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# Nursing informatics: A key to improving nursing practice in Nigeria

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Nursing informatics is a new nursing specialty in Nigeria; even though it was approved by the American Nurses Association in 1992 as a recognized specialty and has since been growing. The building blocks of this specialty are nursing, information and computer sciences. These three combined provide the knowledge base of nursing informatics. Expanded roles and technology are being incorporated into the domain of nursing informatics. The effects of these roles are visible across all sectors of nursing. This paper explores the field of nursing informatics and presents the relevance to contemporary nursing. Nursing leaders in all areas including research, education and administration and the Nursing and Midwifery Council of Nigeria have a big role to play in ensuring that nursing informatics is embraced by all nurses in Nigeria.

**Key words:** Nursing informatics, contemporary nursing practice, competencies, Nigeria.

## INTRODUCTION

The healthcare delivery environment is dramatically changing and nursing has found itself in the midst of these revolutionary changes. Health care providers are expected to be able to provide safe, competent care in a highly technical and digital environment. Today's nursing requires nurses to be constantly aware of new develop-ments, new medications, and new technologies among others. With the influx of patients into the medical system, it is more essential than ever that nurses keep up. A major theme in this new healthcare arena is the use of information systems and technologies to improve the quality and safety of patient care (TIGER, 2007). Nurses represent the largest health professionals; working in virtually all settings where patient care is received. This includes both in-patient and out-patient settings, as well as, long-term care, hospice, public health, and emer-gency settings to name a few. In addition to providing direct nursing services, nurses by virtue of their training and responsibilities are the coordinators of each patient's care. Whether reviewing a patient's health history, documenting an assessment, or researching evidence based guidelines for patient care, nurses are the consumers, purveyors and brokers of information (Health IT Workforce, 2012).

Contemporary nursing care in Nigeria mainly involves the use of the nursing process. The nursing process, a common philosophy to all nursing professionals includes assessment, diagnosis, planning, implementation, and

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evaluation. Each of these steps of the nursing process supports physically interacting with the patient as well as managing the patients' needs (Jones, 2007) and documenting all that was done for the patient. Hence the nurse in his/her work is either sourcing for information or documenting information in the management of a patient. Thus, "information management" is integrated into every-thing that nurses routinely do and like other fields, the nursing profession is turning towards using computers for many areas of their daily tasks like documentation, communication between shifts, departments and even facilities and building an information database, the steps of utilizing information, applying knowledge to a problem and acting with wisdom form the basis of nursing practice science. In order for practicing nurses to be able to be responsive to the changes in their practice environment, a new specialty called "Nursing Informatics" has emerged that integrates nursing science, computer science, and information science to manage and communicate data, information, knowledge and wisdom in nursing practice (McGonigle and Mastrian, 2009).

Nursing informatics focuses on how nurses structure knowledge and organizes data to support nursing management, practice, and research (Feldman et al., 2008); hence it is an important quality tool for contem-porary nursing in Nigeria. This paper therefore discusses nursing informatics as a specialty and how it can be a key to changing the contemporary Nursing Practice, Nursing Education and Nursing Research in Nigeria.

## NURSING INFORMATICS

Nursing informatics emerged over the past 20 years to assist nurses fully use information technology to improve the delivery of care (TIGER Informatics Competencies Collaborative, 2007). Nursing informatics is a specialty that integrates nursing science, computer science and information science to manage and communicate data, information and knowledge in nursing practice. According to Staggers and Bagley-Thompson (2002), Nursing informatics facilitates the integration of data, information and knowledge to support patients, nurses and other providers in their decision making in all roles and settings. This support is accomplished through the use of information structures, information processes and information technology. This definition is a product of review of other definitions and the most acceptable of all the definitions. The American Nurses Association Nursing Informatics Scope and Standards also adopted this definition in 2008 (ANA, 2008 in Anderson et al., 2011). Factors inherent in this definition is that nursing informatics is a multidisciplinary science practice and secondly, the definition clarify that nursing informatics is not to be equated with the generic term informatics; it is

specific to nursing and nursing practice because of the inclusion of the nursing science domain. Nursing informatics is not just about computers but rather the core elements derived from computers involving data, information, knowledge and how best to structure nursing documentation systems to ensure that the output will meet the needs of patient care and nursing science (Jones, 2007). Other organizations have also veered into embracing and defining nursing informatics; notably among this group is the Canadian Nurses Association (2001, 2006). Nursing informatics is defined as a "science and practice which integrates nursing, its information and knowledge, and their management, with information and communication technologies to promote the health of people, families and communities worldwide" (IMIA, 2009).

