Abstract

This paper aims to discuss how nurses can optimally use information and communication technologies in the delivery and practice of nursing among Asians using the iNursing Systems Model, a middle-range theory grounded on the philosophical underpinning of the wholeness of a person. The framework presents how nursing care can be delivered through the use of data, information and knowledge in four major areas: administration, research, practice and education. During the delivery of nursing care, clients are often treated as mere “data” that nurses need to chart. Hence, the nurse can better care for their stakeholders with an understanding how data supports in viewing the wholeness of a person to maintain his humanness despite the technological media used in nursing interventions.

Keywords: iNursing Systems Model, Informatics, Theory, IT models

iNursing Systems Model: Integrating Nursing and Informatics

In the advent of the 21st century, delivery of healthcare has evolved into technological heights. Health is now viewed not only as an aspect of a person, but revolves greatly by the methods it can be delivered. Thus, we see the term eHealth, which is a major component emerging nowadays in the advent of health care delivery systems. The World Health Organization (n.d.) in fact defines this term as “the use of information and communications (ICT) for health to, for example, treat patients, pursue research, educate students, track diseases and monitor public health.” However, it is noticeable that no theory exists to clearly depict the scope and definitions of a nursing informatics system. Thus, this paper aims to present perspectives in the optimal use of information and communications technology with an emphasis on the delivery and practice of nursing that maintains “nurturing persons living caring and growing in caring” (Boykin and Schoenhofer, 2001).
Living and Growing in Caring in a Technological Environment

As we enter an era where paper-based systems are phased-out, electronic information management systems govern the delivery of health care services. Nursing is of no exemption, as we start communicating with colleagues in the health care profession and with clients using information and communication technologies (ICT). In fact, viewing one’s health has greatly evolved with the application of internet and other related technologies in the healthcare industry to improve the access, efficiency, effectiveness, and quality of clinical and business processes utilized by health care organizations, practitioners, patients, and consumers to improve the health status of patients (Wooton, Patil, Scott and Ho, 2009). This evolution in health care delivery lead to the development of information systems among laboratories, pharmacies, billing, medical and even nursing. Thus, nurses are presented with the challenge of keeping apt with caring for person without seeing them as mere coded data in information system.

Technological Anatomy of a Person: Data, Information, Knowledge and Wisdom

To further zoom into the scope of health information systems in detail, we can highlight Nelson’s (2001) Data to Wisdom Continuum to present the different concepts utilized in dealing the health care information systems. Generally Figure 2 outlines the following information about Data, Information, Knowledge and Wisdom.

![Figure 2: The Nelson data to Wisdom Continuum.](Englebardt, Nelson, 2001)

Data
- Uninterrupted observations and measurements made about the world
- Patient assessment forms are, for the most part, data collection forms.
- Data Attributes: Descriptive and Measureable

Information
- Processed data that contains meaning
- A completed patient assessment contains a great deal of information.
- Information Attributes: Quantifiable, Verifiable, Accessible, Free from bias, Comprehensive, Clear, Appropriate, Timely, Precise, Accurate

Knowledge
- Knowledge results when data and information are identified and the relationships between the data

Figure 1: Scott RE. Module 2. Instructors Commentary on ‘Introduction to eHealth’. Taken from the ‘Foundations in Global eHealth’ Certificate Course, University of Calgary, 2009.
and information are formalized. A knowledge base is more than the sum of the data and information pieces in that knowledge base.

- Knowledge Attributes: Accurate, Relevant, Quality, Type (Empirical, Ethical, Personal, Aesthetic)

**Wisdom**

- Knowing when and how to use knowledge in the process of caring for people

**Nursing Informatics Competencies: Ingredients for Caring using Technology**

Instituting the idea of nursing and integrate informatics was first presented as a core element of Locsin’s (2005) Knowing persons as a framework for Nursing Practice. This middle range theory exemplifies Boykin and Schoenhofer’s (2001) Nursing as Caring, Knowing Person and Carper’s Multiple Patterns of Knowing in Nursing.

However, this gray area in nursing informatics started to be filled up when an Asian perspective in nursing informatics practice was presented by Chang, Poyton, Gassert and Staggers (2011), with the American Nurses Association’s (2007) scope and standards of nursing informatics practice. To outline, tables 1 and 2 present the competencies and indicators needed by nurses in basic informatics practice.

