfaction; workload; job security or quality of worklife.

The effects on nursing in this context include changes in nursing communication patterns; within/between departments; changes in quality of nursing assessments; quality of nursing care plans; use of nursing care plans; the delivery of care; and the outcomes of nursing care.

Effects on patients included in this context are the communication patterns with nurses'. Changes in reliability, comprehensivesness, ogranization and structure of care; continuity, timeliness, effectiveness and safety of care; the amount of time the nurses spend with patients; and the degree to which patient information is confidential and secure.

Additional space has been provided for qualitative data; comments (see Appendix B).. The data generated/analyzed from this questionnaire will clarify nursing informatics issues so that educational curricula may meet nursing education needs regarding computerization more specifically. The instrument is six sheets printed both sides, plus the covering letter (consent form) (Appendix - A).

*Data Collection*

A total of four hundred and forty questionnaires were distributed to four hospitals. Fifty percent of the total distributed (N=236) was returned. (See Figure 2 on following page).

Figure 2. Percentage of Total Distributed Questionnaires

| Agency | Type | Sent | Returned |
|---|---|---|---|
| Toronto Western Hospital<br>Toronto, Ontario | general<br>hospital | 200 | 115 = 57.5% |
| Credit Valley Hospital<br>Mississauga, Ontario | general<br>hospital | 200 | 109 = 54.5% |
| Baycrest Geriatric Centre<br>Toronto, Ontario | geriatric | 20 | 6 = 30% |
| Urgence Santé<br>Montreal, Quebec | emergency<br>telephone line | 20 | 6 = 30% |

Staff nurses, team leaders, head nurses and nursing supervisors, educators and administrators working in a variety of nursing departments were given a questionnaire in a self-addressed numbered envelope.

The questionnaire seems to be the most popular client-centered method for data collection on activities and functions (Treece & Treece, 1986; Cates, 1985; Steadman, 1980; Tuckman, 1978; Borg, 1965). The problem of non-response associated with this method can be addressed by trying to maximize response. The covering letter and a second memo made appeals for returns. In addition, to increase the percentage of response, it is necessary to monitor the respondents to ensure a representative sample of nurses. Each envelope, and questionnaire was numerically coded so that a clear picture of returns from specific areas could be recorded. A schedule of returns regarding their date of return was implemented.

Other disadvantages of survey research is the "limited provision for free expression and limited utility at getting to the causes of problems or possible solutions" (Steadman, 1980).

Every effort was made to anticipate the information needed for the research. Wide ranges of response were designed for multiple choice or scaled items. Open-ended questions were also used.

## RESULTS

*Analysis of Data from Nurse Respondent Profile Questionnaire(s)*

*Statistical Procedure(s)*

The purpose of this study was to fulfil the six stated sub objectives given on page 14, data from the questionnaires was subjected to the following statistical analysis:

1) frequencies and percentages;
2) cross tabs;
3) search for discrimination was not possible as there were too many missing values; the respondents from TWH (N = 115) who did not have the experience with an HIS did not complete many of the items of the questionnaire although their hopes and aspirations were asked for; and
4) co-relation co-efficients were done on sections, 1, 2, 3 and 5; clustering was attempted. Because there were too many missing values some conceptual attempt was made to cluster out conceptual concepts. This involved the dubious assumption that a missing value (overridden in the stats software constituted an answer of no (a negative answer). Although interesting, these results should be considered in the highly explorative/ speculative perspective in which they were carried out; and
5) Cronbach alpha formula for reliability was applied in Section IV. The analysis produced an alpha of 0.87. KR-20 was not done as there was no interval data to analyze.

The results of the analysis and their impact upon the research questions are presented.

### Section I

*Educational Profile*

Fifty eight point five percent (N = 138) of the 236 respondents to the questionnaire are RN's (57% N = 69 of 121) from TWH and 61% (N = 69 of 114) from

CVH 22% (N = 52 of 236) are Bachelor prepared. Fourteen point four percent (N = 34 of 236) have a Bachelor in Nursing.

Seventy seven point seven percent (N = 174 of 224) of the respondents who work in all settings of their general hospitals report no formal computer training. At CVH 44.5% (N = 81 of 182) of the nurses reported nursing personnel as their teachers in their computer program at CVH. Twelve point six percent (N = 23 of 182) of the nurses reported peers as their teachers.

At CVH a hands on demonstration and exercise booklet was the teaching strategy used in the training program. Seventy one point two percent (N = 94 of 132) of the respondents reported CAI as the strategy and 15.9% (N = 21 of 132) reported that it was their peers or preceptors who taught them.

Seventy eight point nine percent (N = 86 of 109) of the CVH nurses reported the student teacher ratio in their training program as one instructor to 2-5 learners. Thirteen point eight percent (N = 15 of 109) reported one instructor to 6-15 learners.

Thirty five percent of CVH nurses (N = 38 of 108) report 2 hours or less in the classroom; 29% (N = 31 of 108) have had 2-4 hours; and 15% (N = 16 of 108) had 5-15 hours. At TWH, 20% (N = 23 of 110) report some training in the classroom although their system is not yet in place.

Forty eight point six percent (N = 106 of 218) of respondents at CVH and TWH reported no classroom training experience.

Seventy four point three percent (N = 81 of 109) of the respondents CVH nurses have had up to 4 hours in a "hands-on" computer training workshop. Sixteen point five percent reported 5-15 hours in "hands-on" training. At TWH 70% (N = 80 of 115) report no "hands-on" training.

Sixty seven point nine percent (N = 74 of 109) of the respondents at CVH report their training workshops were given in multiple sessions. Usually this happens over a three day period.

Seventy one percent (N = 98 of 138) of the CVH nurses reported having their computer compentence evaluated in a "hands-on" test. Two point two percent claimed they were not evaluated at all at CVH.

Thirty percent (N = 33 of 109) at CVH reported having additional computer training. Forty one percent (N = 35 of 85) on a mainframe. Thirty four percent (N = 29 of 85) at CVH and 38% (N = 44 of 115) at TWH did not know whether their additional training was on a mainframe, mini or micro machine.

Twenty two percent (N = 23 of 109) of CVH nurses reported additional experience with word processing software and an additional 22% (N = 24 of 109) reported experience with other software packages.

Twenty one percent of CVH nurses (N = 23 of 109) and 8% (N = 9 of 115) at TWH reported having had experience using computers for managing patient information at another hospital.

Sixty seven percent (N = 73 of 109) nurses at CVH report that they type "well" to "fairly well" as compared with 45% (N = 52 of 115) nurses at TWH.

Sixty five point six percent of respondents (N = 147 of 224) reported they would like to have additional training to help them with computers; 86.1% (N = 99 of 115) at TWH and 44% (N = 48 of 109) at CVH. 54.1% (N = 59 of 109) at CVH said "no" and 4.3% (N = 5 of 115) at TWH said "no" to additional training.

## Section II

*Organizational Profile*

Ninety four point nine percent (N = 224 of 236) of the respondents, work in a general hospital in metropolitain Toronto, Ontario and the remaining 5.1% (N = 12 of 236) of the respondents came from an emergency centre in Montreal, Quebec and a geriatric centre in Toronto, Ontario.

Primary nursing is the model used by 97.2% (N = 107 of 110) nurses at CVH while TWH nurses report a variety of models to organize nursing care for patients.

The settings where the data was collected included N = 240 ambulatory care N = 16; emergency N = 6; geriatrics N = 8; ICU's N = 27; medicine N = 20; obstetrics/ gynecology N = 22; paediatrics N = 12; palliative care N = 2; psychiatry N = 15; surgery N = 33; and other N = 81 — units which offer a variety of specialties.

Seventy six percent (N = 83 of 109) nurses at CVH and 74% (N = 85 of 115) at TWH reported working permanent fulltime; 11% (N = 12 of 109) at CVH and 19% (N = 22 of 115) at TWH are permanent part time; 12% (N = 12 of 109) at CVH and 3.5% (N = 4 of 115) at TWH are casual workers.

Sixty nine percent (N = 75 of 109) of the respondents at CVH and 55% (N = 63 of 115) at TWH report working rotating shifts.

Seventy seven percent (N = 83 of 108) of nurses at TWH and 55% (N = 62 of 112) at CVH report working an 8 hour shift.

Fifty six percent (N = 105 of 189) of the respondents at TWH report working days; 22% (N = 41 of 189) evenings; 23% (N = 43 of 189) nights; 53% (N = 105 of 198) of the respondents at CVH reported working days; 21% (N = 42 of 198) evenings; and 26% (N = 51 of 198) nights.

Fifty percent (N = 80 of 160) of CVH nurses reported having 8 hours/day of clerical coverage as compared with 5% (N = 5 of 98) at TWH. 31% (N = 50 of 160) of the respondents at CVH reported 12 hours/day 5 days/week clerical coverage on their units. 53% (N = 49 of 92) reported clerical coverage 7 days/week at CVH.

Seventy eight percent of the respondents (N = 85 of 109) claimed the clerical coverage at CVH had remained the same or had increased since the system was installed.

Sixty four percent (N = 76 of 118) of the nurses at TWH and 31% (N = 35 of 113) at CVH reported their hospital would expand or introduce computers in certain areas.

Toronto Western Hospital is unionized and Credit Valley Hospital is not. At TWH, 62% (N = 71 of 115) of the nurses claimed union membership; 64% (N = 74 of

115) claimed they never went to union meetings; 71% (N = 82 of 115) claimed they didn't know which issues related to the computers the union was addressing; 76% (N = 87 of 115) reported they didn't know if there was a technology clause — in fact there is not. Four point three percent (N = 5 of 115) of the nurses at TWH reported their union was addressing issues related to computer education/training.

Section III

*Computer System Profile*

Seventy four percent (N = 89 of 120) nurses at CVH knew the computer system to be Data General. Fifty eight percent (N = 61 of 105) nurses at CVH knew the software on the system to be MEDITECH.

Seventeen point six percent (N = 3 of 17) of the respondents at CVH were involved in assessing the computer needs for nursing use; 23.5% (N = 4 of 17) were involved in the designing/developing of nursing applications. Twenty nine point four percent (N = 5 of 17) reported being involved in implementing the system as trainer/ evaluator; 23.5% (N = 4 of 17) in evaluating the system (quality control). At TWH 23.8% (N = 5 of 21) reported being involved in the system development before the system was chosen; 9.5% at TWH (N = 2 of 21) in assessing computer needs for nursing use; 33.3% (N = 7 of 21) in designing/developing nursing applications; 9.5% (N = 2 of 21) in looking at implementing the system as trainers/evaluators; 14.3% (N = 3 of 21) at evaluating the system for quality control.

Eight five percent (N = 93 of 109) nurses knew that computers had been in the nursing units 2 to 3 years. At CVH 55% (N = 60 of 109) nurses have been using computers for 2 to 3 years in their nursing unit. Seventy five percent (N = 82 of 109) of CVH nurses report using the computer more than 10 times/work week.

Nineteen point three percent (N = 21 of 109) nurses at CVH report they "always" get the information they need to do their job from the system; 68.8% (N = 75 of 109)

reported it "usually" provided needed information. Seven point three percent (N = 8 of 109) said "occasionally" and 2.8% (N = 3 of 109) said "never".

Eighty seven point two percent (N = 95 of 109) nurses at CVH reported having 2 terminals in the nursing unit for nurses use; 91% (N = 109 of 120) of the respondents at CVH reported that the terminals were at the nursing station.

At CVH 31% (N = 65 of 210) of respondents reported staff nurses to be the most frequent users of the system; 44% (N = 92 of 210) claimed it was the ward clerk; 14% (N = 29 of 210) said head nurse/team leader and 9% (N = 19 of 210) reported it to be the doctors.

Ninety nine percent (N = 107 of 109) at CVH reported the keyboard as the mechanism for entering data into the system.

Ninety eight point two percent (N = 107 of 109) reported that they used the keyboard as the primary mechanism for entering data into the system.

Seventy one point six percent (N = 78 of 109) of the respondents at CVH claimed that "occasionally" the response time caused them a problem with doing their job.

Eleven percent (N = 12 of 109) of the nurses at CVH reported that "downtime" seriously affected their ability to do their job; 13% (N = 14 of 109) said it "usually" was a problem; 53% (N = 58 of 109) claimed it "occasionally" affected their performance and 22% (N = 24 of 109) said "never".

At CVH 30% (N = 33 of 109) of the respondents reported that there was no scheduled "downtime" each day; 44% (N = 48 of 109) claimed it to be 2 hours or less, which in fact occurs during the night; 18.3% (N = 20 of 109) said they didn't know.

Fifty nine percent (N = 64 of 109) of the respondents at CVH reported "unscheduled downtime" as occuring 1-2 times/week. Thirty one percent (N = 34 of 109) claimed no "unschedule downtime".

Fifty two percent (N = 85 of 164) of the respondents at CVH claimed they used special forms to communicate when the system was down, 32% (N = 52 of 164) reported using the telephone system.

Of the many types of available assistance to CVH nurses on an ongoing basis, the most frequently used assistance reported was the training manual by 20% of the respondents (N = 87 of 444) followed by peers 19% (N = 86 of 444) and then the ward clerk 19% (N = 84 of 444).

When asked to identify which applications they use a computer for in their job, with a request to indicate which applications they had had training for, the nurses at CVH responded in the following manner:

Training for the demographic/financial applications were reported on as follows:

Eighty eight percent (N = 96 of 109) of the respondents at CVH reported training for the admission/transfer/discharge application; 11.9% (N = 13 of 109) had training for chart locator application; 41.3% (N = 45 of 109) reported training for patient locator application (this application identifies the room number of the patient); 76.1% (N = 83 of 109) reported training for demographic data applications; 65.1% (N = 71 of 109) reported training for patient profile application.

Training for the packages providing data regarding patient tests (order entry and result reporting) which fall into the collaborative responsibilities for nurses and other health team members are reported on as follows -

Eighty two point six percent (N = 90 of 109) of the respondents at CVH reported training for dietary orders/information; 16.5% (N = 18 of 109) reported training for drug orders application; 4.6% (N = 5 of 109) reported training for drug administration; 95.4% (N =104 of 109) reported training for drug charting application; 78.9% (N = 86 of 109) reported training for EKG order application; 32% (N = 35 of 109) reported training for EKG report application; 91.7% (N = 100 of 109) reported training for lab order application; 89% (N = 97 of 109) reported training for lab report application; 80.7% (N = 88 of 109) reported training for radiology orders application; 81.7% (N = 89 of 109) reported training for radiology reports application; 61.5% (N = 67 of 109) reported training for respiratory orders application; 43.1% (N = 47 of 109) reported training for

respiratory reports application; 3.7% (N = 4 of 109) reported training for CSR inventory control application.

What is noteworthy is that the applications which apply more directly to independent nursing practice are the packages for which nurses have had the least training to date. Specifically, 1.8% (N = 2 of 109) of the respondents reported training at CVH for patient care plans applications; 2.8% (N = 3 of 109) reported training for patient teaching application; 1.8% (N = 2 of 109) reported training for quality assurance application; 5.5% (N = 6 of 109) reported training for nursing KARDEX application; 3.7% (N = 4 of 109) reported training for nursing progress notes application; 2.8% (N = 4 of 109) reported training for problem oriented charting application; 0.9% (N = 1 of 109) reported training for narrative charting application; 87.2% (N = 95 of 109) reported training for messaging between departments application; 1.8% (N = 2 of 109) reported training for critical care monitoring application; 1.8% (N = 2 of 109) reported training for procedure manual application; 2.8% (N = 3 of 109) reported training for list of preparations application; 20.2% (N = 22 of 109) reported training for statistics applications; 13.8% (N = 15 of 109) reported training for other applications.

Table I Computer Training Table from CVH and TWH

| TWH N= 115 | | Training | | On the Job | | Formal | |
|---|---|---|---|---|---|---|---|
| CVH N = 109 | Variable | CVH | TWH | CVH | TWH | CVH | TWH |
| Application | V3.20 | % | % | % | % | % | % |
| adm/disch/trans (A.1.2.3) | | 88.1 | 9.6 | 17.4 | 2.6 | 13.8 | 1.7 |
| chart locator (B.1.2.3) | | 11.9 | 0.9 | 3.7 | -- | 1.8 | -- |
| ***critical care monitoring*** (C.1.2.3) | | 1.8 | 8.7 | 1.8 | 4.3 | 1.8 | 3.5 |
| diet orders info (D.1.2.3) | | 82.6 | 4.3 | 14.7 | 0.9 | 11.0 | -- |
| drug orders (E.1.2.3) | | 16.5 | 3.5 | 4.6 | 0.9 | 6.4 | -- |
| drug adm. (F.1.2.3) | | 4.6 | 0.9 | 1.8 | -- | 1.8 | -- |

| Application | Variable V3.20 | Training CVH % | Training TWH % | On the Job CVH % | On the Job TWH % | Formal CVH % | Formal TWH % |
|---|---|---|---|---|---|---|---|
| drug charting (G.1.2.3) | | 95.4 | 1.7 | 0.9 | -- | 1.8 | 0.9 |
| EKG orders (H.1.2.3) | | 78.9 | 0.9 | 15.6 | -- | 12.8 | -- |
| EKG reports (I.1.2.3) | | 32.1 | 2.6 | 9.2 | -- | 6.4 | -- |
| (CSR) inventory control (J.1.2.3) | | 3.7 | 3.5 | 0.9 | -- | 0.9 | -- |
| lab orders (k.1.2.3) | | 91.7 | 2.6 | 19.3 | -- | 20.2 | -- |
| lab reports (L.1.2.3) | | 89.0 | 3.5 | 17.4 | -- | 19.3 | 0.9 |
| ***message system*** (M.1.2.3) | | 87.2 | 2.6 | 12.8 | -- | 11.9 | 0.9 |
| ***nurses progress notes*** (N.1.2.3) | | 3.7 | 0.9 | 2.8 | -- | 1.8 | 0.9 |
| ***problem oriented charting*** (O.1.2.3) | | 2.8 | -- | 2.8 | -- | 1.8 | -- |
| ***narrative charting*** (P.1.2.3) | | 0.9 | 0.9 | 0.9 | -- | 0.9 | -- |
| other charting (Q.1.2.3) | | 0.9 | 0.9 | 0.9 | -- | 0.9 | -- |
| other charting (R.1.2.3) | | 0.9 | 0.9 | 0.9 | -- | 0.9 | 0.9 |
| ***patient care plans*** (S.1.2.3) | | 1.8 | 2.6 | 0.9 | 0.9 | -- | 1.8 |
| patient locator (RM) (T.1.2.3) | | 41.3 | 4.3 | 5.5 | 1.8 | 2.8 | -- |
| patient profile (U.1.2.3) | | 65.1 | 3.5 | 5.5 | 0.9 | 4.6 | -- |
| demographic data (V.1.2.3) | | 76.1 | 3.5 | 10.1 | -- | 11.0 | 0.9 |
| ***nursing info*** (KARDEX) (W.1.2.3) | | 5.5 | 2.6 | 2.8 | 0.9 | 2.8 | 1.8 |
| other (X.1.2.3) | | 0.9 | -- | 0.9 | -- | 0.9 | -- |
| ***patient teaching*** (Y.1.2.3) | | 2.8 | 0.9 | 0.9 | -- | 0.9 | -- |
| ***procedure manual*** (Z.1.2.3) | | 1.8 | 0.9 | 0.9 | -- | 0.9 | -- |
| ***list of preparations*** (AA.1.2.3) | | 2.8 | 1.7 | 0.9 | 0.9 | 0.9 | 0.9 |
| other (AB.1.2.3) | | 0.9 | -- | 0.9 | -- | 1.8 | -- |
| ***quality assurance*** (AC.1.2.3) | | 1.8 | 1.7 | 0.9 | 0.9 | -- | -- |
| radiology orders (AD.1.2.3) | | 80.7 | 2.6 | 11.0 | 0.9 | 10.1 | 0.9 |
| radiology reports (AE.1.2.3) | | 81.7 | 2.6 | 11.0 | -- | 10.1 | -- |
| respiratory orders (AF.1.2.3) | | 61.5 | 0.9 | 7.3 | -- | 6.4 | -- |
| respiratory reports (AG.1.2.3) | | 43.1 | 0.9 | 7.3 | -- | 6.4 | -- |
| ***statistics*** (AH.1.2.3) | | 20.2 | 3.5 | 2.8 | 1.8 | 1.8 | 1.8 |
| ***other*** (AI.1.2.3) | | 13.8 | 8.7 | 3.7 | 0.9 | 4.6 | -- |

***applications which apply more directly to independent nursing practice***

It is interesting to note from the above table that the applications which apply more specifically to the *independent nursing role* do not seem to be a high priority for either on the job or formal training at either of these institutions.

When the nurses were asked to rank the possible computer applications in their order of importance to them, both the Credit Valley Hospital nurses and the TWH nurses tended to rank the demographic/financial applications and the test order/entry and results reporting packages highest (see Table II).

Table II - Variable 3.21

Rank "possible" computer applications in their order of importance to you "1" is the most important. You need not rank all items.

| | CVH responses | % | TWH responses | % |
|---|---|---|---|---|
| 1. admission/discharge/transfer (A 1.2.3) | 144 | 14.9 | 117 | 14.9 |
| 2. chart locator (B 1.2.3) | 105 | 10.9 | 66 | 8.4 |
| 3. ***critical care monitoring*** (C 1.2.3) | **100** | **10.4** | **59** | **7.5** |
| 4. dietary orders/info. (D 1.2.3) | 95 | 9.9 | 64 | 8.2 |
| 5. drug orders (E 1.2.3) | 91 | 9.4 | 55 | 7.0 |
| 6. drug administration (F 1.2.3) | 76 | 7.9 | 47 | 6.0 |
| 7. drug charting (G 1.2.3) | 66 | 6.8 | 47 | 6.0 |
| 8. EKG orders (H 1.2.3) | 55 | 5.7 | 40 | 5.1 |
| 9. EKG reports (I 1.2.3) | 49 | 5.1 | 36 | 4.9 |
| 10. CSR inventory control (J 1.2.3) | 37 | 3.8 | 31 | 3.9 |
| 11. lab orders (K 1.2.3) | 27 | 2.8 | 28 | 3.6 |
| 12. lab reports (L 1.2.3) | 23 | 2.4 | 21 | 2.7 |
| 13. ***message system between depts.*** (M 1.2.3) | **16** | **1.7** | **22** | **2.8** |
| 14. ***nurses progress notes (charting)*** (N 1.2.3) | **12** | **1.2** | **16** | **2.0** |
| 15. ***patient care plans*** (S 1.2.3) | **11** | **1.1** | **20** | **2.5** |

| | CVH responses | % | TWH responses | % |
|---|---|---|---|---|
| 16. patient locator (identifies room ) (T 1.2.3) | 11 | 1.1 | 18 | 2.3 |
| 17. patient profile (U 1.2.3) | 7 | 0.7 | 16 | 2.0 |
| 18. ***patient teaching*** (V 1.2.3) | **9** | **0.9** | **17** | 2.2 |
| 19. ***quality assurance*** (AC 1.2.3) | **7** | **0.7** | **14** | 1.8 |
| 20. radiology orders (AD 1.2.3) | 5 | 0.5 | 13 | 1.7 |
| 21. radiology reports (AE 1.2.3) | 5 | 0.5 | 14 | 1.8 |
| 22. respiratory orders (AF 1.2.3) | 5 | 0.5 | 12 | 1.5 |
| 23. respiratory reports (AG 1.2.3) | 3 | 0.3 | 9 | 1.1 |
| 24. ***statistics*** (AH 1.2.3) | **2** | **0.2** | **3** | 0.3 |
| 25. ***other - specify*** (AI 1.2.3) | **2** | **0.2** | -- | -- |
| Responses | 964 | | 785 | |

When asked which applications they would or would not like to learn about 31.3% (N = 36 of 115) of the respondents at TWH and 34.9% (N = 38 of 109) at CVH responded that they wanted to learn about applications relating to nursing, patient care — see 3.22 Summary of Comments in the Appendices.

When asked about the possibility of changes being made to the patient information management system in the nursing unit, the nurses ranked the training program as their first priority 35.8% (N = 111 of 310) at CVH and 22.9% (N = 44 of 192) at TWH; followed by availability of support/assistance (see Table III on the following page).

Table III "Possible" changes to the HIS ranked in order of importance to nurses at TWH and CVH - Variable 3.23

If changes were to be made to the Patient Information Management System in your nursing unit, which of the following would you recommend. Rank changes in order of importance to you. "1" as the most important. You need not rank all items.

| | CVH responses | % | TWH responses | % |
|---|---|---|---|---|
| 1. ***training program*** | **111** | **35.8** | **44** | **22.9** |
| 2. availability of support/assistance | 66 | 21.3 | 26 | 13.5 |
| 3. # of terminals | 46 | 14.8 | 23 | 11.8 |
| 4. location of terminals | 30 | 9.7 | 20 | 10.4 |
| 5. mechanism for entering data | 23 | 7.4 | 17 | 8.9 |
| 6. response time of the computer | 13 | 4.2 | 13 | 6.8 |
| 7. mechanism for retrieving data | 7 | 2.3 | 10 | 5.2 |
| 8. downtime | 4 | 1.3 | 8 | 4.2 |
| 9. security measures (privacy rights) | 3 | 1.0 | 6 | 3.1 |
| 10. applications for nurses | 4 | 1.3 | 4 | 2.1 |
| 11. nursing model | 1 | 0.3 | 2 | 1.0 |
| 12. networking with colleagues | 1 | 0.3 | 2 | 1.0 |
| 13. clerical coverage | -- | -- | 2 | 1.0 |
| 14. accuracy of patient info | -- | -- | 1 | 0.5 |
| 15. complexity of the system | -- | -- | 1 | 0.5 |
| 16. no change | 1 | 0.3 | -- | -- |
| 17. remove the computer | -- | -- | -- | -- |
| 18. other - specify | -- | -- | 13 | 6.8 |
| Responses | 310 | | 192 | |

The "training program" was the top priority at TWH and CVH.

At CVH 47.5% (N = 48 of 101) of the respondents reported that they felt they could "never" influence change to the computer system; 41.6% (N = 42 of 101) felt they "occasionally" could, 0.9% (N = 1 of 101) reported "always" and 8.9% (N = 9 of 101) said "usually" they felt they could influence change to the system.

Thirty percent (N = 79 of 261) of the respondents at CVH reported they could access information about "their patients." 29% (N = 76 of 261) about the "ward patients" 11.5% (N = 30 of 261) the "service patients" 6.9% (N = 18 of 261) the "hospital patients."

Thirty three percent (N = 36 of 109) of the respondents at CVH reported they could access information for "display;" 23.9% (N = 26 of 109) for "update" of information.

At CVH 67% (N = 82 of 123) reported being responsible for "their patients" and are likely to be RNs; 10.6% (N = 13 of 123) are responsible for "ward patients" and are likely to be Head Nurse/team leaders; 18.7% (N = 23 of 123) are responsible for the "service patients" and are likely to be directors of nursing 4.1% (N = 5 of 123) reported being responsible for all hospital patients and are likely to be top management, research, educators or quality control personnel. At TWH 39% (N = 32 of 82) reported being responsibe for "their" patients; 36.6% (N = 30 of 82) reported being responsible for the "ward" patients; 14.6% (N = 12 of 82) for the "service" patients; and 9.8% (N = 8 of 82) reported being responsible for all hospital patients.

Sixty three point five percent (N = 101 of 159) reported gaining access to the system with an individual password at CVH; 35.8% (N = 57 of 159) stated and it was after successfully completing the training program. Fifty eight point four percent (N = 59 of 101) of the respondents at CVH reported they "didn't know" what disciplinary action(s) are in place in the unit for breach of security; 15.8% (N = 16 of 101) thought there was "no disciplinary action" and 25.7% (N = 26 of 101) reported it was "situation dependent," which it is.

## Section 4

*Nursing Attitudes*

For the 55 of a total of 236 cases who completed section 4, table IV, page 38 the range is one to six. Means between 2.5 and 3.5 do not reflect a strong attitude either way. Nurses have declared a positive attitude towards computers (*M* 1.7), see the computer as a valuable tool for nurses (*M* 20), and would recommend computers to other hospitals for managing patient information ( *M* 2.0).

With regard to nursing practice and the role that computers play in changing practice, nurses have disagreed slightly (*M* 3.7). More specifically, whether patient assessments are more reliable, comprehensive, nursing care plans more organized/structured; nursing actions more timely/efficient and outcomes being more effective, the mean scores range between *M* 3.2 to *M* 3.6. This is probably a reflection of the lack of software which addresses the independent nursing functions in current nursing practice.

Nurses have indicated that patient care is based on more current information (*M* 2.8), however are more tentative whether this translates into the improvement of the continuity of care(*M* 3.1) or whether each nurse is able to spend more time with patients (*M* 3.6). They tend to disagree with the statement that nurses are expected to care for more patients as a result of computers (*M* 4.2). In fact, the level of care and the number of decisions required by nurses for a more acutely ill population is increasing because of the increasing complexity of health problems of patients in hospitals today. As budgets are cut, and nursing staffing shortages remain high, beds are closed. As a consequence patients in hospital tend to be more acutely ill, often with more complex health problems.

With regard to communication, nurses have indicated that because of computers communicating increases particularly with patients (*M* 4.9); with peers (*M* 4.7); and with health team members (*M* 4.9). Nurses see computers as somewhat easy to use (*M* 4.4); they like to use computer in their job (*M* 2.6), they disagree that nurses are expected to care for more patients as a result of computers (*M* 4.2); that the care for patients is safer

(*M* 3.7); that patient information is less secure (*M* 3.5); less confidential (*M* 3.4); that they feel more competent in their job as a result of computers (*M* 3.5).