The foundation of nursing informatics is based on the concepts of data information and knowledge. Data are discrete observations that are interpreted, organized or structured. Information is data that has been interpreted, organized or structured to provide meaning to the data, for instance, age, number of home visits, blood pressure, disease, and weight among others. Nursing informatics has the purpose and the potential to support and improve the care of patients and communities through the collec-tion, management, and communication of information about and for the patient. Nursing informatics can assist in making the contributions of nursing visible in the medical record and assist the nurse by providing decision support tools. Nurses are presented with an increasing array and complexity of information that they are expected to synthesize and incorporate into their patient care decisions. More information does not necessarily result in better care unless it is thoughtfully analyzed, organized, and presented in ways that are meaningful to nurses and their practice (Jones, 2007).

The goal of nursing informatics is to improve the health of populations, communities, families and individuals by optimizing information, management and communication. This includes the use of information and technology in the direct provision of care, in establishing effective adminis-tration systems, in managing and delivering educational experiences, in supporting lifelong learning and in supporting nursing research (Staggers and Bagley-Thompson, 2002).

## BUILDING BLOCKS OF NURSING INFORMATICS

### Nursing science

According to McGonigle and Mastrian (2009), nursing science is the ethical application of knowledge acquired through education, research and practice to provide services and interventions to patients in order to

maintain, enhance or restore their health; to advocate for health, and to acquire process, generate and disseminate nursing knowledge to advance the nursing profession. Turley (1996) suggests that the nursing science is the foundation on which the other sciences rest. Nursing science is the raison d'être of nursing informatics, and without the needs and context of nursing science, nursing informatics would have no purpose (Jones, 2007). Nursing is an information intensive profession. The steps of utilizing information, applying knowledge to a problem and acting with wisdom form the basis of nursing practice science. Nurses acquire data and information in bits and pieces and then transform the information into knowledge which in turn is used to develop the profession.

## Information science

Information science is the study of information and how it is used by people within organization. It involves studying the application and usage of information and knowledge in organizations and the interfacings or interaction between people, organizations and information systems. It is an extensive, interdisciplinary science that integrates features from cognitive science, communication science, computer science, library science and social sciences. Information science is primarily concerned with the input, processing, output, and feedback of data and information through technology integration with a focus on compre-hending the perspective of the stakeholders involved and then applying information technology as needed (McGonigle and Mastrian, 2009).

## Computer science

Computer science is a branch of engineering (application of science) that studies the theoretical foundations of information and computation and their implementation and application in computer systems (McGonigle and Mastrian, 2009). Computer science offers valuable tools that can facilitate the acquisition and manipulation of data and information by nurses, who can then synthesize these into an ever evolving knowledge and wisdom base. Computer Science involves the use of the computer hardware. This hardware is often classified as processing components, memory, and input and output devices.

1. Processing components: The central processing unit (CPU) is the brain of the computer. The CPU is the control center, directing the flow of information while also interpreting, directing and monitoring the execution of instructions received from memory, the CPU is also responsible for arithmetic logic, the foundation of computer function. The motherboard is another key element, providing the connective infrastructure of the computer. The CPU, chips, hard drive and disk drive are mounted on the motherboard (Jones, 2007).

2. Input and output devices: In order to work and accomplish tasks using the computer, input devices are necessary. Input devices enable the user to enter data, such as numbers or words that the computer then uses to perform computations based on commands that are also entered by input devices. Another way of perceiving input devices is that they enable two-way communication between the user and the computer (Jones, 2007). Commonly used input devices include the keyboard, mouse, and scanner; some computers support the use of light pens or touch-screens and other devices. In most cases, a combination of input devices, such as the keyboard and mouse, is needed for entry of data and commands. A means of extracting data from the computer is also necessary; output devices are required for this purpose. Output devices include disks, CDs, flash drive, electronic transmission to another computer, and printers, to name the more commonly used devices

