

TIGER-Based Assessment of Nursing Informatics Competencies (TANIC)

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Abstract. All nurses must have a minimum set of competencies in nursing informatics (NI). Online, reliable, and valid tools for self-assessment of one's skill level with a set of NI competencies were lacking. Research team followed a systematic process to design, develop, and pilot test an online tool based on the TIGER Initiative competencies. Tool, known as TANIC, addresses 3 competency areas: basic computer, information literacy, and clinical information management. Pilot test was conducted by inviting participants in a nursing informatics online forum to become respondents. The content validity index (CVI) approach was used to estimate content validity. Values ranged from .9 to 1.0 with an average of .98, demonstrating acceptable content validity. Internal consistency reliability results were: basic computer (.948), information literacy (.980), and clinical information management (.944). TANIC was determined to be a reliable, valid, and usable online tool.

Keywords: Competencies, nursing informatics, measurement, informatics competencies.

1 Introduction

Nursing informatics (NI) and the use of computer technology have become pervasive within the profession and practice of nursing. As a result, nurses practicing in all domains and all settings need to be competent in selected aspects of nursing informatics (NI). In 2009, the TIGER Initiative published a set of basic NI competencies for all nurses [1]. Measures to assess these competencies are needed. This paper presents the first part of an ongoing research program related to assessing NI competencies. The first part of the research focused on developing and testing a reliable and valid online self-assessment of NI competencies, based on a set of NI competencies published by the TIGER Initiative.

2 Background

To gain an understanding of competency in general and nursing informatics competency specifically, it is necessary to first look at how these concepts have been

defined, historically. In 1989, Grobe wrote about nursing informatics competencies and defined competency as knowledge, judgment, skill, or strength sufficient for a task [2]. With a focus on managers' competencies, Lucia & Lepsinger crafted a definition in which they assert that competencies are knowledge-skill-attitude sets that correlate with a person's performance on the job. Competencies can be measured against accepted performance standards and improved through education or training (1999) [3]. For The Joint Commission, an accreditor of healthcare organizations in the United States, competency refers to the skill, knowledge, and capability necessary to meet defined expectations (2005) [4].

Competency is a concept applicable to multiple situations. Agreement on a uniform, standard definition is lacking. At its most basic and broadest, competency means one has the knowledge, skills, and ability to perform or do a specific task, act, or job. Depending on the context, competency might refer to adequate, effective, or expert performance. For this research, competency was defined as adequate knowledge, skills, and ability for the conduct of specific nursing informatics activities.

Nurse researchers have been investigating NI competencies for some time, Curran (2003) [5]; Desjardins and colleagues (2003) [6]; Staggers; Gassert, and Curran (2002) [7]; Jiang, Chen, and Chen (2004) [8]; and McNeil's team of researchers (2005) [9]. The majority of this research focused on determining the educational needs of nurses – that is, what nurses need to know in order to be competent in nursing informatics. Some researchers looked into existing curricular content at different levels of nursing education preparation (undergraduate, graduate, and doctoral). Other researchers explored the need for different competencies at different levels of nursing expertise.

For many years, private and public organizations have advocated the identification of informatics competencies for all healthcare professionals. Nursing informatics competencies have been identified through formal research (noted above) and the collaborative work of experts. Organizations involved in identifying NI competencies include the American Nurses Association (ANA); the American Medical Informatics Association (AMIA); the Healthcare Information Management Systems Society (HIMSS) – which has a nursing informatics working group; the National League for Nursing (NLN) – working through a task group on NI competencies; and the original TIGER Initiative, now the TIGER Initiative Foundation.

The Technology Informatics Guiding Educational Reform (TIGER) Initiative was established through the collaboration of several nursing organizations. TIGER's purpose was to produce information and activities that would encourage both nursing students and practicing nurses to learn about nursing informatics and apply acquired NI knowledge and skills to effectively use the electronic information tools and devices found in modern healthcare settings. The nursing organizations involved in launching TIGER were the Alliance for Nursing Informatics (ANI), which is an alliance of 20 nursing informatics organizations, and some of the leading professional nursing organizations, including the American Nurses Association (ANA), the Association of Nurse Executives (AONE), the American Association of Colleges of Nursing (AACN). TIGER began in 2006 with an invitation-only summit, titled *Evidence and Informatics Transforming Nursing*. From this summit came a vision covering the next ten years and an action plan for the first three years [10].

