The Impact of Informatics on Nursing Education: A Review of the Literature

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abstract

On the basis of a study by the Institute of Medicine, the current health care system is facing several challenges that may be addressed by changes in health professions education. The study focused on integration of five core competencies into health professions education, one of which was informatics. This critical analysis investigates current use of technology and online instructional strategies in nursing education. It also explores the potential impact of integration of informatics into nursing education to increase the cognitive skills of nurses to promote evidence-based nursing. Advantages and disadvantages of using online education in the instruction of nursing students and recommendations for best online practices in nursing education are discussed.

According to the Institute of Medicine’s (IOM) report Health Professions Education: A Bridge to Quality, “All health professionals should be educated to deliver patient-centered care as members of an interdisciplinary team, emphasizing evidence-based practice, quality improvement approaches, and informatics” (Hundert et al., 2003, p. 45). The IOM report focuses on integrating five core competencies—patient-centered care, working in interdisciplinary teams, emphasizing evidence-based practice, quality improvement, and informatics—into health professions education. It also lists some challenges facing the current health care system. These challenges include the absence of a system and coordination across sectors, resulting in lack of continuity, poor accommodation of patient needs, an inability to assimilate the increasingly complex science base, slow adoption of information technology, failure to address consumerism among patients who are better educated and more informed about their health needs and health care, and work force shortages and discontent (Hundert et al.). Because technology could be used to impact the five core competencies and, as a result, the quality of health care, this article focuses mainly on the use of technology. It also explores inclusion of informatics in nursing education.

NURSES AS LEARNERS

The ages and academic achievements of nursing students vary greatly. Nursing students can be identified as intended nurses and practicing nurses. They can be high school graduates who enroll in higher education to complete prerequisites for nursing programs or currently employed nurses. Nursing students may be enrolled in nursing programs at universities or community colleges or in nursing diploma programs. Many nursing programs offer courses or degrees online. Regardless of learners’ ages, they enter programs to prepare for nursing practice, earn an advanced degree, improve chances for career advancement, or improve their level of professional practice.

REVIEW OF THE LITERATURE


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Their study attempted to link educational elements to nurse preparation for practice. Li and Kenward found that: Inadequate preparation of several nursing functions were identified as predictive of difficulty with patient care assignments. These areas include working effectively within the healthcare team, administering medications to groups of patients, analyzing multiple types of data when making client-related decisions, delegating tasks to others, and understanding the pathophysiology underlying a client's conditions. In addition, it was found that the graduates were more likely to feel adequately prepared when nursing programs taught them use of information technology and evidence-based practice; integrated pathophysiology and critical thinking throughout the curriculum; taught content related to the care of client populations as independent courses; and had a higher percentage of faculty teaching both didactic and clinical components of the curriculum. (pp. 110-111)

According to Li and Kenward (2006), only 62.1% of registered nurse study participants felt that they were adequately prepared by their classroom education to use information technology to enhance patient care. Informatics develops new uses for information technology to solve specific problems in areas as diverse as biology, fine arts, and economics. Informatics is also interested in how individuals transform technology and how technology transforms individuals (Indiana University, 2006). Erdley (2005), who published a study that focused on developing a definition for nursing information, concluded that:

Nursing information is contextually dependent, multidimensional, complex, and necessary for patient care. Essential elements of nursing information include intervention (doing for the patient and others), communication, form (attributes/traits), and value (commodity). Use of power can enhance or detract from the value of nursing information in the patient care encounter. (p. 98)

McDowell and Ma (2007), who studied computer literacy among baccalaureate nursing students, stated: Students may be entering nursing programs with basic skills in word processing and e-mailing, but educators need to ensure graduates are leaving the program equipped with other experiences that incorporate the use of databases, spreadsheets, and statistical analysis packages. These programs may assist them to deal with technologies that are still on the horizon and essential to professional nursing practice. (p. 35)

Evidence-based nursing is nursing practice based on research and the literature resulting from that research. Nurses who are skilled in using technology and databases can retrieve information to make sound decisions based on current research rather than opinion. The field of nursing informatics was defined by Graves and Corcoran (1989) as a "combination of computer science, information science and nursing science designed to assist in the management and processing of nursing data, information and knowledge to support the practice of nursing and the delivery of nursing care" (p. 227). Although 80% of deans and directors who participated in an online survey expected baccalaureate nursing graduates to have nursing informatics competencies such as proficiency with e-mail, word processing, bibliographic retrieval, and the Internet, fewer than one third reported teaching such competencies (McNeil et al., 2003). The authors of the online study concluded that current nursing informatics education in baccalaureate programs was lacking in areas necessary for nursing professionals to use evidence-based practice and collect accurate clinical data (McDowell & Ma, 2007).