Table IV Table of means of nurses attitudes towards computers - Section IV

Circle which best reflects your expectations/experience (N = 55 of 224)

| Because of CPIMS | *M* | S.D. | Median | Skewness |
|---|---|---|---|---|
| 4.1 nurses feel more competent in their job | 3.5 | 1.4 | 4.0 | 0.3 |
| 4.2 computers are *not* easy for nurses to use | 4.4 | 1.3 | 4.0 | 0.1 |
| 4.3 nurses do/would *like* to use computers | 2.6 | 1.3 | 2.0 | 1.2 |
| 4.4 nurses accountability for care is increased | 3.0 | 1.6 | 3.0 | 0.4 |
| 4.5a communication *decreases* with peers | 4.7 | 1.4 | 5.0 | 0.7 |
| 4,5b communication *decreases* with health team | 4.9 | 1.6 | 4.0 | 0.4 |
| 4.5c communication *decreases* with patients | 4.9 | 1.2 | 5.0 | 0.9 |
| 4.6 nursing practice changes | 3.7 | 1.6 | 3.0 | 0.0 |
| 4.6a patient assessments are more reliable | 3.4 | 1.5 | 3.0 | 0.2 |
| 4.6aa patient assessments are more comprehensive | 3.2 | 1.6 | 3.0 | 0.4 |
| 4.6b patient care plans are more organized | 3.4 | 1.7 | 3.0 | 0.1 |
| 4.6bb patient care plans are more structured | 3.4 | 1.7 | 3.0 | 0.2 |
| 4.6c nursing actions are more timely | 3.6 | 1.5 | 3.0 | 0.1 |
| 4.6cc nursing actions are more *efficient* | 3.4 | 1.5 | 3.0 | 0.1 |
| 4.6d nursing outcomes are more effective | 3.4 | 1.5 | 3.0 | 0.2 |
| 4.7 the care provided for patients is safer | 3.7 | 1.4 | 4.0 | 0.0 |
| 4.8 patient care is based on more information | 3.6 | 1.6 | 2.0 | 1.0 |
| 4.8a continuity of care is improved | 3.1 | 1.5 | 3.0 | 0.5 |
| 4.8b nurse is able to spend more time with patients | 3.6 | 1.4 | 3.0 | 0.1 |

| | | | | |
|---|---|---|---|---|
| 4.8c nurse is expected to care for *more* patients | 4.2 | 1.3 | 4.0 | 0.6 |
| 4.9a patient information is *less* confidential | 3.4 | 1.6 | 3.0 | 0.1 |
| 4.9b patient information is *less* secure | 3.5 | 1.6 | 4.0 | 0.0 |
| 4.10 the computer is a valuable tool for nurses | 2.0 | 1.0 | 2.0 | 0.9 |
| 4.11 my attitude towards computers is positive | 1.7 | 0.9 | 1.0 | 1.5 |
| 4.12 I would recommend computers to other hospitals for managing patient information | 2.0 | 1.3 | 1.0 | 1.6 |

The 55 nurses (N = 55 of 224) who responded to all the items in this section of the questionnaire were asked to indicate their attitudinal preference on a 1-6 point scale. This scale was chosen specifically in order to force an opinion from the respondents. What occured is that for the means which have been calculated on a 1-7 point scale, the respondents created a 3.5 point on the scale and therefore the calculation was done accordingly. The Alpha Cronbach method for reliability was applied to the section of the questionnaire with a 0.879 result.

Section V

*Personal Profile*

Forty six percent (N = 50 of 109) of the respondents at CVH reported to be between 20-30 years of age; 41% (N = 45 of 109) reported being between 31-45 years old; and 5.5% (N = 6 of 109) are between 46-65. At TWH 41% (N = 47 of 115) are between 20-30; 43.5% (N = 50 of 115) are between 31-45; and 11% (N = 13 of 115) are between 46-65. There were no respondents over the age of 65.

Ninety one percent (N = 99 of 109) at CVH of the respondents are female as compared with 89% (N = 102 of 115) at TWH.

Seventy three percent (N = 80 of 109) of the respondants at CVH are staff nurses;

5% (N = 5 of 109) head nurses or team leaders; 3% (N = 3 of 109 administrative managers/supervisors; 3% (N = 3 of 109) instructors/educators. At TWH 62% (N = 71 of 115) are staff nurses; 13% (N = 15 of 115) head nurses/team leaders; 9% (N = 10 of 115) administrative managers/supvervisors and 4% (N = 5 of 115) instructor/educators.

At CVH 74% (N = 81 of 109) reported being in their current position 1-5 years as compared with TWH where 43% (N = 49 of 115) were there 1-5 years. Fourteen percent (N = 16 of 115) at TWH reported being in their current job 6-10 years and 17% (N = 30 of 115) over 10 years.

*Summary of Results of Cross Tabulation of Section I (Educational Profile) with Section IV (Attitudes of Nurses Towards Computers)*

The following data reflect the results of the cross-tabulation of the educational profile section of the questionnaire (section 1) with section IV which was designed to relate nurses attitudes towards computers to the effects of educational preparation from the point of view of discipline and level(s) of education. The cross tabulation produced the following results. (See tables in Appendix B.)

64 CVH RNs report the most positive attitude of all the nurses towards computers (*M* 1.75); they would recommend computers to other hospitals for managing patient information (*M* 1.91); the computer is a valuable tool for nurses to use (*M* 2.05); that computers are easy for nurses to use (*M* 4.97); that communication increases with patients (*M* 4.88); with peers (*M* 4.84); and health team members (*M* 4.50); they disagree most strongly of all nurses sampled that nursing practice changes (*M* 4.09); they disagree that patient care plans are more organized (*M* 4.90) or more structured (*M* 4.04); that each nurse is expected to care for more patients (*M* 4.10); or is able to spend more time with patients (*M* 3.98).

Sixteen nurses at CVH with bachelor education in nursing felt the most strongly that computers are easy for nurses to use (*M* 5.43); nurses do like to use computers

(*M* 2.18); they disagreed most strongly that each nurse is expected to care for more patients (*M* 4.61) but recommend most strongly the use of computers for the management of patient information to other hospitals (*M* 1.88).

Generally speaking nurses at TWH had the highest anticipated expectations from the CPIMS as compared with CVH RN's and BN's.

When considering the effects of the different types of formal computer education/ training on nurses attitudes the study produced the following findings:

Twelve CVH nurses who reported having a formal computer credit course reported that computers are easy for nurses to use (*M* 4.8); that nurses do like to use computers in their job (*M* 2.3); that communication increases most strongly with patients (*M* 4.9); with peers (*M* 4.4); with health team members (*M* 4.3). They tend to disagree that nursing practice changes (*M* 3.8); that patient assessments are more reliable (*M* 3.6); more comprehensive (*M* 3.7); that patient care plans are more organized (*M* 4.0); or more structured (*M* 3.9). They agree that patient care is based on more current information (*M* 2.7), however, they disagree that each nurse is able to spend more time with patiens (*M* 3.9); and that each nurse is expected to care for more patients (*M* 3.8). They do express a positive attitude towards computers (*M* 1.4); they see computers as a valuable tool (*M* 1.7); and they would strongly recommend computers to other hospitals for managing patient information (*M* 1.5).

When considering the effects of different personnel who taught nurses to use the computer for managing patient information on the attitudes of nurses towards computers the study produced the following findings. Fourteen CVH nurses tend to agree that the strongest teaching influence on their attitudes has come from peers — specifically their positive attitudes towards computers (*M* 1.43); their ability to see the computer as a valuable tool (*M* 1.79); and their recommendation of computers to other hospitals for the managing of patient information (*M* 1.58). In addition they report that because of peers computers are easy to use (*M* 5.50); communication increases with peers (*M* 5.02); with

health team (*M* 5.44) and with patients (*M* 5.14).

The next group of teachers who have had the strongest reported influence on nurses attitudes towards computers are nursing personnel: either a nurse system coordinator or nursing administration personnel as compared with continued education personnel.

When considering the effect of teaching strategy on nurses attitudes the study suggested that nurses saw preceptorship or peer teaching as having influenced their attitudes most positively, specifically: Eighteen CVH nurses chose the preceptorship (peer teaching) model as having effected their positive attitude towards computers (*M* 1.61). They would recommend computers to other hospitals for managing patient information (*M* 1.78); that the computer is a valuable tool for nurses (*M* 1.89); that computers are easy for nurses to use (*M* 5.44); and nurses like to use them (*M* 2.06); that communication increases with patients (*M* 5.00); with peers (*M* 4.78); with health team members (*M* 4.64). They disagree that nursing practice changes (*M* 4.11); that each nurse is able to spend more time with patients (*M* 4.06); and that each nurse is expected to care for more patients (*M* 4.23). Those nurses who had CAI as the teaching strategy in their training program agreed more strongly (*M* 5.01) than those who had peer teaching teaching (*M* 4.78) that communication with peers increases; they disagreed that nursing practice changes (*M* 4.15); that patient care plans are more organized (*M* 4.28) or more structured (*M* 4.18); that each nurse is expected to care for more patients (*M* 4.34).

Nurses who had "lecture" as their teaching strategy agreed most strongly that communication with peers increases (*M* 5.14) because of computers; that they would recommend computers to other hospitals for managing patient information (*M* 1.75) even though they disagree that because of computers nurses are able to spend more time with patients (*M* 4.43).

When reflecting on the effects of the student/teacher ratio in their training pro-

gram on their attitudes towards computers, nurses in this study reported the following: Both groups, those who had a 1:2-5 student/teacher ratio and those who had a 1:6-15 ratio said that they would recommend computers to other hospitals for managing patient information (*M* 1.87). Those who had the 1:2-5 ratio reported a slightly more positive attitude towards computers (*M* 1.71) than those who had a 1:6-15 (*M* 1.80). They reported that computers are a valuable tool for nurses to use (*M* 2.09). The nurses who had 1:6-15 ratio agreed that patient information is less secure (*M* 2.33); that communication increases with patients (*M* 5.36); with peers (*M* 4.87); with health team members (*M* 4.57); that computers are easy for nurses to use (*M* 4.80); that nurses do like to use computers (*M* 2.27). They disagree that nursing practice changes (*M* 4.40); that patient assessments are more reliable (*M* 4.07); more comprehensive (*M* 4.29); that patient care plans are more organized (*M* 5.09); more structured (*M* 5.09) that nursing activities are more timely (*M* 4.21); that the care provided is safer (*M* 4.40); that continuity of care is improved (*M* 4.20); that each nurse is able to spend more time with patients (*M* 4.64) or that each nurse is expected to care for more patients (*M* 4.33).

When considering classroom training time on the attitudes of nurses towards computers the study produced the following findings:

Thirty three CVH nurses who reported 2 hours or less of classroom training agreed strongly that they would recommend computers to other hospitals for managing patient information (*M* 1.85); that they had a positive attitude towards computers (*M* 1.70); that the computer is a valuable took for nurses (*M* 1.97); that computers are easy to use (*M* 4.91); that nurses do like to use computers (*M* 2.15); that communication increases with peers (*M* 4.64); with patients (*M* 4.63) and with the health team (*M* 4.33).

They disagree with the notion that nurses are expected to care for more patients (*M* 4.48); that patient care plans are more organized (*M* 4.24); more structured (*M* 4.08) or that nurses are able to spend more time with patients (*M* 4.07).

Sixteen CVH nurses who reported 5-15 hours of classroom training agree more strongly than those who had 2-4 hours that computers are easy for nurses to use (*M* 5.00). They disagree more strongly that nursing practice changes (*M* 4.11) because of CPIMS; that patient care plans are more organized (*M* 4.55); or structured (*M* 4:55).

It is interesting to note that classroom training has altered the attitudes of nurses in a positive manner generally as compared with those nurses who reported no classroom training. Particularly, their perception that computers are easy to use (*M* 3.85) before training and (*M* 5.00) after 5-15 hours of class training. Their perception of the effect of CPIMS on nursing tends to change in a negative manner from nurses who have had no class training (*M* 2.27) to nurses who have had 5-15 hours (*M* 4.55) perhaps because of the lack of nursing applications. Their general attitude towards computers becomes more positive with classroom training (*M* 2.43) to (*M* 1.73).

When nurses are reporting the effects of "hands on" computer training or their attitudes towards computers, the study produces the following findings: Nurses who report 5-15 hours of "hands on" training (as compared with nurses who report no "hands on" training or 2 hours or less) report a most positive attitude towards computers (*M* 1.61). They agree most strongly that communication increases with peers (*M* 4.89); with the health team (*M* 4.83) with patients (*M* 4.80); that patient care plans are more organized (*M* 4.33) more structured (*M* 4.27) and that the computers is a valuable tool (*M* 2.06) they also report that nurses do like to use computers (*M* 2.22).

When reporting whether their training was in single or multiple sessions, 70 CVH nurses who reported having had multiple training sessions reported the more positive attitude toward computers (*M* 1.63) than those who reported a single session training; that they would recommend computers to other hospitals for managing patient information (*M* 1.73); that nurses do like to use computers (*M* 2.26); that computers are a valuable tool (*M* 2.07); that communication increases with patients (*M* 4.95); with peers (*M* 4.72); with health team members (*M* 4.52).

They disagree more strongly than nurses who report single session training that nursing practice changes (*M* 4.12); that patient care plans are more organized (*M* 4.26) or structured (*M* 4.26); that each nurse is able to spend more time with patients (*M* 4.11); that each nurse is expected to care for more patients (*M* 4.49).

The attitude of the 69 CVH nurses whose competence using the computer was evaluated by a "hands on" test had a more positive attitude towards computers (*M* 1.70) and would recommend computers to other hospitals for managing patient information more strongly (*M* 1.88) than nurses whose competence had been evaluated by a "written test." The attitude of the nurses who had a "hands on" evaluation saw the computer more positively as a valuable tool (*M* 2.12); they supported more strongly the notion that communication increases with patients (*M* 5.06); with peers (*M* 4.87); and with health team members (*M* 4.68). They disagreed more that nursing practice changes (*M* 4.14) however they felt computers are easy for nurses to use (*M* 5.10).

When considering the effects of "additional" computer training on the attitudes of nurses, 29 CVH nurses who reported additional computer training reported a more positive attitude than 59 TWH nurses who reported no "additional" training with regard to computers being easy for nurses to use (*M* 5.00); nurses liking to use computers (*M* 2.31); communication increasing with patients (*M* 4.78); with peers (*M* 4.69); with the health team (*M* 4.56). They report a very positive attitude towards computers (*M* 1.66); that they would recommend the computer to other hospitals for managing patient information (*M* 1.76); and that they see the computer as a valuable tool for nurses (*M* 2.00). They disagree that nurses are expected to care for more patients (*M* 4.12).

When reporting the effects of "additional hands on" experience using a mainframe computer; as compared with using a mini; micro; or not knowing what type of computer their additional hands on, was on the attitudes of the 34 CVH nurses who were aware that they were using a mainframe, had a more positive attitude towards using the

computer (*M* 2.18). They felt communication increases with patients (*M* 4.88); with peers (*M* 4.82) and with the health team (*M* 4.52).

They disagree that nursing practice changes (*M* 4.00) but report a positive attitude towards computers (*M* 1.79). They would recommend computers to other hospitals for the management of patient information (*M* 1.85) and see the computer as a valuable tool for nurses (*M* 2.15).

When nurses reported the effect(s) of using "word processing" software packages on their attitudes towards computers the study revealed the following: 20 CVH nurses tended to have a more positive attitude towards computers than 16 nurses at TWH who reported using "other" types of software (*M* 1.40).

When considering the effects of additional computer experience in other hospitals for managing patient information, on nurses' attitudes, this study revealed the following: 17 CVH nurses who reported additional experience with compuers in other hospitals felt that computers are very easy to use (*M* 5.12) that nurses do like to use computers (*M* 2.18); that communication increases the most with patients (*M* 5.29); with peers (*M* 5.13); with the health team (*M* 4.73).

They disagreed that nursing practice changes (*M* 4.11); that patient assessments are more reliable (*M* 4.00); that patient care plans are more organized (*M* 4.31); more structured (*M* 4.31); that patient outcomes are more efficient (*M* 4.00); and that each nurse is expected to care for more patients (*M* 4.27).

They agreed most strongly that the computer is a valuable tool for nurses (*M* 2.00). However, they had a slightly less positive attitude towards computers than 80 nurses at CVH with no additional experience with computers in other hospitals (*M* 1.94) and were slightly less certain (*M* 1.94) than the CVH nurses with no additional experience that they would recommend computers to other hospitals for managing patient information.

When considering the effects of "typing skills" on the attitudes of nurses the

study revealed the following information: 26 CVH nurses who reported typing "well" reported a very positive attitude towards computers (*M* 1.77); they felt that because of CPIMS patient information is less secure (*M* 2.50); that communication increases with patients (*M* 5.29); with the health team (*M* 4.83); and with peers (*M* 4.80); that computers are easy for nurses to use (*M* 4.96).

They disagreed that nursing practice changes (*M* 4.27) because of computers that patient assessments are more comprehensive (*M* 4.22); that patient careplans are more organized (*M* 4.48); or more structured ( *M* 4.45); that each nurse is able to spend more time with patients (*M* 4.30) or that nurses are expected to care for more patients (*M* 4.20). Their attitude towards computers was slightly less positive (*M* 2.27) than nurses who reported typing "poorly" (*M* 2.18) and they agreed slightly less (*M* 2.04) than nurses who reported typing poorly (*M* 2.00) that they would recommend computers to other hospitals for managing patient information.

Forty four nurses at CVH who reported that they wanted more training to help them with computers for managing patient information reported a positive attitude towards computers (*M* 1.55); claimed strongly (*M* 1.70) that they would recommend computers to other hospitals for the management of patient information; and see computers as a valuable tool for nurses (*M* 1.84). They see computers as easy for nurses to use (*M* 4.80) but not as easy as 55 CVH nurses who reported that they did not want more training (*M* 5.11). The CVH nurses generally claim they do like to use computers (*M* 2.38); the 44 CVH who reported that they want more training feel that communication increases with patients (*M* 5.03); with peers (*M* 4.83) with health team members (*M* 4.64).

They disagree that patient care plans are more organized (*M* 4.47); or more structured (*M* 4.42); that each nurse is able to spend more time with patients (*M* 4.11); or that each nurse is expected to care for more patients (*M* 4.55). They agree somewhat that patient information is less confidential (*M* 2.43).

*Summary of Factor Analysis*

Factor analysis was done to discover patterns/clusters among the variables in items 3.20; 3.21; 3.23 Friedman two-way ANOVA was done to test the significance between the sets of data in items 3.20; 3.21; 3.23.

Item 3.20 asks the nurses to indicate for which of the following applications do/ did you use a computer in your job — as well as the training hours they received on the job, formally, for each application.

Item 3.21 asks the nurses to rank the following possible computer applications in their order of importance to them.

Item 3.23 asks the nurses rank in order of importance to them "changes" they would recommend to the CPIMS in their nursing unit.

It is interesting to note that the respondents have ranked nursing applications as their highest priority in item 3.23, particularly when there are none available to them presently on the systems at CVH and TWH. Among their next priorities included are training program, security measures, support, mechanism for entering data, a nursing model and networking - these are all factors which have been identified as significant in other areas of the research and as the nurses have indicated would make a difference to them in their practice with patients.

Reliability refers to the consistency of the data gathering instrument, the questionnaire. In obtaining the same results in similar situations even though the subjects and environments differ. Reliability co-efficients refer to the correlation between two measurements that are obtained in the same manner.

A Cronbach alpha reliability test was done in Section IV of the questionnaire for the 55 cases who had answered all the items. An alpha of 0.88 was obtained which validates the internal consistancy/reliability for this section of the questionnaire.

## DISCUSSION AND IMPLICATIONS

Most nursing curricula do not reflect current opportunities/problems with technology, in this age when nursing education and practice is increasingly 'data driven.'

This study indicates that there is a need for nursing education/training to prepare nursing information specialists so that higher quality patient care can be provided based on the benefits (effective outcomes) of the technology. The promotion of nursing research regarding the professionalization of nursing practice, and the development of a nursing database will clarify professional accountability.

Boyd (1989) discusses an affiliative propagative cybersystemic modeling as a methodology for developing, implanting and transferring a training project. This method according to Boyd, is helpful to ensure the viability of the project at the level of selves-machine interaction design and development as well as at the higher socio-technical levels of group projects and institutional development.

*Modelling of a Training System*

The author will attempt to apply the seven dimensions of a training system proposed by Boyd (1989) (Appendix C) and use the data generated by this study from the Nurse Respondent Profile to discuss the implications of Singer's research design for nursing education.

The focal system in this model includes nurses, the health team and patients. The machines are the Hospital Information Systems (HIS) and Nursing Information Systems (NIS) or Computerized Patient Information Systems (CPIMS).

The nominal functions are nursing informatics activity and patient care. The environment where this takes place is in the hospital. An examination of the internals of the focal system, (data from Section I, III, IV, V of the Questionnaire) and the interaction between the focal system of the environment (data from Section II of the Questionnaire), so that new options for education/training may be identified/implemented using Singer's

research design will be attempted by the author (who is a stakeholder) using the Boyd's Modeller's Checklist (Boyd, 1989,by permission of the author) (Appendix C).

Since the aspects of communication and control are central to education and training systems, these are cybernetic systems and therefore the modelling must include cybernetic mechanisms and principles such as feedback control and the provision of requisite control variety at all requisite levels of the system hierarchy, (or hetrarchy) if possible.

*Ownership and Aims of the Focal System*

The legitimate aim of the systems being modeled is to provide high quality care to patients. The author's role as a researcher is to identify specific and effective educational attributes of the RN's in the sampled hospital environments which influence the quality of patient care, and also to identify the interactions which create new educational needs to improve such systems.

The goal of this thesis includes the identification and clarification of factors which effectively contribute to education and training of professional nurses who are nursing patients in hospitals at the preservice/inservice levels of education.

Hospital administration in each of the sites sampled have committed themselves to various computer educational/training programs for the nursing staff.

Performance levels were monitored and evaluated in all settings. The main concern identified by the the nurses, as major stakeholders, was for additional training, specifically related to nursing practice or nursing informatics activity concerning patient care. Patients, administrators and doctors are also stakeholders.

*Context of the Focal System*

Nurses (RN's) are key to the focus of this study. The majority of the respondents work in two large general hospitals in Ontario. A small percentage of the respondents

come from a specialized psychogeriatric centre (Baycrest Geriatric Centre). (There was also data returned from Urgence Santé but it is inadequate to draw conclusions from, as there were many missing values. The data has not been included in the analysis, however feedback will be provided to that agency regarding the study.)

Each of the agencies sampled in this study is part of the Canadian Health Care System.

The hospital settings where the data was collected came from nurses, nursing in all the main types of services offered in a general hospital. The computer education/ training programs offered prepare nurses in this study in various ways to interact with the HIS/NIS and face-to-face (F2F) in the following settings: ambulatory care, emergency, geriatrics, intensive care units, medicine, obstetrics, gynecology, paediatrics, palliative care (oncology), psychiatry, surgery, as well as units which have a combination of these specialties.

The Canadian Nurses Association, like the Canadian Medical Association, as well as associations for other health team member groups, lobby in the professional interest of their membership at the national government levels for health care issues/concerns/ policy. The consumers of health care, the patients lobby for their concerns/requirements through the ballot box by electing officials who may best represent their interests to the policy setting group in government.

In Canada, health and welfare is funded largely at the national level, education is a provincial matter. Educational institutions are accredited for nurses as for health team member groups in the provincial jurisdictions. Nursing education occurs predominantly in universities, community colleges (pre-service) and to a much lesser degree in hospital settings (in-service). Few of these programs offer computer education/training in their curricula.

Nurses have a hetrarchical relationship with nursing education, institutionally, provincially and nationally as well as with patients, the consumers of health care, through

the quality of nursing practice, the application of nursing education.

The decision makers in the agencies sampled in this study, in addition to offering access to their nursing staff, to collect data using the Nurse Respondent Profile Questionnaire, have requested feedback from the author, so that the findings may be considered and where appropriate/possible, incorporated into their systems.

The majority of the respondents (59%) in this study are registered nurses. Twenty two percent of the total have a bachelor level of education and 14% of these nurses have a bachelor in nursing. Thiele (1988) suggests that preparation for 'real world' uses of computers in nursing must begin at the undergraduate level (pre-service), however, this study indicates that 78% of the respondents have had no computer training.

Nursing education (pre-service/in-service) is the primary resource in the environment for nurses to acquire the requisite skills/knowledge to meet the desired goal of quality care through effective nursing outcomes. Currently nursing curricula (pre-service) do not incorporate systematic computer education/training to promote purposive outputs to the environment.

With the decisions taken by the CNA as well as provincial professional associations regarding a Baccalaureate education as the basic requirement for entry to practice of nursing by the year 2000; "by incorporating computers in the curriculum, content in nursing is learned faster and can be presented in such a way that clinical judgement and decision-making abilities can be developed systematically and sequentially" (Thiele, 1988).

This study has shown that when a NIS is incorporated into a HIS (i.e., at Baycrest Hospital) nurses report that outcomes of "care are more effective in an integrated workplace, nurses interact with the system, and maintain control by inputting nursing decisions regarding the treatment plan; then monitoring and altering the plan as required."

The respondents to the questionnaire are a predominantly female stable working

group between the ages of 20-45 and in their current position between 1-5 years. Seventy five percent of the nurses reported working permanent full-time eight hour shifts. Credit Valley Hospital reports 15% and Toronto Western Hospital 19% of the staff as permanent part-time. CVH has a slightly larger group (12%) casual workers than TWH (3.5%). This stability should faciliate the education/training inputs from the environment.

*Main Form of Wasteful or Undesired Outputs*

The study indicates that nursing units have an average of two terminals situated in the nursing station. Staff nurses are reported to be the most frequent users followed by ward clerks, head nurses and doctors. Clerical coverage in the units sampled ranges from total coverage at Baycrest to no coverage at TWH. Clerical coverage is reported to have increased at CVH with CPIMS. Although 97% of the respondents reported that their agency used a nursing model to organize patient care, if the HIS does not have a NIS, the time nurses spend using the HIS (CPIMS) is largely for data capture for financial purposes. Although this output is a very important output, the net benefit may be greater to the environment than directly to nurses and nursing. Although nursing budgets are highest in hospitals and represents more than 50% of the total hospital budgets, nursings' percentage of total budget for development of NIS is often "the lowest" (Carnavalle, 1989).

Data input is primarily through a keyboard, although the use of light pen and/or touch screen is also reported in the study. Sixty seven percent of CVH nurses and 45% of TWH hospital nurses reported typing "well"-"fairly well". Given that the keyboard is the primary mechanism for data capture, the variety of typing skills in the population sampled may be a wasteful use of limited computer education/training time in in-service programs and a skill which may be practiced at the pre-service levels of education. Practice with keyboarding skills and/or a *typing tutor* module at the pre-service level or experience with a word processing package, this study has shown can influence nurses

attitudes positively towards computers.

Downtime is reported to be scheduled conveniently and is a rare *unscheduled* occurrence. Hence it is not seen as an interfering or enhancing factor of the system by the respondents of this study.

Although the desired goal of the agencies is to prepare and assure that nurses provide high quality care for patients within the legal ethical boundary of nursing practice using an HIS, there is minimal evidence in the literature and in this study of nursing involvement in decision making related to HIS, either before or after development/ implementation is underway.

Adams (1986) suggests that in order for technology to accommodate nurses' needs, nurses must contribute to designing/developing the technology that they are expected to use in practice. There were no nurses reported to be involved in the system design/development at CVH before the system was chosen. Twenty four percent of the respondents from TWH reported their involvement from the outset. At Baycrest, where nurses expressed the most positive attitudes towards automation, a third of the nurses were involved in all phases of the system development/implementation.

The degree of involvement in the design/development of the computer system may be an organizational decision or may be attributed "to the fact that nurses are often beset with current work problems, the lack of knowledge of computer science (supported in this study) which in turn may contribute to the lack of assertiveness and foresight to be meaningfully involved in the long range development of computer plans" (Dowling, 1985).

Happ (1983) suggests, and this study supports the notion that "nurses may sense the gap between what they currently know about computers and what they need/want to know, to influence the ways in which computers will be used in their working environments". This is reflected in the priority identified by the respondents at all sites sampled for computer education/training as one of their primary needs — regardless of other

factors.

Awareness of the planned expansion of the HIS was reported most frequently by TWH nurses, perhaps because the CPIMS is a new project which is currently being well publicized as compared with CVH which has had its system in place since the agency was opened three years ago. This communication about change, could be beneficial to the viability of the system and its end users, if it were more nourished.

The use of a nursing model, which ideally would contribute to the formation of the database of an NIS is applied inconsistantly in the testing agencies. CVH and Baycrest use a primary nursing model as compared with TWH which uses a combination of primary nursing, team nursing and total patient care to organize nursing practice. This variety of organizing nursing practice would make the implementation of an NIS more difficult and challenging because of the inconsistancy of nurses' job design across the system.

Because of CPIMS communication was reported to increase in this study with patients, peers and the health team providing a mechanism, whereby desired outcomes can be acknowledged and implemented and lead to improvement in the CPIMS (Chang, Jordan, & Marsh, 1983).

The messaging system was used neither to identify educational needs of nurses about computers, nor to increase the awareness of the nurses about an NIS, nor to promote possible educational changes for nurses, nursing practice or patients in the agencies sampled.

At Baycrest, which was the only agency sampled with an NIS, and the setting where nursing data was most positive about computers, the nurses reported that they would like a computer application for interdepartmental communication. A decision to remove the computer system was reported by the nurses at Baycrest.

TWH and Baycrest are unionized. CVH is not. The union was not reported to be addressing computer education/training related issues to any degree by the respondents,

nor were issues related to occupational health/safety; privacy rights; liability or job security issues related to technological change on the agenda. Nurses generally did not see the union as a lobbying unit on their behalf in these matters, and, from the data, unions were either not dealing with these issues or not communicating this information to the system.

*Loops Connecting Outputs Back to Inputs*

At Baycrest, where nursing applications (NIS) are available on-line, the respondents ranked nursing applications as *the* most important to them followed by test/ order/ entry/retrieval applications. At CVH where there do not appear to be any nursing applications currently, test order/entry/retrieval and demographic financial applications were ranked as *the* most important, however, when asked to rank *changes* to the CPIMS in order of importance, the training program was identified by 36% of the nurses as the top priority. No other alternative received higher percentages. Training was also the *top* priority identified by Baycrest nurses.

Since this study shows that nurses who had more education/training had more positive attitude(s) towards the computer and saw them most beneficially, education/ training is a loop which connects outputs back to inputs in a growth promoting manner.

