Nursing Informatics: What's It All About?

The purpose of this article is to help nurses more fully recognize the scope of nursing informatics, the role of nursing informatics specialists and the impact of informatics on nursing practice.

At the completion of the article and the post test, the reader should be able to:

- Define nursing informatics.
- Discuss the role of the nursing informatics specialist.
- Recognize the impact of informatics on nursing practice and patient care delivery.

Mari Tietze, PhD, RN-BC
Dr. Tietze is currently the Director of Nursing Research and Informatics with the Dallas-Fort Worth Hospital Council – Education and Research Foundation. She graduated from Kansas University with an MS in Nursing and received a PhD from the College of Nursing at Texas Woman's University. She is Board Certified by the American Nurses Credentialing Center in Nursing Informatics.

The author reports no relevant financial relationships or conflicts of interest and does not intend to discuss any off-label or investigative use of any products.

Technology in health care is increasingly becoming an integral part of the U.S. health care delivery system and is declared by strategists as a means whereby sustained improvement in health care outcomes can be attained. Nurses, through their role in patient care delivery, have a pivotal role in this technology deployment, maintenance and evolution and although nurses are involved in technology in health care, the specific roles are diverse. Of those many roles, nursing informatics has become one of those key roles.

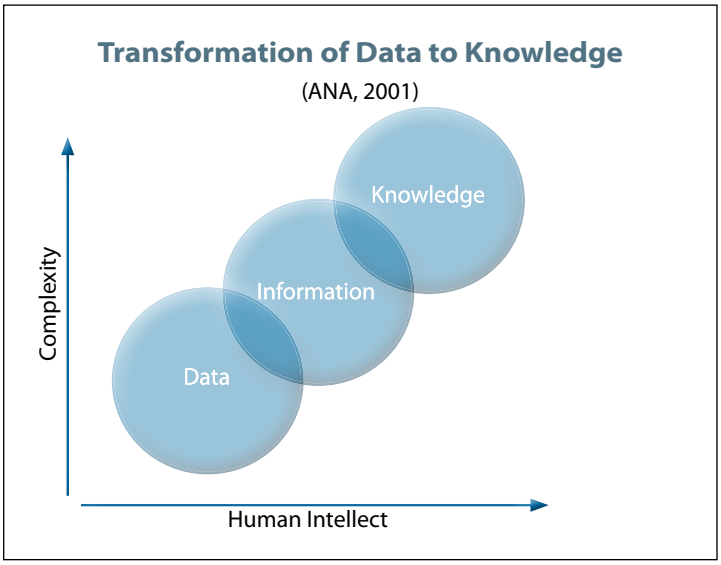
Role of Informatics Nurse Specialist

Informatics nurse specialists have been working in health care organizations for decades but how would you know if one was working in your organization? Have you considered being an informatics nurse specialist?

Well, according to the ANA, the role of the informatics nurse is distinguished from other informatics roles by its association with patient care delivery. ANA provided the current definition in 2001 as:

1. A specialty that integrates nursing science, computer science and information science to manage and communicate data, information, knowledge in nursing/patient practices.
2. Facilitates the integration of data, information, knowledge to support patients, nurses and other providers in their decision-making in all roles and settings.

Figure 1



3. Accompanied through the use of information structures, information processes, and information technology.

ANA also outlined the five major component standards of nursing informatics role as:

1. Problem identification
2. Alternative (or solution) identification
3. Alternative (or solution) development
4. Solution implementation
5. Solution evaluation.

Table 1 lists the tenets of nursing informatics as defined by the ANA standards of nursing informatics practice.

Nursing informatics specialists practice in a wide variety of roles that are ultimately aimed at improving patient care delivery and the nursing practice experience. To accomplish this, they must become an integral part of the health care organization. Would you be able to recognize the nursing informatics specialist in your organization?

Some of those roles are:

- Project manager
- Educator
- Product developer
- Decision support/outcomes manager
- Systems analyst
- Consultant
- Programmer
- Advocate/policy developer
- Web developer
- CIO, CEO, CNO
- Entrepreneur
- Researcher
- Sales and marketing
- Consumer advocate.