3. Memory: Computer memory consists of read-only memory (ROM), random access memory (RAM), and storage memory. ROM is memory used only by the computer and is protected from alteration, including erasure, by the user. The information stored in ROM supervises the overall function of the computer and enables certain computer functions, such as starting computer operation, often referred to as booting. RAM is usually called the working memory of the computer, and it is RAM that supports the various applications used, such as spreadsheet and word processing. Instructions needed to operate an application are retrieved from permanent storage, such as the hard drive, CD, or diskette, and used by RAM while the application is in use. Because RAM loses the information stored in it each time the computer is turned off, any work completed using applications must be saved to permanent storage so that it can be retrieved later. The files created and saved while working on the computer are placed in storage memory, sometimes called permanent memory, the files stored in permanent memory reside there until such time as they are erased or overwritten by new files. Hard disks, CDs, and diskettes are used to store files. Another, more recent innovation for file storage is the flash drive, also known as a thumb drive or memory sticks. These highly portable devices are available in ever increasing memory capacities (Saba and McCormick, 2006; Thede, 2003)

## HISTORY OF NURSING INFORMATICS

The history of nursing informatics starts from the definition of nursing informatics over time. In 1994, the American Nurses Association defined nursing informatics as "the

specialty that integrates nursing science, computer science, and information science in identifying, collecting, processing, and managing data and information to support nursing practice, administration, education, research and the expansion of nursing knowledge (Strachan et al., 2011)". Specifically, at the heart of this definition, is identifying, collecting and processing of information. By 2001, the American Nurses Association updated its definition to focus more on informatics for the "support of patients, nurses, and other providers in their decision making." An even more recent definition focuses the role of nursing informatics on managing and communicating data for improved information, knowledge and wisdom in the practice of nursing.

In 1857, Florence Nightingale compiled and processed data in an effort to advocate for appropriate nursing and medical protocols. However, in more recent history, nurses have been involved in informatics since the 1960s. According to Collen (1995), nurses utilized computer-readable punch cards to check-off their observations of patients as early as 1965. The data from these cards were then read into computers at San Jose Hospital, which then served as an electronic record of patient care. In 1966, nurses at the Institute of Living in Hartford used similar technology to document patient statuses. In this case, nurses used machine-readable bubble sheets similar to Scranton technology that can read penciled markings. The term "nursing informatics" was not actually coined until 1980 by Scholes and Barber (Marin and Marques, 2005). Thereafter, in 1992, the American Nurses Association approved nursing informatics as a recognized specialty. Since the mid-1990s nursing informatics has virtually "exploded" as a discipline. The US began certifying nurses in Informatics competencies in the early 1990s. This occurred concurrently with the development of the internet and desktop computing advances (Health IT Workforce, 2012).

In Canada, concerns about the effectiveness and efficiency of the Canadian health-care systems, beginning in the mid 1980s, led to a growing recognition of health information (CARNA, 2009). As the need for better information with which to manage the health-care system became an increasing consistent theme and a national priority in Canada; the Canadian Institute for Health Information (CIHI) was established. Its mandate is to provide "essential data and analysis on Canada's health system and the health of Canadians" (CIHI, 2008). Nursing informatics evolved as nurses participated in the early initiatives in hospital information system adoption in various health agencies across the nation. As these systems improved, specialized nursing components and even free-standing nursing information systems began to sprout up. Early systems were primarily imported from other countries, especially the USA. By the late 1980s, most hospitals had at least a rudimentary information system that required nurses to enter common data such as admission profiles and basic care requirements like diet, medications, and treatments into a computer as part of their routine duties.

The International Council of Nurses (ICN), with the support of its member countries, also developed the International Classification for Nursing Practice (ICNP®). ICNP® is a unified nursing language system. It is a compositional terminology for nursing practice that facilitates the development of and the cross-mapping among local terms and existing terminologies (ICN, 2008). Ever since, the nursing informatics specialty had come into practice, annual conferences, meetings and publications have provided opportunities to network with nursing informatists, for ongoing education and to share knowledge and expertise (National Nursing Informatics Discussion paper, 2007). In the UK, computer project nurses were hired as a result of computer implementations (National Nursing Informatics Discussion paper, 2007)

## Roles of nurses in informatics

Hersher (2000) described several current and future roles for nurses in informatics, they include:

1. User Laison- A nurse in this role is involved in the installation of a computer information system and interfaces with the system vendor, the users and management of health care institutions.
2. Product manager- The nurse in this role is responsible for constantly updating a current product and keeping abreast of new developments in the field. They develop applications like decision support systems, nurse staffing systems, scheduling systems, bedside and handheld terminals.
3. Clinical systems installator- In this role, the nurse works with the vendor who sold the computer systems to the health care institution. She/he helps train users of the system, serves as liaison between the health care institution and the vendor and works closely with the system coordinator for the health care institution.
4. Systems analyst/programmer- The nurse in this role works in the information systems department analyzing and maintaining the system.