Work on the 3-year action plan began with efforts within the individual organizations that participated in the 2006 summit. To facilitate collaboration among the individual organizational efforts, nine collaboratives were formed. Each collaborative focused on a strategic area: Standards and interoperability, national health IT agenda, informatics competencies, education and faculty development, staff development, leadership development, usability and clinical application design, virtual demonstration design, and consumer empowerment and personal health records [12].

The TIGER Informatics Competencies Collaborative (TICC) developed a 3-part model, known as the TIGER Nursing Informatics Competencies Model. The three parts of the model were: Basic computer competencies, information literacy, and information management, which included electronic health record use. These model elements were mapped to existing competency sets that were maintained by standards development organizations (SDOs) or that functioned as *de facto* standards. The basic computer competencies element of the model fit well with the European Computer Driving License Foundation. The American Library Association information literacy standards aligned to the information literacy element. The Health Level Seven's (HL7) Electronic Health Record Functional Specification for Clinical Care Components was a very good fit to the information management element [12]. Table 1 shows the alignment of the competency model elements to the selected existing sets of competencies. The number of items in each original set is shown in parentheses.

Table 1. Alignment of TIGER model to existing competencies

TIGER Model Elements	Existing Competencies
Basic Computer Skills	European Computer Driver's License (108)
Information Literacy	American Library Association's Information Literacy Standards (47)
Clinical Information Management	HL7 EHRs Functional Model Clinical Care Components (76)

3 Method

This research project focused on developing a self-assessment of NI competencies, based on the TIGER competencies. The project came about because informatics faculty at Chamberlain College of Nursing could not find a research-based, valid, and reliable instrument for this kind of self-assessment. After examining the various instruments found in the literature, the TIGER competencies were selected as the basis for the instrument because the faculty supported the work of this group. Originally, the informatics faculty was looking for an instrument to use in the informatics specialization track within the Master of Science in nursing (MSN) program. After discussions with other faculty, the informatics faculty focused on an instrument to be used throughout the student populations and for faculty in all programs.

The specific aim of this research was to develop a reliable and valid online instrument for self-assessment of perceived competencies in selected nursing-informatics activities.

This research followed general principles for developing a measurement instrument: establish the objectives for the instrument; identify appropriate elements; review the elements for their fit with the instrument objectives; and revise, review, and test.

The sets of competencies described above (basic computer skills, information literacy, and clinical information management) were reviewed by the researchers, with each researcher independently reviewing one set. Within each set, researchers removed duplicate items. The first round of reviews resulted in minimal change to two categories; in the clinical-information-management category, several items with similar content were combined.

Three experts in nursing informatics practice, research, and education, with peer-reviewed publications and presentations in their background, served as expert reviewers of the revised sets of competencies. These expert reviewers independently examined all three sets, noting that no items needed to be deleted or added. Table 2 displays the number of items before and after the experts' reviews.

Table 2. Number of Items in Each Competency Set Before and After Expert Review

Competency Set	Number of Items Before Expert Review	Number of Items After Expert Review
Information literacy	42	42
Clinical information management	12	12
Basic computer skills	99	99

Following this review, all of the items were reworded to have a consistent focus on measurable behaviors. A third round of reviews, by an additional three nursing informatics experts, was conducted to estimate content validity. In the third round, three experts independently evaluated each set of competency items for the extent to which each item in a set was relevant to the instrument's stated objective. From their assessment, a content-validity index (CVI) for each set was calculated. The resulting CVIs demonstrated moderate content validity, ranging from 0.52 to 0.75. The CVI for each competency set is shown in Table 3. Using the CVI, we removed all items classified as not relevant to the objective of the instrument. This enabled us to reduce the number of items. Information literacy went from 42 items to 25; clinical information management was reduced to 9 items; Basic computer literacy was shortened from 99 to 51 items.

