IMPLICATION OF INFORMATION COMMUNICATION TECHNOLOGY (ICT) ON NURSING DEVELOPMENT AND NURSING OUTCOME

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Abstract: Information communication technology is a modern and veritable way of getting across information from person to person, group and for this purpose from nurse to patient / client and vice – versa. 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. Also, advances in diagnostic technologies enable practitioners to contribute to clinical decision making from a distance. For example, ultra-sound scans can be transmitted over telephones lines for specialist opinion. This article is intended to explore the field of nursing informatics and presents the relevance to contemporary nursing in today's healthcare delivery services.

Keywords: ICT, Nursing Development.

1. INTRODUCTION

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.

Information and Communication technologies (ICT) allow us to access information and communicate effectively and efficiently (e-Health Europe, 2007). Nurses have an excellent opportunity to contribute to innovation by using them to develop services for patients (NMC, 2009).

Technology is transforming health care delivery. Advances in diagnostic technologies enable practioners to contribute to clinical decision making from a distance. For example, ultrasound scans can be transmitted over telephone lines foe specialist opinion. In acute situations, paramedics can call on medical assistance using web technologies while patients with long term conditions can use SMS text messaging to confirm blood results (Horton, 2008; Shanit et al, 1996).

This article explores how nurses can use ICT to support patients with long-term conditions. For example, it considers how telephone and text messaging can be used to complement clinic attendance in providing support for them.

There are 15.4 Million people with long term conditions in England (Department of Health, 2009) and their care can be enhanced by using ICT. Davies (2006) showed that technology has made it easy for patient to access high quality evidence-based information, making them more informed and able to manage their conditions more effectively.

Service Agendas

Lord Darzi's NHS Next stage review highlighted the need for quality care that is patient centered and more flexible (DH, 2008). This will help patient with busy lifestyles to manage their care using technologies; nurses have the potential to reshape how they work, to provide care tailored to the needs of the increasing numbers of patients with long term conditions. Using a range of ICT will lead to both better quality and increased personalization of patients care.

The NMC (2009) consultation on core competencies for nurses places skills in managing ICT and information literacy as a core requirement. The DH modernizing, Nursing Careers strategy argued that nursing care should be based on evidence and critical thinking and aided by new technology (Centre for the development of Health care Policy and Practice 2008).

FISK (2008) suggested that the use of ICT could change power relationship between practioners and patients. As patients use technologies they have access to moiré information. They expect and demand faster responses. FISK (2008) showed this change in practice is challenging for nurses since they find it more difficult to establish a rapport with patients familiar with using technologies.

However, if the use of alternative forms of communication can be harnessed this may enable nurse to develop a more patient-centered approach to care. For example, if the use of technology enables people with long term conditions to take a more active role in setting goals and understanding the choices available to them, this can surely only increase opportunities to optimize health (Barlow, 2006).

Definition of Terms

Information communication technology

➢ Information :-Message about issue of phenomenon

➢ Communication:- Interaction or exchange of information between two or more individuals or groups.

➢ Technology:-modern device to propel or transfer information from an individual or groups to another.

➢ Impact:- the desire change

➢ Nursing:- Act of caring based on scientific, evidenced based approach to individuals or groups which he/ she has the will, strength and capacity to do so.

➢ Nursing Development:- Growth in the Science of Nursing

➢ Nursing outcome:- Results from ICT intervention to Nursing Sciences

2. 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, Daniel and Oyetunde (1993) 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) In Nigeria, nursing informatics is a new specialty and therefore should cover major sectors of the healthcare 94 Int. J. Nurs. Midwifery system where nurses work; this includes the clinical, administrative, research and education areas. These four areas interrelate to deliver evidence based practice.

Communication Technologies

A range of communication technologies is being adapted for use in the NHS. Some are relatively simple to use, others require greater technical skills in terms of design and use.

Telephone services are the most established ICT (Davies, 2006). These are continuing to be developed for use with other technologies and form a key component of the NHS Direct Computerized decision support software. They have being merged with other technologies to transport assessment data to aid clinical decision making. This includes the transfer of data such as vital signs and ultrasound readings.

Shaint *et al* (1996), showed how a remote access cardiac support system could help people with long term heart conditions. They use handheld electrocardiogram monitoring device equipped with a memory card to transfer data. This data informed the GP's discussion about the patient's condition with a specialist registrar.

