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Nursing Informatics in Nursing Education

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Full integration of nursing informatics education at all levels at academic institutions and in practice is critical to nursing as the profession faces the 21st century. Nursing informatics, which encompasses computer hardware, software, and network systems, supports the profession's goals of achieving computer literacy by the year 2000. Strategies for successful integration of nursing informatics into curricula are identified, and specific tactics that promote desired outcomes suggested. The benefits that nursing informatics brings to education, administration, research, and practice are stated and the role of professional nursing organizations in promoting nursing informatics' status as a recognized nursing specialty is noted, and the specialty's role in promoting the profession's future development described.

Introduction

The full integration of nursing informatics into nursing education is essential to the health of the nursing profession as it faces the 21st century. Nursing informatics, which encompasses new technologies, supports the nursing profession's goal of achieving computer literacy by the year 2000. To accomplish this goal, educators must integrate informatics into their basic, advanced, and continuing education nursing programs. Even though nursing informatics was introduced in nursing education over a decade ago, it has made slow progress.

The major obstacle to the success of nursing informatics programs has been reluctance on the part of nursing faculty to integrate it into nursing curricula. Four factors account for this reluctance. First, since the majority of nursing educators were generally not computer literate, they have had difficulty embracing technology. Second, there have been a limited number of informatics experts and qualified faculty available to teach and upgrade their colleagues' skills. Third, only a few educational programs are available that can educate faculty to this new speciality. Fourth, educational institutions have not allocated sufficient funds for technology resources.

Background

Informatics is derived from the French word *informatique* which refers to computer technology. As early as the 1950's, computer technology was introduced into the health care industry. Informatics evolved as the computer industry advanced and as the nursing profession developed. In the 1980's, informatics was recognized by the nursing profession, and informatics specialists without formal credentials in this specialty emerged in the field [1].

Nursing informatics

Nursing informatics is the integration of nursing science, computer science, and information science as applied to the identification, collection, analysis, and management of data for nursing in clinical practice, administration, education, and research. Computer science refers to computer hardware, computer system configurations, and communication networks. Information science refers to computer software programs. Computer programs process data into information, which when aggregated and evaluated, can be processed into knowledge. Nursing science refers to the practice of nursing and is the theoretical and knowledge base for nursing informatics [2,3].

Nursing education

The introduction of nursing informatics into academic nursing programs has not followed any particular pattern. Generally, an educational institution introduced nursing informatics as a result of a faculty member's interest in the subject or a school's decision to integrate technology into the curriculum.

In the 1980's, federal grants were available to finance the integration of nursing informatics as a specialty track in graduate programs. Also, during that decade, private educational technology organizations funded grants to establish computer laboratories for technology practicum. These laboratories typically were equipped with microcomputers, generic software packages, laser disc players which ran interactive video (IVD) and computer-assisted instruction (CAI) programs.

These initiatives were not begun in sufficient numbers to ensure that the majority of nursing students and faculty in nursing educational institutions become computer literate. However, in the 1990's, with the introduction and rapid spread of E-mail, the Internet, and the explosive growth of the information superhighway, faculty and students began, and are now voicing an urgent need to utilize computer technology effectively. Faculties are eager to become computer literate; to incorporate technology-based pedagogy; to ensure information management skills by successful integration of nursing informatics in the curricula; to provide computer-based presentations using graphical data shows; and, to implement distance learning projects. In fact, faculties are demanding technology education, services and support for their professional endeavors.

Educational programs

Nursing informatics educational programs employ at least four different strategies to teach computer literacy. They are designed to: (a) conduct continuing education programs as workshops, institutes, or conferences; (b) introduce a specific course at the undergraduate or graduate level; (3) establish a graduate specialty program; or (4) integrate content into nursing courses and curricula. Each of these strategies uses different methods to integrate nursing informatics in educational programs.

Continuing education

Nursing informatics workshops and institutes are the most popular methods used to teach computer literacy. The most successful are those offered as separate events associated with computer conferences; others as one or two day programs during the orientation sessions at educational institutions; or as one or two week summer institutes offered by an educational institution or private organization.

The educational content generally focuses on providing an overview of the field [3]. The content includes: (a) computer fundamentals (hardware, software, data processing, and communication networks); (b) computer systems designed for administering nursing services; (c) nursing systems designed for managing the delivery of patient care; (d) computer applications that link nursing research resources; and (e) computer applications that support nursing education. The courses generally include a hands-on practicum; a demonstration of an information system; and, in many situations, a field trip to a health care facility using an information system.