Table 3. Content Validity Assessment

Competency Set	Content Validity Index
Information literacy	0.75
Clinical information management	0.64
Basic computer skills	0.52

The final form of TANIC was an online questionnaire divided into 3 parts or sets: basic computer skills, information literacy, and clinical information management. The total number of items was 85, with the following distribution among the 3 parts: basic computer skills had 51 items, information literacy had 25 items, and clinical information management had 9 items. For each item, respondents were asked to choose from a set of 4 responses (Expert, Proficient, Competent, and Novice) their self-perceived level of competence for that item.

The pilot test of this instrument was conducted online. Approval was obtained from Chamberlain College of Nursing's IRB. The items in the individual competency sets were converted to the format of a Qualtrix online survey. The participants in an online discussion forum focused on nursing informatics constituted the research population. An invitation to participate in the research was posted to the online forum and included the URL of the survey's location. A cover page at the online location of the survey included information on the purpose of the survey, the procedure for completing the survey, and that participating in the survey served as consent. The duration of availability of the survey was set at 14 days. A reminder was posted on the forum near the end of the time and the survey closed on the posted date.

4 Results

The sample consisted of 184 participants, whose age ranged from 26 – 70 years, with a mean age of 48-50 years. Not surprisingly, the majority of the respondents were female. 161 of the respondents were registered nurses. Highest educational level achieved by the respondents included diploma in nursing (3), associate of science degree (5), bachelor of science degree (42), master's degree (108), and doctoral degree (6). In the sample, 32% reported 2-5 years of experience in nursing informatics. The next largest group (25%) had 6 to 10 years of experience, and the third largest group claimed 11 to 15 years (18%). These numbers might reflect the growing demand for NI practitioners coupled with increases in NI graduate programs. Most of the respondents do not hold board certification in nursing informatics or any other informatics certification (89%)

Internal consistency reliability was assessed through calculation of Chronbach's alpha on each competency set. For each set, the Chronbach's alpha values were: information literacy (.98), clinical information management (.94), and basic computer skills (.95).

The sample was drawn from an online discussion forum focused on nursing informatics. On each item in TANIC, the majority of the respondents self-rated their competency as expert. Within each competency set, there were some items for which there were no ratings of expert. These included 17% of the items in information literacy, 22% of the items in clinical information management, and 4% of the items in the set of basic computer skills.

The specific items in the set of clinical information management competencies for which there were no ratings of expert were: a) define e-learning and b) recognize examples of social networking websites, internet forums, chat rooms, online discussions. Two items in the set of basic computer skills competencies not rated as expert by anyone were: a) name options for recycling computer components, printer

cartridges and paper and b) recognize attempted phishing. The set of information literacy competencies had the most items not self-rated as expert. These items were:

- Describe the available proprietary information systems (CINAHL, EBSCO, etc.)
- Assess the quantity, quality and relevance of the search results to determine whether alternative information retrieval systems or investigative methods should be utilized
- Evaluate information and its sources critically and incorporate selected information into his or her knowledge base and value system
- Compare information from various sources to evaluate reliability, validity, accuracy, authority, timeliness and point of view or bias
- Analyze the structure and logic of supporting arguments or methods
- Determine the value added by the new information
- Synthesize conclusions based upon information gathered

5 Conclusions

The TIGER competencies are useful as a foundation for creating measurable competency sets. The TIGER competency sets required some revision to incorporate measurable behaviors. Removal of items that were not rated as relevant by the expert reviewers reduced the number of items in each competency set. Content validity was estimated for the original set of items and used to revise the instrument. A pilot test of TANIC showed strong reliability. TANIC is usable in an online setting and elicits different levels of perceived competency. The items where most of the respondents were not experts are in the cognitive domain. Results from using this instrument could be useful in planning NI education opportunities for nursing students, nursing faculty, and nurses in a variety of practice settings.

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