Since then, there has been a rapid-expansion in more sophisticated computer-assisted technologies. This has brought about further opportunities for change in nurse's communication strategies.

In a study of computer assisted assessment, Horton (2008) showed that patients with chronic obstructive pulmonary disease were able to use an electric sphygmomanometer and thermometer to send data to a base computer. A community nurse was then able to offer telephone advice. Patients who were maintaining their conditions felt this was beneficial since it offered them effective contact with a clinical nurse specialist while minimizing interaction time.

The UK national Chamydia screening programme is an example of harnessing technologies for advice, diagnostic screening and treatment (www.chlamydiascreening.nhs.uk). It uses telephone SMS, online order and email to offer a comprehensive communication strategy.

The Southampton Hand Assessment Procedure (SHAP) illustrate the potential for innovation in ICT, in developing simulated diagnostic assessment (Ford 2009; www.shap.ecs.soton.ac.uk)

ICT fit for purpose

A wide range of ICTs are available to nurses. Effective and efficient use of these requires a range of skill. ICT must be fit for purpose (RCN, 2008), so when adapting technologies nurses need to consider the needs of the target group. For example, in the national Chlamydia screening programme the target group is young people aged 15-24. Since many in this group are likely to be confident in using ICT, the programme has adopted a range of technologies to target them. However, it is important not to make assumption, since some young people may not have access to ICT while older people may have sophisticated access and skills.

Question to consider

When developing ways of working with patients using ICT, Nurses need to consider the evidence and the resources they will need. Consideration should include:

- Why is ICT considered an appropriate way to support a particular patient group?

- Have you made a base-line profile of the numbers and types of patients it may suit?

- Does your employer have a strategy of developing patient focused ICT initiatives?

- Do you have support from management?

- What technologies are available and are compatible with other health and social care provision?

- Do you have sufficient knowledge of the types of technologies that are available?

- Will the clients group have access to and skills in using technologies?

- Are training opportunities available to improve your skills in using ICT?

- Are staffs available that can help design and monitor the ICT development?

- What is your time scale for developing a patient-focused support programme?

- How will you test the effectiveness of the programme before rolling it out to patient?

- How will you evaluate the programme?

Skills in designing and managing communication strategies that optimise use of resources. One way this could be achieved is by engaging with ICT programme to discover new ways of connecting with patients.

Key points

When developing ICT, support systems for patient with long term conditions, nurses must adopt a considered, evidenced-based approach. They must take into account issues such as:

➢ The patient/client groups need;

➢ Their access to ICT resources;

➢ Skill needed to use the system efficiently and effectively;

➢ The purpose of the initiative;

➢ Resources needed to set up and manage it;

➢ Evaluation of the system or monitoring its effect on health;

➢ Implication for skill mix;

➢ Implications for organisational changes in managing workloads and patient contact.

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 developments, 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 3major 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 emergency 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 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 computer s 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 contemporary 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.

3. 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.

4. 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 nursesfor 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 taxonomy, 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 competencies, 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 competencies. This level includes nurses who have mastered basic kills 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 Daniel and Oyetunde (1995) on average salaries of ($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 documentation 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 communication 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.

5. 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 core 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 upto- 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.

6.   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.

REFERENCES

[1]   Adebanjo F, Olubiyi K (2008). Reforms in nursing education: The national open university of Nigeria experience. www.nou.edu.ng.

[2]   American Library Association (2000). Information Literacy Competency Standards for Higher Education. www.ala.org/acrl/standards/informationliteracycompetency.

[3] American Nurses Credentialing Center (2011). Informatics Nursing Board Certification Test Content Outline http://www.ancc.org accessed on 10/7/2013.

[4] Anderson C, BartHold M, Deuker T, Guinn P, Ruth M, Joyce S (2011).

[5] HIMSS: Nursing Informatics, Empowered Care through Leadership and Technology; Nursing informatics 101. www.himss.org/ni. Accessed 1/05/2012.

[6] Canadian Institute for Health Information (2008). CIHI Profile. http://secure.cihi.ca/cihiweb/dispPage.jsp ?cw_page=profile_e accessed on 10/7/2013.

[7] Canadian Nurses Association (2001). What is nursing informatics and why is it so important? Nursing Now 11, 1-4. Available at www.cnanurses.ca.