Computers in education have been reported to be cost/time effective (Thiele, 1988).

This study has shown that an HIS which does not incorporate an NIS is only marginally an aide to nursing practice (see Table 4, Appendix B).

Attitudes about CPIMS were most positive amongst nurses at Baycrest Hospital which has an NIS, followed by the highest expectations about the effects of CPIMS on nursing practice reported by nurses at TWH prior to the installation of the HIS. It would appear that an HIS without an NIS component is merely a minor adjunct rather than a main resource to the focal system. Despite this, nurses reported that computers are easy for them to use, and they see the HIS as a valuable tool. This output data will be con-

nected back to the inputs in other institutions as the subjects in the study claimed they would recommend the use of CPIMS to other hospitals.

*Internal Structures of the System*

The main transformer units of the system include patients, nurses, the health team, CPIMS, education, administration/unions, government; which interact with each other 'hetrarically' (i.e., in a multiple parallel relationship of controller to controlled) in parallel bi-directional ways to achieve the main goal which is the provision of higher quality patient care. Nurses provide care for patients 24 hours/day 365 days/year and are the predominant and pivotal handlers of patient information, along with CPIMS, to the degree that they are integrated. The health team administration, unions and government interact with each other, patients, and education ifistitutions (pre-service/in-service) hetrarically. The quality of care, the promotion, maintenance of health and prevention of illness is reflected in the degree to whfch the demands/responsibilities of these main transformer units of the system are effectively attended to, met or not met. The pay-off for this *game* is the maximal bio-psycho-social health of the main transformer units of the system.

Hebda (1986) reports that approximately 50% of the baccalaureate nursing programs in the U.S. currently have a computer component. However, where they exist, they are not systematically incorporated into the curricula.

Some of the constraints to the structure of the system include the data in the study which indicates that 48% of the respondents reported they felt they could "never" influence change to the system; 42% reported they felt they "occasionally" could influence change to the system. Improvement of this communication loop might contribute constructive inputs from staff nurses back into the environment and influence the quality of achievement of the system goal.

The requirement of rotational work in hospital environments which must be staffed by nurses 24 hours/day, 365 days per year is a system constraint. The impact of a

rotating work schedule influences one's energy levels, and motivation, and increases the complexity of the job design for the nurse and the system. The variety of knowledge, skills and experience which are expected and must be provided for patients is greater over a twenty-four hour period in a hospital setting. This staffing factor requirement makes a greater demand on human and budget resources, which must provide training schedules/ content to all nursing staff to maintain standards of care for individual, institutional, provincial and national accreditation.

The issue of confidentiality and security of patient information was somewhat of a concern to CVH RN's. It was these nurses perception that because of CPIMS patient information was somewhat less confidential and less secure.

These nurses perceived that patient information is "less secure" than "confidential." They also reported that they want "more training". At Baycrest, the nurses strongly disagreed that patient information was either less secure or confidential. They were all aware of the agency policy for breech of security; as compared with the other agencies sampled where there was no "specific" policy for breech of patient information. In spite of the potential legal and ethical implications of the privacy/security of individual information many respondents reported not "knowing" *if* or *what* a policy was in their hospitals and nursing unions did not appear to have this issue as an item on their current agenda(s).

By closing this loop, with a specific well publicised and implemented policy regarding the confidentiality/security of patient information the legal ethical connexion has been clarified for the main transformer units at Baycrest.

Another neglected issue of considerable importance to the standard of care and nursing education is the lack of a *technology clause* in any of the contracts of the agencies sampled. Such a clause would commit the institution publicly and accountably to providing amongst other things *ongoing* education/training programs to meet the dynamic education/training needs of nurses and other groups in the system and possibly to

maintain good staffing levels.

The hospitals sampled use a variety of hardware and software in their agencies. Credit Valley has Meditech software on a Data General System. Baycrest Geriatric Hospital uses the PROMIS system software on Hewlett-Packard Hardware. Baycrest was the only agency sampled using a touch screen in addition to a keyboard to capture data. Toronto Western will be using the Health Data Science System.

Some of the requisite variety in the system include the nurses as part of the health team group members, the patients, the politicians and legislators.

There is a great variety of skill in the nursing staff and accompanying requisite knowledge. However, the study has indicated that nurses do not feel they have the requisite knowledge, skills or experience to interact effectively with HIS, NIS to manage patient information in a way that the outcomes benefit nursing practice.

It would seem that the influence of heath team members, patients, politicians and legislators have not demonstrated their knowledge/skills/experience in a way to effect the system for the benefit of nursing practice and patient care.

68% of the nurses reported they "usually" got what they needed to do their job from the computer system they used; "downtime" was conveniently scheduled; "response time" was adequate; and a variety of help is reported to be available and used by nurses on an ongoing basis in the agencies sampled. These factors promote job satisfaction and contribute to quality of work life environment in a positive manner.

Dowling (1985) has expressed concern that most computer applications currently available for use by nurses are of limited use in the complex daily activities of a nursing division.

The consequence of a major missing component in the system, the nursing information system (NIS) in the HIS makes the whole question of the value of CPIMS to nurses and nursing practice an issue. Baycrest nurses, although a small group, were the only group sampled who reported that nursing assessments are more reliable as a result of

the computer system.

This study indicates that RN's from TWH who reported no computer education/ training or experience, but a lecture in a group of 1-15 participants, about computers, were the most hopeful group, after the Baycrest nurses, that patient assessments would be more comprehensive as a result of CPIMS. They reported wanting more "training."

CVH hospital nurses, who had nursing personnel as teachers in a 5-15 hour computer education training program, over multiple sessions, whose performance was evaluated in a hands-on test, strongly disagreed that because of CPIMS patient care plans are more organized. These nurses reported that they could type "well" and had had some additional experience with computers in another hospital. This data would indicate that the CVH, HIS and the training/experience is not perceived by the respondents in this study to be contributing to the organization of patient care plans. This group does report wanting more additional "training." TWH nurses who report no education/training or experience anticipate that the HIS will contribute to more organized patient care plans and, Baycrest respondents report that their HIS does contribute to more organized patient care plans. Both these groups want additional training.

CVH respondents who had nursing personnel as their teachers in their 15 hour class/hands on computer education/training program in multiple sessions disagreed that patient care plans are more structured. These nurses reported that they type "well," have had some additional experience with computers in other hospitals and want to learn more about computers. The claimed no formal computer training, and the training/experience that they reported did not facilitate "structuring" their care plans more effectively. TWH RN's anticipated that because of CPIMS patient care plans would be more structured and Baycrest nurses reported that because of the computer system patient care plans are more structured.

Baycrest hospital nurses were the only group sampled that reported that because of CPIMS nursing actions are more timely. The anticipation for timeliness in nursing

actions was not anticipated nor experienced by the other groups in the study.

Baycrest hospital nurses reported that because of CPIMS nursing actions are more efficient. This was not the perception of CVH nurses. TWH agreed somewhat with this perception.

Nursing informatics activity appears to have been positively influenced by the HIS/NIS at Baycrest, not influenced by the HIS at CVH, and somewhat anticipated to have an influence by the nurses at TWH.

Baycrest nurses strongly agree that because of CPIMS nursing outcomes are more effective. Of the other groups sampled CVH Bachelor prepared nurses disagreed most strongly that because of CPIMS nursing outcomes are more effective.

The impact on nursing informatics activity when nursing education, computer education/training and experience with a nursing information system are major missing components of the system have been discussed.

This study demonstrates the direct benefits to the main transformer units of the system in their hetrarchial interaction when effective ways to enhance quality patient care are incorporated into the structure of the system.

In spite of the positive attitudes towards computers, consistantly reported by Baycrest nurses as a result of their nursing information system (NIS), the one noticeable omission which is supported by all the respondents of this study (except for a group of TWH RN's who had some experience with a word processing package), is that nursing practice is not perceived to change with the current systems.

In order for nurses to feel they have the requisite skill/knowledge variety to be more effective in the NIS/high quality care interface, the major consistent request this study has produced is for education/training related to nurse/patient clinical applications. Even though Baycrest nurses feel that patient care is based on more current information, because of CPIMS, which is the hope expressed by TWH but not the reality experienced

by CVH nurses; and Baycrest nurses feel that continuity of care is improved, which is neither the hope nor the reality of other groups sampled; nurses in all these systems (less at Baycrest) do not report that they are able to spend more time with patients.

Nursing practice is a complex process in a system involving people, events, knowledge, skill, experience, communication and control. The nurses respondent profile has provided a vehicle to sensitize nurses to issues related to automating a hospital environment; and in that sense has reportedly been an effective educational tool.

In addition the Cronback alpha statistical formula has shown section four to be statistically reliable and valid and produced an alpha of 0.88.

The five profiles in the nurse respondent profile questionnaire may have different applications depending on the purpose of their implementation: for example Section I and IV (Educational Profile and Nursing Attitudes) would be recommended for pre-service nursing education data collection. Section II, II and IV (Organizational, System Profile and Nursing Attitudes) would be recommended for in-service data collection. Section V (Personal profile) might be useful in either instance. Several items in the questionnaire were responded to with multiple responses, similarly in each of the testing sites. Consequently, the data was compiled to reflect response totals rather than total respondent totals.

This data analysis from the questionnaire clearly indicates that nurses in all settings sampled want more computer/education/training so that they, as key stakeholders in the system can more effectively contribute to the viability of the system, humanistically enhancing the quality of patient care; and so that they may have the requisite variety of knowledge/skills to deal with the opportunities and problems of the changing workplace due to technological innovation.

## CONCLUSIONS AND RECOMMENDATIONS

The introduction of CPIMS/HIS is only one aspect of the major changes occuring in hospitals today, but it is a particularly significant one for nursing education.

Currently there is a blizzard of information in hospital environments, nursing education requirements and experience boundaries are continually changing in these settings. The increased demands on the system of an ageing and growing population, nursing staff shortages and diminishing financial resources, as well as the increasing automation in the workplace require a clear demonstrable justification for allocation of resources. New roles are emerging for nurses and nursing education and educators as a result of automation. They include a greater demand for analytical and critical thinking and problem solving skills, or as Bowen (1987) suggested, reflective judgement based on systematic reasoning.

Incorporation of computers into nursing curricula in a systemic way at the pre-service and in-service levels is recommended. As a natural consequence, nurses will accept the computer as an aid to professional practice. With planned practice of clinical decision making using nursing databases, nurses are better prepared to nurse in clinical situations and can transfer the decision making ability developed by interacting with the NIS to increase effective nursing outcomes in delivering quality patient care.

The results of this study indicate that to achieve this end, nursing curricula should be restructured. Specific learning requirements at strategic points in the curriculum which incorporate information technology will alter the required teaching and learning strategies and outcomes. Rather than acting as transmitters of facts, faculty will need to use their knowledge and ability to lead analytical and problem solving activities. Specifically the ANA, Scope of Practice (Draft, 1987) has recommended that "professionals must be educated to understand the various modes of nursing inquiry; know the principles of scientific investigation; be able to synthesize relevant information and make

clinical inferences." Greater differentiation of nursing concepts related to the acquisition of nursing knowledge will result through increased and continued research which will contribute to the professionalization of nursing practice, build a scientific nursing database, clarify professional accountability, and stimulate nurses to be discriminating users of information.

Nursing faculty need a basic understanding of the ways the computer can be used to assist the nurse in patient care (AACN, 1986). The author recommends and the study supports the introduction of a nursing informatics course or a nursing cybernetics course developed for and with nurses input. In addition, Thiele suggests, that "faculty need to participate in planning for computers in the curriculum." Recognition that productivity in nursing increases with computerization supports this resolve (Adams, 1986) .

Institutional encouragement for risk taking and the creative confrontation of technology problems is needed. The Committee on Testing, a standing policy committee of the CNA, which establishes and monitors standards for the Canadian licensing examination for registered nurses, adopted a resolution in 1988 which will change the exam from a norm-referenced to a criterion referenced exam. This decision will precipitate the identification of a list of nursing competencies which reflect the levels of understanding of the principles of nursing from a national perspective. It is also the first step towards computerizing the Canadian licensing exam for nurses (Singer, 1988).

Thinking about the computer's role in nursing education doesn't mean thinking about the computer; it means thinking about education. In other words computers in nursing education must be a valid tool for achieving desired outcomes in professional practice.

Romano (1988) argues that currently there is no formal education program which adequately prepares nurses to function as nursing information system specialists.

The data which was obtained from the Nurse Respondent Profile is useful for planning the structure and content of a Cybernetic Training system for nurses.

The key elements of a nursing system are the participants, personal interfaces, the communication network, the HIS, NIS and the protocols.

Boyd's (1989) seven dimensions of a training subsystem developed from Helmar Frank's — six dimensions of the pedagogical space are:

1) goal;
2) content;
3) socio-structure;
4) media;
5) psycho-structure;
6) algorithmic control procedures (Frank, 1969);

to which Boyd has added

7) reconstitutive discourse.

These dimensions correspond to the key questions:

1) why?
2) what?
3) with whom?
4) through what?
5) who?
6) how?
7) how to restructure

in the form of both structures and processes which are required to model any learning system.

Boyd argues that each dimension involves both opportunities and resource constraints. The author will apply this model in order to propose and explain the design of a cybernetic training system for nurses guided by the data analysis from the Nurse Respondent Questionnaire in this study.

*Goal*

The primary goal of the Cybernetic Training System is the ongoing computer education and training for nurses at the pre-service and in-service levels of education to promote the highest possible quality of patient care within the legal ethical boundaries of nursing practice.

*Content*

The results of this survey indicate that the content of this cybernetic training system for nurses should consist of a series of preferably computer aided learning (CAL) modules — developed on instructional design principles and nursing databases to support clinical decision making which teach the requisite knowledge and skills required for the level of complexity and specificity of care to be provided to patients.

Good educational technology practice dictates that diagnostic tools should be administered at the front end of each learning module to establish the entry level of knowledge/skill/experience and be flexible enough so that the participant may enter the program at the appropriate level depending on their knowledge/skills/experience to avoid boredom and/or provide an opportunity for practice through increasingly complex simulations to achieve the required standard of performance. It is recommended that exercises related to legal and ethical issues about technology should be provided to foster reflective professional development.

The CAL modules should be based on a systemic nursing model incorporating cybernetic systems modelling to provide end users with an appreciation and understanding of HIS/NIS and organizational development.

A module on general computer literacy related to the media used might increase nursing familiarity and assertiveness in lobbying appropriate individuals and groups to become more involved in the development of the technology from a nursing perspective. To the degree that the training system is learner flexible this type of a training system may stimulate a sensitivity for continual knowledge acquisition. By providing feedback/control through a built in formative/evaluation/development/needs assessment loop the viability of both the system and the users will be nourished.

*Sociostructure*

The recommended sociostructure of the training system based on this study

includes using a preceptorship strategy, or instructional groups of one instructor to 2-5 participants with nursing personnel/peers as tutors/educators. In addition a variety of available help on an ongoing basis tends to maintain positive learning attitudes.

Unions are an important potential lobbying force at all levels of the organization including government. In the agencies sampled they were perceived as a negative/missing loop, rather than a proactive force recognizing and representing potential opportunities and problems related to technology for nurses. Nurses ought to communicate their expectations to unions and other groups who may form coalitions and political actors to better achieve the patient care goals of the system.

A known appreciated policy regarding computer security deals with methods to prevent unwarranted access to data, unwanted destruction of data and unauthorized changes to the data or the program that process the data (Krever, 1980). The need for adequate safeguards to assure that personal data has not gotten into the hands of the wrong people has been emphasized by Walker and Schwartz (1984). Adams (1986) suggests that with the proliferation of computers in health care agencies, privacy of patient records is becoming increasingly difficult to guarantee. Krever (1980) also points out that the gap is widening between what patients perceive as the meaning of confidentiality and what in fact occurs in large hospital computer systems. Confidentiality of patient information would delineate the security or breech thereof the privacy of information as well as promote job satisfaction for those working in the system. Each of the agencies sampled have a training program for nurses, the end users of the system at the in-service level.

*Media*

The media in this training system includes the NIS, which is part of the HIS or CPIMS, the CBT on the system and F2F (face-to-face) interactions between all of the participants in the system.

Communication loops which promote an exchange of information and ideas from all participants in the system in a hetrararichal manner, with a capability to address the uncertainty brought about by constant change in the supra systems, could help provide greater relevant credibility status (Boyd, 1977) to the users of the system where it would be an important moderator variable in this knowledge development game.

*Psychostructure*

The psychostructure of the learners is that of the RN's, a predominantly female stable working group between 20-45, the majority of whom in this study have reported no formal computer training. The survey showed that their aspirations are for more training, their expectations are that the HIS will improve the quality of nursing care; however, it also showed the fear that HIS without a NIS does not seem to affect nursing practice or contribute to the safety of care. The nurses expressed strongly the need for training for clinical nursing applications related to patient care.

*Algorithmic Control and Reconstitutive Discourse (Perestroika)*

The type of training to be recommended on the basis of the survey includes discussion group classes and hands on workshops of approximately 15 hours each. It is recommended that these 30 hours be offered over multiple sessions of two hours or less duration. The suggested location is a training laboratory staffed with nursing personnel who have an understanding of nursing informatics, as well as ideally cybernetic modelling. A hands-on evaluation for performance proficiency would clearly identify the skill and knowledge acquisition of the nurses who participate in the particular module of the program. This training could be integrated at the pre-service and/or in-service level of education depending on the program flexibility and learner or organizational need.

A technology clause committing the institutions to support for ongoing education/ training for nurses and other groups; in the system based on identified needs, by

involvement from representatives from all groups effected by the process would promote and protect legal ethical standards worthy of modelling in such a way that other groups are likely to take up this model and pass it on to others.

This study has shown that a HIS with an NIS can support critical thinking in nursing decision making however, nurses must be aware of and discuss the margin of error of the person/machine systems interface and determine who/when and under what conditions course corrections will and must be made.

Expert systems (artificial intelligence) where the computer serves as advisor or interpreter using software "judges" to develop decision trees are another promising aid for nursing educators. Through an integrated system the computer memory will have nursing knowledge and have the capability of proposing new hypothesis for care for the nurse to consider.

As nurses we must continue to nourish the 'touch' component of technology.

Gattis (1982) notes that "without computer skills nurses will be among the educationally disadvantaged." Romano (1980) argues that "computer application in practice/education/administration is evolving however the complementing need for knowledge in this area remains a void yet to be filled."

The data has shown that nursing administration in this study saw the need for training more clearly than nursing educators. Modular nursing informatics courses for nursing administration and head nurses might meet their identified needs more effectively than the current programs which are designed primarily for staff nurses.

Fifty nine percent of the respondents who were in their job 1-5 years want more training. A needs assessment is recommended to identify specific learning needs of this group so that their positive attitudes may be directed towards continued professional development.

The availability of interactive video disc CAI applications would promote learning through different learning channels. Source data capture at the bedside and voice data

capture are/ought to be part of the educational repertoire. CAI may be developed for patient education.

"Automated trending" (computer software generated trend reports)(Carnavalli, 1989) allows nurses to match their observations with real biological data recorded by the system. Visualization of this data can be used as teaching material as well as for research purposes.

For nursing curricula to be effective they should include trends of information rather than discreet pieces of data.

This study has shown that technology is evolving more quickly than nurses and nursing education, are currently integrating it into their curricula.

Despite the rapid expansion of the use of computers for managing patient information in Canadian hospitals predicted for the near future (Infostat, 1987), the use of computers by nurses for the management of nursing information is in its infancy.

The research literature to guide and direct decision makers is sparce (Schwirian, 1986).

There is a need for further research to be done to further clarify the nursing education issues and factors in systems reported from the profile data of this study; as well as to implement the Cybernetic Training System for nurses at the pre-service or in-service levels depending on nursing needs.

The findings from this research will be reported to the agencies sampled in Quebec and Ontario so that decision-makers may integrate the recommendations into the training programs in their agencies where and when appropriate.

Collaboration between nurses and manufacturers should be promoted so that HIS/NIS may more adequately reflect nursing knowledge and practice needs of the nursing profession.

Educational technology is about instruction and learning. At its best educational technology addresses the design and implementation of systems of learning by building

consensus among the stakeholders.

A partnership needs to be created between those who know what is needed for nursing education and practice and nurses who can develop and market the technology as well as those who can research the process.

Such collaboration would place the nurse in her rightful role – leader in the development of technology for the nursing profession.

The challenge is before us!

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# APPENDIX A

## Nurse Respondent Profile Questionnaire and Covering Letter

# CONCORDIA UNIVERSITY

**Educational Technology Department**


Dear fellow nursing practitioner:

As the Toronto Western Hospital is one of several hospitals in Canada incorporating computers for the management of patient data, I am requesting your assistance. In an attempt to assess the impact of the computer on the nursing workplace and on future nursing education needs, I am doing a study to collect statistical information from Canadian nurses.

Your experience in this regard will be invaluable in the development of a database of Canadian nursing information to deal with this new reality — to better recognize and respond to nursing needs.

Completion of the questionnaire is voluntary. I invite you to complete this confidential, anonymous questionnaire, which will take approximately twenty minutes of your time. Your cooperation in completing the questionnaire will increase the potential to interpret sections which have been answered. Please return the completed questionnaire in the enclosed envelope to: Toronto Western Hospital, Judy Tilvel, Coordinator, Nursing Computer Project, 2 McLaughlin, Room 2-409, 1st floor or the mail box of Nalini Jairath, Coordinator of Nursing Research, Nursing Office, East Wing, 5th floor by October 16, 1987.

Copies of the report of the study, which will document the findings of the effects and implications of computerized patient info-management systems on nurses, nursing and patient care and the interrelated conditions in which these effects occur will be sent to your institution within six months of the completion of the study.

For further clarification, please feel free to contact me at (514) 381-8861. I thank you in advance for your assistance with this collaborative Canadian project designed by Canadian nurses for Canadian nurses — to ensure that ongoing quality care will result from technological change.

Sincerely,

Lorraine Singer


Lorraine Singer, N., M.A. (candidate)
Research Associate
Toronto Western Hospital

SIR GEORGE WILLIAMS CAMPUS
1455 DE MAISONNEUVE BLVD. WEST
MONTREAL, QUEBEC H3G 1M8

# NURSE RESPONDANT PROFILE

**Please answer every question.**
**Use pen or pencil.**
**You need not include your name.**

For Office Use Only
Card 1
1/6____
2/6____

## EDUCATIONAL PROFILE

I.1 Your highest level of education completed (check one only)

____Diploma$_1$
____Post R.N. Certificate$_2$
Baccalaureate Degree:
____In Nursing$_3$
____other, please specify$_4$ _____
Master's Degree:
____In Nursing$_5$
____other, please specify$_6$ _____ 7____
____Doctorate$_7$

I.2 Your formal computer education includes (check all that apply)

____credit course(s)$_1$
____non-credit course(s)$_2$
____systems analysis course(s)$_3$
____no formal course$_4$ 8____

I.3 Who taught you to use the computer for managing patient information? (if anyone)

____Data processing personnel$_1$
____Continuing education personnel$_2$
____Nursing administration personnel$_3$
____Peers (other nurses)$_4$
____A nurse system co-ordinator$_5$
____A ward clerk (unit co-ordinator)$_6$
____A representative of the computer company$_7$
____A training manual (printed material)$_8$
____Other, please specify$_9$ _____ 9/10____

I.4 The teaching strategy used in your training program was

____computer assisted instruction$_1$
____preceptorship (peer teaching)$_2$
____lecture(s)$_3$
____not applicable$_4$
____other, please specify$_5$ _____ 11/12____

I.5 The student teacher ratio in your training program was

____one instructor to one learner$_1$
____one instructor to 2-5 learners$_2$
____one instructor to 6-15 learners$_3$
____one instructor to more than 15 learners$_4$
____not applicable$_5$
____other, please specify$_6$ _____ 13____

OVER...

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I.6a How much computer training have you received in the classroom?

____None$_1$
____2 hours or less$_2$
____2-4 hours$_3$
____5-15 hours$_4$
____16-45 hours$_5$
____More than 45 hours$_6$
____Other, please specify$_7$ _____

14___

I.6b In a 'hands-on' workshop?

____None$_1$ If none, go to I.7.
____2 hours or less$_2$
____2-4 hours$_3$
____5-15 hours$_4$
____16-45 hours$_5$
____More than 45 hours$_6$
____Other, please specify$_7$ _____

15___

I.6c Was the workshop a:

____single session$_1$
____multiple sessions$_2$

16___

I.7 Your competence using the computer for the management of patient information was (check all that apply)

____evaluated by a written test$_1$
____evaluated by an oral test$_2$
____evaluated by a 'hands-on' test$_3$
____not evaluated$_4$
____other, please specify$_5$

17___

I.8 Have you had additional training?

____Yes$_1$
____No$_2$ Please explain$_3$ _____

18___

I.9a Your additional 'hands-on' experience with computers has been on a (check all that apply)

____mainframe computer$_1$
____mini computer$_2$
____micro computer$_3$
____don't know$_4$

19___

I.9b Your additional 'hands-on' experience has been using

____word processing software$_5$
____other, please specify$_6$ _____

20/21___

I.10 Have you used computers for the management of patient information in another hospital?

____A great deal$_1$
____Some$_2$
____Not at all$_3$

22___

I.11 Evaluate your typing skills. "I type..

____well."$_1$
____fairly well."$_2$
____poorly."$_3$
____not at all."$_4$

23___

I.12 Would you like to have additional education/training to help you with computers?

____No$_1$
____Yes$_2$ If yes, please specify.

_____

_____

24

## ORGANIZATIONAL PROFILE

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II.1 In which province in Canada do you work?

____British Columbia$_1$
____Alberta$_2$
____Saskatchewan$_3$
____Manitoba$_4$
____Ontario$_5$
____Quebec$_6$
____New Brunswick$_7$
____Nova Scotia$_8$
____Prince Edward Island$_9$
____Newfoundland$_{10}$

25____

II.2 The type of agency where you work is

____a general hospital$_1$
____a specialty hospital$_2$
____an extended care hospital$_3$

26____

II.3 Which nursing model does your nursing unit use?

____Team nursing$_1$
____Total patient care$_2$
____Primary nursing$_3$
____Other, please specify$_4$ _____

27____

II.4 Your current specialty area in nursing is (check one only)

____ambulatory care$_1$
____emergency$_2$
____geriatrics$_3$
____intensive care$_4$
____medicine$_5$
____obstetrics/gynecology$_6$
____paediatrics$_7$
____palliative care$_8$
____psychiatry$_9$
____surgery$_{10}$
____other, please specify$_{11}$ _____

28/29____

II.5 Your current employment status is

____permanent full time$_1$
____permanent part time$_2$
____casual$_3$
____other, please specify$_4$ _____

30____

II.6$_a$ The shift/schedule you usually work is

____permanent shift$_1$
____rotating shifts$_2$

31____

II.6$_b$
____8 hour shifts$_3$
____12 hour shifts$_4$

32____

II.6$_c$
____days$_5$
____evenings$_6$
____nights$_7$

33____

II.7$_a$ What level of clerical coverage on the Computerized Patient Information Management System do you currently have in your nursing unit?

____In hours/day

| | | |
|---|---|---|
| ____ 8 hours$_1$ | ____5 days$_1$ | ____7 days$_2$ |
| ____12 hours$_2$ | ____5 days$_1$ | ____7 days$_2$ |
| ____16 hours$_3$ | ____5 days$_1$ | ____7 days$_2$ |
| ____24 hours$_4$ | ____5 days$_1$ | ____7 days$_2$ |

____No coverage$_5$
____Don't know$_6$

34____

11.7$_b$ ____In days/week

____5 days$_7$
____7 days$_8$

35____

____Other, please specify$_9$ _____

OVER...

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II.8 Has the amount of clerical coverage on the system changed from before the system was installed?

____More coverage$_1$
____Same coverage$_2$
____Less coverage$_3$
____No coverage$_4$

36____

II.9 Will your organization introduce or expand the use of computers during the next year?

____Yes, will expand in certain areas$_1$
Which application(s)
_____

____Yes, will introduce in certain areas$_2$
Which application(s)
_____

____No, won't expand$_3$
____No, won't introduce$_4$
____Don't know$_5$
____Other, please specify$_6$ _____

37____

II.10 Are the nurses in your organization unionized? (Response optional)

____Yes$_1$
____No$_2$ **If no, go to Section III on the next page.**

38____

II.11 The position you hold in your union is (Response optional)

____non-member$_1$
____member$_2$
____ward representative$_3$
____shop steward$_4$
____other, please specify$_5$ _____

39____

II.12 Do you attend union meetings? (Response optional)

____Always$_1$
____Usually$_2$
____Sometimes$_3$
____Never$_4$

40____

II.13 Which of the following issues related to computer use is your nurses' union addressing?

____Education/training$_1$
____Support on the system$_2$
____Computer communication among nurses$_3$
____Occupational health/safety$_4$
____Privacy rights of the nurse/patient$_5$
____Liability$_6$
____Job security$_7$
____None of the above$_8$
____Don't know$_9$
____Any issue you would like your union to address?
Please specify$_{10}$

41/42____
_____

II.14 Is there a technology clause in your collective agreement?

____Yes$_1$
____No$_2$
____Don't know$_3$

43____

(1)

For Office Use Only

## SYSTEM PROFILE

III.1 What make of computer have you used or do you use?

____None$_1$ If none, go to III.3.
____Burroughs$_2$
____CADO$_3$
____Data General$_4$
____IBM$_5$
____Tandem$_6$
____Health Data Science (HDS)$_7$
____Don't know$_8$
____Other, please specify$_9$ _____ 44___

III.2 What has been or is the name of the software used on the computer?

____Beothuk$_1$
____Meditech$_2$
____Office Concepts Administrative Resident Care$_3$
____Patient Care System (DHIS)$_4$
____PROMIS$_5$
____Technicon$_6$
____Health Data Science (HDS)$_7$
____Don't know$_8$
____Other, please specify$_9$ _____ 45___

III.3 Were you involved in the system design/development?

____No$_1$ 46___
____Yes$_2$ ____1) before the system was chosen$_{1a}$
____2) assessing computer needs for nursing use$_{1b}$
____3) designing/developing nursing applications$_{1c}$
____4) implementing the system as a trainer or evaluator$_{1d}$
____5) evaluating the system (quality control)$_{1e}$
____6) other please specify$_{1f}$ _____ 47/48___

III.4 How long has the computer system been in use in your nursing unit?