**Table 1** Informatics competencies for nurses at the beginner level by Chang, Poyton, Gassert & Staggers

<table>
<thead>
<tr>
<th>Competency Categories</th>
<th>Knowledge and Skills</th>
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<tbody>
<tr>
<td>Computer Literacy</td>
<td>• Computer Skills – Administration</td>
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<td>• Computer Skills – Communication</td>
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<td>• Computer Skills – Data Access</td>
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<td>• Computer Skills – Documentation</td>
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<td>• Computer Skills – Education</td>
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<td>• Computer Skills – Monitoring</td>
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<td>• Computer Skills – Basic Desktop Software</td>
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<td>• Computer Skills – Systems</td>
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<td>• Computer Skills – Research</td>
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<tr>
<td>Information Literacy</td>
<td>• Informatics Knowledge – Data</td>
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<td></td>
<td>• Informatics Knowledge – Literacy</td>
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<td></td>
<td>• Informatics Knowledge – Impact</td>
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<td></td>
<td>• Informatics Knowledge – Privacy / Security</td>
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<tr>
<td></td>
<td>• Informatics Knowledge – Systems</td>
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<td>• Informatics Knowledge – Education</td>
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Table 2 Beginning nurse informatics competencies by the American Nurses Association

<table>
<thead>
<tr>
<th>Beginning Nurse Informatics Competency</th>
<th>Indicators</th>
</tr>
</thead>
</table>
| Computer Literacy                      | ● Computer Skills – Administration  
|                                        | ● Computer Skills – Communication  
|                                        | ● Computer Skills – Data Access  
|                                        | ● Computer Skills – Documentation  
|                                        | ● Computer Skills – Education  
|                                        | ● Computer Skills – Monitoring  
|                                        | ● Computer Skills – Basic Desktop Software |
| Information Literacy                   | ● Informatics Knowledge – Impact  
|                                        | ● Informatics Knowledge – Privacy / Security  
|                                        | ● Informatics Knowledge – Systems  
|                                        | ● Standards for Privacy and Security  
|                                        | ● Adapting information technology as a primary means of patient safety  
|                                        | ● Openness to disruptive innovation |
| Professional Development               | ● Recognize the role on informatics in nursing  
|                                        | ● Use of information technology to support clinical and admin processes  
|                                        | ● Adopting computerized patient records  
|                                        | ● Use of information technology to support patient safety initiatives |

The iNursing Systems Model: The Epistemological Underpinning of an Informatics Nurse

Several concepts comprise the iNursing Systems Model as depicted in Figure 3. Among these, the major concept encompassing all elements is called the iNursing System. This term refers to the information management systems involved in arriving at the nursing process which are all geared towards making meaningful use of data, information and knowledge to support the nursing care of clients. The nursing process, as highlighted by Daniels and Nicoll (2012), comprises of assessment, nursing diagnoses, planning, implementation and evaluation. The management of this process leads to Information Management. However, in the era of technology use, information handling has been automated with the use of what we call applications. These are software needed to run complex computer-aided operations that arise from
the use of the binary language – 0 and 1 – that the computer understands. iNursing systems can encompass different fields of nursing, including: education, service, research and administration.

In order to successfully transfer data, information and knowledge, users of the applications must understand the media known as Information and Communication Technology. These can transgress from the simplest wired telephones to the sophisticated computers and mobile devices. Within, an iNursing System communication take place, which mimics the sender and receiver processes involved in a person-to-person communication. One must understand, however, that computers work on limited knowledge. This means that it cannot understand syntax and semantics the way the human brain does. Hence, it is important to incorporate the elements of standards in this process.

**Theory Assumptions**

In an attempt to conceptualize the models in the practice of Nursing Informatics, the following theory assumptions are gathered by the author to reflect the nature of the iNursing Systems Model presented in Figure 3:

1. In using the nursing process, there is a cyclical use of assessment, diagnosis, planning, implementation and evaluation. The output of the prior nursing process acts as a precursor in the beginning of the next nursing process.

2. In processing data, the nursing process converts it to meaningful units called ‘information’ and attaches inherent relationship with norms to produce ‘knowledge’.

3. Processed data uses standards to conform within a system’s use. However, this data format maybe meaningless in another system’s structure/format as they may be using another standard not congruent with the prior system’s data structure.
4. Each application houses data, information and knowledge. However, each application may also be non-conformant to another system’s data structure if they are using different standards.

5. To ensure data structure conformity between applications in iNursing systems, interoperability standards are applied.

6. Nursing data can be generally classified under education, service, research and administration.

7. When transferring sets of data, information and knowledge between systems, an information and communications technology is used. This can be in a form of a mobile device, a wired electronic gadget (such as a telephone) or sophisticated devices like the computer, tablets or androids. It may use any networking method, like the internet (GSM, 3G, Edge, HSPA, HSPA+ or 4G signals), intranet, or any other forms of electronic communication.