History

Nursing informatics was recognized as a specialty in 1992 and a scope of practice was developed through the American Nurses' Association in 1994. The first American Nurses Credentialing Center[1] nursing informatics exam was available in November 1995. In 2007, 0.80% of all 22,159 certifying nurses were nursing informaticists.

Nursing Informatics Framework

In the times leading up to the development of standards of practice and the ANA involvement in the discipline of nursing informatics, several practitioners posed concepts, frameworks and theory of nursing informatics. Schwirian, in 1986, was the first and she proposed a model for nursing informatics where information, goal, user context and computer all lead to nursing informatics activity. The framework of the model is shaped like a pyramid interlinking all the concepts.

Components of Practice

Transformation of Data to Knowledge

The transformation of data to knowledge is a key concept of the nursing informatics role and has the potential to significantly impact nursing practice. It involves three components:

1. **Data** are discrete entities that are described objectively without interpretation
2. **Information** is data that are interpreted, organized, or structured
3. **Knowledge** is information that is synthesized so that relationships are identified and formalized.

Figure 1 depicts the relationship of data, information and knowledge. As data are transformed into information and information into knowledge, each level increases in complexity and requires greater application of human intellect.

As an example, a single instance of vitals signs – heart rate, respirations, temperature and blood pressure – for a single patient can be considered a set of data. A series of vital signs taken over time, placed into a context, and compared is considered information. However, a dropping blood pressure, increasing heart rate, respiratory rate, and fever in an elderly, catheterized patient are recognized as being out of the norm. The recognition that this patient may be septic and in need of nursing and medical interventions reflects information synthesis (knowledge).

Nursing informatics specialists are commonly involved in implementation of new technology in health care. As such, they realize the goals for every new health care technology implementation are to enhance service, streamline a process, and reduce cost.

1 ANCC – a formal, systematic mechanism whereby individuals may voluntarily seek a credential that recognizes quality in professional practice and continuing education

Project Management

Project management is frequently the responsibility of the informatics nurse specialist and is used to successfully implement a new service, technology or change in process. For example, organizations have been most successful where nursing was an integral part of the project management implementation of electronic medical records systems.

Common characteristics of project management are that it:

- Is carefully planned and organized to accomplish a specific, and usually, one-time effort
- Includes development of a project plan that covers:
    - Defining project goals and objectives
    - Specifying tasks of how goals will be achieved
    - Identifying needed resources
    - Associating budget and timeline for completion
- Includes implementation of the project plan, along with careful controls to stay on the "critical path," ensuring the plan is being managed according to plan
- Usually follows major phases:
    - Feasibility study
    - Planning
    - Implementation
    - Evaluation
    - Support and maintenance

Human Factors Components

The term human factors describes the general relationship between humans and machines. It can include topics such as user-friendliness of computer systems, the use of output devices such as mouse, touchscreens and printers, or the effectiveness of training.

Ergonomics is intertwined with human factors but focuses on design and effectiveness of equipment, tools and machines for human safety, comfort and convenience. For example, ergonomics addresses the optimal placement of computer terminals in a patient room or design of computer chairs at a nurses' station to promote comfort and safety.

Human factors and ergonomics are considered overarching standards of practice for the informatics nurse specialist and if addressed appropriately promote optimal nursing delivery of patient care.

Privacy – Confidentiality – Security

The role of staff nurses as the protector of patient information is becoming more crucial as more health care information becomes part of the medical record and as it becomes more available electronically instead of on paper. The staff nurse may be ask to provide information such as a printed medical administration list from an electronic medical record to the patient, the patient's family member, a medical student, or an attending physician. A nursing informatics specialist can assist with policy formation and education related to release of such information.