[8] Canadian Nurses Association (2006). Position statement: Nursing information and knowledge management. Ottawa: Author.

[9] College and Association of Registered Nurses of Alberta (CARNA) (2009). The Role of the Registered Nurse in Health Informatics: CARNA POSITION: Author. www.nurses.ab.ca accessed on 10/7/2013.

[10] Collen MF (1995). A history of medical informatics in the United States 1950-1990. Bethesda (MD): AMIA.

[11] Feldman HR, Jaffe-Ruiz M, McClure ML, Greenberg MJ, Smith TD (2008). Nursing Leadership, a Concise Encyclopedia. Springer Publishing Company, LLC. pp. 175-179.

[12] Grobe SJ (1989). Nursing informatics competencies. Methods Inf. Med. 28(4):267-269.

[13] Health IT Workforce (2012). History of Health Information Technology in the US; Evolution of Nursing Informatics and HIT tools used. The University of Alabama Birmingham, Department of Health and Human Services, Office of the National Coordinator for Health Information Technology. Available at:http://www.ala.org/ala/mgrps/divs/acrl/ standards/information literacy competency.cfm.

[14] Hersher BS (2000). New roles for nurses in healthcare information systems. In Ball M.J et al editors: Nursing informatics: where caring and Technology meet, 3rd edition, New York, 2000, Springer-Verlag.

[15] HIMSS (2011). Nursing Informatics Workforce Survey http://www.allheathcaredegree.com/informatics_ni_pdf /2011HIMSSsurvey.pdf accessed on 11/7/2013.

[16] IMIA (2009). (International Medical Informatics Association) The nursing informatics special interest group definition. Retrieved from:http:www.imiani.orgindex.phpoption=com_content&task=view&Id=27&It emid=5 accessed on 10/7/2013.

[17] International Council of Nurses (2008). International Classification for Nursing Practice (ICNP®). available at www.icn.ch/news/international-classification-for-nursing-pra accessed on 10/7/2013.

[18] Jones RA (2007). Nursing Leadership and Management Theories, Processes and Practice. F. A. Davies Company, Philadelphia pp. 123-124, 132-146.

[19] Kaminski J (2007). Nursing informatics competencies: self-assessment for nurses. Available at http://www.nursinginformatics.com/niassess/index.html.

[20] Marin HF, Marques E (2005). Nursing Informatics: learning from the past to build a new future. Rev. Bras. Enferm 58(2):143-146.

[21] McGonigles D, Mastrian K (2008). Nursing informatics and the foundation of knowledge; Overview of nursing informatics. Jones and Barlett Publishers, LLC.

[22] National Nursing Information Project Discussion Paper (2007). DRAFT- 27/08/07 http://www.nursinginformatics.com/kwantlen/National_NI_Project_Discussion_paperDR AFT.pdf.

[23] Nicoll LH (2002). Computers, Informatics, Clinical Information and the Professional Nurse. In Cherry, B and Jacob, S editors: Contemporary Nursing; Issues, trends and Management. 2nd edition. Mosby Inc. USA. p 309.

[24] Saba VK, McCormick KA (2006). Essentials of nursing informatics.4th edition. New York: McGraw-Hill.

[25] Staggers N, Bagley-Thompson C (2002). The evolution of definitions for nursing informatics: A critical analysis and revised definition. J. Am. Med. Inform Assoc. (JAMIA) 9(3):255-261.

[26] Strachan H, Murray P, Erdley W (2011). Nursing informatics history and its contributions to nursing knowledge.

[27] Thede LQ (2003). Informatics and nursing: Opportunities & challenges.2nd edition. Philadelphia: Lippincott Williams and Wilkins.

[28] Technology Informatics Guiding Educational Reform. (2007). TIGER informatics competencies collaborative final report. Retrieved from www.tigersummit.com accessed on 10/7/2013.

[29] Tomajan J (2012). Advocating for Nurses and Nursing. http://nursingworld.org/MainMenuCategories/ANAMarketpl ace/ANAPeriodicals/OJIN/TableofContents/Vol-17-2012/No1-Jan-2012/Advocating-for-Nurses.html.   Online   J. Issues Nurs. 17:1.

[30] Turley JV (1996) Toward a Model for Nursing Informatics. Image: Available athttp://www.igi-global.com/chapter /nursing-informaticshistory- its-contributions/48924. J. Nurs. Scholarsh. 28(4):309-313.