Other roles of nurses in informatics include chief information officer, nursing informatics consultant, network administrator, data repository specialist, nursing informatics project manager, nursing informatics educator and clinical information liaison (Nicoll, 2002).

In Nigeria, nursing informatics is a new specialty and therefore should cover major sectors of the healthcare

system where nurses work; this includes the clinical, administrative, research and education areas. These four areas interrelate to deliver evidence based practice. The importance of nurses in informatics functioning in these sectors is outlined as follows:

## Clinical practice

1. Provides a work list to remind staff of planned nursing interventions.
2. Electronic medical records and computer based patient record.
3. Monitoring devices that record vital signs and other measurement directly into the client record.
4. Computer generated nursing care plan and critical pathway.
5. Automatic billing for supplies and procedures or procedures with nursing documentation.
6. Reminders and prompts that appear during documentation to ensure comprehensive charting.

## Nursing administration

1. Automated staff scheduling.
2. E-mail for improved communication among departments.
3. Cost analysis and finding trends for budget purposes.
4. Quality assurance and outcome analysis.

## Nursing education

1. Computerized record keeping.
2. Computerized assisted instruction.
3. Interactive video technology (Telenursing).
4. Distance learning web based courses and degree programmes.
5. Teaching and presentations.

## Nursing research

1. Computerized literature searching.
2. Retrieval of evidence based practice.
3. The adoption of standardized language related to nursing terms.
4. The ability to find trends in aggregate data i.e. data derived from large population groups statistical software.
5. Use of knowledge bases via internet.

## NURSE INFORMATICS COMPETENCIES

Nursing Informatics has developed into a mandatory focus for all registered nurses on a global scale (Kaminski, 2007). Now, in the twenty-first century, official organizations, schools, and continuing education which help prepare nurses for engaging in informatics related practice are springing up all over the world especially in technologically advanced nations. There is however a growing need for practicing registered nurses, nurse educators and researchers and nursing administration to ensure that the expected competencies in informatics are met. Nurses certified in Nursing Informatics are: skilled in the analysis, design, and implementation of information systems that support nursing in a variety of healthcare settings; function as translators between nurse clinicians and information technology personnel and ensure that information systems capture critical nursing information American Library Association (2000). The TIGER Nursing Informatics Competencies Model (2007) consists of three parts: Basic computer competencies, information literacy and information management. Grobe (1989) identified three levels of competencies as: beginner entry or user level, intermediate or modifier level and advanced or innovator level of competency. Each of the three competency levels includes both knowledge and skills required to: use information and communication technologies to enter, retrieve and manipulate data; interpret and organize data into information to affect nursing practice; and combine information to contribute to knowledge development in nursing. The expertise of these competencies is in a continuum and include;

1. Technical competencies - Technical competencies are related to the actual psychomotor use of computers and other technological equipment. Specific nursing informatics competencies include the ability to use selected applications in a comfortable and knowledgeable way. It is important that nurses feel confident in their use of computers and software in the practice setting, especially at the bedside, in order to be able to attend to the client at the same time (Grobe, 1989; Kaminski, 2007).
2. Utility competencies - Utility competencies are related to the process of using computers and other technological equipment within nursing practice, education, research and administration. Specific nursing informatics competencies include the process of applying evidenced based practice, critical thinking, and accountability in the use of selected applications in a comfortable and knowledgeable way (Grobe, 1989; Kaminski, 2007).
3. Leadership competencies - Leadership competencies are related to the ethical and management issues related to using computers and other technological equipment within nursing practice, education, research and administration. Specific nursing informatics competencies include the process of applying accountability, client privacy and confidentiality and quality assurance in documentation in the use of selected applications in a

comfortable and knowledgeable way (Grobe, 1989; Kaminski, 2007).