____No computer system in use in the nursing unit$_1$
____Less than 1 month$_2$
____2-6 months$_3$
____7-12 months$_4$
____1-2 years$_5$
____2-3 years$_6$
____3-5 years$_7$
____More than 5 years$_8$
____Don't know$_9$ 49___

III.5 How long have you been using the computer in your nursing unit?

____No computer to use in my nursing unit$_1$
____Less than one month$_2$
____2-6 months$_3$
____7-12 months$_4$
____1-2 years$_5$
____2-3 years$_6$
____3-5 years$_7$
____More than 5 years$_8$ 50___

OVER...

For Office Use Only

III.6 How long have you used a computer as a nurse?

____Never used a computer as a nurse$_1$
____Less than 1 month$_2$
____2- 6 months$_3$
____7-12 months$_4$
____1-2 years$_5$
____2-3 years$_6$
____3-5 years$_7$
51____ ____More than 5 years$_8$

III.7 How frequently did/do you use the computer on the average in a work week period?

____0 times/week$_1$
____1-3 times/week$_2$
____4-6 times/week$_3$
____7-10 times/week$_4$
____More than 10 times/week$_5$
52____ ____Other, please specify$_6$ _____

III.8 Did/Do you get the information you need to do your job from the system ?

____Always$_1$
____Usually$_2$
53____ ____Occasionally$_3$
____Never$_4$

III.9 How many terminals did/do you have in your nursing unit that are used by nurses?

____None$_1$
____One$_2$
____Two$_3$
54____ ____More than two$_4$

III.10 Where were/are these terminals located? (Check all that apply)

____None$_1$
____At the nurses' station$_2$
____At the patient's bedside$_3$
____In the nursing administrator's office$_4$
____In the critical care areas$_5$
____They were/are portable$_6$
55/56____ ____Other, please specify$_7$ _____

III.11 Who were/are/is the most frequent user(s) of the system? (Check all that apply)

____No one$_1$
____Staff nurse(s)$_2$
____Head nurse/team leader$_3$
____Ward clerk/unit co-ordinator$_4$
____Doctor(s)$_5$
57____ ____Other, please specify$_6$ _____

III.12 What mechanism(s) for entering data were/are available to you on the computer system?

____Light pen$_1$
____Keyboard$_2$
58/59____ ____Other, please specify$_3$ _____

III.13 What was/is the primary mechanism(s) that you use(d) for entering data?

____Light pen$_1$
____Keyboard$_2$
60____ ____Other, please specify$_3$ _____

III.14 How often did/does the "response time" cause you a problem with doing your job?

____Always$_1$
____Usually$_2$
____Occasionally$_3$
61____ ____Never$_4$

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III.15 Did/Does the computer "down-time" seriously affect your ability to do your job?

____Always$_1$
____Usually$_2$
____Occasionally$_3$
____Never$_4$ 62___

III.16 What was/is the scheduled "down-time" each day?

____None$_1$
____2 hours or less$_2$
____More than 2 hours$_3$
____Don't know$_4$
____Other, please specify$_5$ _____ 63___

III.17 How frequently did/does unscheduled "down-time" occur on the average in a work week period?

____0 times/week$_1$
____1-2 times/week$_2$
____3-4 times/week$_3$
____5-6 times/week$_4$
____More than 6 times/week$_5$ 64___

III.18 What type(s) of back-up system(s) did/do you use when the computer system is down? Check as many as apply.

____A second computer$_1$
____A manual system$_2$
____Special forms/paperwork$_3$
____The telephone system$_4$
____Charts$_5$
____None$_6$
____Other, please specify$_7$ _____ 65/66___

III.19 What type(s) of assistance were/are available to you on an ongoing basis? Check as many as apply.

____On line HELP$_1$
____Data processing personnel$_2$
____System co-ordinator nurse(s)$_3$
____Continuing education personnel$_4$
____Nursing administration personnel$_5$
____Peers (other nurses)$_6$
____Ward clerk (unit co-ordinator)$_7$
____A training manual (printed material)$_8$
____Hot line telephone number to call$_9$
____No assistance available on an ongoing basis$_{10}$
____Other, please specify$_{11}$ _____ 67/68___

OVER...

For Office Use Only
Card 2
1/4___
5/6___
7___ 8/9___ 10/11___
12___ 13/14___ 15/16___
17___ 18/19___ 20/21___
22___ 23/24___ 25/26___
27___ 28/29___ 30/31___
32___ 33/34___ 35/36___
37___ 38/39___ 40/41___
42___ 43/44___ 45/46___
47___ 48/49___ 50/51___
52___ 53/54___ 55/56___
57___ 58/59___ 60/61___
62___ 63/64___ 65/66___
67___ 68/69___ 70/71___
72___ 73/74___ 75/76___
7___ 8/9___ 10/11___
12___ 13/14___ 15/16___
17___ 18/19___ 20/21___
22___ 23/24___ 25/26___
27___ 28/29___ 30/31___
32___ 33/34___ 35/36___
37___ 38/39___ 40/41___
42___ 43/44___ 45/46___
47___ 48/49___ 50/51___
52___ 53/54___ 55/56___
57___ 58/59___ 60/61___
62___ 63/64___ 65/66___
67___ 68/69___ 70/71___
72___ 73/74___ 75/76___
76___ 76/77___ 78/79___
7___ 8/9___ 10/11___
12___ 13/14___ 15/16___
17___ 18/19___ 20/21___
22___ 23/24___ 25/26___
27___ 28/29___ 30/31___
32___ 33/34___ 35/36___

Cards 1/4___
5/6___

Card 4 1/4___
5/6___

III.20 For which of the following application(s) did/do you use a computer in your job? Check as many as apply. Indicate the number of hours of training that you have had for each application.

| | TRAINING HOURS | |
|---|---|---|
| | On the Job | Formal |
| ___Admission/transfer/discharge | ___hrs. | ___hrs. |
| ___Chart locator (identifies location of charts) | ___hrs. | ___hrs. |
| ___Critical care monitoring | ___hrs. | ___hrs. |
| ___Dietary orders/information | ___hrs. | ___hrs. |
| ___Drug orders | ___hrs. | ___hrs. |
| ___Drug administration | ___hrs. | ___hrs. |
| ___Drug charting | ___hrs. | ___hrs. |
| ___EKG orders | ___hrs. | ___hrs. |
| ___EKG reports | ___hrs. | ___hrs. |
| ___Inventory control, ordering (CSR) | ___hrs. | ___hrs. |
| ___Lab orders | ___hrs. | ___hrs. |
| ___Lab reports | ___hrs. | ___hrs. |
| ___Message system between departments | ___hrs. | ___hrs. |
| ___Nurses' progress notes (charting) | ___hrs. | ___hrs. |
| ___Problem oriented format | ___hrs. | ___hrs. |
| ___Narrative format | ___hrs. | ___hrs. |
| ___Other, please specify _____ | ___hrs. | ___hrs. |
| ___Patient care plans | ___hrs. | ___hrs. |
| ___Patient locator (identifies room # of patient) | ___hrs. | ___hrs. |
| ___Patient profile | | |
| ___Demographic data | ___hrs. | ___hrs. |
| ___Nursing information (Kardex) | ___hrs. | ___hrs. |
| ___Other, please specify _____ | ___hrs. | ___hrs. |
| ___Patient teaching | | |
| ___Procedure manual | ___hrs. | ___hrs. |
| ___List of preparations | ___hrs. | ___hrs. |
| ___Other, please specify _____ | ___hrs. | ___hrs. |
| ___Quality assurance | ___hrs. | ___hrs. |
| ___Radiology orders | ___hrs. | ___hrs. |
| ___Radiology reports | ___hrs. | ___hrs. |
| ___Respiratory orders | ___hrs. | ___hrs. |
| ___Respiratory reports | ___hrs. | ___hrs. |
| ___Statistics | ___hrs. | ___hrs. |
| ___Other, please specify _____ | ___hrs. | ___hrs. |

III.21 Please rank the following "possible" computer applications in their order of importance to you. Place a "1" in the most important, etc. You need not rank all the items.

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____Admission/transfer/discharge 57/58
____Chart locator 59/60
____Critical care monitoring 61/62
____Dietary orders/information 63/64
____Drug orders 65/66
____Drug administration 67/68
____Drug charting 69/70
____EKG orders (ECG) 71/72
____EKG reports (ECG) 73/74
____Inventory control, ordering (CSR) 75/76
____Lab orders 77/78
____Lab reports 79/80
____Message system between departments 7 / 8
____Nurses' progress notes (charting) 9 /10
____Patient care plans 11/12
____Patient locator (identifies room # of patient) 13/14
____Patient profile 15/16
____Patient teaching 17/18
____Quality assurance 19/20
____Radiology orders 21/22
____Radiology reports 23/24
____Respiratory orders 25/26
____Respiratory reports 27/28
____Statistics 29/30
____Other, please specify _____ 31/32
33/34
35/36
37/38
39/40

Card 5 1/4

III.22 Which application(s) would you like/not like to learn about?

_____ 40/41

III.23 If changes were to be made to the Patient Information Management System in your nursing unit, which of the following would you recommend?
Please rank the changes in their order of importance to you, with "1" as the most important, etc. You need not rank all the items.

____Training program$_1$ 43/43
____Availability of support/assistance$_2$ 44/45
____Number of terminals$_3$ 46/47
____Location of terminals$_4$ 48/49
____Mechanism for entering data$_5$ 50/51
____Response time of the computer$_6$ 52/53
____Mechanism for retrieving data$_7$ 54/55
____Down-time$_8$ 56/57
____Security measures (privacy rights)$_9$ 58/59
____Applications for nurses$_{10}$ 60/61
____Nursing model$_{11}$ 62/63
____Networking with colleagues$_{12}$ 64/65
____Clerical coverage/unit co-ordinator$_{13}$ 66/67
____Accuracy of patient information$_{14}$ 68/69
____Complexity of the system$_{15}$ 70/71
____No change$_{16}$ 72/73
____Remove this computer system$_{17}$ 74/75
____Other, please specify$_{18}$ _____ 76/77
78/79

OVER

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Card 6 1/4 5/6

7___

III.24 Did/Do you feel you can influence change(s) to the computer system?

___Always$_1$
___Usually$_2$
___Occasionally$_3$
___Never$_4$
___Other, please specify$_5$ _____

III.25$_a$ What type(s) of information could/can you access from the computer system? Information about

___your patient(s)$_1$
___the ward patient(s)$_2$
___the service(s) patients$_3$
___all patients$_4$
___the hospital$_5$

8 / 9___

(and/or)

10/11___ III.25$_b$ ___for display$_1$

12/13___ III.25$_c$ ___for update$_2$

III.26 Which patients were/are you responsible for? (Check all that apply)

___Your patient(s)$_1$
___The ward patient(s)$_2$
___The service(s) patients$_3$
___All hospital patients$_4$

14___

III.27 How did/do you get access to the system?

___After successfully completing the training program$_1$
___With an individual password$_2$
___With a group password$_3$
___Other, please specify$_4$ _____

15___

III.28 What disciplinary action(s) were/are in place in your nursing unit for breach of security?

___Situation dependent$_1$
___None$_2$
___Don't know$_3$
___Other, please specify$_4$ _____

16___

**Please circle the number that best reflects your expectation(s) and/or experience with computers.**

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IV Because of Computerized Patient Information Management Systems:

| | Strongly Agree | | | | | Strongly Disagree | |
|---|---|---|---|---|---|---|---|
| 1) Nurses feel more competent in their job. | 1 | 2 | 3 | 4 | 5 | 6 | 17 |
| 2) Computers are not easy for nurses to use. | 1 | 2 | 3 | 4 | 5 | 6 | 18 |
| 3) Nurses do or would like to use computers in their job. | 1 | 2 | 3 | 4 | 5 | 6 | 19 |
| 4) Nurses accountability for care is increased. | 1 | 2 | 3 | 4 | 5 | 6 | 20 |
| 5) Communication decreases: | | | | | | | |
| a) with peers. | 1 | 2 | 3 | 4 | 5 | 6 | 21 |
| b) with health team members. | 1 | 2 | 3 | 4 | 5 | 6 | 22 |
| c) with patients | 1 | 2 | 3 | 4 | 5 | 6 | 23 |
| 6) Nursing practice changes. | 1 | 2 | 3 | 4 | 5 | 6 | 24 |
| Patient assessments are: | | | | | | | |
| a) more reliable. | 1 | 2 | 3 | 4 | 5 | 6 | 25 |
| a) more comprehensive. | 1 | 2 | 3 | 4 | 5 | 6 | 26 |
| Patient care plans are: | | | | | | | |
| b) more organized. | 1 | 2 | 3 | 4 | 5 | 6 | 27 |
| b) more structured. | 1 | 2 | 3 | 4 | 5 | 6 | 28 |
| Nursing actions are: | | | | | | | |
| c) more timely. | 1 | 2 | 3 | 4 | 5 | 6 | 29 |
| c) more efficient. | 1 | 2 | 3 | 4 | 5 | 6 | 30 |
| Nursing outcomes are: | | | | | | | |
| d) more effective. | 1 | 2 | 3 | 4 | 5 | 6 | 31 |
| 7) The care provided for patients is safer. | 1 | 2 | 3 | 4 | 5 | 6 | 32 |
| 8) Patient care is based on more current information. | 1 | 2 | 3 | 4 | 5 | 6 | 33 |
| a) Continuity of care is improved. | 1 | 2 | 3 | 4 | 5 | 6 | 34 |
| b) Each nurse is able to spend more time with patients. | 1 | 2 | 3 | 4 | 5 | 6 | 35 |
| c) Each nurse is expected to care for more patients. | 1 | 2 | 3 | 4 | 5 | 6 | 36 |
| 9) Patient information is | | | | | | | |
| a) less confidential. | 1 | 2 | 3 | 4 | 5 | 6 | 37 |
| b) less secure. | 1 | 2 | 3 | 4 | 5 | 6 | 38 |
| 10) The computer is a valuable tool for nurses. | 1 | 2 | 3 | 4 | 5 | 6 | 39 |
| 11) My attitude towards computers is positive. | 1 | 2 | 3 | 4 | 5 | 6 | 40 |
| 12) I would recommend computers to other hospitals for managing patient information. | 1 | 2 | 3 | 4 | 5 | 6 | 41 |

OVER...

For Office Use Only

## PERSONAL PROFILE

V.1 Your age is between

42___ ____20-30$_1$
____31-45$_2$
____46-65$_3$
____over 65$_4$

V.2 Sex

43___ ____female$_1$
____male$_2$

V.3 Your current position in nursing is

____staff nurse$_1$
____head nurse/team leader$_2$
____administrator/manager/supervisor$_3$
____instructor/educator$_4$
44___ ____other, please specify$_5$ _____

V.4 How long have you been in your current position?

____Less than 1 year$_1$
____1-5 years$_2$
____6-10 years$_3$
45___ ____Over 10 years$_4$

Thank you for sharing your time and experience in building this database of nursing information. Any further comments are welcomed.

_____

_____

_____

_____

_____

_____

**RETURN TO:**

**Toronto Western Hospital**
**399 Bathurst Street**
**Toronto, Ontario**
**M5T 2S8**

**Nalini Jairath**
**Coordinator of Nursing Research**
**Nursing Office**
**East Wing, 5th floor**

**OR**

**Judy Tilvel**
**Coordinator, Nursing Computer Project**
**2 McLaughlin**
**Room 2-409, 1st floor**

# APPENDIX B

## Frequencies and % Responses from Nurses

## NURSE RESPONDENT QUESTIONNAIRE

### Section I

*Educational Profile*

I.1 Your highest level of education completed (check only one)

| Total N = 236 | Toronto Western Hospital (TWH) N = 115 | | Credit Valley Hospital (CVH) N = 109 | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Diploma | 69 | 57.0 | 69 | 60.5 |
| 2. Post RN Certificate | 21 | 17.4 | 18 | 15.8 |
| 3. Baccalaureate in Nursing | 17 | 14.0 | 17 | 14.9 |
| 4. Other, specify | 10 | 8.3 | 8 | 7.0 |
| 5. Master's in Nursing | 2 | 1.8 | -- | -- |
| 6. Other, specify | 2 | 1.8 | 2 | 1.8 |
| 7. Doctorate | -- | -- | -- | -- |
| | Responses 121 | | 114 | |

The major percent of respondents 57% (TWH) and 61% (CVH) are nurses whose highest level of education completed is as a diploma registered nurse. The other percent of levels of nursing education are representational of nurses in Canada.

I.2 Your formal computer education includes (check all that apply)

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. credit course(s) | 8 | 7 | 2 | 11.0 |
| 2. non-credit course(s) | 6 | 5.2 | 21 | 19.3 |
| 3. systems analysis-course(s) | 3 | 1.9 | -- | -- |
| 4. no formal course | 98 | 85.2 | 76 | 69.7 |

14% of the respondents (TWH) and 30% of the respondents (CVH)reported that they had formal computer training; 85.2% (TWH) and 69.7% (CVH) reported having *no* formal computer education/training.

I.3 Who taught you to use the computer for managing patient information? (If anyone)

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Data processing personnel | 4 | 4.5 | 18 | 9.9 |
| 2. Continuing education personnel | 3 | 3.4 | 21 | 11.5 |
| 3. Nursing administration personnel | 3 | 3.4 | 61 | 33.5 |
| 4. Peers (other nurses) | 7 | 8.0 | 23 | 12.6 |
| 5. A nurse system co-ordinator | 7 | 8.0 | 20 | 11.0 |
| 6. A ward clerk | -- | -- | 13 | 7.1 |
| 7. Computer company rep. | 10 | 11.4 | 1 | 0.5 |
| 8. A training manual | 54 | 61.4 | 23 | 12.6 |
| 9. Other, specify | -- | -- | 2 | 1.1 |
| | Responses 88 | | 182 | |

Of the nurses who had computer training to manage patient information 44.5% (CVH) N = 81 of 18 of the respondents reported their trainer as nursing administration personnel. 13% (CVH) reported that their peers taught them to manage patient information. This may reflect a peer support teaching which takes place between colleagues on the units. In addition, Credit Valley Hospital has created positions for nursing personnel to be involved in their staff training of nursing personnel who use the system.

I.4 The teaching strategy used in your training program was

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Computer assisted instruction | 11 | 9.4 | 94 | 71.2 |
| 2. Preceptorship (peers) | 11 | 9.4 | 21 | 15.9 |
| 3. Lecture(s) | 15 | 12.8 | 13 | 9.8 |
| 4. Not applicable | 72 | 61.5 | 1 | 0.76 |
| 5. Other, specify | 8 | 6.8 | 3 | 2.3 |
| | Responses 117 | | 132 | |

The teaching strategy used in the training program is reported to be CAI by 71% of the nurses at Credit Valley Hospital. Approximately 16% reported their peers as their teachers or preceptors.

I.5 The student teacher ratio in your training program was

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. one instructor to one learner | 7 | 6.1 | 5 | 46 |
| 2. one instructor, 2-5 learners | 7 | 6.1 | 86 | 78.9 |
| 3. one instructor, 6-15 learners | 7 | 6.1 | 15 | 13.8 |
| 4. one instructor, 15+ learners | 7 | 6.1 | 2 | 1.8 |
| 5. not applicable | 71 | 61.7 | 1 | 0.9 |
| 6. other, specify | 7 | 6.1 | -- | -- |

The student teacher ratio at Credit Vally was reported to be 1-2:5 by 78.9% of the respondents. At TWH 13.8% reported a 1-6:15 ratio. This probably reflects the fact that new personnel in groups as small as 2 nurses would be oriented to the system with one instructor.

I.6$_a$ How much computer training have you received in the classroom?

| | Toronto Western Hospital Frequency | % | Credit Valley Hospital Frequency | % |
|---|---|---|---|---|
| 1. None | 87 | 79.1 | 19 | 17.6 |
| 2. 2 hours or less | 7 | 6.4 | 38 | 35.1 |
| 3. 2-4 hours | 5 | 4.5 | 31 | 28.7 |
| 4. 5-15 hours | 1 | 0.9 | 16 | 14.8 |
| 5. 16-45 hours | 6 | 5.5 | 2 | 1.9 |
| 6. more than 45 hours | 2 | 1.8 | 1 | 0.9 |
| 7. other, specify | 2 | 1.9 | 1 | 0.9 |
| Responses | 110 | | 108 | |

35% of Credit Valley nurses reported two hours or less of training. 17% claimed to have had no training at all in the classroom. It may be this group which acquired their training by/with/through their peers. 29% had 2-4 hours and 15% reported 5-15 hours. Although TWH has no training program to date as they are scheduled to come on stream this year approximately 20% (N = 23 of 110) of their nurses have reported some training. This figure would be important for this agency to consider in designing their training program, as an entry level assessment would screen the level of knowledge of the nurses.

I.6$_b$ in a hands on workshop?

| | Toronto Western Hospital Frequency | % | Credit Valley Hospital Frequency | % |
|---|---|---|---|---|
| 1. None | 80 | 69.6 | 2 | 1.8 |
| 2. 2 hours or less | 9 | 7.8 | 35 | 32.1 |
| 3. 2-4 hours | 5 | 4.3 | 46 | 42.2 |
| 4. 5-15 hours | 4 | 3.5 | 18 | 16.5 |
| 5. 16-45 hours | 1 | 0.9 | 2 | 1.8 |
| 6. More than 45 hours | 2 | 1.7 | -- | -- |
| 7. Other, specify | 2 | 1.8 | 1 | 0.9 |

Approximately 75% of CVH nurses report their training to be up to 4 hours in a hands-on workshop which supports the data in VI.4 (CAI).

I.6$_c$ Was the workshop a:

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. single session | 12 | 10.4 | 28 | 25.7 |
| 2. multiple sessions | 9 | 7.8 | 74 | 67.9 |

67.9% of CVH nurses report their training as a multiple session experience.

I.7 Your competence using the computer for the management of patient information was (check all that apply)

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. evaluated by a written test | -- | -- | 31 | 22.5 |
| 2. evaluated by an oral test | -- | -- | 6 | 4.4 |
| 3. evaluated by hands-on test | 4 | 6.7 | 98 | 71.0 |
| 4. not evaluated | 51 | 85.0 | 3 | 2.2 |
| 5. other, specify | 5 | 8.3 | -- | -- |
| Responses | 60 | | 138 | |

71% of CVH nurses claimed their computer competence was evaluated in a hands-on te[redacted] 2.2% of the respondents claim they were not evaluated at CVH.

I.8 Have you had additional training?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Yes | 7 | 6.1 | 33 | 30.3 |
| 2. No | 80 | 69.6 | 74 | 67.9 |
| 3. Explain | 2 | 1.7 | -- | -- |

30.3% of CVH nurses reported to have additional training to use computers, without any further explanation, which was requested.

I.9$_a$ Your additional hands-on experience with computers has been on a (check all that apply)

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. mainframe computer | 2 | 1.7 | 35 | 41.2 |
| 2. mini computer | 2 | 1.7 | 13 | 15.3 |
| 3. micro computer | 5 | 4.3 | 8 | 9.4 |
| 4. don't know | 44 | 38.3 | 29 | 34.1 |
| | | | Responses 85 | |

34% of CVH nurses did not know whether their additional training was on a mainframe, mini or micro. 38.3% from TWH reported not knowing the type of computer they were trained on either.

I.9$_b$ Your additional hands-on experience has been using

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 5. word processing software | 8 | 7.0 | 24 | 22.0 |
| 6. other, specify | 17 | 14.8 | 24 | 22.0 |

22% of CVH nurses worked with a word processing package.

I.10 Have you used computers for the management of patient information in another hospital?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. A great deal | 1 | 0.9 | 5 | 4.6 |
| 2. Some | 8 | 7.0 | 18 | 16.5 |
| 3. Not at all | 98 | 85.2 | 85 | 78.0 |

21% (N = 24 of 109) of CVH nurses have had some/great deal of experience using computers for managing patient information in another hospital. 8% at TWH reported some experience with a computer at another institution.

I.11 Evaluate your typing skills. "I type. . .

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. well" | 11 | 9.6 | 27 | 24.8 |
| 2. fairly well" | 41 | 35.7 | 46 | 42.2 |
| 3. poorly" | 38 | 33.0 | 33 | 30.3 |
| 4. not at all" | 19 | 16.5 | 2 | 1.8. |

67% (N = 73 of 109) of the respondents from CVH reported that they could type "well" to "fairly well" as compared with 45.3% (N=52 of 115) of respondents from TWH. 33% of the respondents at TWH and 30.3% of the respondents at CVH assessed that their typing ability was "poor." 1.8% of the respondents at CVH claimed they "could not type at all."The differences most probably reflect the fact that CVH has had a HIS system for the last number of years.

I.12 Would you like to have additional education/training to help you with computers?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. No | 5 | 4.3 | 59 | 54.1 |
| 2. Yes | 99 | 86.1 | 48 | 44.0 |

When asked if they would like to have additional education/training to help with the computer, 86.1% (N=99 of 115) respondents from TWH said 'yes', 44% (N = 48 of 109) from CVH said 'yes'. 54.1% (N = 59 of 109) of the respondents from CVH said 'no' and 4.3% (N = 5 of 115) of respondents from TWH said 'no'.

*Summary of Comments on Question 1-12*

*Baycrest Hospital*

Computers made my work easier. Everything was printed — so hand writing was not a problem to interpret, and therefore saved time.

Doctor's. orders went straight to lab - pharmacy.

Information was easy to find and quick.

I would like to learn a computer language to improve speed.

*Toronto Western Hospital*

Classes with lectures on software packages x 3

More hands on x 3

Experience with computers limited

No formal training

Basic learner

Complete A-Z package

When we get computers I will need it

Booklets to read

Practice time

Exercises to do

Always something to learn

Software functionability and system design (from an RN)

Thorough in-service training is required with ample opportunity to practice in a lab setting

Follow up and ongoing education/training will be needed after initial introduction to the computer

Taking computer course as part of a business degree

I will take an introductory course in the near future

Introductory training

I'd like to know what the data base is, what the capabilities of the computer are; what all possible information I can get from the computer

Basic theory

Training to use the computer proficiently for the input of patient information

Basic training (supervisor)

I need to be taught (administrator)

Training with reference to patient information

Training if the computer will be used in the work area with patient care

Review of the system

If you were to change anything. . .method of project management (by a computer nurse analyst)

To access system - a badge inserted into a badge reader

I would like training on computers if they relate to my work

Training specific to a nursing model

Basic knowledge of computers to start

So I could use it on the ward

We touched it slightly at another hospital, I feel I would have to start over again

Would be very interested to have course

Course in college program

I would like to have known how to type before using the computer

Keyboarding

Word processing

Greater understanding of the other systems involved

Plan to take computer nursing course at local community college

Mnemonics

In-house training very adequate

Ordering tests

Drawing up results on all multidisciplines

Additional training in-services as well as updating

More knowledge with the programming aspect

A/D/T, diet orders; lab orders/reports/message system between depts./profile; demo data; rad. orders/reports/resp. orders. All included in initial 2-4 hour training session

A specific course related to world processing of patient information would be interesting

If applicable to my job as head nurse, to facilitate compiling data for staff and management area

I will be taking training in computer courses next summer.

Need training in which routes to take to pull information out

Computers are not necessary for the workplace (BN staff med 20-30)

Would like to understand the system better - what its capabilities are

Any further training would certainly be beneficial

Only if it applies to the hospital system

Evaluation of different software options

Development of nursing care plans

With the ward clerks for more time with administrative module

Understanding software and how computers work

Related to specific department applications

Hands-on training in an area that I don't often use

It's not necessary for work here (hemodialysis RN) but for my degree

Training on IBM software packages

Would like to take some formal computer courses

Would like more information about computers in hospital I work at

Some computer theory in a course

Would like to program computers

*Baycrest*

— I find the computer very helpful. It was fast, efficient and easy to use. In particular, everything is in print for us, so handwriting is no longer a problem. It's especially good as regards medication.

It is important that the complete patient record be computerized

The computer system is being removed

Difficulty with financing

Computers make everyone Dr's. (from an RN) nurses, etc.

All are more accountable which can do nothing but improve nursing care. Also computers are great for review and getting overview of your patient in two or more areas at the same time — I love it!

Look forward to initial training course

Complete training course in the use of computers in the hospital

No training yet x 3

Limited experience was only an introduction at university

I haven't had formal training as of now, but as much as possible would be beneficial

I believe if we are going to use computers in the hospital, we should have somewhat of a course, on how a computer works, not just what keys to punch.

It would be interesting to obtain further information on the individual patients through the computer. I'd like to be taught on more detailed computers

I have no basis in computer use, so any education/training would be useful

I have not started yet

I would like very much to have a course

Anything would be helpful

I haven't had any training, basic-advanced would be necessary

Everything! I do not know anything about computers

A general understanding

I would appreciate to have time off for lectures and typing

Since I don't know anthing about computers, I would like to learn to use patient's bedside computers

Will serve as an added skill

Obviously all areas related to computers in a ward structure

*Credit Valley Hospital*

Include course as elective at university

Total training time is 7 hours for all aspects of computers

Just to remain current

## Section II

*Organizational Profile*

II.1 In which province in Canada do you work?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. British Columbia | | | | |
| 2. Alberta | | | | |
| 3. Saskatchewan | | | | |
| 4. Manitoba | | | | |
| 5. Ontario | 114 | 99.1 | 109 | 100 |
| 6. Quebec | | | | |
| 7. New Brunswick | | | | |
| 8. Nova Scotia | | | | |
| 9. Prince Edward Island | | | | |
| 10. Newfoundland | | | | |

99.1% of the total respondents (N=236) are from Ontario.

II.2 The type of agency where you work is

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. a general hospital | 112 | 97.4 | 109 | 100 |
| 2. a speciality hospital | 2 | 1.7 | -- | -- |
| 3. an extended care hospital | -- | -- | -- | -- |

CVH is a General Hospital as is Toronto Western.