Table 1

Tenets of Nursing Informatics
• Distinct specialty practice and body of knowledge
• Includes both clinical and non-clinical
• Supports nurses to improve quality of care and welfare of health care consumers
• Focus is delivering right information to right person at the right time
• Human factors concepts are interwoven in practice
• Ensure confidentiality and security of data and information and advocates privacy
• Promotes innovative, emerging and established information technology
• Collaborates with and is closely linked to other health-related informatics specialties

The ANA Standard IV for nursing informatics practice states that the informatics nurse specialist implements solutions that, among other criteria, ensure the confidentiality and security of data and privacy for individuals.

Privacy is a means of protecting health information so that it is not used or disclosed except as *authorized* by the individual. It protects the privacy of the individual. This applies to business partners of a given organization as well as to the organization itself.

Whereas privacy addresses protection of information for the individual, confidentiality and security address protection of the information itself. Confidentiality means that information, once allowed to be disclosed by the individual, will not be shared without the permission of the individual thereby keeping is confidential.

Security is a means by which data is stripped of identifiers that might otherwise be sued to identify a given individual. Standards have been developed, for example, by the Department of Health and Human Services (DHHS) who proposed 19 identifiers for removal such as:

1. Name
2. Address
3. Telephone number
4. Birth date
5. Relative's name
6. Employer's name.

Table 2 provides a descriptive comparison of privacy, confidentiality and security.

Nursing Data Sets and Terminologies

Professional informatics standards such as nursing informatics standards address the concepts of using standardized nomenclatures coding

Table 2

Comparison of Privacy, Confidentiality and Security

Privacy

Privacy is a right of patients to determine what information about their health state they choose to share with their health care team.

Confidentiality

Confidentiality describes the health care professional's duty t o protect the secrecy of information about a patient's condition, regardless of its source.

Security

Security standards require that data be stripped of all identifiers so that techniques cannot be used to re-identify the individual.

systems and vocabularies in practice. These are particularly important as the electronic health record and associated electronic nursing documentation advance. As such, the ANA has developed a committee to guide the standards used by nursing in practice -- Committee for the Nursing Practice Information Infrastructure (CNPII). The committee aims to promote awareness, use, and further development of standardized data elements and terminologies.

ANA Recognized Data Sets

Criteria have been established for ANA recognized data set and numerous data sets and terminologies. These data sets and terminologies are key to effective and efficient use of the electronic health record by nurses. Several of those are described here.

Nursing Minimum Data Set

- Foundation for nursing languages development 1972 (UHDDS), 1977, 1985
- Nursing diagnosis
- Nursing interventions
- Nursing Outcomes
- Intensity of nursing care
- International NMDS efforts

NANDA Terminology

- North American Nursing Diagnosis Association International
- Updated every 2 years (2005 – 2006)
- Diagnosis Review Committee evaluates, larger membership reviews and comments, NANDA Board approves
- Research –based
- Represents 167 nursing diagnoses

Clinical Care Classification (CCC) Terminology

- Virginia Saba developed it in 1991 as Home Health Care Classification (HHCC)
- Public domain – free use
- Includes 176 nursing diagnostic categories in CCC of Nursing Diagnoses (2.0) taxonomy
- Modified by an expected/actual outcome axis represented by three qualifiers
    - Improved
    - Stabilized
    - Deteriorated
    - Totaling 528 items
- Includes 197 nursing interventions
- Coding structure based on ICD-10 (WHO, 1992)

Nursing Interventions Classification System (NIC) Terminology

- 514 interventions (4th ed., 2004)
- 7 domains at top, most abstract level
    1. Physiologic – basic
    2. Physiologic – complex
    3. Behavioral
    4. Safety
    5. Family
    6. Health system
    7. Community

Nursing Outcomes Classification System (NOC) Terminology

- 330 outcomes described the state of the patient at data collection time
- Includes definitions, indicators, and measurement scale
- 7 domains
    1. Physiologic health
    2. Psychosocial health
    3. Health knowledge
    4. Health behavior
    5. Perceived health
    6. Family health
    7. Community health

Impact on Patient Care Delivery

Challenges of Health Care Technology

Health care informatics has the potential to impact patient care and nursing practice. In one survey, eighty percent of nurses indicated that it had a positive effect on their patient care delivery outcomes. In the survey, the use of technology was said to allow nurses to access patient information more quickly, improve efficiency, reduce the potential for errors and access timely and relevant patient information. Regarding challenges, nurses cited poor integration and/or interoperability, regular system failures, limited access to information and applications, and lack of training as the most frustrating elements of using information technology on the job.