Nursing Informatics Defined

The American Nurses Association's Scope and Standards of Nursing Informatics Practice provides a description of informatics competencies for nurses ranging from "beginning" to "specialist" (American Nurses Association, 2001). Beginning nursing informatics competency includes information management and computer literacy skills (e.g., using a word processor, database, or spreadsheet program). Experienced nursing informatics competency focuses on proficiency in information management and communication directly related to one's major area of practice. Specialist nursing informatics competency relates to standards of practice and professional performance.

Current Online Instructional Strategies Used in Nursing Education

Simpson (2006a) discussed several strategies for online nursing education being either used currently or projected for the near future. He discussed Internet2, a consortium of 207 universities, industry, and government with the goals of creating a leading-edge network capability for the national research community, enabling revolutionary Internet applications, and ensuring the rapid transfer of new network services and applications to the broader Internet community. Internet2 is similar to the consortium that was instrumental in the development of the Internet. In 2003, Internet2 Commons was used to offer a pilot course via videoconferencing in nursing informatics for the University of Iowa, the University of Wisconsin-Madison, Indiana University, and the University of Michigan. The Internet2 Commons videoconferencing service allows institutions to participate even though they may use different videoconferencing applications. Instructors and students participated in live, interactive lectures and had access to archived videos. Web-based conferencing and course management were also used. The course employed traditional teach-
ing and learning strategies. Participating classes were also able to schedule group or class sessions to accommodate research and education (Simpson).

Simpson (2006a) also discussed how pervasive computing allows access to educational content anytime and anywhere. Virginia Commonwealth University’s Department of Nurse Anesthesia, School of Allied Health Professions, received funding allowing the creation of simulator-based video modules that can be viewed using mobile memory devices. The short videos enable students to see and hear instructors as they present patient profiles and perform proper procedures and tasks on patient simulators (Simpson).

According to Simpson (2006a), virtual reality settings using avatars allow learners to master technical skills in virtual clinical settings and gain practice interacting with patients through role-playing. In addition to virtual reality, Simpson discussed how augmented reality, an emergent technology, allows users to overlay computer-generated graphics, sounds, sensations, and smells on the real world. Because this technology requires users to wear some type of device, it will most likely be used in clinical settings or preceptorships (Simpson).

Online instructional environments are also used in nursing education. Social interaction with peers was identified as necessary for professional socialization in order for individuals to become members of a given society. The constructivist pedagogy typically used in online virtual communities allows learners to develop personal constructs based on personal observations and interactions; thus, they gain the socialization necessary to make them members of the society of which they are studying to become a part (Simpson, 2006a). Several strategies for developing social presence in an online setting were identified by Steinweg, Trujillo, Jeffs, and Warren (2006). They found that web-based photo albums, student information sheets, student-friendly language, audio and video files, podcasting, assistive technology, discussion, and group projects helped to establish relationships and social presence in online courses (Steinweg et al.).

Faculty members also have access to virtual communities for collaboration, support, and resources. Multimedia Educational Resource for Learning and Online Teaching (MERLOT) is an online community providing “... a leading edge, user-centered, searchable collection of peer reviewed higher education, online learning materials created by registered members, and a set of faculty development support services” (MERLOT, 2006). Users can also share advice and expertise about education. The site has active communities from several disciplines, including a teaching and technology community. The Teaching link offers several examples of online techniques. The Teaching Health Sciences with Technology link includes collection, animation, simulation, lecture/presentation, tutorial, and reference material examples. A brief definition is provided for each, along with a link to a working example.

**Advantages to Using Online Education in Nursing**

Online education in nursing increases accessibility for students in rural areas and those who work or have family responsibilities prohibiting them from attending traditional classes. The number of online programs is growing. The College of Nursing at East Carolina University (2006) offers a transfer program for associate degree nurses who return to school to earn a bachelor of science in nursing that is completely online. The College of Nursing also offers several master’s degree programs online.

Online educational settings offer nursing students the ability to collaborate with colleagues in other geographic areas through participation in online group activities, thus increasing opportunities for social professionalism. Participating in online courses, videoconferencing, group discussion threads, and group chats gives nursing students the opportunity to gain experience working in interdisciplinary teams. Using online databases to search current literature offers nursing students the opportunity to understand the value of research and literature to evidence-based nursing practice. Online collaboration regarding search results also provides nursing students with the opportunity to develop the skills necessary to identify valid sources through peer reinforcement.

