CHAPTER 1

INTRODUCTION

Background and significance of the problem

Throughout the world, the handling of information using computer technology has been the most significant development since the Second World War (Blackwell, 1994). Computers were first used in the 1950's in the United States (Kalbach & Kalbach, 1988; Saba & McCormick, 1986). As computer technology advanced, the use of computers in health care systems has become very widely in developed countries. Most of computerized systems have been implemented in hospitals since the mid-1970s (Sullivan & Decker, 1985). In 1980, it was estimated that over two-third of the 5,851 community hospitals in the United States, and almost all hospitals with more than two hundred beds used computers to some extent. It was reported that every health care system globally used computers at some level of its organization (Blackwell, 1994).

Computers have many functions. They are used in hospitals for ordering and recording pharmacy supplies, laboratory tests, radiology orders, supply and material

management. It was reported that the computers improved regibility and completeness of the medical record, saved time, and made entering of data easy (Kalbach & Kalbach, 1988). Computers have also been developed for nurses to use in patient monitoring, writing histories, scheduling, training, and evaluating. They could provide decision assistance and decrease nursing time spent in doing clerk work. Moreover, such computerized systems could decrease handwriting errors because they have better and more systematic check program than manual operation (Sullivan & Decker, 1985). Using computers in nurses' routine work, nurses will be able to give more attentive patient care, and nurse administrators can effectively complete managerial and educational tasks (Blackwell, 1994).

In developed countries, the most effective use of computers in hospitals is a Hospital Information System (HIS), which integrates all computers into one system, and allows all of units to communicate and share the same data (Sullivan & Decker, 1985). HIS has been utilized in more and more health care systems in many countries, including the United States, Canada, Australia, Japan and so on. According to Ford (1990), in Canada, the decision to implement a computerized system is for the sake of improving production, promoting the quality of health care, and reducing the upward

cost of health care. Thus, based on the economic arguments, the installation of computers in hospitals is necessary and inevitable. The use of HIS ultimate will offer remarkable power to users. However, the conversion from manual to computerized procedures is a very important and arduous change process. Many studies on the implementation process of HIS have been carried out. It was reported that the change process would inevitably accompany resistance. The resistance may come from the problems of computer hardware, software, and human being's factors (Cao & Li, 1994; Dowling, 1980; Gibson & Rose, 1986; Marr, 1988; Sorrentino, 1991; Sullivan & Decker, 1985). Cao and Li (1994) stated that as the computer hardware and software technique improved, the social factors and human being's behaviors, such as the management level, the nurses' computer knowledge, attitudes and skills, will become main factors to affect the spread and utilization of HIS. Sullivan and Decker (1985) suggested that nurse administrators and other hospital personnel have to spend significant time investigating this field before HIS can be implemented. Marr (1988) considered that the implementation of HIS was an important organizational change process and there were certain predictable phases and change principle which should be followed. The support of the highest management level was very important for overcoming

the resistance to change. Also positive support and active involvement of the head nurses was vital to system acceptance by staff nurses. From literature, many factors affecting system acceptance need to be considered which included lack of computer knowledge and skills of staff nurses, negative attitudes, inadequate training, poor planning, and lacking of support. Furthermore, nurses' computer knowledge, attitudes and skills were regarded as three key variables affecting implementation of computerized systems. Abbott (1966) and Sullivan and Decker (1985) considered that computer knowledge and skills were very important for staff nurses to effectively use computers while the negative attitudes toward a computerized system could make the system far less valuable. Lange (1988) also reported that negative attitudes toward computers might represent a significant barrier to effective use of computer technology.

In China, computers were initially used in hospitals in the mid-1970s (Shao, 1994). It was reported that almost all hospitals in urban used computers in some extent, but without integrated HIS (Cao & Li, 1994). Since 1977, the project of research and development of HIS was presented and supported by Ministry of Public Health of China (MPHC). However, during the first ten years, there was not an integrated HIS that was developed and implemented

successfully. It was reported that the common factors affecting system implementation were nurses' lack of computer knowledge and skills; and negative attitudes toward computer use; lack of readiness for learning and using computers; and lack of support (Cao & Li, 1994; Shao, 1994). On the basis of summarizing experience, in 1990, a specific HIS software development company, Zhongbang Huizhi Company, was established again by MPHC. Up till now, this company has developed HIS, named Chinese Hospital Information System (CHIS). Chinese experts in computer applications in medicine regarded CHIS as the best HIS in China. This system was developed mainly to serve as administrative tasks and medical information, including hospital administration of personnel; financial and material resources; in-patient information system recording admission, order, transfer, discharge and bill of patients; case management; medical information statistics; and order treatment system. However, the CHIS had not been used until it was first introduced into People's Hospital in July of 1995. This hospital is a general teaching hospital with 1000 beds affiliated to Beijing Medical University situated in Beijing, China, and it has been the first pilot hospital for utilizing CHIS.

After CHIS was selected, the total committee for implementation of CHIS was founded at the highest management

level, including president and managers from all departments. Many preparation works had been done before CHIS was installed and implemented, for example, modifying programs in order to fit the needs of this hospital, purchasing computer hardware devices including two hundred 586 microcomputers and one hundred printers, and staff training. In each ward, there were one terminal and one printer at the nurse station. Two instructors of CHIS Software Company conducted the formal computer training of nurses for ten two-week sections in People's Hospital Computer Center. It took five months to train two hundred nurses, including all head nurses and one half staff nurses working at wards. Each section had about twenty nurses attended. In this two weeks, the nurses had to learn how to work on CHIS. Since the CHIS was developed using some type of Windows displays, the computer knowledge and skills for Windows operations as well as the applications of CHIS were required. So, the contents of the formal computer training courses included computer components, terminology, functions, how to use Windows, as well as the purpose, functions and applications of CHIS. In addition, one copy written user and operator guide was distributed to each nurse. After two weeks formal computer training, every nurse had to take the computer skills examination, and got a qualified certification. Because the formal computer training

was time-consuming, and nurses are shortage in this hospital, not all nurses can attend the course. The trained nurses had to be the trainers and trained the others left by the informal training. The trained nurses taught their colleagues one to one, and after that the trainee would improve computer knowledge and skills by practice. In case that they had problem regarding computer use, they could consult the computer personnel directly.