Clinical Decision Support Systems

Clinical decision support systems (CDSSs), a key application driven by information technology, have been associated with advancements in the science of evidence-based practice in nursing. An example of a CDSS in use would be a staff nurse having access to health care information such as trauma history, vital signs, and current treatments in summary form with graphics depicting trends via a computer system.

Clinical decision support systems are computer software applications that match patient characteristics with a knowledge base to generate specific care recommendations. These recommendations can be used as practice guidelines and/or to support nurses' decision making in patient care delivery. Recent studies demonstrate a significant gap in the knowledge of nurses' use of CDSSs to enhance evidence-based practice.

Nursing Informatics Contribution

Nursing informatics specialist can assist in advancing the use of CDSSs by nurses and the subsequent improvement in patient care outcomes. Organizations with nursing informatics professionals on staff are the most likely to have adequate training. Only about 40% of organizations had such a position, but if they did they were twice as likely to offer more than 16 hours of IT training per year.

Summary

Nursing informatics background, components of practice and impact on patient care delivery have been discussed. The role of the informatics nurse specialist has been described along with the key components used to carry out the associated advancement of health care information technology. Today's nurse informaticist aims to improve patient care delivery outcomes through optimal interventions on behalf of nurses and patients.

References

American Medical Informatics Association's Nursing Informatics Working Group (2008). Nursing Informatics - A Historical Review Retrieved May 25, 2008 from http://www.duke.edu/~goodw010/AMIA/index.html.

American Nurses Association (2008). Scope and Standards of Nursing Informatics Practice. Silver Spring, MD: Nursesbooks.org.

American Nurses Association (2008). Committee for Nursing Practice Information Infrastructure (CNPII). Internet [On-line]. Available: http://www.nursingworld.org/npii/

American Nurses Credentialing Center (2007). ANCC 2007 Certification Data Silver Springs, MD: American Nurses Credentialing Center.

Anderson, J. A. & Willson, P. (2008). Clinical Decision Support Systems in Nursing: Synthesis of the Science for Evidence-based Practice. CIN: Computers, Informatics, Nursing 26[3], 151-158.

Englebardt, S. P. & Nelson, R. (2002). Health Care Informatics: An Interdisciplinary Approach. Philadelphia, PA: Mosby.

Gaumer, G. L., Koeniger-Donohue, R., Friel, C., & Sudbay, M. B. (2007). Use of Information Technology by Advanced Practice Nurses. Comput. Inform.Nurs., 25, 344-352.

Informatics Consulting and Continuing Education, L. (2007). Weekend Immersion in Nursing Informatics: April 2007, Dallas, Texas. Olney, MD: ICCE, LLC.

PDA Cortex (2006). Eighty-six percent of nurses link information technology to improved patient care. PDA Cortex, 9.

Rice, B. A. & Nelson, C. (2005). Safety in the pediatric ICU: the key to quality outcomes. Crit Care Nurs.Clin.North Am., 17, 431-40, xi.

Schwirian, P. M. (1986). The NI pyramid: A model for research in nursing informatics. Computrs in Nursing 4[3], 134-136.

A Challenge to You

Does your organization have a Nursing Informatics Specialist? If so, have you met them and learned what they do and how their work impacts your patient care?

Have you considered nursing informatics as a potential career path for yourself? It is a very exciting specialty in nursing and has great potential for positively impacting nursing practice and all patient care.

Take the challenge! Learn all you can about nursing informatics, ask questions, and offer your ideas. Nursing informatics will continue to grow and be an integral partner in nursing practice everywhere!

Registration Form and Test for **Continuining Education Credit**

"Nursing Informatics: What's It All About?""