When instructors include cutting-edge technologies in their teaching strategies, students have the opportunity to become technology literate. Simpson (2006b) asserted: Despite a wealth of studies showing how information technology (IT) improves care, makes the workplace better for clinicians, and reduces costs, nursing has been the slowest constituency to accept it. Whatever basis nursing has for not using IT, there are even more compelling reasons why nursing must. Paramount among these is the rise of consumerism in healthcare and the resultant demand for evidence-based nursing (EBN). (p. 12)

Nurses can use online databases to stay up-to-date on current research and can make decisions based on that research, thereby increasing the possibility of improved health care. Simpson (2006b) proposed a PLAN (products, learning, access, and need) for tackling the obstacle to information technology ubiquity. Simpson asserted: One of the best ways to get technology into education is collaboration between those who have knowledge and those who can deliver it. Such technological ubiquity will prepare students to take positions at hospitals, regardless of the presence or absence of an electronic health record or the specific vendor product. (p. 16)
Simpson (2006b) went on to say:
If computers exist but we can't understand them or get to them, do they really improve practice? Organizational culture is a leading determinant in our use of IT, evidence, and research in practice. (p. 16)

Participation in online instructional activities and learning exposes nurses to the very technology that is becoming so central to nursing practice.

Disadvantages to Using Online Education in Nursing

Educators not "knowing" their students' needs, receiving adequate training in online education, or using information learned in training are disadvantages. Weber (2005) discussed several issues associated with technology use in relation to students with disabilities. He focused mainly on students in grades K through 12, but also on learners in higher education programs, asserting:
Instructional technology may present barriers to learning that nurse educators do not consider, because it has features not accessible by students with disabilities. Furthermore, access and use needs of students with mild disabilities, such as those with learning disabilities, who can use standard platforms, are routinely overlooked. (p. 451)

Weber (2005) suggested that faculty "do their homework" by determining how technology is used in general instruction and brainstorming how it can be used to better meet the needs of nurse practitioner students.

It might seem that educators may not be able to promote a caring atmosphere for nursing students in online education and, therefore, may not be able to have a positive impact on the affective domain of nursing education. On the basis of a literature review and a study of graduate student perceptions, Leners and Sitzman (2006) asserted that caring has long been associated with nursing and should also be evident in nursing education. They stated:
Intentional caring on the part of the teacher improves nursing student outcomes in face-to-face settings through enhanced learning, enhanced student self-esteem, perceived competency, retention, and program completion. (p. 258)

Leners and Sitzman (2006) went on to say, however, that caring has been attached to:
... one-to-one interactions where participants are able to directly and physically experience the other's voice, body language, facial expressions, and shared physical context, as found in face-to-face classroom settings. Online interactions lack the direct, physical aspects of face-to-face interactions. (p. 316)

Leners and Sitzman (2006) identified several areas where faculty model caring for their students, such as possessing an empathetic perspective toward students; communicating in a timely fashion; using a tone of appreciation; modeling an attitude of "being the best one can be"; finding a chord of harmony; and feeling the passion of caring. Further, Leners and Sitzman found that the caring attitude of faculty promoted students' achievement and an attitude of giving their best. This "passing down" of a caring attitude incorporates the instructional strategy of modeling into nursing education by providing an example for nursing students, who will later enter the nursing profession as more caring health care providers.

Instruction related to psychomotor skills or activities might also be problematic in online learning environments, but audiovisual technology may offer a solution. Love, McAdams, Patton, Rankin, and Roberts (1989) conducted a study that found no difference in performance of psychomotor skills between students who learned in a self-directed manner and those who were taught in a structured clinical laboratory. Each student participating in the study was given a skill package that included an audiovisual resource. Love et al. found laboratory experience, prior to direct patient care, important for students enrolled in nursing education programs.

CONCLUSION

Technology and online instructional strategies can be used in positive ways in nursing education. Evidence-based nursing practice requires that nurses possess the cognitive skills necessary to identify problems, research them, and solve them by applying new knowledge. Including instruction in basic technology (e.g., e-mail, database, and spreadsheet applications) in nursing education is important to adequately prepare nurses and promote evidence-based nursing, communication, and collaboration. Using technology to teach and teaching students to use technology and informatics can ensure that nursing students learn the psychomotor skills associated with the use of the hardware and software that will be beneficial in a health care setting. The opportunity to interact and collaborate with and learn from a diverse group of faculty and peers via online educational settings and technology can promote growth and the nursing profession's caring attitude. Exposure to technology and informatics in nursing education can have the broad impact of improved health care.

RECOMMENDATIONS

Based on the review of the literature, several recommendations can be made regarding promoting technology awareness and skill and including technology in online learning environments.

Instructors should take advantage of professional development opportunities and promote an attitude of
key points

Informatics

1 The Institute of Medicine recommends integrating the following five core competencies into health professions education: patient-centered care; working in interdisciplinary teams; emphasizing evidence-based practice; quality improvement; and informatics.

2 Informatics (i.e., information management and computer literacy skills) impacts the other four core competencies.

3 Health professions education strategies may be used to equip students with skills and experiences in technology and informatics with the goal of improving health care delivery.

The strategies offered in this article are a starting point. Educators should model a love of learning, teaching the importance of being informed and staying up-to-date on strategies to improve professional practice.

REFERENCES