A "User" level of competency indicates nurses who demonstrate core nursing informatics competencies. This level includes practicing nurses, nursing administration, nurse researchers and educators. In most taxonomies, this is the basic level that all nurses should minimally demonstrate, no matter what area of practice he or she works in. The competencies required by nurses in the workplace are categorized in a number of ways. Although different language is used to describe these compe-tencies, the key concepts and categories are quite similar across taxonomies. All proposed frameworks include competencies that describe: the use of information and communication technology (technical competencies), the use of automated information in a professional context (utility competencies), decision-making with respect to planning for and using both the technology and information (leadership competencies).

A "Modifier" level of competency indicates nurses who demonstrate intermediate nursing informatics competen-cies. This level includes nurses who have mastered basic skills and use technology in inventive ways in their practice and the "Innovator" level of competency indicates nurses who demonstrate advanced and specialized nursing informatics competencies. This level includes practicing nurses, nursing administration, nurse researchers and educators who have mastered expert skills and use technology in design, plan and coordinate the use of technologies and informatics theory in nursing. As of 2009, one of the accepted assumptions in the competencies and blueprint document for the Canadian Registered Nurse Examination (Canadian Registered Nurse Examination Competencies, 2009) is that the entry-level registered nurse uses information and communication technologies to interpret, organize and utilize data to affect nursing practice, improve client outcomes and contribute to knowledge development in nursing.

Results from the 2011 Healthcare Information and Management Systems Society (HIMSS) and Nursing Informatics Workforce Survey indicate that nursing informatics is growing as a nursing specialty.

1. Nursing informatics increasingly attracts highly qualified, formally educated professionals. More than half of the 2011 respondents reported having a post-graduate degree (56%), which includes a Masters or PhD in nursing or other specialty, up from 52% in 2007.
2. Salaries are substantially higher in the 2011 survey, with the average salary reported at $98,703, a 16% increase since 2007 and a 42% increase since 2004.
3. Certification can lead to improved competitiveness in the job market and potentially higher salaries. Certified nursing informatics professionals reported earning higher average salaries ($119, 644) than their non-certified colleagues ($93, 787).
4. Of the major certifications for nursing informatics, more than one-third (35%) of respondents stated they are pursuing the nursing informatics certification offered by American Nurses Credentialing Center (ANCC).

It should also be noted that respondents to the 2011 HIMSS Survey were in their positions for more than 10 years and more than half of the 2011 respondents reported having a post graduate degree. Therefore, the new informatics nurse should not expect that level of salary, but know that with education and experience that level of salary can be attained.

## The impact of nursing informatics on the health care system

According to McGonigles and Mastrian (2008), nursing informatics impacts the health care system and the nursing profession in a lot of ways, this includes:

1. Nursing Informatics digitizes paper charting into interoperable electric charting hence decreasing docu-men-tation time which relieves nurses from writing on and handling of papers thus creating a paperless environment.
2. Nursing informatics eliminates ambiguity, redundancy and the tedious process of documentation
3. Nursing informatics reduces turnaround time. The turnaround time starts from the time a request is made to the time it is fully accomplished. For example laboratory results can be sent directly to the nurses' station with the use of an E-mail, so there is more time available for client care.
4. Nursing informatics impacts quality and cost of health care.
5. Optimizes information management and communica-tion among health care providers.

## Impact of nursing informatics on the nursing profession

1. Computer information systems prevent nurses from making medication errors.
2. Computer order entry systems help nurses easily interpret orders from physician in the management of a patient.
3. There is better collaboration and sharing of patient information with other health care providers.
4. Nurses perform better assessments and monitoring of patients diseases and ailments.
5. Helps nurses utilize research to provide evidence

based care.
6. Helps nurses work faster, smarter and more competent in whatever they do.