II.3 Which nursing model does your nursing unit use?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Team nursing | 10 | 8.8 | 1 | 0.9 |
| 2. Total patient care | 74 | 65.5 | 2 | 1.8 |
| 3. Primary nursing | 21 | 18.8 | 107 | 97.2 |
| 4. Other, specify | 8 | 7.1 | -- | -- |
| Responses | 113 | | 110 | |

97% of the respondents reported that primary nursing is the model used at CVH. Toronto Western seems to use a variety of approaches for delivering patient care. 9% reported using team nursing; 66% reported total patient care; 19% reported using the primary nursing model and 7% reported other.

II.4 Your current specialty area in nursing is (check one only)

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. ambulatory care | 4 | 3.3 | 12 | 10.0 |
| 2. emergency | 6 | 5.0 | -- | -- |
| 3. geriatrics | 5 | 4.2 | 3 | 2.5 |
| 4. intensive care | 18 | 15.0 | 9 | 7.5 |
| 5. medicine | 9 | 7.5 | 11 | 9.2 |
| 6. obstetrics/gynecology | -- | -- | 22 | 18.3 |
| 7. paediatrics | -- | -- | 12 | 10.0 |
| 8. palliative care | 2 | 1.7 | -- | -- |
| 9. psychiatry | 2 | 1.7 | 13 | 10.8 |
| 10. surgery | 22 | 18.3 | 11 | 9.2 |
| 11. other, specify | 54 | 45.0 | 27 | 22.5 |
| Responses | 113 | | 110 | |

The responses came from a variety of different areas in the hospital. At TWH 33% of the responses came from ambulatory care; 5% from emergency; 4.2% from geriatrics; 15% from intensive care; 7.5% from medicine; 1.7% from palliative care; 1.7% from psychiatry; 18.3% from surgery; 45% chose other. At CVH the responses were reported as follows: 10% from ambulatory care; 2.5% from geriatrics; 7.5% from intensive care; 9.2% from medicine; 18.3% from obstetrics/gynecology; 10% from paediatrics; 10.8% from psychiatry; 9.2% from surgery and 22.5% chose other. The other category represents units where a combination of these specialities is practiced.

II.5 Your current employment status is

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. permanent full time | 85 | 73.9 | 83 | 76.1 |
| 2. permanent part time | 22 | 19.1 | 12 | 11.0 |
| 3. casual | 4 | 3.5 | 13 | 11.9 |
| 4. other, specify | 1 | 0.9 | 1 | 0.9 |

76.1% of the respondents at CVH and 73.9% at TWH reported working permanent full-time; 11% of the respondent at CVH and 19.1% at TWH reported working permanent parttime; 11.9% of the respondents at CVH are casual workers as compared with 3.5% at TWH.

II.6 The shift/schedule you usually work is

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. permanent shift | 43 | 37.4 | 33 | 30.3 |
| 2. rotating shifts | 63 | 54.8 | 75 | 68.8 |

30.3% of the respondants at CVH and 37.4% of the respondents at TWH work permanent shifts; 68.8% at CVH and 54.8% at TWH reported working rotating shifts.

| II.6b | | | | |
|---|---|---|---|---|
| 3. 8 hour shifts | 83 | 76.9 | 62 | 55.4 |
| 4. 12 hour shifts | 25 | 23.1 | 50 | 44.6 |
| Responses | 108 | | 112 | |

76.9% of the respondents at TWH and 55.4% at CVH reported working 8 hour shifts.

23.1% at TWH and 44.6% at CVH reported working 12 hours shifts.

| II.6c | | | | |
|---|---|---|---|---|
| 5. days | 105 | 55.6 | 105 | 53.0 |
| 6. evenings | 41 | 21.7 | 42 | 21.2 |
| 7. nights | 43 | 22.8 | 51 | 25.8 |
| | Responses 189 | | Responses 198 | |

55.6% of the respondents work days at TWH and 53.0% at CVH are on day shift.

II.7 What level of clerical coverage on the Computerized Patient Information Management System do you currently have in your nursing unit? (Input by ward clerks instead of nurses)

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. 8 hours, 5 days, 7 days | 5 | 5.1 | 80 | 50.0 |
| 2. 12 hours, 5 days, 7 days | -- | -- | 50 | 31.3 |
| 3. 16 hours, 5 days, 7 days | 3 | 3.1 | 17 | 10.6 |
| 4. 24 hours, 5 days, 7 days | 2 | 2.0 | 4 | 2.5 |
| 5. No coverage | 70 | 71.4 | 3 | 1.9 |
| 6 Don't know | 18 | 18.4 | 6 | 3.75 |
| | Responses 98 | | 160 | |

50% (N= 80 of 160) at CVH reported having clerical coverage 8 hrs/day as compared

with 5.1% (N = 5 of 98) at TWH . 31.3% (N = 50 of 160) of the respondents reported coverage 12 hrs/day, 5 days/week at CVH and 1.9% reported no clerical coverage whereas at TWH 71.4% (N = 70 of 98) reported no clerical coverage on their units.

II.7$_b$ (in days/week)

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 7. 5 days | 4 | 3.5 | 32 | 34.8 |
| 8. 7 days | 3 | 2.6 | 49 | 53.2 |
| 9. Other, specify | 16 | 13.9 | 11 | 12.0 |
| | | | Responses 92 | |

35% of respondents at CVH reported 5 day/week clerical coverage, 53% reported 7 day/week clerical coverage. The figures are considerably lower at TWH 3.5% for 5 day coverage; 2.6% for 7 days.

II.8 Has the amount of clerical coverage on the system changed from before the system was installed?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. More coverage | 5 | 4.3 | 29 | 26.6 |
| 2. Same coverage | 2 | 1.7 | 56 | 51.4 |
| 3. Less coverage | 1 | 0.9 | 4 | 3.7 |
| 4. No coverage | 60 | 52.2 | 2 | 1.8 |

At CVH 78% (N = 85 of 109) of the respondents claimed the clerical coverage had remained the same or increased from before the system was installed, and 52.2% of the respondents at TWH reported no clerical coverage on their units.

II.9 Will your organization introduce or expand the use of computers during the next year?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Yes, will expand in certain areas | 17 | 14.4 | 29 | 25.7 |
| 2. Yes, will introduce in certain areas | 59 | 50.0 | 6 | 5.3 |
| 3. No, won't expand | 1 | 0.8 | 6 | 5.3 |
| 4. No, won't introduce | 1 | 0.8 | -- | -- |
| 5. Don't know | 35 | 29.6 | 68 | 60.2 |
| 6. Other, specify | 5 | 4.2 | 4 | 3.5 |
| Responses | 118 | | 113 | |

64% at TWH and 31% of the respondents at CVH reported that their hospital would either expand or introduce the use of computers during the next year. 60% of respondents at CVH and 30% at TWH said they didn't know whether their hospitals would expand/ introduce the use of computers in the next year.

II.10 Are the nurses in your organization unionized? (Response optional)

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Yes | 112 | 97.4 | 3 | 2.8 |
| 2. No. | 1 | 0.9 | 104 | 95.4 |

97.4% of the nurses at TWH reported that the nurses are unionized and 95.4% of the nurses at CVH reported that the nurses are non-unionized.

II.11 The position you hold in your union is (Response optional)

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. non-member | 37 | 32.2 | -- | -- |
| 2. member | 71 | 61.7 | -- | -- |
| 3. ward representative | -- | -- | -- | -- |
| 4. shop steward | -- | -- | -- | -- |
| 5. other, specify | 1 | 0.9 | 2 | 1.8 |

At TWH 32.2% of the respondents claimed to be non-members of the union; 61.7% are reported to be members.

II.12 Do you attend union meetings? (Response optional)

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Always | -- | -- | -- | -- |
| 2. Usually | 1 | 0.9 | -- | -- |
| 3. Sometimes | 26 | 22.6 | -- | -- |
| 4. Never | 74 | 64.3 | 4 | 3.7 |

22.6% of the respondents at TWH reported attending union meetings 'sometimes' and 64.3% said they 'never' attended union meetings.

II.13 Which of the following issues related to computer use is your nurses' union addressing?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Education/training | 5 | 4.3 | -- | -- |
| 2. Support on the system | 4 | 3.4 | -- | -- |
| 3. Computer communication among nurses | 2 | 1.7 | -- | -- |
| 4. Occupational health/safety | 3 | 2.6 | -- | -- |
| 5. Privacy rights of nurse/patient | 1 | 0.9 | -- | -- |
| 6. Liability | 3 | 2.7 | -- | -- |
| 7. Job security | 4 | 3.6 | -- | -- |
| 8. None of the above | 2 | 1.7 | 0.9 | 1 |
| 9. Don't know | 82 | 71.3 | -- | -- |
| 10. Any issue you would like your union to address? | 2 | 1.7 | -- | -- |

71.3% of the respondents at TWH said they didn't know which issues related to computer use their union was addressing; 4.3% reported their union was addressing issues related to computer education/training. CVH hospital is non-unionized.

II.14 Is there a technology clause in your collective agreement?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Yes | 3 | 2.6 | -- | -- |
| 2. No | 12 | 10.4 | -- | -- |
| 3. Don't know | 87 | 75.7 | 2 | 1.8 |

75.7% of the respondents at TWH stated they didn't know if there was a technology clause in their collective agreement, in fact there is not.

## Section III

*System Profile*

III.1 What make of computer have you used or do you use?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. None | 63 | 56.3 | 1 | 0.8 |
| 2. Burroughts | -- | -- | 1 | 0.8 |
| 3. CADO | -- | -- | -- | -- |
| 4. Data General | 1 | 0.9 | 89 | 74.2 |
| 5. IBM | 8 | 7.1 | 12 | 10 |
| 6. Tandem | -- | -- | -- | -- |
| 7. Health Data Science (HDS) | 9 | 8.0 | -- | -- |
| 8. Don't know | 19 | 17.0 | 11 | 9.2 |
| 9. Other, specify | 12 | 10.7 | 6 | 5.0 |
| Responses | 112 | | 120 | |

74.2% of the respondents at CVH reported that the make of computer they have used or do use is the Data General system. 56.3% of the respondents at TWH reported they had never used a computer system.

III.2 What has been or is the name of the software used on the computer?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Beothuk | 1 | 1.7 | -- | -- |
| 2. Meditech | -- | -- | 61 | 58.1 |
| 3. Office Concepts Administrative Resident Care | -- | -- | -- | -- |
| 4. Patient Care System (DHIS) | 2 | 3.3 | 2 | 1.9 |
| 5. PROMIS | -- | -- | -- | -- |
| 6. Technicon | -- | -- | -- | -- |
| 7. Health Data Science (HDS) | 10 | 16.7 | -- | -- |
| 8. Don't know | 38 | 63.3 | 32 | 30.5 |
| 9. Other, specify | 9 | 15.0 | 10 | 9.5 |
| Responses | 60 | | 105 | |

58% of the respondents at CVH reported that the name of the software used on the computer is called Meditech and 29.4% said they didn't know.

III.3 Were you involved in the system design/development?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Before the system was chosen | 5 | 23.8 | -- | -- |
| 2. Assessing computer needs for nursing use | 2 | 9.5 | 3 | 17.6 |
| 3. Designing/developing nursing applications | 7 | 33.3 | 4 | 23.5 |
| 4. Implementing the system as a trainer or evaluator | 2 | 9.5 | 5 | 29.4 |
| 5. Evaluating the system (quality control) | 3 | 14.3 | 4 | 23.5 |
| 6. Other, specify | 2 | 9.5 | 1 | 5.9 |
| | Responses 21 | | 17 | |

0% of the respondents at CVH claimed they were involved before the system was chosen; 17.6% of the respondants (N = 3 of 17) were involved assessing the computer needs for nursing use; 23.5% (N = 4 of 17) reported having been involved in designing/developing nursing applications;29.4% (N = 5 of 17) reported being involved in implementing the system as trainer/evaluator; and 23.5% (N = 4 of 17) in evaluating the system or in quality control. At TWH 23.8% (N = 5 of 21) of the respondents reported being involved in the system development before the system was chosen; 9.5% (N = 2 of 21) in assessing computer needs for nursing use; 33.3% (N = 7 of 21) in designing/development nursing applications; 9.5% (N = 2 of 21) in looking at implementing the system as trainer/evaluators; 14.3% (N = 3 of 21) at evaluating the system and for quality control.

III.4 How long has the computer system been in in use in *your* nursing unit?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. No computer to use in my nursing unit | 91 | 79.1 | -- | -- |
| 2. Less than one month | 1 | 0.9 | -- | -- |
| 3. 2-6 months | 3 | 2.6 | -- | -- |
| 4. 7-12 months | 1 | 0.9 | -- | -- |
| 5. 1-2 years | 5 | 4.3 | 13 | 11.9 |
| 6. 2-3 years | 5 | 4.3 | 93 | 85.3 |
| 7. 3-5 years | -- | -- | 1 | 0.9 |
| 8. More than 5 years | -- | -- | -- | -- |
| 9. Don't know | 1 | 0.9 | 2 | 1.8 |

11.9% of the respondents at CVH reported that the system had been in use in their nursing unit for 1-2 years; 85.3% reported 2-3 years; whereas 79.1% of the respondents at TWH reported that they had no computer in their nursing unit.

III.5 How long have you been using the computer in your nursing unit?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. No computer in unit | 92.0 | 80.0 | -- | -- |
| 2. Less than one month | -- | -- | -- | -- |
| 3. 2-6 months | 2 | 1.7 | 5 | 4. 6 |
| 4. 7-12 months | 1 | 0.9 | 9 | 8.3 |
| 5. 1-2 years | 3 | 2.6 | 32 | 29.4 |
| 6. 2-3 years | 5 | 4.3 | 60 | 55.0 |
| 7. 3-5 years | -- | -- | 2 | 1.8 |
| 8. More than 5 years | -- | -- | -- | -- |

80% of the respondents at TWH reported no computer in their nursing unit; 1.7%

reported using a computer for 2-6 months; 0.9% reported 7-12 months; 2.6% - 1-2 years; 4.3% 2-3 years. At CVH 4.5% reported they had been using a computer in their nursing unit for 2-6 months; 8.3% reported 7-12 months experience; 29.4% reported 1-2 years use and 55% reported 2-3 years; 1.8% reported 3-5 years use with computers in their unit.

III.6 How long have you used a computer as a nurse?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Never used a computer as a nurse | 89 | 77.4 | 4 | 3.7 |
| 2. Less than 1 month | 2 | 1.7 | -- | -- |
| 3. 2-6 months | 3 | 2.6 | 2 | 1.8 |
| 4. 7-12 months | 3 | 2.6 | 7 | 6.4 |
| 5. 1-2 years | 6 | 5.2 | 25 | 22.9 |
| 6. 2-3 years | 5 | 4.3 | 58 | 53.2 |
| 7. 3-5 years | 3 | 2.6 | 9 | 8.3 |
| 8. more than 5 years | 1 | 0.9 | 2 | 1.8 |

77.4% of respondents at TWH reported never having used a computer as a nurse. Whereas 3.7% of the respondents at CVH reported never having used a computer as a nurse. 22.9% have used the computer 1-2 years and 53.2% 2-3 years at CVH.

III.7 How frequently did/do you use the computer on the average in a work week period?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. 0 times/week | 86 | 74.8 | -- | -- |
| 2. 1-3 times/week | 5 | 4.3 | 3 | 2.8 |
| 3. 4-6 times/week | 2 | 1.7 | 6 | 5.5 |
| 4. 7-10 times/week | 4 | 3.5 | 6 | 5.5 |
| 5. More than 10 times/week | 5 | 4.3 | 82 | 75.2 |
| 6. Other, specify | 5 | 4.3 | 10 | 9.2 |

75.2% of the respondents reported using the computer more than 10 times per work week at CVH. 2.8% reported a use of 1-3 times/week; 5.5% 4-6 times and 5.5% 7-10 times use of the computer per week. 18% of the respondents at TWH report using a computer.

III.8 Did/Do you get the information you need to do your job from the system?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Always | 4 | 3.5 | 21 | 19.3 |
| 2. Usually | 14 | 12.2 | 75 | 68.8 |
| 3. Occasionally | 5 | 4.3 | 8 | 7.3 |
| 4. Never | 45 | 39.1 | 3 | 2.8 |

19.3% of the respondents from CVH reported they always got the information they needed to do their job from the system. 68.8% reported they usually got the information they needed, 7.3% said occasionally and 2.8% said never.

III.9 How many terminals did/do you have in your nursing unit that are used by nurses?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. None | 88 | 76.5 | -- | -- |
| 2. One | 11 | 9.6 | 3 | 2.8 |
| 3. Two | 1 | 0.9 | 95 | 87.2 |
| 4. More than two | 5 | 4.3 | 11 | 10.1 |

87.2% of the respondents at CVH reported having 2 terminals in the nursing unit used by nurses; 76.5% of respondents at TWH reported having none.

III.10 Where were/are these terminals located? (Check all that apply)

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. None | 86 | 77.5 | -- | -- |
| 2. At nurses's station | 10 | 9.0 | 109 | 90.8 |
| 3. At the patient's bedside | 5 | 4.5 | -- | -- |
| 4. In the nursing administrator's office | -- | -- | 1 | 0.8 |
| 5. In critical care areas | 2 | 1.8 | 1 | 0.8 |
| 6. They were/are portable | -- | -- | -- | -- |
| 7. Other, specify | 8 | 7.2 | 9 | 7.5 |
| | Responses 111 | | 120 | |

The terminals at CVH are reported to be at the nursing station by 91% of the respondents.

III.11 Who were/are/is the most frequent user(s) of the system? (Check all that apply)

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. No one | 79 | 69.9 | -- | -- |
| 2. Staff nurse(s) | 14 | 12.4 | 65 | 31.0 |
| 3. Head nurse/team leader | 6 | 5.3 | 29 | 13.8 |
| 4. Ward clerk/unit co-ordinator | 7 | 6.2 | 92 | 43.8 |
| 5. Doctor(s) | 3 | 2.7 | 19 | 9.0 |
| 6. Other, specify | 4 | 3.5 | 5 | 2.4 |
| Responses | 113 | | 210 | |

31% of the respondents at CVH reported the staff nurses to be most frequent users of the system. 14% claimed it was the Head Nurse/team leader; 44% claimed it was the ward clerk; 9% reported it to be the doctors. At TWH 70% said 'no one' was using the system. 12% said it was staff nurses; 5% reported that it was Head Nurses/team leader; 6% said it was the ward clerk and 3% claimed it was the doctors.

III.12 What mechanism(s) for entering data were/are available to you on the computer system?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Light pen | 1 | 2.4 | 1 | 0.9 |
| 2. Keyboard | 24 | 57.1 | 108 | 99.1 |
| 3. Other, specify | 17 | 40.5 | -- | -- |
| Responses | 42 | | | |

99.1% at CVH said the keyboard was the mechanism available for entering data.

III.13 What was/is the primary mechanism(s) that you use(d) for entering data?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Light pen | 2 | 5.4 | -- | -- |
| 2. Keyboard | 21 | 56.8 | 107 | 98.2 |
| 3. Other, specify | 14 | 37.8 | 1 | 0.9 |
| Responses | 37 | | | |

98.2% of the respondents at CVH reported they used the keyboard as the primary mechanism to enter data into the system.

III.14 How often did/does the "response time" cause you a problem with doing your job?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Always | -- | -- | 2 | 1.8 |
| 2. Usually | 2 | 1.7 | 1 | 0.9 |
| 3. Occasionally | 9 | 7.8 | 78 | 71.6 |
| 4. Never | 28 | 24.3 | 26 | 23.9 |

71.6% of the respondents at CVH claimed that occasionally the response time caused them a problem with doing their job.

III.15 Did/Does the computer "down-time" seriously affect your ability to do your job?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. Always | 4 | 3.5 | 12 | 11.0 |
| 2. Usually | 1 | 0.9 | 14 | 12.8 |
| 3. Occasionally | 9 | 7.8 | 58 | 53.2 |
| 4. Never | 27 | 23.5 | 24 | 22.0 |

The down time was reported at CVH as seriously affecting the ability to do the job by 11% of the respondents; 12.8% said it was 'usually' a problem; 53.2% claimed it occasionally affected their ability to do their job and 22% said it was 'never' a problem.

III.16 What was/is the *scheduled* "down time" each day.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. None | 21 | 18.3 | 33 | 30.3 |
| 2. 2 hours or less | 4 | 3.5 | 48 | 44.0 |
| 3. More than 2 hours | -- | -- | 1 | 0.9 |
| 4. Don't know | 16 | 13.9 | 20 | 18.3 |
| 5. Other, specify | 5 | 4.3 | 6 | 5.5 |

At CVH 30.3% of the respondents reported that there was no scheduled "down time" each day; 44% claimed it to be 2 hours or less; 18.3% said they didn't know.

III.17 How frequently did/does unscheduled "down time" occur on the average in a work week period?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. 0 times/week | 32 | 27.8 | 34 | 31.2 |
| 2. 1-2 times/week | 3 | 2.6 | 64 | 58.7 |
| 3. 3-4 times/week | 2 | 1.7 | 1 | 0.9 |
| 4. 5-6 times/week | 1 | 0.9 | 3 | 2.8 |
| 5. More than 6 times/week | -- | -- | 4 | 3.7 |

31.2% of the respondents at CVH claimed there was no unscheduled "down time" in a work week period - 58.7% claimed it was 1-2 times/week.

III.18 What type(s) of back-up system(s) did/do you use when the computer system is down? (Check as many as apply.)

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. A second computer | 1 | 2.1 | 2 | 1.2 |
| 2. A manual system | 4 | 8.3 | 17 | 10.4 |
| 3. Special forms/paperwork | 4 | 8.3 | 85 | 51.8 |
| 4. The telephone system | 5 | 10.4 | 52 | 31.7 |
| 5. Charts | 6 | 12.5 | 4 | 2.4 |
| 6. None | 23 | 47.9 | 3 | 1.8 |
| 7. Other, specify | 5 | 10.4 | 1 | 0.6 |
| Responses | 48 | | 164 | |

52% of the respondents at CVH claimed they used special forms/paper work and 32% said they used the telephone system when their computer system was down.

III.19 What type(s) of assistance were/are available to you on an ongoing basis? (Check as many as apply.)

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 1. On line HELP | 4 | 3.5 | 41 | 9.2 |
| 2. Data processing personnel | 5 | 4.4 | 51 | 11.5 |
| 3. System co-ordinator nurse(s) | 6 | 5.2 | 23 | 5.2 |
| 4. Continuing education personnel | 1 | 0.9 | 21 | 4.7 |
| 5. Nursing administration personnel | 3 | 2.6 | 23 | 5.2 |
| 6. Peers (other nurses) | 12 | 10.4 | 86 | 19.4 |
| 7. Ward clerk (unit co-ordinator) | 6 | 5.2 | 84 | 18.9 |
| 8. A training manual (printed material) | 9 | 7.8 | 87 | 19.6 |
| 9. Hot line telephone number to call | 3 | 2.7 | 24 | 5.4 |
| 10. No assistance available on an ongoing basis | 9 | 7.8 | -- | -- |

| | | | | |
|---|---|---|---|---|
| 11. Other, specify | 9 | 7.9 | 4 | 0.9 |
| | Responses 67 | | Responses 444 | |

At CVH all respondents felt there was some help available; 78.9% of the responses indicated that peers were the most frequent/available assistance for/among nurses.

III.20 For which of the following application(s) did/do you use a computer in your job? Check as many as apply. Indicate the number of hours of training that you have had for each application.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| A1 Admission/transfer/discharge | 11 | 9.6 | 96 | 88.1 |
| A2 On the job | 3 | 2.6 | 19 | 17.4 |
| A3 Formal training | 2 | 1.7 | 15 | 13.8 |

When asked "for which of the following applications did/do you use a computer in your job?" the respondents replied in the following way at CVH - 88.1% reported having had training for admission/trasnfer/discharge applications; 17.4% reported this training on the job; 13.8% reported their training was formal.

| | | | | |
|---|---|---|---|---|
| B1 Chart locator | 1 | 0.9 | 13 | 11.9 |
| B2 On the job | -- | -- | 4 | 3.7 |
| B3 Formal training | -- | -- | 2 | 1.8 |

Approximately 11.9% of the respondents reported having training at CVH for the chart locator application which identifies the location of a chart. 11.9% reported having had this training; 3.7% on the job; 1.8% in formal training at CVH. No training for this application was reported at TWH.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| III.20 | | | | |
| C1Critical care monitoring | 10 | 8.7 | 2 | 1.8 |
| C2 On the job | 5 | 4.3 | 2 | 1.8 |
| C3 Formal training | 4 | 3.5 | 2 | 1.8 |

For the critical care monitoring application 1.8% of the respondents reported having had training; 1.8% on the job and 1.8% formally at CVH. At TWH 8.7% of the respondents reported having had this training; 4.3% on the job and 3.5% formally.

| | | | | |
|---|---|---|---|---|
| D1 Dietary orders/information | 5 | 4.3 | 90 | 82.6 |
| D2 On the job | 1 | 0.9 | 16 | 14.7 |
| D3 Formal training | -- | -- | 12 | 11.0 |

For the dietary orders/information application 82.6% of the respondents at CVH reported this training; 14.7% on the job and 11% formally. At TWH 4.3% of the respondents reported training for this application.

| | | | | |
|---|---|---|---|---|
| E1 Drug orders | 4 | 3.5 | 18 | 16.5 |
| E2 On the job | 1 | 0.9 | 5 | 4.6 |
| E3 Formal Training | -- | -- | 7 | 6.4 |

For the drug order application at CVH - 16.5% of the respondents reported having this training; 4.6% on the job and 6.4% formal training. At TWH 3.5% of the respondents reported training with this application.

| | | | | |
|---|---|---|---|---|
| F1 Drug administration | 1 | 0.9 | 5 | 4.6 |
| F2 On the job | -- | -- | 2 | 1.8 |
| F3 Formal training | -- | -- | 2 | 1.8 |

For the drug administration application at CVH 4.6% of the respondents reported having had this training; 1.8 on the job and 1.8 formally. At TWH no training was reported for this application.

| | | | | |
|---|---|---|---|---|
| G1 Drug charting | 2 | 1.7 | 104 | 95.4 |
| G2 On the job | -- | -- | 1 | 0.9 |
| G3 Formal training | 1 | 0.9 | 2 | 1.8 |

For the drug charting application at CVH 95.4% of the respondents reported having training; 0.9% on the job and 1.8% formally. At TWH 2.6% of the respondents reported training with this application.

| | | | | |
|---|---|---|---|---|
| H1 EKG orders | 1 | 0.9 | 86 | 78.9 |
| H2 On the job | -- | -- | 17 | 15.6 |
| H3 Formal training | -- | -- | 14 | 12.8 |

For EKG order application at CVH 17.8% of the respondents reported having training, 15.6% on the job and 12.8% formally. At TWH no training was reported for this application.

| | | | | |
|---|---|---|---|---|
| I1 EKG reports | 3 | 2.6 | 35 | 32.1 |
| I2 On the job | -- | -- | 10 | 9.2 |
| I3 Formal training | -- | -- | 7 | 6.4 |

For the EKG reports applicaiton at CVH 32.1% of the respondents reported having training; 9.2% on the job and 6.4% formally. At TWH 2.6% of the respondents reported training with this application.

| | | | | |
|---|---|---|---|---|
| J1 Inventory control, ordering (CSR) | 4 | 3.5 | 4 | 3.7 |
| J2 On the job | -- | -- | 1 | 0.9 |
| J3 Formal training | -- | -- | 1 | 0.9 |

For the inventory control/ordering (CSR) at CVH 3.7% of the respondents reported training; 0.9% on the job and 0.9% formally. At TWH 3.5% of the respondents reported training with this application.

| | | | | |
|---|---|---|---|---|
| K1 Lab orders | 3 | 2.6 | 100 | 91.7 |
| K2 On the job | -- | -- | 21 | 19.3 |
| K3 Formal training | 1 | 0.9 | 22 | 20.2 |

For the lab orders applications at CVH 91.7% of the respondents reported training; 19.3% on the job and 20.2% formally. At TWH 3.5% of the respondents reported training with this application.

| | | | | |
|---|---|---|---|---|
| L1 Lab reports | 4 | 3.5 | 97 | 89.0 |
| L2 On the job | -- | -- | 19 | 17.4 |
| L3 Formal training | 1 | 0.9 | 21 | 19.3 |

For the lab reports application, 89% at CVH reported training; 17.4% on the job and 19.3% formally. At TWH there was no reported training for this application.

| | | | | |
|---|---|---|---|---|
| M1 Message system between departments | 3 | 2.6 | 95 | 87.2 |
| M2 On the job | -- | -- | 14 | 12.8 |
| M3 Formal training | -- | -- | 95 | 87.2 |

For the message system between departments application, at CVH 87.2% of the respondents reported training; 12.8% on the job and 11.9% formally. At TWH 3.5% of the respondents reported training for the application.

| | | | | |
|---|---|---|---|---|
| N1 Nurses' progress notes (charting) | 1 | 0.9 | 4 | 3.7 |
| N2 On the job | -- | -- | 3 | 2.8 |
| N3 | -- | -- | 2 | 1.8 |

For the nurses progress notes (charting) at CVH 3.7% of the respondents reported training; 2.8% on the job and 1.8% formally. At TWH there was no reported training for this application.

| | | | | |
|---|---|---|---|---|
| O1 Problem oriented format | -- | -- | 3 | 2.8 |
| O2 On the job | -- | -- | 3 | 2.8 |
| O3 Formal training | -- | -- | 2 | 1.8 |

For the problem oriented charting application at CVH 2.8% of the respondents reported training; 2.8% on the job and 1.8% formally. At TWH, there was no reported training for this application.

| | | | | |
|---|---|---|---|---|
| P1 Narrative format | 1 | 0.9 | 1 | 0.9 |
| P2 On the job | -- | -- | 1 | 0.9 |
| P3 Formal training | -- | -- | 1 | 0.9 |

For the narrative charting application at CVH 0.9% of the respondents reported training; 0.9% on the job and 0.9% formal training with no training reported at TWH.

| | | | | |
|---|---|---|---|---|
| Q1 Other, please specify | 1 | 0.9 | 1 | 0.9 |
| Q2 On the job | -- | -- | 1 | 0.9 |
| Q3 Formal training | -- | -- | 1 | 0.9 |