Nursing informatics course
In many educational institutions, a computer literacy course is offered as an elective at the undergraduate or graduate level. Generally, this basic course is designed to ensure that the students become proficient users of computer technology. A basic nursing informatics literacy course is designed to prepare students to: (a) acquire basic computer skills; (b) understand computer concepts; (c)obtain sufficient knowledge to utilize computer applications; (d) use computer communication links to libraries, E-mail and the Internet; and (e) learn how to manage nursing data and information.

Graduate specialty program
The most advanced nursing informatics programs are educational programs that lead to a graduate degree at the Masters or Doctoral level. These programs are designed to ensure that the students become not only proficient in the use of technology, but also capable of developing computer-based information management systems. The students are taught: (a) to acquire in-depth knowledge of computer concepts; (b) to be able to adapt generic software packages to nursing; and (c) to develop and apply systems analysis, design, and implementation of a computer-based nursing information system.

Integration into nursing curricula
Nursing informatics content is being integrated into nursing educational courses as another strategy to promote computer literacy. Technology content is being integrated into courses in response to faculty and student demand. In some schools, the identification of computer literacy as an outcome for the educational nursing program is instituted to meet National League for Nursing accreditation standards. This strategy requires that a technology objective be included in appropriate courses throughout the program to enable students to meet the program outcome of computer literacy. However, in other courses nursing informatics content is taught; and in still others, students are required to implement technology content in their course work.

Today, more and more students are acquiring computer skills prior to entering nursing programs. They are not only entering educational institutions with their own PCS, but also are expecting computer laboratories to prepare assignments; demanding communication networks to access E-mail; and requiring computer support to search the literature and review course content.

Educational strategy
The full integration of nursing informatics into educational nursing programs regardless of the method of integration selected requires an educational strategy. The implementation of the education strategy generally requires: (a) framework and/or model, (b) strategic plan, (c)milestone chart, and (d) technology resources, staff, and budget.

Framework and/or model
An educational model provides a framework and a guide for the integration of technology in academic institutions. The framework provides the philosophies and methodologies that direct the integration of nursing informatics into nursing education [4]. An example of a model that provides a framework for the integration of technology into the curriculum is the Nursing Informatics Education Model (NIEM) developed by Riley and Saba [5]. It focuses not only on the identification of the three dimensions of nursing informatics content -- computer science, information science, and nursing science; but also, on the three domains of learning -- cognitive, affective, and psychomotor.

Achieving outcomes in each domain of learning allows students to integrate nursing informatics into their nursing roles. This integration of knowledge and competence requires the teaching of content, "hands on" application, and attitude. The NIEM model supports the integration of technology into nursing education to enhance the critical thinking skills of students of nursing and provides an active learning environment.

Strategic lan

A strategic plan needs to be developed by a task force responsible for overseeing the development, administration, and periodic evaluation of the nursing informatics program. The task force, ideally directed by a nursing informatics expert, should comprise a technology expert (e.g., communication network manager) and a representative from each level in the school and program that are involved in the initiative.

The strategic plan includes a wide range of activities, such as: (a) conducting a survey of faculty knowledge, skills, and usage of computer technology; (b) evaluating existing computer courses, content, and technology; © assessing computer resources (facilities, equipment, Internet access and staff), available to faculty, students and staff; and (d) preparing a financial statement for a proposed budget.

Milestone chart

A milestone chart outlines the action plan with a time table for achieving the action activities. It includes: (a) designing a continuing education program to upgrade the faculty skills; (b) establishing a computer department to oversee the staff and resources;(c)creating a learning resources center with a computer laboratory; and (d) preparing an annual budget to initiate, maintain and upgrade the computer office and resources.

The milestone chart activities focus on assigning task force faculty members to: (a) develop specific goals for individual courses, and the terminal outcomes for each of the undergraduate and graduate nursing program; (b) identify nursing resources for the computer laboratory such as computer software, books, CD-ROM for specific courses, literature services and databases, etc.; and (c)serve as a resource for faculty by attending health-related computer conferences, staying current, and obtaining information about new resources.

Technology resources

Technology resources support the integration of nursing informatics in the curriculum. They need to be available to students, faculty, and administrators. Technology resources include hardware and software, and support staff to optimize the use of the technology. They also include a learning resource center (LRC) with a microcomputer laboratory and technical support, computer classrooms, and support for research, administration and other special initiatives.