Purpose: The purpose of this article is to help nurses more fully recognize the scope of nursing informatics, the role of nursing informatics specialists and the impact of informatics on nursing practice.

Objectives:

At the completion of the article and the post-test, the reader should be able to:

1. Define nursing informatics.
2. Discuss the role of the nursing informatics specialist.
3. Recognize the impact of informatics on nursing practice and patient care delivery.

How to Earn One Contact Hour:

1. Read the article.
2. Complete the posttest questions and program evaluation by circling the selected responses on the answer sheet.
4. Fill out the registration form.
5. Send registration form, answer sheet, and a check for $12.00

Continuing Nursing Education
The University of Texas at Arlington
Box 19197
Arlington, TX 76019-0197

6. Send before August 15, 2010.

Within three weeks after receipt of your posttest and registration, you will be notified of your results. A passing score is 80%. If you pass, your CE certificate will be forwarded to you. If you do not pass, you will be notified and may repeat the test once at no cost.

The University of Texas at Arlington Center for Continuing Nursing Education is an approved provider of continuing nursing education by the Texas Nursing Association, an accredited approver by the American Nurses Credentialing Center's Commission on Accreditation.

Accredited status does not imply any endorsement by the provider, Texas Nurses Association, or ANCC's COA of any commercial products displayed in conjunction with this activity.

Registration Information:

Name: _____

Address: _____

City/State/ZIP: _____

State(s) of Licensure: _____

Telephone Number: _____

Email: _____

Post Test Questions for Continuing Education Credit Article : " Nursing Informatics: What's It All About?"

Please circle your response for each question

1. When was the first American Nurses Credentialing Center nursing informatics exam available?
a. 1960
b. 1970
c. 1980
d. 1995

2. Which item is NOT a key component of the nursing informatics role?
a. Project manager
b. Educator
c. Product developer
d. Dietician

3. One of the three main goals for every new technology are to enhance service, streamline the process, and _____.
a. Keep track of who is not using the new system
b. Reduce learning needs of users
c. Reduce cost
d. Duplicate the old system

4. What is a clinical decision support system?
a. Computer software applications that match patient characteristics with a knowledge base to generate specific care recommendations
b. Telephone that provides patient information to healthcare team members
c. Screen monitor that displays maps of hospitals
d. Track-ball that allows selection of clinic appointments

5. Which is one of the ANA recognized nursing terminologies?
a. NANDA
b. SPSS Inc.
c. PDA
d. ICD-9

6. Addressing the optimal placement of computer terminals in a patient room is an example of . . .
a. Training
b. Education
c. Ergonomics
d. Activation

7. The term human factors describes the general relationship between. . .
a. Nurses and physicians
b. Nurses and their managers
c. Nurses and patients
d. Humans and machines

8. Which means of protecting health information is authorized by the individual?
a. Voting
b. Privacy
c. Admitting
d. Storing

9. What is the sequence whereby data is transformed to knowledge?
a. Data, information, knowledge
b. Knowledge, information, data
c. Information, knowledge, data
d. Data, knowledge, information

10. One single instance of vital signs – heart rate, respirations, temperature and blood pressure – is an example of which level of "transformation of data to knowledge?"
a. Data
b. Information
c. Knowledge
d. Wisdom

Program Evaluation

Strongly Disagree *Strongly Agree*

Objective 1 was met.
1 2 3 4 5

Objective 2 was met.
1 2 3 4 5

Objective 3 was met.
1 2 3 4 5

The article was effective as a learning resource/tool
1 2 3 4 5

The objectives were relevant to the overall purpose.
1 2 3 4 5

The activity met your expectations.
1 2 3 4 5

List two ways that you will integrate what you learned in this activity into your practice and/or work environment: _____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

The following were disclosed:

Requirements for successful completion
Yes No

Conflicts of interest
Yes No

Non-Endorsement of Products
Yes No

Off-label use
Yes No

Did you as the participant, notice any bias that was not previously disclosed in this presentation?
Yes No

If Yes, please describe _____
_____
_____

State the number of minutes it took you to read the article, complete the test and evaluation
_____min.