After completing all the preparation work, CHIS was first implemented at several pilot wards in March of 1996. Until September of 1996, CHIS has been implemented at all wards, it was an important conversion from manual procedures to computerization.

Since the beginning, the use of CHIS in China had been still at the low level of functioning. Because nurses are major operators of computers and users of information, the periodic investigations regarding the satisfaction level of staff nurses with CHIS have been done. In initial few months of implementation of CHIS, the investigation results showed that some nurses had complaints about the limitations of using CHIS, such as the computers response slowly during the computer use peak time; the standard orders provided through computers were inflexible and could not meet specific needs, and so on. In addition, nurses complained that they

did not know what different error messages mean, and they always depended on computer personnel to solve some common problems of computer use, therefore, the work of nurses was delayed. Some nurses also complained that they often needed to repeat printing because of unskillful paper installation technique. Analysis of these complaints implied that the CHIS failed to meet nurses' expectations at some extent, and some nurses lack of enough computer knowledge and proficient skills to operate computers, as well as negative attitude toward CHIS use.

Henderson and Deane (1996) reported that if a computer system did not meet nurses' expectations, the extent of satisfaction with the computer system and the enthusiasm of nurses in work would be decreased. Sullivan and Decker (1985) suggested that before a nurse could effectively use computers, she had to understand the capabilities and advantages of the computers. It was necessary to provide them enough computer knowledge and skills. In People's Hospital, even though about 50% of nurses working at wards were formally trained, however, the time may be too short for them to obtain enough computer knowledge and skills, or to be proficient computer users. Furthermore, the rest of nurses had no opportunity to attend the formal computer training; their computer knowledge and skills might be limited.

Ngin, Simms and Erbin-Roesemann (1993) reported that computer skills were positively related to nurse's enthusiasm and interest in nursing tasks needed of using computers. So, to be skillful in using computers, nurses should have positive attitudes toward computer use, and be willing to work with computers. Several studies also identified that the nurses' attitudes toward computers were a key variable in the successful implementation of clinical information system (Brodt & Stronge, 1986; Sorrentino, 1991). Therefore, to improve implement quality of CHIS, the nurses' computer attitudes also need to be enhanced.

Since implementing CHIS can improve the quality of health care, it is necessary to enhance effective use of CHIS. Therefore, nurses' competence in computer work needs to be improved. It is necessary to identify the level of computer knowledge, attitudes, and skills of nurses' in People's Hospital; and study the relationships among these variables. The findings will be the baseline information for nurse administrators to plan the ongoing computer training to increase nurses' computer knowledge and skills, and to foster nurses' positive attitude toward computer use. With increased computer knowledge, positive attitudes toward computers, and increased computer skills, the quality of CHIS implementation will be improved, and the success of using

CHIS in China will be achieved.

Objectives of the study

The objectives of this study were as follows:

1. To identify the level of computer knowledge of nurses working at People's Hospital.

2. To identify computer attitudes of nurses working at People's Hospital.

3. To identify the level of computer skills of nurses working at People's Hospital.

4. To compare the computer knowledge, attitudes, and skills level of nurses receiving formal and those receiving informal computer training.

5. To examine the relationships among computer knowledge, computer attitudes, and computer skills of nurses.

Research questions

The questions to be answered in this study were as follows:

1. What is the level of computer knowledge of nurses working at People's Hospital?

2. Is there any difference of computer knowledge of

nurses receiving formal and those receiving informal computer training?

3. What are the attitudes toward computers of nurses working at People's Hospital?

4. Is there any difference of computer attitudes of nurses receiving formal and those receiving informal computer training?

5. What is the level of computer skills of nurses working at People's Hospital?

6. Is there any difference of computer skills of nurses receiving formal and those receiving informal computer training?

7. Is there any relationship among nurses' computer knowledge, computer attitudes, and computer skills?

Scope of the study

The study was conducted in a four-month period from November 1997 through February 1998 in a sample of 169 certificate and diploma nurses who had been working at People's Hospital of Beijing Medical University.

Definition of the terms

Computer knowledge refers to the understanding of a computer system's purpose, functions, and interaction with nursing staff, including the basic computer knowledge; the purpose, functions, and use of Chinese hospital information system (CHIS); the limitations of CHIS; and system security, measured by the Computer Knowledge Questionnaire developed by the researcher.

Computer attitudes refer to complex internal state of nurses that affect their choice or behavior toward computer use, including three components: satisfaction (an attitude of preference for a certain computer-use outcome); beliefs (an expectation that using computerized nursing programs will lead to preferred outcome); and motivation (the force or willing to use computerized nursing programs), measured by modified Burkes' Nurses' Attitude toward Computer Use Questionnaire (Burkes, 1991).

Computer skills refer to ability to operate computers, and to use Chinese hospital information system (CHIS). These skills primarily include the basic computer skills for Windows operation; the skills of using CHIS for order entry, enter and retrieve patient data, information communication with other departments; and skills of system

security for using password and detecting virus. It is measured by the Nurses' Computer Skills Scale developed by the researcher.