Learning resources center

A Learning Resource Center (LRC) enables faculty and students to function effectively in their roles. The basic requirements of an LRC include: (a) hardware; (b) generic software packages; (c)nursing and other health-related software programs; (d) communication links to other resources, e.g., E-mail, and Internet; (e) a network system; and (f) supporting technology materials. It also needs a technology specialist who maintains the resources including the communication network; assist all levels of users -- faculty, students and staff -- teaches and assists faculty to use the hardware and software such as electronic teaching guides programs.

Computer classrooms
Computer classrooms offer a new dimension to the educational process. The newer computer classrooms consist of several tiers of microcomputers with a lead crystal display (LCD) projector and a teaching workstation. Such classrooms are used not only to teach nursing informatics, but also used for innovative technological techniques to teach for example distance learning courses. These new classrooms allow faculty to: (a) display lecture content; (b) provide stimulating presentations using graphical software packages such as Power Point; (c)use a local area network (LAN) to communicate and link other resources into the classroom, such as the Internet or distance learning groups; (d) demonstrate clinical information systems, (e) search library knowledge databases; (f) use software developed for teaching on CD ROM (Compact Disks), Computer-Assisted Instruction (CAI), and Interactive Video (IVD); and (g) use statistical software to analyze research study data.

Research support
Technology resources need to support faculty research and be an integral part of any research program. Faculty research is essential to professional advancement, tenure, and funding sources; and is an integral component of nursing academic scholarship. Most research studies conducted by faculty need to use computers to collect, process, analyze, and generate reports on the research findings. Technology is used in research to: (a) search the bibliographic retrieval systems for resource and background information; (b) collect, code, store, and process the study data using a database management system; (c)communicate with collaborating colleagues at other institutions around the world; (d) analyze data using statistical software packages; and (e) prepare, track, and manage research studies

Administration support
Technology resources need to also support the efficient administration and management of student, faculty, and staff. Several administrative functions need technology for their successful performance to support the delivery of services to students, register student courses, track academic credit of students; and assist evaluation of faculty courses and students. They are also needed to network PCS among and between the administrative staff; to improve communication and share workload; provide E-mail to communicate between and among staff and faculty; and to develop a system to provide E-mail to all students for enhanced communication.

Professional involvement
Nursing informatics was advanced in the United States with the support of national professional nursing organizations. The American Nurses Association (ANA) and the National League for Nursing (NLN) promoted and continue to promote, the integration of nursing informatics in nursing education, clinical practice and the profession at-large. In the 1980's, each of these organizations instituted a computer council. Both organizations developed initiatives that focused on the needs of this new nursing specialty. Each developed policies, recommendations, and resolutions that impacted on nursing practice and education. Additionally, each published materials that outlined the scope of practice; identified teaching strategies for educational process; identified data standards for the computer-based patient record; recognized nursing vocabularies and classification schemes; and addressed numerous other technology needs for the profession.

Today, nursing informatics is a recognized nursing specialty. The ANA offers an examination to credential a nurse as a Nursing Informatics Specialist. Further, the NLN requires that

nursing informatics be included in the academic nursing educational programs as a requirement for accreditation.

Summary

Faculty must adapt to emerging technologies, which are continually changing. Faculty must change the way they teach. Further, they must transform their didactic classroom lecture methodology to an evolving one; use technologies to support their teaching; and communicate with their students online using the information superhighway. New communication media are changing how we educate nurses and how nurses practice. To best exploit these new media, nurse educators must be computer literate and knowledgeable about nursing informatics. We will then be able to use the information superhighway to bring the world of nursing together.

References

1 Saba VK, McCormick KA. Essentials of Computers for Nurses. 2nd Ed. New York: McGraw-Hill, 1996.
2. Graves JR, Corcoran, S. The Study of Nursing Informatics. *Image* 1989; 21(4): 227-231.
3 Saba VK. A New Nursing Vision: The Information Highway. *Nursing Leadership Forum* 1995;1(2):44-51.
4 Ronald JS, Skiba DJ. Guidelines for Basic Computer Education in Nursing. New York: National League for Nursing, 1987.
5 Riley JB, Educational Applications. In :VK Saba, KA McCormick.Essentials of Computers for Nurses 2nd. Ed New York: McGraw Hill: 1996:527-574.