For other formats of charting at CVH 1.8% reported training; 1.8% on the job and 1.8% formally. There was no reported training for this application at TWH.

| | | | | |
|---|---|---|---|---|
| S1 Patient care plans | 3 | 2.6 | 2 | 1.8 |
| S2 On the job training | 1 | 0.9 | 1 | 0.9 |
| S3 Formal training | 2 | 1.8 | -- | -- |

For patient care plans at CVH 1.8% of the respondents reported training; 0.9% on the job and 0% formally. At TWH 2.6% of the respondents reported training for patient care plans; 0.9% on the job and 1.8% formally.

| | | | | |
|---|---|---|---|---|
| T1 Patient locator (identifies room # of patient) | 5 | 4.3 | 45 | 41.3 |
| T2 On the job training | 2 | 1.8 | 7 | 5.5 |
| T3 Formal training | -- | -- | 3 | 2.8 |

For the patient locator application which identifies the room number of the patient, at CVH 41.3% of the respondents reported training; 5.5% on the job and 2.8% formally. At TWH 6.1% of the respondents reported training.

| | | | | |
|---|---|---|---|---|
| U1 Patient profile | 4 | 3.5 | 71 | 65.1 |
| U2 On the job training | 1 | 0.9 | 6 | 5.5 |
| U3 Formal training | -- | -- | 5 | 4.6 |

For the patient profile application at CVH 65.1% of the respondents reported training; 5.5% on the job and 4.6% formally. At TWH 4.6% of the respondents reported training.

| | | | | |
|---|---|---|---|---|
| V1 Demographic data | 4 | 3.5 | 83 | 76.1 |
| V2 On the job training | -- | -- | 11 | 10.1 |
| V3 Formal training | 1 | 0.9 | 12 | 11.0 |

For the demographic data application at CVH 76.1% of the respondents reported training; 10.1% on the job and 11.0% formally. At TWH, 3.5% of the respondents reported training.

| | | | | |
|---|---|---|---|---|
| W1 Nursing information (Kardex) | 3 | 2.6 | 6 | 5.5 |
| W2 On the job training | 1 | 0.9 | 3 | 2.8 |
| W3 Formal training | 2 | 1.8 | 3 | 2.8 |

For the nursing information (Kardex) application, at CVH; 5.5% reported training - 2.8% on the job and 2.8% formally. At TWH, 5.3% of the respondents reported training.

| | | | | |
|---|---|---|---|---|
| X1 Other, please specify | -- | -- | 1 | 0.9 |
| X2 On the job training | -- | -- | 1 | 0.9 |
| X3 Formal training | -- | -- | 1 | 0.9 |

An 'other' category was provided to address applications which were not listed which might have been included in training either on the job or formally and 0.9% of the respondents responded that they had had training; 0.9% on the job and 0.9% formally at CVH. No additional data was provided at TWH.

| | | | | |
|---|---|---|---|---|
| Y1 Patient teaching | 1 | 0.9 | 3 | 2.8 |
| Y2 On the job training | -- | -- | 1 | 0.9 |
| Y3 Formal training | -- | -- | 1 | 0.9 |

For the patient teaching application at CVH 2.8% of the respondents reported training; 0.9% on the job and 0.9% formally at CVH. At TWH no reported training.

| | | | | |
|---|---|---|---|---|
| Z1 Procedure manual | 1 | 0.9 | 2 | 1.8 |
| Z2 On the job training | 1 | 0.9 | 1 | 0.9 |
| Z3 Formal training | 1 | 0.9 | 1 | 0.9 |

For the procedure manual application (protocols) 1.8% of the respondents reported training; 0.9% on the job and 0.9% formally at CVH. There are several cases of nurses at TWH who report training for this application.

| | | | | |
|---|---|---|---|---|
| AA1 List of preparations | 2 | 1.7 | 3 | 2.8 |
| AA2 On the job training | 1 | 0.9 | 1 | 0.9 |
| AA3 Formal training | 1 | 0.9 | 1 | 0.9 |

For the list of preparations at CVH, 2.8% of the respondents reported training; 0.9% on the job and 0.9% formally. At TWH, 3.5% of the respondents reported training with this application.

| | | | | |
|---|---|---|---|---|
| AB1 Other, please specify | -- | -- | 1 | 0.9 |
| AB2 On the job training | -- | -- | 1 | 0.9 |
| AB3 Formal training | -- | -- | 2 | 1.8 |

Another 'other' category was left open to respondents - 0% chose this option at TWH and 0.9% chose this at CVH.

| | | | | |
|---|---|---|---|---|
| AC1 Quality assurance | 2 | 1.7 | 2 | 1.8 |
| AC2 On the job training | 1 | 0.9 | 1 | 0.9 |
| AC3 Formal training | -- | -- | -- | -- |

For the quality assurance application at CVH 1.8% reported training; 0.9% on the job and 0% formally. At TWH, 2.6% of the repondents reported training with this application.

| | | | | |
|---|---|---|---|---|
| AD1 Radiology orders | 3 | 2.6 | 88 | 80.7 |
| AD2 On the job training | 1 | 0.9 | 12 | 11.0 |
| AD3 | 1 | 0.9 | 11 | 10.1 |

For the radiology orders application 80.7% reported training; 11% on the job and 10% formally at CVH. At TWH 4.4% of the respondants reported training with the application.

| | | | | |
|---|---|---|---|---|
| AE1 Radiology reports | 3 | 2.6 | 89 | 81.7 |
| AE2 On the job training | -- | -- | 12 | 11.0 |
| AE3 | 1 | 0.9 | 11 | 10.1 |

For the radiology reports application at CVH 81.7% of the respondents reported training; 11% on the job and 10.1% formally. At TWH 3.5% of the respondents reported training with this application.

| | | | | |
|---|---|---|---|---|
| AF1 Respiratory orders | 1 | 0.9 | 67 | 61.5 |
| AF2 On the job training | -- | -- | 8 | 7.3 |
| AF3 Formal training | -- | -- | 7 | 6.4 |

For the respiratory orders application 61.5% of the respondents reported training; 7.3% on the job and 6.4% formally at CVH. At TWH, there was no reported training for this application.

| | | | | |
|---|---|---|---|---|
| AG1 Respiratory reports | 1 | 0.9 | 47 | 43.1 |
| AG2 On the job training | -- | -- | 7 | 6.4 |
| AG3 Formal training | -- | -- | 5 | 4.6 |

For the respiratory reports application 43.1% of the respondents reported training; 6.4% on the job and 4.6% formally at CVH. At TWH there was no reported training for this application.

| | | | | |
|---|---|---|---|---|
| AH1 Statistics | 4 | 3.5 | 22 | 20.2 |
| AH2 On the job training | 2 | 1.8 | 3 | 2.8 |
| AH3 Formal training | 2 | 1.8 | 2 | 1.8 |

For the statistics application, 20.2% of the respondents reported training, 2.8% on the job and 1.8 formally at CVH. At TWH 7.1% of the respondents reported training with this application.

| | | | | |
|---|---|---|---|---|
| AI1 Other, please specify | 10 | 8.7 | 15 | 13.8 |
| AI2 On the job training | 1 | 0.9 | 4 | 3.7 |
| AI3 Formal training | -- | -- | 5 | 4.6 |

There was another 'other' category provided. At CVH 13.8% reported training; 3.7% on the job and 4.6% formally. At TWH, 8.7% of the respondents reported 'other' training, 0.9% on the job.

Since TWH has not as yet implemented a training program for their staff, it is interesting to note the responses made by a small % of the reporting population as to which applications had been used.

Following is a table with percentages reported for each application at TWH and CVH.

III.20 Composite Table for Toronto Western and Credit Valley Hospitals

| | Training | | On the Job | | Formal | |
|---|---|---|---|---|---|---|
| Application | CVH | TWH | CVH | TWH | CVH | TWH |
| Admission/transfer/discharge (A1.2.3) | 88.1 | 9.6 | 17.4 | 2.6 | 13.8 | 1.7 |
| Chart locator (B.1.2.3) | 11.9 | 0.9 | 3.7 | -- | 1.8 | -- |
| Critical care monitoring (C 1.2.3) | 1.8 | 8.7 | 1.8 | 4.3 | 1.8 | 3.5 |
| Dietary orders/information (D 1.2.3) | 82.6 | 4.3 | 14.7 | 0.9 | 11.0 | -- |
| Drug orders (E 1.2.3) | 16.5 | 3.5 | 4.6 | 0.9 | 6.4 | -- |
| Drug administration (F 1.2.3) | 4.6 | 0.9 | 1.8 | -- | 1.8 | -- |
| Drug charting (G 1.2.3) | 4.6 | 1.7 | 0.9 | -- | 1.8 | 1.9 |
| EKG orders (H 1.2.3) | 78.9 | 0.9 | 15.6 | -- | 12.8 | -- |
| EKG reports (I 1.2.3) | 32.1 | 2.6 | 9.2 | -- | 6.4 | -- |
| Inventory control, ordering (CSR) (J 1.2.3) | 3.7 | 3.5 | 0.9 | -- | 0.9 | -- |

I.20 (cont'd.)

| | Training | | On the Job | | Formal | |
|---|---|---|---|---|---|---|
| Application | CVH | TWH | CVH | TWH | CVH | TWH |
| Lab orders (K 1.2.3) | 91.7 | 2.6 | 19.3 | -- | 20.2 | 0.9 |
| Lab reports (L 1.2.3) | 89.0 | 3.5 | 17.4 | -- | 19.3 | 0.9 |
| Message system between depts. (M 1.2.3) | 87.2 | 2.6 | 12.8 | -- | 11.9 | 0.9 |
| Nurses' progress notes (charting) (N1.2.3) | 3.7 | 0.9 | 2.8 | -- | 1.8 | -- |
| Problem oriented format (O 1.2.3) | 2.8 | -- | 2.8 | -- | 1.8 | -- |
| Narrative format (P 1.2.3) | 0.9 | 0.9 | 0.9 | -- | 0.9 | -- |
| Other, please specify (Q 1.2.3) | 0.9 | 0.9 | 0.9 | -- | 0.9 | -- |
| Other, please specify (R 1.2.3) | 0.9 | 0.9 | 0.9 | -- | 0.9 | -- |
| Patient care plans (S 1.2.3) | 1.8 | 2.6 | 0.9 | 0.9 | -- | 1.8 |
| Patient locator (T 1.2.3) | 41.3 | 4.3 | 5.5 | 1.8 | 2.8 | -- |
| Patient profile (U 1.2.3) | 65.1 | 3.5 | 5.5 | 0.9 | 4.6 | -- |
| Demographic data (V 1.2.3) | 76.1 | 3.5 | 10.1 | -- | 11.0 | 0.9 |
| Nursing information (Kardex) (W 1.2.3) | 5.5 | 2.6 | 2.8 | 0.9 | 2.8 | 1.8 |
| Other, please specify (X 1.2.3) | 0.9 | -- | 0.9 | -- | 0.9 | -- |
| Patient teaching (Y 1.2.3) | 2.8 | 0.9 | 0.9 | -- | -- | -- |
| Procedure manual (Z 1.2.3) | 1.8 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| List of preparations (AA 1.2.3) | 2.8 | 1.7 | 0.9 | 0.9 | 0.9 | 0.9 |
| Other (AB 1.2.3) | 0.9 | -- | 0.9 | -- | 1.8 | -- |
| Quality assurance (AC 1.2.3) | 1.8 | 1.7 | 0.9 | 0.9 | -- | -- |
| Radiology orders (AD 1.2.3) | 80.7 | 2.6 | 11.0 | 0.9 | 10.1 | 0.9 |
| Radiology reports (AE 1.2.3) | 81.7 | 2.6 | 11.0 | -- | 10.1 | -- |
| Respiratory orders (AF 1.2.3) | 61.5 | 0.9 | 7.3 | -- | 6.4 | -- |
| Respiratory reports( AG 1.2.3) | 43.1 | 0.9 | 6.4 | -- | 4.6 | -- |
| Statistics (AH 1.2.3) | 20.2 | 3.5 | 2.8 | 1.8 | 1.8 | 1.8 |
| Other (AI 1.2.3) | 13.8 | 8.7 | 3.7 | 0.9 | 4.6 | -- |

3.21 Rank 'possible' computer applications in their order of importance to you. "1" is the most important. You need not rank all items.

| | Credit Valley | | Toronto Western | |
|---|---|---|---|---|
| | Responses | % | Responses | % |
| Admission/trsfer/discharge (A 1.2.3) | 144 | 14.9 | 117 | 14.9 |
| Chart locator (B 1.2.3) | 105 | 10.9 | 66 | 8.4 |
| Critical care monitoring (C 1.2.3) | 100 | 10.4 | 59 | 7.5 |
| Dietary orders/information (D 1.2.3) | 95 | 9.9 | 64 | 8.2 |
| Drug orders (E 1.2.3) | 91 | 9.4 | 55 | 7.0 |
| Drug administration(F 1.2.3) | 76 | 7.9 | 47 | 6.0 |
| Drug charting (G 1.2.3) | 66 | 6.8 | 47 | 6.0 |
| EKG orders (H 1.2.3) | 55 | 5.7 | 50 | 5.1 |
| EKG reports (I 1.2.3) | 49 | 5.1 | 36 | 4.9 |
| Inventory control, ordering (CSR) (J 1.2.3) | 37 | 3.8 | 31 | 3.9 |
| Lab orders (K 1.2.3) | 27 | 2.8 | 28 | 3.6 |
| Lab reports (L. 1.2.3) | 23 | 2.4 | 21 | 2.7 |
| Message system between depts. (M 1.2.3) | 16 | 1.7 | 22 | 2.8 |
| Nurses' progress notes (charting) (N 1.2.3) | 12 | 1.2 | 16 | 2.0 |
| Patient care plans (S 1.2.3) | 11 | 1.1 | 20 | 2.5 |
| Patient locator (T 1.2.3) | 11 | 1.1 | 18 | 2.3 |
| Patient profile (U 1.2.3) | 9 | 0.9 | 17 | 2.2 |
| Patient teaching (V 1.2.3) | 7 | 0.7 | 17 | 2.0 |
| Quality assurance (AC 1.2.3) | 7 | 0.7 | 14 | 1.8 |
| Radiology orders (AD 1.2.3) | 5 | 0.5 | 13 | 1.7 |
| Radiology reports (AE 1.2.3) | 5 | 0.5 | 14 | 1.8 |
| Respiratory orders (AF 1.2.3) | 5 | 0.5 | 12 | 1.5 |
| Respirtory reports (AG 1.2.3) | 3 | 0.3 | 9 | 1.1 |
| Statistics (AH 1.2.3) | 2 | 0.2 | 3 | 0.3 |
| Other (AI 1.2.3) | 2 | 0.2 | -- | -- |
| Responses | 964 | | 785 | |

**3.22 Which application(s) would you like/not like to learn about?**

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| | 36 | 31.3 | 38 | 34.9 |

**At CVH 34.9% of the nurses responded to the question ; 31.3% responded at TWH.**

3.22 Summary of Comments from TWH —

Which applications would you like/not like to learn about?

- all of 3.21 x 11
- quality assurance x 2
- progress notes x 2
- MIS
- statistics x 2
- all aspects regarding nursing/patient care x 5
- applications which relate to nursing role
- message system between departments
- patient teaching
- all the components of computer applications for nurses
- practical applications
- sensory dermatomes for spinal cord patients, doctor's orders
- on the job training (If I have to!)
- I would like to learn how to operate a computer
- patient care plans x 4
- inventory conrol would be helpful to cardiac catheter lab
- lab reports
- admission/discharge/transfer
- appointment (ambulatory services)

3.22 Summary of comments from CVH —

Which applications would you like/not like to learn about?

- patient care plans x 11
- quality assurance x 4
- what ever applications apply to patient care x 3
- entering drug orders x 5
- critical care monitoring x 3
- statistics x 9
- word processing x 4
- progress notes x 11
- grasp staffing module
- patient teaching x 8
- bedside computers
- inventory control x 4
- patient profile x 2
- I don't like computers
- The qualitative data from CVH has a more concentrated focus on nursing/patient care application than the comments from TWH.

3.23 If changes were to be made to the patient information management system in your nursing unit, which of the following would you recommend. Rank changes in order of importance to you. Number "1" as the most important. You need not rank all items.

| | Credit Valley | | Toronto Western | |
|---|---|---|---|---|
| | Responses | % | Responses | % |
| TrainingpProgram | 111 | 35.8 | 44 | 22.9 |
| Availability of support/assistance | 66 | 21.3 | 26 | 13.5 |
| Number of terminals | 46 | 14.8 | 23 | 11.8 |
| Location of Terminals | 30 | 9.7 | 20 | 10.4 |
| Mechanism of entering data | 23 | 7.4 | 17 | 8.9 |
| Response time of the computer | 13 | 4.2 | 13 | 6.8 |
| Mechanism for retrieving data | 7 | 2.3 | 10 | 5.2 |
| Down time | 4 | 1.3 | 8 | 4.2 |
| Security measures (privacy rights) | 3 | 1.0 | 6 | 3.1 |
| Applications for nurses | 4 | 1.3 | 4 | 2.1 |
| Nursing model | 1 | 0.3 | 2 | 1.0 |
| Networking with colleagues | 1 | 0.3 | 2 | 1.0 |
| Clerical coverage | -- | -- | 2 | 1.0 |
| Accuracy of patient information | -- | -- | 1 | 0.5 |
| Complexity of the system | -- | -- | 1 | 0.5 |
| No change | 1 | 0.3 | -- | -- |
| Remove the computer | -- | -- | -- | -- |
| Other - specify | -- | -- | 13 | 6.8 |
| Responses | 310 | | 192 | |

3.23 Summary of Comments from CVH

Rank changes in order of importance to you

Number of terminals x 38
Application for nurses x 25
Training program x 22
Security issues x 21
Mechanisms for entering and retrieving data x 19

Location of terminals x 18
No changes x 15
Nursing model x 12
Clerical coverage x 9
Down time x 8
Networking with colleagues x 8
Accuracy of patient information x 8
Complexity of the system x 6

Administration at CVH reported that a third terminal would be available on the units shortly

Summary of Comments from TWH
- Method of project management
- our system has not progressed enough as yet to identify useful changes

3.24 Did/do you feel you can influence change(s) to the computer system?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Always | 5 | 4.3 | 1 | 0.9 |
| Usually | 6 | 5.2 | 9 | 8.9 |
| Occasionally | 18 | 15.7 | 42 | 41.6 |
| Never | 19 | 16.5 | 48 | 47.5 |
| Other, specify | 13 | 11.3 | 1 | 0.9 |
| Responses | | | 101 | |

At CVH 47.5% of the respondents reported they felt they could "never" influence changes to the computer system. 41.6% reported they "occasionally" felt they could influence changes to the computer system. 0.9% said always and 8.9% said usually.

III.25$_a$ What type(s) of information could/can you access from the computer system?
Information about

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| your patient(s) | 24 | 43.6 | 79 | 30.1 |
| the ward patient(s) | 13 | 23.6 | 76 | 29.1 |
| the service(s) patients | 3 | 5.5 | 30 | 11.5 |
| all patients | 12 | 21.8 | 58 | 22.2 |
| the hospital | 3 | 5.5 | 18 | 6.9 |
| Responses | 55 | | 261 | |

30% of the respondents at CVH reported they could access information about their patients; 29% could access information about the ward patients; 11.5% could access service patients; and 6.9% access all the hospital patients.

III.25$_b$ for display

| | | | | |
|---|---|---|---|---|
| | 10 | 8.7 | 36 | 33.0 |

33% reported they could access information from the computer for display at CVH and 23.9% reported they could access information for update.

III.25 for update

| | | | | |
|---|---|---|---|---|
| | 12 | 10.4 | 26 | 23.9 |

III.26 Which patients were/are your responsible for? (Check all that apply)

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Your patient | 32 | 39.0 | 82 | 66.7 |
| The ward patient(s) | 30 | 36.6 | 13 | 10.6 |
| The service(s) patients | 12 | 14.6 | 23 | 18.7 |
| All hospital patients | 8 | 9.8 | 5 | 4.1 |
| Responses | 82 | 123 | | |

67% of the respondents at CVH reported they were responsible for their own patients and are bedside nurses. 1% reported being responsible for the ward patients and are probably head nurses/team leaders/administrative/supervisors. 4.1% reported they were responsible for all hospital patients and are the administrator/educator group.

III.27 How did/do you get access to the system?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| After successfully completing training | 11 | 29.8 | 57 | 35.8 |
| With an individual password | 10 | 27.0 | 101 | 63.5 |
| With a group password | 4 | 10.8 | 1 | 0.6 |
| Other, specify | 12 | 32.4 | -- | -- |
| Responses | 37 | | 159 | |

At CVH 35.8% reported getting access to the system after having successfully completed their training. 63.5% reported having an individual password.

III.28 What disciplinary action(s) were/are in place in your nursing unit for breach of security?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Situation dependent | 6 | 5.2 | 26 | 25.7 |
| None | 8 | 7.0 | 16 | 15.8 |
| Don't know | 24 | 20.9 | 59 | 58.4 |
| Other, specify | 3 | 2.6 | -- | -- |
| Responses | | | 101 | |

25.7% of the respondents reported that disciplinary action(s) at CVH for breach of security is situation dependent on their unit. 14.7% reported there was no policy and 58.4% claimed they didn't know. At TWH 27.9% reported that there was no policy or they didn't know.

## Section IV

*Attitudes*

For the 55 cases who completed section 4, the means indicate that these nurses have declared a positive atttitude towards computers, see the computer as a valuable tool for nurses and would recommend computers to other hospitals for managing patient information.

With regard to nursing practice and the role that computers play in changing practice, more specifically whether patient assessments are more reliable, comprehensive, nursing care plans more organized/structured; nursing actions more timely/efficient and outcomes being more effective; the mean scores range between 3.3636 to 3.6545. This is probably a reflection of the lack of software which addresses the independent nursing functions in current nursing practice.

Nurses have indicated that patient care is based on more current information, however are more tentative whether this translates into the improvement of the continuity of care, or whether each nurse is able to spend more time with patients. They tend to disagree with the statement that nurses are expected to care for more patients as a result of computers. In fact, the level of care and the number of decisions required by nurses for a more acutely ill population is increasing because of the increasing complexity of health problems.

With regard to communication, nurses have indicated that they agree that communication increases with health team members; peers and more particularly with patients as a result of computers.

There are no strong opinions on the issues of accountability, security and confidentiality of patient information and the safety of care.

IV. Because of Computerized Patient Information Management Systems:

1 Nurses feel more competent in their job

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 2 | 1.7 | 5 | 4.6 |
| | 9 | 7.8 | 18 | 16.5 |
| | 17 | 14.8 | 43 | 39.4 |
| | 26 | 22.6 | 21 | 19.3 |
| | 9 | 7.8 | 5 | 4.6 |
| Strongly Disagree | 8 | 7.0 | 7 | 6.4 |

This item was calculated on a scale of 1-7 N = 55; mean = 3.5273.

2. Computers are not easy for nurses to use

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 7 | 6.1 | 3 | 2.8 |
| | 5 | 4.3 | 3 | 2.8 |
| | 21 | 18.3 | 10 | 9.2 |
| | 19 | 16.5 | 9 | 8.3 |
| | 17 | 14.8 | 32 | 29.4 |
| Strongly Disagree | 9 | 7.8 | 44 | 40.4 |

Nurses feel that computers are somewhat easy to use for nurses. N = 55; scale 1-6; mean 4.4000.

3. Nurses do or would like to use oomputers in their job

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 16 | 13.9 | 30 | 27.5 |
| | 10 | 8.7 | 32 | 29.4 |
| | 34 | 29.6 | 22 | 20.2 |
| | 15 | 13.0 | 8 | 7.3 |
| | 3 | 2.6 | 5 | 4.6 |
| Strongly Disagree | 1 | 0.9 | 4 | 3.7 |

Nurses mildly agree. N = 55; scale 1-7; mean = 2.5455.

4. Nurses accountability for care is increased

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 17 | 14.8 | 11 | 10.1 |
| | 13 | 11.3 | 16 | 14.7 |
| | 16 | 13.9 | 40 | 36.7 |
| | 13 | 11.3 | 15 | 13.8 |
| | 4 | 3.5 | 11 | 10.1 |
| Strongly Disagree | 8 | 7.0 | 7 | 6.4 |

N = 55; scale 1-6; mean = 3.000.

5. Communication decreases:

a) with peers.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 5 | 4.3 | 2 | 1.8 |
| | 13 | 11.3 | 2 | 1.8 |
| | 11 | 9.6 | 10 | 9.2 |
| | 19 | 16.5 | 16 | 14.7 |
| | 12 | 10.4 | 30 | 27.5 |
| Strongly Disagree | 11 | 9.6 | 38 | 34.9 |

Nurses perceive that communication increases with peers. N = 55; scale = 1-6; mean = 4.6727.

b) with health team members.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 7 | 6.1 | 4 | 3.7 |
| | 10 | 8.7 | 7 | 6.4 |
| | 11 | 9.6 | 11 | 10.1 |
| | 19 | 16.5 | 11 | 10.1 |
| | 13 | 11.3 | 24 | 22.0 |
| Strongly Disagree | 8 | 7.0 | 35 | 22.1 |

Nurses perceive that communication increase with health team members. N = 55; scale = 1-6; mean = 4.8727.

Communication decreases

c) with patients.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 5 | 4.3 | 3 | 2.8 |
| | 8 | 7.0 | 1 | 0.9 |
| | 8 | 7.0 | 7 | 6.4 |
| | 17 | 14.8 | 11 | 10.1 |
| | 17 | 14.8 | 30 | 27.5 |
| Strongly Disagree | 13 | 11.3 | 40 | 36.7 |

Nurses perceive that communication increases most with patients. N = 55; scale 1-6; mean = 4.8727.

6. Nursing practice changes.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 11 | 9.6 | 1 | 0.9 |
| | 9 | 7.8 | 4 | 3.7 |
| | 13 | 11.3 | 18 | 16.5 |
| | 3 | 2.6 | 6 | 5.5 |
| | -- | -- | 13 | 11.9 |
| Strongly Disagree | 3 | 2.6 | 10 | 9.2 |

Nurses disagree slightly that nursing practice changes. N = 55; scale = 1-6; mean = 3.6909.

6.a) Patient assessments are: more reliable

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 7 | 6.1 | 7 | 6.4 |
| | 20 | 17.4 | 5 | 4.6 |
| | 21 | 18.3 | 35 | 32.1 |
| | 10 | 8.7 | 18 | 16.5 |
| | 5 | 4.3 | 17 | 15.6 |
| | 5 | 4.3 | 11 | 10.1 |
| Strongly Disagree | 1 | 0.9 | 2 | 1.8 |

Nurses don't feel that patient assessments are more reliable. N = 55; scale = 1-7; mean = 3.4182.

6.aa) Patient assessments are more comprehensive.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 12 | 10.4 | 8 | 7.3 |
| | 29 | 25.2 | 6 | 5.5 |
| | 14 | 12.2 | 28 | 25.7 |
| | 8 | 7.0 | 20 | 18.3 |
| | 4 | 3.5 | 16 | 14.7 |
| | 1 | 0.9 | 12 | 11.0 |
| Strongly Disagree | -- | -- | 1 | 0.9 |

N = 55; scale = 1-7; mean = 3.1455.

6.b) Patient care plans are more organized.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 13 | 11.3 | 4 | 3.7 |
| | 29 | 25.2 | 7 | 6.4 |
| | 18 | 15.7 | 16 | 14.7 |
| | 4 | 3.5 | 20 | 18.3 |
| | 2 | 1.7 | 19 | 17.4 |
| Strongly Disagree | 2 | 1.7 | 17 | 15.6 |

Patient care plans are not more organized N = 55; scale = 1-6, mean = 3.4182.

6.bb) Patient care plans are more structured.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 14 | 12.2 | 5 | 4.6 |
| | 32 | 27.8 | 6 | 5.5 |
| | 15 | 13.0 | 18 | 16.5 |
| | 4 | 3.5 | 18 | 16.5 |
| | 2 | 1.7 | 18 | 16.5 |
| Strongly disagree | 2 | 1.7 | 17 | 15.6 |

Patient care plans are not more structured N = 55; scale 1-6; mean = 3.3636.

6.c) Nursing actions are more timely.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 5 | 4.3 | 7 | 6.4 |
| | 17 | 14.8 | 13 | 11.9 |
| | 22 | 19.1 | 25 | 22.9 |
| | 15 | 13.1 | 19 | 17.4 |
| | 5 | 4.3 | 15 | 13.8 |
| Strongly Disagree | 5 | 4.3 | 10 | 9.2 |

Nursing actions are not more timely N = 55; scale = 1-6; mean = 3.5636.

6.cc) Nursing actions are more efficient.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 7 | 6.1 | 6 | 5.5 |
| | 18 | 15.7 | 16 | 14.7 |
| | 23 | 20.0 | 24 | 22.0 |
| | 14 | 12.2 | 18 | 16.5 |
| | 4 | 3.5 | 15 | 13.8 |
| Strongly Disagree | 2 | 1.7 | 9 | 8.3 |

Nursing actions are not more efficient N = 55; scale = 1-6; mean = 3.400.

6.d) Nursing outcomes are more effective

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 5 | 4.3 | 7 | 6.4 |
| | 12 | 10.4 | 13 | 11.9 |
| | 21 | 18.3 | 19 | 17.4 |
| | 17 | 14.8 | 21 | 19.3 |
| | 4 | 3.5 | 16 | 14.7 |
| Strongly Disagree | 3 | 2.6 | 9 | 8.3 |

Nursing outcomes are not more effective N = 55; scale = 1-6; mean = 3.3455.

7. The care provided for patients is safer.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 3 | 2.6 | 5 | 4.6 |
| | 13 | 11.3 | 16 | 14.7 |
| | 24 | 20.9 | 30 | 27.5 |
| | 23 | 20.0 | 23 | 21.1 |
| | 6 | 5.2 | 15 | 13.8 |
| Strongly Disagree | 4 | 3.5 | 10 | 9.2 |

Because of CPIMS the care provided for patients is not safer N = 55; scale = 1-6; mean = 3.6545.