## CREATING A SUPPORTIVE ENVIRONMENT FOR NURSING INFORMATICS IN NIGERIA

### Nurse leadership

Leaders in nursing must play the role of advocates for nursing informatics. Advocacy is about influencing people, policies, practices, structures and systems in order to bring about change (Tomajan, 2012). In advocating for nursing informatics, leaders need to communicate clearly and concisely and to structure their message to fit both the situation and the intended audience (the intended audience could be nursing students or practicing nurses). Leaders should be comfortable in communicating in verbal, written, and electronic formats. Nurse leaders as advocates must be able to influence others to action. Influence is the ability to alter or sway an individual's or group's thoughts, beliefs, or actions; it is essential to the advocacy process (Tomajan, 2012). Influence is built on competence, credibility, and trustworthiness hence all nurse leaders in education, administration and even in practice should be computer literate and have basic competencies of nursing informatics for them to influence others. Lastly, nurse leaders must establish positive, collaborative relationships with others to garner the support necessary to address the issue of nursing informatics. Collaboration is working with other individuals or groups for example doctors, laboratory technicians, and administrators etc to achieve a common goal. Successful collaboration requires careful communication with the groups involved in the process, seeking input when appropriate, and providing ongoing reports related to progress on achieving the goal.

### The Nursing and Midwifery Council of Nigeria (NMCN)

This is the governing body of Nursing in Nigeria which also has a part to play in making policies and developing a national informatics agenda for Nursing Education and Practice that are geared towards improving nurses' use of information and technology. These includes: An agenda to educate nursing students and practicing nurses in core informatics content, this can be done by ensuring that all nursing schools have well equipped and functional computer rooms with internet facilities that will help nursing students be competent in the use of computers and in the sourcing of information that will help improve patient care; enhancing nursing practice and education through informatics projects and support for

increased nursing preparation in informatics through the use of collaborative programmes among public and private organizations (National Nursing Informatics Discussion paper, 2007).

### Education

Nursing education in Nigeria takes cognizance of the National Policy in developing sound educational principles which are essential to the preparation of nurses to function independently and/or as members of interdisciplinary and intersectoral teams (Adebanjo and Olubiyi, 2008) hence there are so many programmes in the nursing education in Nigeria starting from the basic nursing programme, degree programmes (Full time and Part time), distant learning programmes, Open University and Postgraduate (Masters and PhD) programmes in a few universities. Strategies for providing Nursing Informatics education within these programmes include; integrating nursing informatics into the curriculum or as individual courses of undergraduate and diploma nursing programmes, make nursing informatics a specialty or elective for graduate programmes, have nursing informatics certificate program in formal continuing education for practicing nurses and could be a non credit/informal continuing education programme for nurses (National Nursing Informatics Discussion paper, 2007). According to Kaminski (2007), "the need to adopt a culture in nursing that promotes acceptance and use of information technology has been identified as an important parallel initiative to establishing Nursing Informatics competencies and educational strategies", hence strategies for achieving nursing informatics competencies in the workplace include in-service training, intranet ready modules for teaching and learning purposes, free access to online resources, and opportunities for continuing education.

Education units of hospitals should ensure a continuing education programme that includes training of nurses on the use of computers, their application programmes and sourcing information for research and application to patient care purposes. Nurses need consistent training to feel comfortable with the use of Information technology in their everyday practice. With the advent of computer technology use in nursing, the need for data to be analysed and interpreted to become usable information in practice escalates with each passing year. In order to work with data, process information and derive knowledge, nurses must be able to apply synthesis and application to their practice. Therefore informatics competencies need to be developed in all three levels of expertise through basic and continuing nursing education programs.

## Research

Nurses spend a significant proportion of their time on information related activities as part of clinical decision-making in order to lead, co-ordinate and support the delivery of safe, effective, person centered care. In order to provide high quality care for patients, nurses need up-to-date, accurate, relevant information about the person and access to the latest evidence or best practice at the point of care delivery. Hence, research in nursing is necessary for the development of nursing practice since nursing informatics is a new specialty. It is important that research be carried out on nursing informatics being applied in the nursing practice in Nigeria.

## CONCLUSION

Nursing informatics attempts to manage the explosion of ever increasing medical information by managing and communicating information in order to promote knowledge in nursing practice for quality care. The ultimate goal of nursing informatics is to use technology to bring critical information to the point of care to increase efficiency and make healthcare safer and more effective. To provide for the advancement of nursing informatics as a specialty in Nigeria, practicing nurses, nursing students, nurse leaders and even the Nursing and Midwifery Council of Nigeria must be committed to continuing education and professional development. Voluntary certification, self-governance; involvement in influencing health care policies and active participation in research efforts are required to contribute to the body of nursing informatics knowledge. However, much work is still needed to educate nurses in informatics competencies so that technology can be embraced as a tool in everyday practice.

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