8. Once an iNursing system receives data, it breaks down information into manageable concepts. This allows an iNursing system to re-process data conformant to its system. Data can be transferred without ambiguity between infinite iNursing systems if interoperability standards are set in place.

Theory Propositions

To strengthen the core relationship present in this model, the author identified several propositions which relate to the affinity that each concept may have with one another. Among these relationships include:

1. The greater the number of the data elements present in a system, the more complex the standards maintenance becomes.

2. The greater the number of other iNursing systems that connects to your core iNursing system, the higher the number of networks created needing interoperability standards.

3. The less standards used between iNursing systems, the more interoperable they become.

4. The more applications used within an iNursing system, the more complex the system becomes.

5. The more reliant the ICT media, the faster the communication becomes.

6. The more abundant the data in an iNursing system, the more information can be generated with them.

7. The more information generated in an iNursing system, the more knowledge generated with them.

8. The more intricate the knowledge generated in an iNursing system, the better a nurse can come up with evidence-based clinical decisions.

9. The more intricate the knowledge generated in an iNursing system, the better a nurse can come up with evidence-based cases for instructional purposes.

10. The more intricate the knowledge generated in an iNursing system, the better a nurse can come up with evidence-based research.

11. The more intricate the knowledge generated in an iNursing system, the better a nurse can create and improve policies grounded on evidenced-based practice and research.

The Nursing Within: What is iNursing, its metaparadigm, and N-P Interaction

The focus of the theory is on iNursing System. iNursing is the focal idea of nursing, which is the force within the nursing profession that sets the vision for its practitioners, lays down the roles and functions and influences the direction towards which the profession should go in informatics-led nursing care. Informatics and Communication Technology (ICT) –enabled nursing systems, as the environment, define the virtual and non-virtual dimension where nursing care activities may transpire. The client remains the beneficiary of
nursing care outcomes emerging from informatics practice. eHealth, a new emerging dimension of health, defines the combination of information technology in the practice of health care science, such as medicine, nursing, medical technology, etc. In the nurse-patient interaction, the nurse may physically or non-physically interact with the clients, with the use of an information and communication technology and as long as he is able to ensure delivery of nursing care or assume practice of nursing. Core nursing problems are addressed by information management among nurses and clients in arriving at clinical decisions and nursing care. Nursing therapeutics is defined through the nursing minimum data sets – a form of standard in health care informatics.

Putting the iNursing Systems Model in Action: The Philippines

This model highly leads in presenting a direction towards electronic nursing information systems which builds on a data archetype to ensure that iNursing systems will be present. It has high applicability and generalizability. Initially, using the model will lead to procurement of several electronic systems and may be perceived as costly. However, sustained operations will reflect that these systems are cost-effective once set in place.

In practice, it also reflects high relevance in this advent of electronic claims being required by the Philippine Health Insurance Corporation and the electronic reporting systems implemented by the Department of Health and other adjunct government agencies.

In research, terms and concepts are seen to be consistent and interoperable with one another. Hence, this model is highly applicable for testing with different systems set in place. Concepts and propositions are highly predictable in any system.

In education, this model is aligned with the context of global competitiveness and staunch leadership on innovations and technology in any institution. The use of information and communication technology for nursing directives is aligned with any of the institutional goals. Concepts are aligned with the Commission on Higher Education number 14 implementation of the nursing informatics course.

In administration, care is structured as a byproduct of the efficiency produced in the system, backed up with effective management of client information which can be used in deciding for the plan of care for any stakeholder. The organization of care reflects that care is “digitalized”, allowing blended strategies in giving care. A client may physically subject himself to nursing modalities, or he can use adjunct technologies available to reach the nursing care provided in any applicable scenario. Guidelines for client care include electronic transmission of data. Similarly, interoperability is highly exemplified with the assumption that the ICT systems set in place will observe the guidelines of ethics and laws protecting clients from undue disclosure of information and breach of privacy. The clients are not specifically categorized in any patient classification system, but are seen to have distinct individual needs that the system needs to address, ensuring interoperability of data from one system to another.

The Next Frontier for the iNursing Systems Model

Infusing Nursing and Informatics reserves a multitude of opportunities to enhance health care delivery in this information age. The iNursing Systems Model presents an avenue to ensure that the personhood of a client remains in the consciousness of the nurse while he lives and grows in caring for the individual. The reality of information and communication technologies domineering nursing care cannot be denied,
much more be deflected. Hence, it is our upmost challenge to see this age of technological innovations as an opportunity to reach clients in geographically isolated and disadvantaged areas in the delivery and practice of nursing.

References