8. Patient care is based on more current information.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Ffequency | % | Frequency | % |
| Strongly Agree | 13 | 11.3 | 10 | 9.2 |
| | 28 | 24.3 | 24 | 22.0 |
| | 16 | 13.9 | 22 | 20.2 |
| | 3 | 2.6 | 15 | 13.8 |
| | 2 | 1.7 | 5 | 4.6 |
| Strongly Disagree | 2 | 1.7 | 8 | 7.3 |

Nurses perceive that patient care is based on more current information. N = 55; scale = 1-7; mean = 2.8000.

8.a) Continuity of care is improved.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 10 | 8.7 | 6 | 5.5 |
| | 18 | 15.7 | 19 | 17.4 |
| | 24 | 20.9 | 21 | 19.3 |
| | 13 | 11.3 | 29 | 26.3 |
| | 3 | 2.6 | 8 | 7.3 |
| Strongly Disagree | 2 | 1.7 | 11 | 10.1 |

Continuity of care is not effected. N = 55; scale = 1-6; mean = 3.0545.

8.b) Each nurse is able to spend more time with patients.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 5 | 4.3 | 6 | 5.5 |
| | 10 | 8.7 | 6 | 5.5 |
| | 24 | 20.9 | 22 | 20.2 |
| | 14 | 12.2 | 24 | 22.0 |
| | 7 | 6.1 | 18 | 16.5 |
| Strongly Disagree | 4 | 3.5 | 15 | 13.8 |

Each nurse doesn't spend more time with patients N = 55; scale = 1-6; mean = 3.6182.

8.c) Each nurse is expected to care for more patients.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 4 | 3.5 | 3 | 2.8 |
| | 5 | 4.3 | 5 | 4.6 |
| | 13 | 11.3 | 17 | 15.6 |
| | 18 | 15.7 | 18 | 16.5 |
| | 12 | 10.4 | 23 | 21.1 |
| Strongly Disagree | 8 | 7.0 | 16 | 14.7 |

Each nurse is not expected to care for more patients N = 55; scale = 1-6; mean= 4.2364.

9.a) Patient informatin is less confidential.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 11 | 9.6 | 28 | 25.7 |
| | 12 | 10.4 | 27 | 24.8 |
| | 16 | 13.9 | 15 | 13.8 |
| | 12 | 10.4 | 14 | 12.8 |
| | 19 | 16.5 | 11 | 10.1 |
| Stomgly Disagree | 5 | 4.3 | 6 | 5.5 |

Because of CPIMS, patient information is slightly less confidential N = 55; scale = 1-6; mean = 3.3455.

9.b) Patient information is less secure.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 8 | 7.0 | 24 | 22.0 |
| | 9 | 7.8 | 27 | 24.8 |
| | 20 | 17.4 | 17 | 15.6 |
| | 12 | 10.4 | 14 | 12.8 |
| | 17 | 14.8 | 10 | 9.2 |
| Strongly Disagree | 5 | 4.3 | 6 | 5.5 |

Patient information is slightly less secure N = 55; scale = 1-6; mean = 3.4909.

10. The computer is a valuable tool for nurses.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 12 | 10.4 | 39 | 35.8 |
| | 24 | 20.9 | 36 | 33.3 |
| | 34 | 29.6 | 14 | 12.8 |
| | 8 | 7.0 | 3 | 2.8 |
| | -- | -- | 6 | 5.5 |
| Strongly Disagree | 1 | 0.9 | 3 | 2.8 |

The computer is perceived as a valuable tool for nurses. N = 55; scale = 1-6; mean = 1.9818.

11. My attitude towards computers is positive.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 17 | 14.8 | 55 | 50.5 |
| | 30 | 26.1 | 31 | 28.4 |
| | 24 | 20.9 | 8 | 7.3 |
| | 8 | 7.0 | 1 | 0.9 |
| | 2 | 1.7 | 6 | 5.5 |
| Strongly Disagree | 1 | 0.9 | -- | -- |

Because of CPIMS nurses' attitudes towards computers is reported to be positive.
N = 55; scale = 1-6;mean = 1.6909.

12. I would recommend computers to other hospitals for managing patient information.

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Strongly Agree | 13 | 11.3 | 51 | 46.8 |
| | 19 | 16.5 | 28 | 25.7 |
| | 20 | 17.4 | 11 | 10.1 |
| | 15 | 13.0 | 5 | 4.6 |
| | 1 | 0.9 | 6 | 5.5 |
| | 2 | 1.7 | -- | -- |
| Strongly Disagree | 1 | 0.9 | -- | -- |

Nurses report they would recommend computers to other hospitals for managing patient information N = 55; scale = 1-7; mean = 1.9455.

N = 55 for Question IV and reflects those respondents from a total of N = 237 from both institutions who responded to all the items. The scale used was 1-6 except for 4.1; 4.3; 4.6a; 4.6aa; 4.8; and 4.12 where a scale of 1-7 was used because the respondents, for those instances noted their response at 3.5 on the scale, and the means have been calculated accordingly for reliability analysis for these 55 cases.

Section IV Table - *Means*

| | CVH/TWH N = 55 | Baycrest N = 6 |
|---|---|---|
| **Because of CPIMS** | | |
| Nurses feel more competent in their job | 3.57 | 1.36 |
| Computers are not easy for nurses to use | 4.40 | 6.50 |
| Nurses do/would like to use computers in their job | 2.55 | 1.40 |
| Nurses accountability for care is increased | 3.00 | 1.40 |
| Communication decreases with peers | 4.67 | 5.20 |
| with health team | 4.87 | 5.20 |
| with patients | 4.87 | 5.20 |
| Nursing practice changes | 3.69 | |
| Patient assessments are more reliable | 3.42 | 1.40 |
| Pateint assessments are more comprehensive | 3.15 | 1.40 |
| Patient care plans are more organized | 3.42 | 1.20 |
| Patient care plans are more structured | 3.36 | 1.20 |
| Nursing actions are more timely | 3.56 | 1.20 |
| Nursing actions are more efficient | 3.40 | 1.20 |
| Nursing outcomes are more effective | 3.35 | 1.20 |
| Patient care is safer | 3.65 | 1.20 |
| Patient care is based on more current information | 2.80 | 1.20 |
| Continuity of care is improved | 3.05 | 1.40 |
| Each nurse is able to spend more time with patients | 3.62 | 2.00 |
| Each nurse is expected to care for more patients | 4.24 | 4.00 |
| Patient information is less confidential | 3.35 | 6.00 |
| Patient information is less secure | 3.49 | 6.00 |

Section IV Table - *Means* (cont'd.)

| | CVH/TWH N = 55 | Baycrest N = 6 |
|---|---|---|
| Computer is a valuable tool for nurses | 1.98 | 1.00 |
| My attitude towards computers is positive | 1.69 | 1.00 |
| I would recommend computers to other hospitals to manage patient information | 1.95 | 1.00 |

## Section V

*Personal Profile*

Section V.1 Your ages is between

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| 20-30 | 47 | 40.9 | 50 | 45.9 |
| 31-45 | 50 | 43.5 | 45 | 41.3 |
| 46-65 | 13 | 11.3 | 6 | 5.5 |
| over 65 | 3 | 2.6 | -- | -- |

At CVH 45.9% of the respondents reported being between 20-30 years of age as compared to TWH with 40.9% of respondents in this age group. AT CVH 41.3% reported to be within 31-45 years of age as compared to TWH which has 43.5% of respondents in this age group. At CVH 5.5% of the respondents reported being between 46-65 years of age whereas at TWH 11.3% were in this age group. It is interesting to note that neither group had respondents who reported being over the age of 65 years.

V.2 Sex

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Female | 102 | 88.7 | 99 | 90.8 |
| Male | 8 | 7 | 8 | 7.3 |

90.8% of respondents were female at CVH and 1.8% were male while 88.7% of respondents were female at TWH and 7% male.

V.3 Your current position in nursing is

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| staff nurse | 71 | 61.7 | 80 | 73.4 |
| head nurse/team leader | 15 | 13.0 | 5 | 4.6 |
| administrator/manager/supervisor | 10 | 8.7 | 3 | 2.8 |
| instructor/educator | 5 | 4.3 | 3 | 2.8 |
| other, specify | 10 | 8.7 | 10 | 9.2 |

The positions held by the respondents were as follows:

| | Toronto Western Hospital | Credit Valley Hospital |
|---|---|---|
| Staff nurse | 61.7% | 73.4% |
| Head nurse/team leader | 13 | 4.6 |
| Administative/manager/supervisor | 8.7 | 2.8 |
| Instructor/educator | 4.3 | 2.8 |
| Other | 8.7 | 9.2 |

V.4 How long have you been in your current position?

| | Toronto Western Hospital | | Credit Valley Hospital | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Less than 1 year | 26 | 22.6 | 14 | 12.8 |
| 1-5 years | 49 | 42.6 | 81 | 74.3 |
| 6-10 years | 16 | 13.9 | 1 | 0.9 |
| Over 10 years | 20 | 17.4 | 5 | 4.6 |

12.8% of the respondents at CVH reported that they were in their current job less than 1 year as compared with 22.6% at TWH. 74.3% of the respondents reported being in thier current job from 1-5 years at CVH as compared with 42.6% at TWH. 0.9% reported being in their job from 6-10 years at CVH as compared with 13.9% at TWH. 4.6% of the respondents reported being in their job over 10 years at CVH as compred with 17.4% at TWH.

*Summary of Comments - Toronto Western Hospital*

I feel that it is unsafe in all ways to sign meds and charts using computers, as all systems are fallible and a real signature is the only safe and reliable record.

I am looking forward to an introduction of computers, but am concerned about the amount of in-service required and how this will be interpolated with the daily care activities.

From a nurse analyst - nursing database being developed - looking at the relationship between computers and safety of care, that continuity of care increases and nurses can spend more time with patients.

We need an incredible amount of in-service it advance and onging training for all

shifts of nurses to make this an efficient and accurate system - nursing schools should include computers in their setting; in their curricula; offer refresher courses for nurses returning to the work force. Onus should not be entirely on hospitals.

The computer is used for staffing/scheduling. I had no exposure other than reading schedules or finding staff phone numbers from a directory produced by the computer.

I think before I can honestly tell you how I feel the computer will effect nursing, I need more information on how they work, their use and perhaps after some basic education I will understand them better.

When a training program is introduced, staff may have more feedback about the feelings of computers.

Are there fail proof systems available? I cannot imagine the "horror" if a computer went down and you couldn't get patient information especially in critical care areas - patients would die! Would paper charts be eliminated?

Patient information is only as good as what is put in by the health team workers. Therefore I feel good training is the key to our success. (RN)

I feel the computer is something to fear. Training should be made as simple and understandable as possible.

I haven't worked with bedside computers (CPIMS). Most of my experience was in the USA with invasive monitoring in a cath. lab and with unit terminals where we ordered patient supplies from CSD. As no personal data was on the system, I cannot answer how this effects nursing/patient care - except to be speculative.

Since we do not have computers, I have not been able to really answer anything much of value; I am looking forward to using computers - of course it will have its plusses and minuses but any added extra helps.

The computer function in my department is strictly for analysis of pressures and used as a means for nurses prop. notes during the cardiac cath. test.

I hope that the introduction of bedside computers will have a database or software that is based on nursing and not administrative.

I am looking forward to the introduction of computers on my ward and believe it will be a great achievement in the nursing profession.

I am neutral about many of the implications of computers on nursing and patient care. Nursing practice may change or it may not. The quality of implementation is the most important.

I am not sure that any of this will be useful to you - as we do not have a computer system in place and I have never worked with one.

I am hoping that computers will make record keeping easier, make access to test results available more rapidly and communication with other departments i.e., locating tests more rapid - to save nurses from frustration of buy phones, etc. At the same time, I am afraid that there may be a danger of requiring too much data of nurses leading to more time required instead of alleviating the amount of time required for record keeping. Also accounting for other things, i.e., supplies etc. - who knows what MBA's might dream up for us to do! There is a real danger of becoming involved in the machinery rather than the patient - depersonalizing both the patient and the nurse.

This study has little relevance to us since we have never had any computers in operation in our unit!

I am willing to learn more about computers, but I feel it's going to take away some of the real bedside nursing that more nurses have gone into the profession for.

It would be nice if we were included in computer education.

I feel I could not answer many questions effectively because we have not started using computers on the ward.

*Summary of Comments - Credit Valley Hospital*

As a clinical teacher in Psychiatry I am responsibe for orienting every nurse in our 365 bed hospital in computers each month. Having done this for 2-1/2 years I am admitedly burned out!

Thank you and best of luck.

Too long and involved

The specific computer data should be directed towards our computer department for continuity of information.

Excellent questionnaire - you've covered every aspect. I love the computer and all the possibilities it offers to nursing and our care of our patients. My only ongoing concern is confidentiality for patients. As a nurse (Dr/or unit clerk) I can obtain information on any in-patient or recent out-patient in the hospital (from an R.N.)

Other wards in hospital can only access patients on their unit. OB/GYN needs to access nursery/labor and delivery and so can access all other units as well - not great for confidentiality (from a staff nurse BN)

Utilize the CR to change mistakes instead of having to redo everything. It would save a lot of time.

In our hospital, the computer is great for access to patient information, i.e, lab results, x-ray, etc. but really has no bearing on the practice of nursing. Databases, care plans, notes are all still hand written.

I feal that computers with good programs would be very valuable toosls in nursing. Nurses would save time to give to their patients (student nurse).

I find computers fascinating and very positive to work with.

System at CVH much more complex than system at McMaster University Medical Centre which had GRASP application for 'hours' [illegible]me.

The computer is a great help and saves a lot of paper.

I strongly recommend computers and would like our system to expand to include nursing progress notes, client profiles and nursing care plans.

There are many errors that can be made with the computer. A lot of time is wasted trying to enter lab orders and finding the correct code. Many nursing hours wasted at the terminal.

I wish we could do nursing care plans and charts on computer.

By virture of the nature of my position (hospital administrative project coordinator) I utilize the computer in a different fashion than do the nurses on the nursing units i.e., data collection for analysis; staff training; patient classification systems, etc.

I find the computer more time consuming when I have to look for codes for tests. Also I feel patient confidentiality greatly suffers as all users have access to hospital wide patients/diagnosis/lab results.

# Composite Table of Means
## Attitudes x Attitudes x Typing Skills

| | Crosstab CVH N = 26 typing well | TWH N = 28 typing poorly | Attitudes Means for N = 55 | Attitudes N = 6 Baycrest |
|---|---|---|---|---|
| 1) Nurses feel more competent in their job | | | 3.57 | 1.36 |
| 2) Computers are not easy for nurses to use | 4.96 | 4.71 | 4.40 | 6.50 |
| 3) Nurses do or would like to use computers in their job | | 2.43 | 2.65 | 1.40 |
| 4) Nurses accountability for care is increased | | | 3.00 | 1.40 |
| 5) Communication decreases: | | | | |
| a) with peers | 4.80 | 4.93 | 4.67 | 5.20 |
| b) with health team members | 4.83 | 4.19 | 4.87 | 5.20 |
| c) with patients | 5.29 | 4.92 | 4.87 | 5.20 |
| 6) Nursing practice changes. | 4.24 | | 3.69 | No data |
| Patient assessments are: | | | | |
| a) more reliable | | | 3.42 | 1.40 |
| a1) more comprehensive | | | 3.15 | 1.40 |
| Patient care plans are: | | | | |
| b) more organized | 4.48 | | 3.42 | 1.20 |
| b1) more structured | 4.45 | | 3.36 | 1.20 |
| Nursing actions are: | | | | |
| c) more timely | | | 3.56 | 1.20 |
| c1) more efficient | | | 3.40 | 1.20 |
| Nursing outcomes are: | | | | |
| d) more effective | | | 3.35 | 1.20 |
| 7) The care provided for patients is safer | | | 3.65 | 1.20 |
| 8) Patient care is based on more current information | | | 2.80 | 1.20 |
| a) continuity of care is improved | | | 3.05 | 1.40 |
| b) each nurse is able to spend more time with patients | 4.39 | | 3.62 | 2.00 |
| c) each nurse is expected to care for more patients | | | 4.24 | 4.00 |
| 9) Patient information is: | | | | |
| a) less confidential | 2.54 | | 3.35 | 6.00 |
| b) less secure | 2.50 | | 3.49 | 6.00 |
| 10) The computer is a valuable tool for nurses | 2.27 | 2.18 | 1.98 | 1.00 |
| 11) My attitude towards computers is positive | 1.79 | 1.89 | 1.69 | 1.00 |
| 12) I would recommend computers to other hospitals for managing patient information | 2.04 | 2.00 | 1.95 | 1.00 |

NI systems influence attitudes the most strongly over education/experience/aspirations

# Composite Table of Means
## Attitudes x Attitudes x Wanting More Time

| | Crosstab More Time x Attitudes | | | Attitudes Means for | Attitudes |
|---|---|---|---|---|---|
| | N = 44 More Training | N = 55 Less Training | N = 69 More training | N = 55 | N = 6 Bayorest |
| 1) Nurses feel more competent in their job | | | | 3.67 | 1.36 |
| 2) Computers are not easy for nurses to use | 4.80 | 5.11 | | 4.40 | 6.50 |
| 3) Nurses do or would like to use computers in their job | 2.41 | 2.38 | | 2.55 | 1.40 |
| 4) Nurses accountability for care is increased | | | | 3.00 | 1.40 |
| 5) Communication decreases: | | | | | |
| a) with peers | 4.83 | 4.91 | | 4.67 | 5.20 |
| b) with health team members | 4.64 | 4.60 | | 4.87 | 5.20 |
| c) with patients | 5.03 | 4.98 | | 4.87 | 5.20 |
| 6) Nursing practice changes. | | 4.31 | 2.73 | 3.69 | No data |
| Patient assessments are: | | | | | |
| a) more reliable | | | | 3.42 | 1.40 |
| a1) more comprehensive | | | 2.51 | 3.15 | 1.40 |
| Patient care plans are: | | | | | |
| b) more organized | 4.47 | | 2.36 | 3.42 | 1.20 |
| b1) more structured | 4.42 | | 2.32 | 3.36 | 1.20 |
| Nursing actions are: | | | | | |
| c) more timely | | | | 3.56 | 1.20 |
| c1) more efficient | | | | 3.40 | 1.20 |
| Nursing outcomes are: | | | | | |
| d) more effective | | | | 3.35 | 1.20 |
| 7) The care provided for patients is safer | | | | 3.65 | 1.20 |
| 8) Patient care is based on more current information | | | 2.46 | 2.80 | 1.20 |
| a) continuity of care is improved | | | | 3.05 | 1.40 |
| b) each nurse is able to spend more time with patients | | | | 3.62 | 2.00 |
| c) each nurse is expected to care for more patients | 4.65 | | | 4.24 | 4.00 |
| 9) Patient information is: | | | | | |
| a) less confidential | 2.43 | | | 3.35 | 6.00 |
| b) less secure | 2.56 | | | 3.49 | 6.00 |
| 10) The computer is a valuable tool for nurses | 1.84 | 2.32 | 2.46 | 1.98 | 1.00 |
| 11) My attitude towards computers is positive | 1.55 | 1.88 | 2.34 | 1.69 | 1.00 |
| 12) I would recommend computers to other hospitals for managing patient informat | 1.70 | 2.02 | 2.65 | 1.95 | 1.00 |

NI systems influence attitudes the most strongly over education/experience/ aspirations

## Composite Table of Means
## Attitudes x Attitudes x Some Add. Computer Experience

| | Attitudes Means for N = 55 | Attitudes N = 6 Baycrest |
|---|---|---|
| 1) Nurses feel more competent in their job | 3.57 | 1.36 |
| 2) Computers are not easy for nurses to use | 4.40 | 6.50 |
| 3) Nurses do or would like to use computers in their job | 2.55 | 1.40 |
| 4) Nurses accountability for care is increased | 3.00 | 1.40 |
| 5) Communication decreases: | | |
| a) with peers | 4.67 | 5.20 |
| b) with health team members | 4.67 | 5.20 |
| c) with patients | 4.87 | 5.20 |
| 6) Nursing practice changes. | 3.69 | No data |
| Patient assessments are: | | |
| a) more reliable | 3.42 | 1.40 |
| a1) more comprehensive | 3.15 | 1.40 |
| Patient care plans are: | | |
| b) more organized | 3.42 | 1.20 |
| b1) more structured | 3.36 | 1.20 |
| Nursing actions are: | | |
| c) more timely | 3.56 | 1.20 |
| c1) more efficient | 3.40 | 1.20 |
| Nursing outcomes are: | | |
| d) more effective | 3.35 | 1.20 |
| 7) The care provided for patients is safer | 3.65 | 1.20 |
| 8) Patient care is based on more current information | 2.80 | 1.20 |
| a) continuity of care is improved | 3.05 | 1.40 |
| b) each nurse is able to spend more time with patients | 3.62 | 2.00 |
| c) each nurse is expected to care for more patients | 4.24 | 4.00 |
| 9) Patient information is: | | |
| a) less confidential | 3.35 | 6.00 |
| b) less secure | 3.49 | 6.00 |
| 10) The computer is a valuable tool for nurses | 1.98 | 1.00 |
| 11) My attitude towards computers is positive | 1.69 | 1.00 |
| 12) I would recommend computers to other hospitals for managing patient information | 1.95 | 1.00 |

NI systems influence attitudes the most strongly over education/experience/aspirations

# Composite Table of Means
## Attitudes x Attitudes x Hands-On Workshop

| | Crosstab Hands-On Workshop x Attitudes N = 33 2 hr or less | N = 18 5-15 hrs. | N = 45 no training | Attitudes Means for N = 55 | Attitudes N = 6 Bayorest |
|---|---|---|---|---|---|
| 1) Nurses feel more competent in their job | | | | 3.57 | 1.36 |
| 2) Computers are not easy for nurses to use | 4.88 | 5.00 | | 4.40 | 6.50 |
| 3) Nurses do or would like to use computers in their job | 2.61 | 2.22 | | 2.55 | 1.40 |
| 4) Nurses accountability for care is increased | | | | 3.00 | 1.40 |
| 5) Communication decreases: | | | | | |
| a) with peers | 4.83 | 4.84 | | 4.67 | 5.20 |
| b) with health team members | | 4.83 | | 4.87 | 5.20 |
| c) with patients | 4.63 | 4.80 | 5.53 | 4.87 | 5.20 |
| 6) Nursing practice changes. | | | 2.61 | 3.69 | No data |
| Patient assessments are: | | | | | |
| a) more reliable... | | | | 3.42 | 1.40 |
| a1) more comprehensive | | | 2.64 | 3.15 | 1.40 |
| Patient care plans are: | | | | | |
| b) more organized | | 4.33 | 2.39 | 3.42 | 1.20 |
| b1) more structured | | 4.27 | 2.34 | 3.36 | 1.20 |
| Nursing actions are: | | | | | |
| c) more timely | | | | 3.56 | 1.20 |
| c1) more efficient | | | | 3.40 | 1.20 |
| Nursing outcomes are: | | | | | |
| d) more effective | | | | 3.35 | 1.20 |
| 7) The care provided for patients is safer | | | | 3.65 | 1.20 |
| 8) Patient care is based on more current information | | 2.53 | 2.40 | 2.80 | 1.20 |
| a) continuity of care is improved | | | | 3.05 | 1.40 |
| b) each nurse is able to spend more time with patients | | | | 3.62 | 2.00 |
| c) each nurse is expected to care for more patients | | 4.31 | | 4.24 | 4.00 |
| 9) Patient information is: | | | | | |
| a) less confidential | 2.64 | | | 3.35 | 6.00 |
| b) less secure | 2.66 | | | 3.49 | 6.00 |
| 10) The computer is a valuable tool for nurses | 2.03 | 1.85 | 1.84 | 1.98 | 1.00 |
| 11) My attitude towards computers is positive | 2.03 | 1.85 | 1.84 | 1.69 | 1.00 |
| 12) I would recommend computers to other hospitals for managing patient information | 2.54 | 2.41 | | 1.95 | 1.00 |

NI systems influence attitudes the most strongly over education/experience/aspirations

# Composite Table of Means
## Attitudes x Attitudes x Software Package

| | Crosstab CVH N = 20 using w.p. | TWH N = 16 other software | Attitudes Means for N = 55 | Attitudes N = 6 Baycrest |
|---|---|---|---|---|
| 1) Nurses feel more competent in their job | | | 3.57 | 1.36 |
| 2) Computers are not easy for nurses to use | 5.00 | | 4.40 | 6.50 |
| 3) Nurses do or would like to use computers in their job | 2.40 | | 2.55 | 1.40 |
| 4) Nurses accountability for care is increased | | | 3.00 | 1.40 |
| 5) Communication decreases: | | | | |
| a) with peers | 5.21 | | 4.67 | 5.20 |
| b) with health team members | 5.26 | | 4.87 | 5.20 |
| c) with patients | 5.32 | | 4.87 | 5.20 |
| 6) Nursing practice changes. | 5.60 | | 3.69 | No data |
| Patient assessments are: | | | | |
| a) more reliable | | | 3.42 | 1.40 |
| a1) more comprehensive | | | 3.15 | 1.40 |
| Patient care plans are: | | | | |
| b) more organized | 4.26 | | 3.42 | 1.20 |
| b1) more structured | | 2.63 | 3.36 | 1.20 |
| Nursing actions are: | | | | |
| c) more timely | | | 3.56 | 1.20 |
| c1) more efficient | | | 3.40 | 1.20 |
| Nursing outcomes are: | | | | |
| d) more effective | | | 3.35 | 1.20 |
| 7) The care provided for patients is safer | | | 3.65 | 1.20 |
| 8) Patient care is based on more current information | | 2.54 | 2.80 | 1.20 |
| a) continuity of care is improved | | | 3.05 | 1.40 |
| b) each nurse is able to spend more time with patients | | | 3.62 | 2.00 |
| c) each nurse is expected to care for more patients | | | 4.24 | 4.00 |
| 9) Patient information is: | | | | |
| a) less confidential | 2.60 | | 3.35 | 6.00 |
| b) less secure | 2.55 | | 3.49 | 6.00 |
| 10) The computer is a valuable tool for nurses | 2.05 | 2.75 | 1.98 | 1.00 |
| 11) My attitude towards computers is positive | 1.40 | | 1.69 | 1.00 |
| 12) I would recommend computers to other hospitals for managing patient information | 1.55 | | 1.95 | 1.00 |

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# Composite Table of Means
## Attitudes x Attitudes x Hands-On

| | Crosstab CVH N = 34 mainframe | TWH N = 33 don't know | Attitudes Means for N = 55 | Attitudes N = 6 Baycrest |
|---|---|---|---|---|
| 1) Nurses feel more competent in their job | | | 3.57 | 1.36 |
| 2) Computers are not easy for nurses to use | 5.18 | | 4.40 | 6.80 |
| 3) Nurses do or would like to use computers in their job | 2.18 | 2.56 | 2.55 | 1.40 |
| 4) Nurses accountability for care is increased | | | 3.00 | 1.40 |
| 5) Communication decreases: | | | | |
| a) with peers | 4.82 | | 4.67 | 6.20 |
| b) with health team members | 4.52 | | 4.87 | 6.20 |
| c) with patients | 4.88 | | 4.87 | 6.20 |
| 6) Nursing practice changes. | | | 3.69 | No data |
| Patient assessments are: | | | | |
| a) more reliable | | | 3.42 | 1.40 |
| a1) more comprehensive | | 2.63 | 3.15 | 1.40 |
| Patient care plans are: | | | | |
| b) more organized | | 2.24 | 3.42 | 1.20 |
| b1) more structured | | 2.20 | 3.36 | 1.20 |
| Nursing actions are: | | | | |
| c) more timely | | | 3.56 | 1.20 |
| c1) more efficient | | | 3.40 | 1.20 |
| Nursing outcomes are: | | | | |
| d) more effective | | | 3.35 | 1.20 |
| 7) The care provided for patients is safer | | | 3.65 | 1.20 |
| 8) Patient care is based on more current information | | 2.52 | 2.80 | 1.20 |
| a) continuity of care is improved | | | 3.05 | 1.40 |
| b) each nurse is able to spend more time with patients | | | 2.62 | 2.00 |
| c) each nurse is expected to care for more patients | | | 4.24 | 4.00 |
| 9) Patient information is: | | | | |
| a) less confidential | 2.62 | | 3.35 | 6.00 |
| b) less secure | 2.58 | | 3.49 | 6.00 |
| 10) The computer is a valuable tool for nurses | 2.15 | 2.48 | 1.98 | 1.00 |
| 11) My attitude towards computers is positive | 1.79 | 2.44 | 1.69 | 1.00 |
| 12) I would recommend computers to other hospitals for managing patient information | 1.85 | | 1.95 | 1.00 |

NI systems influence attitudes the most strongly over education/experience/aspirations

## Composite Table of Means
## Attitudes x Attitudes x Add. Computer training

| | Crosstab CVH N = 29 hands-on | Crosstab TWH N = 59 written-test | Attitudes Means for N = 55 | Attitudes N = 6 Baycrest |
|---|---|---|---|---|
| 1) Nurses feel more competent in their job | | | 3.57 | 1.36 |
| 2) Computers are not easy for nurses to use | 5.00 | | 4.40 | 6.50 |
| 3) Nurses do or would like to use computers in their job | 2.31 | 2.71 | 2.55 | 1.40 |
| 4) Nurses accountability for care is increased | | | 3.00 | 1.40 |
| 5) Communication decreases: | | | | |
| a) with peers | 4.69 | | 4.67 | 5.20 |
| b) with health team members | 4.66 | | 4.87 | 5.20 |
| c) with patients | 4.78 | | 4.87 | 5.20 |
| 6) Nursing practice changes. | | 2.69 | 3.69 | No data |
| Patient assessments are: | | | | |
| a) more reliable | | | 3.42 | 1.40 |
| a1) more comprehensive | | 2.53 | 3.15 | 1.40 |
| Patient care plans are: | | | | |
| b) more organized | | 2.30 | 3.42 | 1.20 |
| b1) more structured | | 2.74 | 3.36 | 1.20 |
| Nursing actions are: | | | | |
| c) more timely | | | 3.56 | 1.20 |
| c1) more efficient | | | 3.40 | 1.20 |
| Nursing outcomes are: | | | | |
| d) more effective | | | 3.35 | 1.20 |
| 7) The care provided for patients is safer | | | 3.65 | 1.20 |
| 8) Patient care is based on more current information | | 2.34 | 2.80 | 1.20 |
| a) continuity of care is improved | | | 3.05 | 1.40 |
| b) each nurse is able to spend more time with patients | | | 3.62 | 2.00 |
| c) each nurse is expected to care for more patients | | | 4.24 | 4.00 |
| 9) Patient information is: | | | | |
| a) less confidential | | | 3.35 | 6.00 |
| b) less secure | | | 3.49 | 6.00 |
| 10) The computer is a valuable tool for nurses | 2.00 | 2.56 | 1.98 | 1.00 |
| 11) My attitude towards computers is positive | 1.66 | 2.47 | 1.69 | 1.00 |
| 12) I would recommend computers to other hospitals for managing patient information | 1.76 | 3.75 | 1.95 | 1.00 |

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## Composite Table of Means
## Attitudes x Attitudes x Evaluation of Competence

| | Crosstab N = 69 hands-on | Crosstab N = 27 written test | Attitudes Means for N = 55 | Attitudes N = 6 Baycrest |
|---|---|---|---|---|
| 1) Nurses feel more competent in their job | | | 3.57 | 1.38 |
| 2) Computers are not easy for nurses to use | 5.10 | 4.75 | 4.40 | 6.50 |
| 3) Nurses do or would like to use computers in their job | 2.43 | 2.30 | 2.55 | 1.40 |
| 4) Nurses accountability for care is increased | | | 3.00 | 1.40 |
| 5) Communication decreases: | | | | |
| a) with peers | 4.67 | 4.92 | 4.67 | 5.20 |
| b) with health team members | 4.68 | 4.46 | 4.87 | 5.20 |
| c) with patients | 5.06 | 4.92 | 4.87 | 5.20 |
| 6) Nursing practice changes. | | | 3.69 | No data |
| Patient assessments are: | | | | |
| a) more reliable | | | 3.42 | 1.40 |
| a1) more comprehensive | | | 3.15 | 1.40 |
| Patient care plans are: | | | | |
| b) more organized | | 4.33 | 3.42 | 1.20 |
| b1) more structured | | | 3.36 | 1.20 |
| Nursing actions are: | | | | |
| c) more timely | | | 3.56 | 1.20 |
| c1) more efficient | | | 3.40 | 1.20 |
| Nursing outcomes are: | | | | |
| d) more effective | | | 3.35 | 1.20 |
| 7) The care provided for patients is safer | | | 3.65 | 1.20 |
| 8) Patient care is based on more current information | | | 2.80 | 1.20 |
| a) continuity of care is improved | | | 3.05 | 1.40 |
| b) each nurse is able to spend more time with patients | | 4.6 | 3.62 | 2.00 |
| c) each nurse is expected to care for more patients | | 4.43 | 4.24 | 4.00 |
| 9) Patient information is: | | | | |
| a) less confidential | | | 3.35 | 6.00 |
| b) less secure | | | 3.49 | 6.00 |
| 10) The computer is a valuable tool for nurses | 2.12 | 2.18 | 1.98 | 1.00 |
| 11) My attitude towards computers is positive | 1.70 | 1.86 | 1.69 | 1.00 |
| 12) I would recommend computers to other hospitals for managing patient information | 1.88 | 2.00 | 1.95 | 1.00 |

NI systems influence attitudes the most strongly over education/experience/ aspirations

# Composite Table of Means
## Attitudes x Attitudes x Single/Multiple Sessions

| | Crosstab Attitudes x No. Sessions N = 70 single | N = 25 multiple | Attitudes Means for N = 55 | Attitudes N = 6 Baycrest |
|---|---|---|---|---|
| 1) Nurses feel more competent in their job | | | 3.57 | 1.26 |
| 2) Computers are not easy for nurses to use | 4.94 | 4.85 | 4.40 | 6.50 |
| 3) Nurses do or would like to use computers in their job | 2.26 | | 2.55 | 1.40 |
| 4) Nurses accountability for care is increased | | | 3.00 | 1.40 |
| 5) Communication decreases: | | | | |
| a) with peers | 4.72 | 5.15 | 4.67 | 5.20 |
| b) with health team members | 4.52 | 4.69 | 4.67 | 5.20 |
| c) with patients | 4.95 | 5.00 | 4.67 | 5.20 |
| 6) Nursing practice changes. | | | 3.69 | No data |
| Patient assessments are: | | | | |
| a) more reliable | | | 3.42 | 1.40 |
| a1) more comprehensive | | | 3.15 | 1.40 |
| Patient care plans are: | | | | |
| b) more organized | 4.26 | | 3.42 | 1.20 |
| b1) more structured | 4.26 | | 3.36 | 1.20 |
| Nursing actions are: | | | | |
| c) more timely | | | 3.56 | 1.20 |
| c1) more efficient | | | 3.40 | 1.20 |
| Nursing outcomes are: | | | | |
| d) more effective | | | 3.35 | 1.20 |
| 7) The care provided for patients is safer | | | 3.65 | 1.20 |
| 8) Patient care is based on more current information | | | 2.80 | 1.20 |
| a) continuity of care is improved | | | 3.05 | 1.40 |
| b) each nurse is able to spend more time with patients | | | 3.62 | 2.00 |
| c) each nurse is expected to care for more patients | 4.49 | | 4.24 | 4.00 |
| 9) Patient information is: | | | | |
| a) less confidential | | 2.15 | 3.35 | 6.00 |
| b) less secure | | | 3.49 | 6.00 |
| 10) The computer is a valuable tool for nurses | 2.07 | 2.27 | 1.98 | 1.00 |
| 11) My attitude towards computers is positive | 1.64 | 2.08 | 1.69 | 1.00 |
| 12) I would recommend computers to other hospitals for managing patient information | 1.73 | 2.35 | 1.96 | 1.00 |

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## Composite Table of Means
## Attitudes x Attitudes x Student/Teacher Ratio in Training Program

| | Crosstab Stu/Teacher Ratio x Attitudes N = 79 1-2:5 | N = 15 1-6:15 | Attitudes Means for N = 55 | Attitudes N = 6 Bayorest |
|---|---|---|---|---|
| 1) Nurses feel more competent in their job | | | 3.57 | 1.36 |
| 2) Computers are not easy for nurses to use | 4.94 | 4.80 | 4.40 | 6.80 |
| 3) Nurses do or would like to use computers in their job | 2.39 | 2.27 | 2.55 | 1.40 |
| 4) Nurses accountability for care is increased | | | 3.00 | 1.40 |
| 5) Communication decreases: | | | | |
| a) with peers | 4.91 | 4.87 | 4.87 | 5.20 |
| b) with health team members | 4.58 | 4.57 | 4.87 | 5.20 |
| c) with patients | 4.90 | 5.36 | 4.87 | 5.20 |
| 6) Nursing practice changes. | | | 3.69 | No data |
| Patient assessments are: | | | | |
| a) more reliable | | | 3.42 | 1.40 |
| a1) more comprehensive | | 4.29 | 3.15 | 1.40 |
| Patient care plans are: | | | | |
| b) more organized | | | 3.42 | 1.20 |
| b1) more structured | | 4.29 | 3.36 | 1.20 |
| Nursing actions are: | | | | |
| c) more timely | | | 3.56 | 1.20 |
| c1) more efficient | | | 3.40 | 1.20 |
| Nursing outcomes are: | | | | |
| d) more effective | | | 3.35 | 1.20 |
| 7) The care provided for patients is safer | | 4.40 | 3.65 | 1.20 |
| 8) Patient care is based on more current information | | | 2.80 | 1.20 |
| a) continuity of care is improved | | | 3.05 | 1.40 |
| b) each nurse is able to spend more time with patients | | 4.64 | 3.62 | 2.00 |
| c) each nurse is expected to care for more patients | | 4.43 | 4.24 | 4.00 |
| 9) Patient information is: | | | | |
| a) less confidential | 2.67 | 2.60 | 3.35 | 6.00 |
| b) less secure | | 2.33 | 3.49 | 6.00 |
| 10) The computer is a valuable tool for nurses | 2.09 | 2.20 | 1.98 | 1.00 |
| 11) My attitude towards computers is positive | 1.71 | 1.80 | 1.69 | 1.00 |
| 12) I would recommend computers to other hospitals for managing patient information | 1.87 | 1.87 | 1.95 | 1.00 |

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# Composite Table of Means
## Attitudes x Attitudes x Training Time

| | Crosstab Training Time x Attitudes | | | Attitudes Means for | Attitudes |
|---|---|---|---|---|---|
| | N = 33 | N = 16 | N = 7 | N = 55 | N = 6 |
| | 2 hrs or less | 5-15 hrs. | no training | | Baycrest |
| 1) Nurses feel more competent in their job | | | | 3.57 | 1.36 |
| 2) Computers are not easy for nurses to use | 4.91 | 5.00 | | 4.40 | 6.50 |
| 3) Nurses do or would like to use computers in their job | 2.15 | 2.60 | 2.74 | 2.55 | 1.40 |
| 4) Nurses accountability for care is increased | | | | 3.00 | 1.40 |
| 5) Communication decreases: | | | | | |
| a) with peers | 4.69 | 4.73 | 5.56 | 4.67 | 5.20 |
| b) with health team members | | | 5.44 | 4.87 | 5.20 |
| c) with patients | 4.63 | 4.80 | 5.53 | 4.87 | 5.20 |
| 6) Nursing practice changes. | | | 2.56 | 3.69 | No data |
| Patient assessments are: | | | | | |
| a) more reliable | | | | 3.42 | 1.40 |
| a1) more comprehensive | | | 2.49 | 3.15 | 1.40 |
| Patient care plans are: | | | | | |
| b) more organized | | 4.55 | 2.34 | 3.42 | 1.20 |
| b1) more structured | | 4.55 | 2.27 | 3.36 | 1.20 |
| Nursing actions are: | | | | | |
| c) more timely | | | | 3.56 | 1.20 |
| c1) more efficient | | | | 3.40 | 1.20 |
| Nursing outcomes are: | | | | | |
| d) more effective | | | | 3.35 | 1.20 |
| 7) The care provided for patients is safer | | | | 3.65 | 1.20 |
| 8) Patient care is based on more current information | | 2.69 | 2.31 | 2.80 | 1.20 |
| a) continuity of care is improved | | | | 3.05 | 1.40 |
| b) each nurse is able to spend more time with patients | | | 4.43 | 3.62 | 2.00 |
| c) each nurse is expected to care for more patients | 4.48 | 4.73 | | 4.34 | 4.24 |
| 9) Patient information is: | | | | | |
| a) less confidential | | | | 3.35 | 6.00 |
| b) less secure | | 2.60 | | 3.49 | 6.00 |
| 10) The computer is a valuable tool for nurses | 1.97 | 2.27 | 2.54 | 1.98 | 1.00 |
| 11) My attitude towards computers is positive | 1.70 | 1.73 | 2.93 | 1.69 | 1.00 |
| 12) I would recommend computers to other hospitals for managing patient information | 1.85 | 2.20 | 2.75 | 1.95 | 1.00 |

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# Composite Table of Means
## Attitudes x Attitudes x Educational Preparation

Crosstab
Educational Preparation x Attitudes

| | N = 14 CVH peers | N = 65 CVH nurse administrator | N = 44 CVH system co-ord. | N = 14 CVH cont. ed. pers. | Attitudes Means for N = 55 | Attitudes N = 6 Bayorest |
|---|---|---|---|---|---|---|
| | 2.71 | | | | 3.57 | 1.36 |
| 1) Nurses feel more competent in their job | 5.50 | 4.97 | 5.47 | 4.57 | 4.40 | 6.50 |
| 2) Computers are not easy for nurses to use | 2.14 | 2.22 | 2.29 | | 2.55 | 1.40 |
| 3) Nurses do or would like to use computers in their job | | | | | 3.00 | 1.40 |
| 4) Nurses accountability for care is increased | | | | | | |
| 5) Communication decreases: | 5.02 | 4.78 | 4.47 | 5.15 | 4.67 | 5.20 |
| a) with peers | 5.14 | 4.58 | | 4.77 | 4.87 | 5.20 |
| b) with health team members | 5.14 | 5.00 | | 5.23 | 4.87 | 5.20 |
| c) with patients | | 4.25 | | 4.25 | 3.69 | No data |
| 6) Nursing practice changes. | | | | | | |
| Patient assessments are: | | | | | 3.42 | 1.40 |
| a) more reliable | | | | | 3.15 | 1.40 |
| a1) more comprehensive | | | | | | |
| Patient care plans are: | 4.40 | | 4.22 | 4.83 | 3.42 | 1.20 |
| b) more organized | | | | 4.83 | 3.36 | 1.20 |
| b1) more structured | | | | | | |
| Nursing actions are: | | | | | 3.56 | 1.20 |
| c) more timely | | | | | 3.40 | 1.20 |
| c1) more efficient | | | | | | |
| Nursing outcomes are: | | | | 4.45 | 3.35 | 1.20 |
| d) more effective | | | | | 3.65 | 1.20 |
| 7) The care provided for patients is safer | | | | | | |
| 8) Patient care is based on more current information | | | 2.53 | | 2.80 | 1.20 |
| | | | | | 3.06 | 1.40 |
| a) continuity of care is improved | | | | | | |
| b) each nurse is able to spend more time with patients | | | 4.29 | | 3.62 | 2.00 |
| c) each nurse is expected to care for more patients | 4.55 | 4.45 | | | 4.24 | 4.00 |
| 9) Patient information is: | | 2.62 | 2.53 | 2.43 | 3.35 | 6.00 |
| a) less confidential | | 2.69 | | 2.43 | 3.49 | 6.00 |
| b) less secure | | | | | | |
| 10) The computer is a valuable tool for nurses | 1.79 | 1.97 | 1.88 | | 1.96 | 1.00 |
| 11) My attitude towards computers is positive | 1.43 | 1.62 | 1.76 | 2.29 | 1.69 | 1.00 |
| 12) I would recommend computers to other hospitals for managing patient information | 1.58 | 1.65 | 1.94 | | 1.95 | 1.00 |

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## Composite Table of Means
## Attitudes x Attitudes x Teaching Strategy

| | Crosstab Teaching Strategy x Attitudes | | | Attitudes | Attitudes |
|---|---|---|---|---|---|
| | N = 18 Preceptorship | N = 70 CAI | N = 9 Lecture | Means for N = 55 | N = 6 Bayorest |
| 1) Nurses feel more competent in their job | | | | 3.57 | 1.36 |
| 2) Computers are not easy for nurses to use | 5.44 | 4.82 | 4.75 | 4.40 | 6.50 |
| 3) Nurses do or would like to use computers in their job | 2.06 | 2.48 | 2.38 | 2.55 | 1.40 |
| 4) Nurses accountability for care is increased | | | | 3.00 | 1.40 |
| 5) Communication decreases: | | | | | |
| a) with peers | 4.78 | 5.01 | 4.25 | 4.67 | 5.20 |
| b) with health team members | 4.67 | 4.66 | 4.14 | 4.67 | 5.20 |
| c) with patients | 5.00 | 5.00 | 5.14 | 4.87 | 5.20 |
| 6) Nursing practice changes. | | | | 3.69 | No data |
| Patient assessments are: | | | | | |
| a) more reliable | | | | 3.42 | 1.40 |
| a1) more comprehensive | | | 4.33 | 3.15 | 1.40 |
| Patient care plans are: | | | | | |
| b) more organized | | 4.28 | | 3.42 | 1.20 |
| b1) more structured | | | 4.50 | 3.36 | 1.20 |
| Nursing actions are: | | | | | |
| c) more timely | | | | 3.56 | 1.20 |
| c1) more efficient | | | | 3.40 | 1.20 |
| Nursing outcomes are: | | | | | |
| d) more effective | | | | 3.35 | 1.20 |
| 7) The care provided for patients is safer | | | | 3.66 | 1.20 |
| 8) Patient care is based on more current information | | | 2.00 | 2.80 | 1.20 |
| a) continuity of care is improved | | | | 3.05 | 1.40 |
| b) each nurse is able to spend more time with patients | | | 4.43 | 3.62 | 2.00 |
| c) each nurse is expected to care for more patients | | 4.34 | | 4.24 | 4.00 |
| 9) Patient information is: | | | | | |
| a) less confidential | | 2.61 | 2.00 | 3.35 | 6.00 |
| b) less secure | | 2.66 | 2.29 | 3.49 | 6.00 |
| 10) The computer is a valuable tool for nurses | 1.89 | 2.20 | 2.60 | 1.98 | 1.00 |
| 11) My attitude towards computers is positive | 1.61 | 1.79 | 2.30 | 1.69 | 1.00 |
| 12) I would recommend computers to other hospitals for managing patient information | 1.78 | 1.93 | 1.75 | 1.95 | 1.00 |

NI systems influence attitudes the most strongly over education/experience/aspirations

## Composite Table of Means
## Attitudes x Attitudes x Computer Training

| | Crosstab Computer Training x Attitudes | | | Attitudes Means for | Attitudes |
|---|---|---|---|---|---|
| | N = 12 CVH* | N = 70 CVH** | N = 65 TWH*** | N = 55 | N = 6 Baycrest |
| 1) Nurses feel more competent in their job. | | | | 3.57 | 1.36 |
| 2) Computers are not easy for nurses to use | 4.75 | 4.98 | | 4.40 | 6.50 |
| 3) Nurses do or would like to use computers in their job | 2.25 | 2.44 | | 2.55 | 1.40 |
| 4) Nurses accountability for care is increased | | | | 3.00 | 1.40 |
| 5) Communication decreases: | | | | | |
| a) with peers | 4.89 | 4.84 | | 4.67 | 5.20 |
| b) with health team members | | | | 4.87 | 5.20 |
| c) with patients | 4.89 | 5.02 | | 4.87 | 5.20 |
| 6) Nursing practice changes. | | | 2.53 | 3.69 | No data |
| Patient assessments are: | | | | | |
| a) more reliable | | | | 3.42 | 1.40 |
| a1) more comprehensive | | | 2.51 | 3.15 | 1.40 |
| Patient care plans are: | | | | | |
| b) more organized | | 4.36 | 2.28 | 3.42 | 1.20 |
| b1) more structured | | 4.33 | 2.33 | 3.36 | 1.20 |
| Nursing actions are: | | | | | |
| c) more timely | | | | 3.56 | 1.20 |
| c1) more efficient | | | 2.69 | 3.40 | 1.20 |
| Nursing outcomes are: | | | | | |
| d) more effective | | | | 3.35 | 1.20 |
| 7) The care provided for patients is safer | | | | 3.65 | 1.20 |
| 8) Patient care is based on more current information | 2.70 | | 2.38 | 2.80 | 1.20 |
| a) continuity of care is improved | | | 2.70 | 3.05 | 1.40 |
| b) each nurse is able to spend more time with patients | | 4.80 | | 3.62 | 2.00 |
| c) each nurse is expected to care for more patients | | 4.33 | | 4.24 | 4.00 |
| 9) Patient information is: | | | | | |
| a) less confidential | | 2.69 | | 3.35 | 6.00 |
| b) less secure | | 2.74 | | 3.49 | 6.00 |
| 10) The computer is a valuable tool for nurses | 1.67 | 2.20 | 2.59 | 1.98 | 1.00 |
| 11) My attitude towards computers is positive | 1.42 | 1.77 | 2.46 | 1.69 | 1.00 |
| 12) I would recommend computers to other hospitals for managing patient information | 1.50 | 1.96 | | 1.95 | 1.00 |

NI systems influence attitudes the most strongly over education/experience/aspirations

*Credit Course; **No formal course; ***No course

## Composite Table of Means
## Attitudes x Attitudes x Educational Preparation

| | Crosstab Educational Preparation x Attitudes | | | Attitudes Means for | Attitudes |
|---|---|---|---|---|---|
| | N = 16 CVH BN | N = 65 CVH RN | N = 44 TWH RN | N = 55 | N = 6 Bayorest |
| 1) Nurses feel more competent in their job | | others 3.13 to 3.80 | | 3.57 | 1.36 |
| 2) Computers are not easy for nurses to use | 5.43 | 4.97 | | 4.40 | 6.80 |
| 3) Nurses do or would like to use computers in their job | 2.18 | 2.48 | 2.43 | 2.55 | 1.40 |
| 4) Nurses accountability for care is increased | | | 2.61 | 3.00 | 1.40 |
| 5) Communication decreases: | | | | | |
| a) with peers | 4.50 | 4.84 | | 4.67 | 5.20 |
| b) with health team members | 4.47 | 4.50 | | 4.87 | 5.20 |
| c) with patients | 4.80 | 4.88 | | 4.87 | 5.20 |
| 6) Nursing practice changes. | | 4.09 | 2.52 | 3.69 | No data |
| Patient assessments are: | | | | | |
| a) more reliable | | | | 3.42 | 1.40 |
| a1) more comprehensive | | | 2.47 | 3.15 | 1.40 |
| Patient care plans are: | | | | | |
| b) more organized | | | 2.23 | 3.42 | 1.20 |
| b1) more structured | | | 2.30 | 3.36 | 1.20 |
| Nursing actions are: | | | | | |
| c) more timely | | | | 3.56 | 1.20 |
| c1) more efficient | | | 2.69 | 3.40 | 1.20 |
| Nursing outcomes are: | | | | | |
| d) more effective | | | | 3.36 | 1.20 |
| 7) The care provided for patients is safer | | | | 3.66 | 1.20 |
| 8) Patient care is based on more current information | | | 2.17 | 2.80 | 1.20 |
| a) continuity of care is improved | | | 2.70 | 3.06 | 1.40 |
| b) each nurse is able to spend more time with patients | | | | 3.62 | 2.00 |
| c) each nurse is expected to care for more patients | 4.61 | | | 4.24 | 4.00 |
| 9) Patient information is: | | | | | |
| a) less confidential | | 2.67 | | 3.35 | 6.00 |
| b) less secure | | 2.74 | | 3.49 | 6.00 |
| 10) The computer is a valuable tool for nurses | 2.19 | 2.05 | 2.38 | 1.98 | 1.00 |
| 11) My attitude towards computers is positive | 1.94 | 1.75 | 2.33 | 1.69 | 1.00 |
| 12) I would recommend computers to other hospitals for managing patient information | 1.88 | 1.91 | 2.41 | 1.95 | 1.00 |

NI systems influence attitudes the most strongly over education/experience/aspirations

# APPENDIX C

## Boyd's Modeller's Checklist

*Modelling Your Situation to Ensure the Viability of Your Computer-Based (or other kind) Training Project* ©by G. M. Boyd, 1989

Propagative Cybersystemic modelling is helpful for the three main phases of any project: development, implantation, and transfer. It is helpful at the level of selves-machine interaction design and develoment, it is also helpful at the higher socio-technical levels of group projects and institutional development.

When the *focal system* has been identified by listing the main: people, machines, and nominal functions, then we look at the environment, then the internals of the focal system, and then the interactions between environment and focal system, in order to create new options and to implement them.

Since the aspects of communication and control are central to educational *and training* systems they are cybernetic mechanisms and the modelling must therefore include cybernetic mechanisms and principles such as feedback control and the provision of requisite control variety at all requisite levels of system hierarchy or hetrarchy - if possible.

A methodology for participiatory, anticipatory, emancipative cybernetic selves-in-system modelling is outlined:

Modellers' Checklists/do Work with a Partner who is also a Stakeholder

1. Identify, Ownership, and Aims of the system being modelled

.1 Name your Focal system (the (sub-) system of concern, where you act or acted.

.2 State your role(s) in it

.3 Name (pseudonyms or titles) other principal actors

.4 State your main aspirations in & for your focal system —

.5 State your main anxieties about the undertaking

.6 Guess if necessary, the main concerns/aspirations &

anxieties of the other main actors ("p" individuals and/or "m" individuals)

.7 What goals have been identified and/or negotiated for this sub-system?

.8 Who have publicly committed themselves to these goals?

2. Map the Context of the Focal system(s)

.1 Diagram the situation of the system in terms of systems in its environment

What supra-system(s) is it part of?

.2 Indicate the main boundaries (spatial, temporal/people) of the Focal system. (Are they moveable by your efforts)

.3 Indicate the main resource and noise inputs (good and bad) from the environment.

.4 Indicate the main desired/goal/purposive outputs to the environment.

.5 Indicate the main forms of waste and undesired outputs.

.6 Indicate any loops in the environment which connect outputs back to inputs (e.g., payment by results, etc.)

.7 Indicate the main sources of control from the environment.

3. Diagram internal structure of the system (slowly changing constraining and supporting components & connexions)

.1 Diagram the main transformer units - subsystems, and how they feed each other. An ordinary Flow-Diagram will do?

.2 Exhibit hierarchies/Hetrarchy

.3 Exhibit redundancies/parallelisms.

.4 What are the main variables in the focal system?

(e.g. cost/people's time, status indicators, etc.)

.5 Give the Pay-Off matrix for the status game, if any?

.6 What deviation-limiting control loops and norms or standards are directly involved?

.7 What Deviation-amplifying loops exist around and within this sub-system?

.8 What control variety (strategies, tactics) has it?

Discuss

4. Operation of the system (Deal with each main sub-system in turn - if that makes sense)

.1What rules, conditions/actions are involved?

What transformation mechanism or game or process is involved?

.2 Construct a flow-chart or decision table of the process (distinguishing clearly between the flows of pattern/information/data, and sequences of events, versus flows of people, aterials, etc.

.3 How does it/did it actually behave over a cycle/term of operation?

Can the behaviour of the most important variables be plotted over the time frame you have chosen? Do so.

5. Discuss Prognosis:

.1 Is/was performance of the whole system and all its main subsystems satisfactory? To Whom?

.2 Is/was there requisite variety to counteract the disturbances from outside? (i.e. Did/does the control variety adequately match the disturbance varieties?

.3 Are the closing and openings sub-optimal?

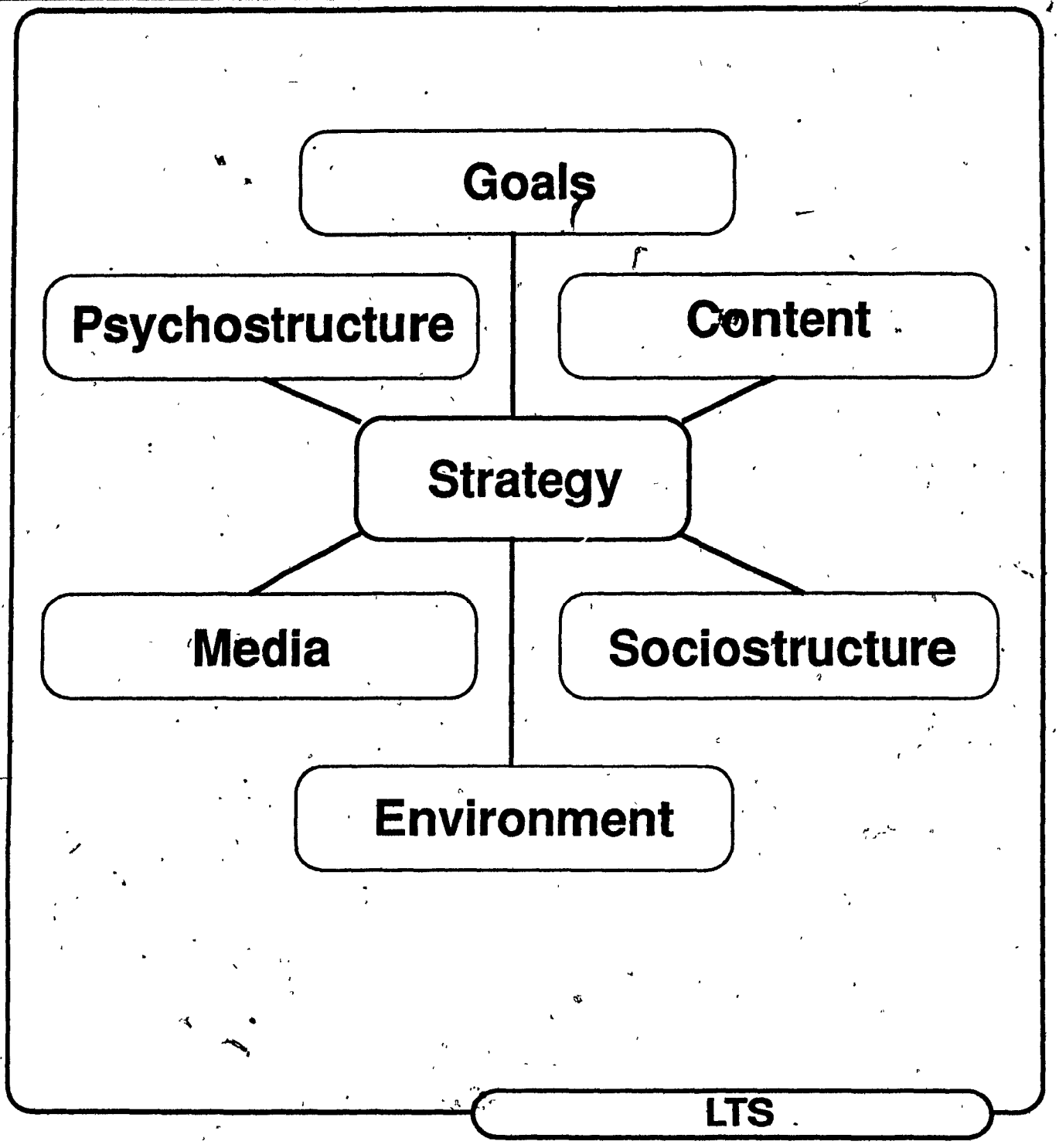
.4 Sensitive Times and Places: Where would/do/did the smallest interventions have large effects? (sensitivity analysis)

6. Make - and carry out - Prescriptions

.1 How can the system be improved? (split it? enlarge it? add loops, remove loops, add variety, remove noise, add noise, add conflict, resolve it?)

.2 By whom?

3. When?


Goals
Psychostructure
Content
Strategy
Media
Sociostructure
Environment
LTS