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Nursing Informatics Competency Assessment for the Nurse Leader

The Delphi Study

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OBJECTIVE: The aim of this study was to identify nursing informatics competencies perceived as relevant and required by nurse leaders.
BACKGROUND: To participate as a full partner in healthcare leadership among rapidly advancing health information technologies (HITs), nurse leaders must attain knowledge of informatics competencies related to their clinical leadership roles and responsibilities. Despite this increased need to engage in HIT-related decision making, a gap remains in validated informatics competencies specific to the needs of nurse leaders.
METHODS: An environmental scan and 3-round survey using Delphi methods used with nurse leaders for competency identification were used.
RESULTS: Between 26 and 41 participants responded to each Delphi round. Most nurse leaders acquired HIT knowledge through on-the-job training. We identified 74 competencies from an initial list of 108 competencies.
CONCLUSION: This work can advance nursing practice to move beyond "on-the-job informatics training" to a more competency-based model of nursing informatics education and practice.

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In today's high-technology environment, leaders in the healthcare field encounter decisions related to health information technology (HIT). The roadmap and recommendations identified by the AMIA Electronic Health Record 2020 Task Force include simplifying and speeding up documentation, improving data exchange and interoperability, reducing data entry, focusing on patient outcomes, improving usability and safety, fostering innovation through the use of application programming interfaces and data standards, and promoting integration of electronic health records (EHRs) to include all areas of care.[1] The achievement of these recommendations to resolve complex EHR issues that bridge the clinical, policy, and technical domains will require effective collaboration between vendors, informaticians, and clinical leaders at healthcare organizations. To participate as a full partner in these collaborations, clinical leaders must attain knowledge of informatics competencies related to their clinical leadership roles and responsibilities. Nurse leaders serve as the voice for more than 3 million nurses, the largest segment of the US healthcare workforce, across hospital, ambulatory, community, home, and long-term-care settings.[2] According to the American Organization of Nurse Executives, the roles that represent most nurse leaders are directors (32%), managers (26%), and chief nursing officers (CNO)/chief nursing executives (CNEs) (17%).[3] We believe that similar to the diffusion of evidence-based nursing practice nurse leaders' ability to make informed strategic and operational decisions related to HIT adoption, implementation, and innovation is critical, necessitating the attainment of informatics competencies relevant to their work.[4,5] Despite this increased need to engage in HIT-related decision making, a gap remains in

validated informatics competencies specific to the needs of nurse leaders and reflective of the rapidly changing information technology (IT) environment.[6,7]

Background

Clancy[8] reported on 28 nursing schools identifying significant nursing informatics deficits in faculty competencies and curriculum. These deficits may inhibit nursing's advancements toward future Real-Time Healthcare System (RTHS) defined as providing 4 rights: "the right information, at the right time, in the right format… to the right audience."[9] Information life-cycle management is a key technology instrumental to the success of the RTHS and is a fundamental component of nursing informatics.[10] Specifically, the RTHS is a next-generation, transformative model for healthcare operations, management, and information technology in which "chief information officers (CIOs) should activate an engagement plan with the CNO including these steps:

- Educate the CNO about the major technology breakthroughs that build the RTHS management paradigm. Review the evolving landscape of applications, real-time analytics, and infrastructure.
- Together, build specific value cases that clarify RTHS benefits—starting with mature wins, like finding smart pumps, but moving ahead to nurse and patient experience and patient throughput. Emphasize those cases with a positive impact on nurses' daily work lives, patient satisfaction, and quality of care.
- Seek out innovative nurse managers and key influencers of staff attitude to improve cultural readiness. As part of this readiness, create or reinvent the role of chief nursing informatics officer, whose focus goes well beyond support of the EHR."[11(p1)]

These recommendations, aligned with our team's recent work on nursing informatics governance structures, are especially noteworthy for nursing practice in that they forecast future competencies for many nurse leader roles and will move well beyond the use of EHRs and management of EHR implementation projects, toward a continued focus on improving the patient experience, as well as the nursing care environment through innovative and applied technologies.[12] In fact, Hessels et al[13] reported evidence linking lower 7-day readmissions and shorter length of stay to advanced EHR adoption, while noting that a supportive nursing environment is independently and positively linked to better delivery of nursing care and patient satisfaction, inferring a significant role for informatics competencies to appropriately integrate technology into nursing practice. Too often IT decisions are left to others as nursing leaders lack the competencies necessary to actively participate in the IT decision-making process.[6] As technologies rapidly expand and new models of healthcare delivery emerge, a new set of competencies are required by today's nursing professional and are critical for nursing practice leaders to continue to advance and innovate.

To address the gap of a lack of nursing informatics competencies for nurse leaders, we conducted a 2-year, multimethod study to define, develop, and validate a nursing informatics competencies self-assessment instrument specific to the needs of nurse leaders to evaluate their levels of nursing informatics competencies and target learning and professional development opportunities. We followed the 8-step scale development process by DeVellis.[14] These steps are summarized in Table 1. For each step, we identified the process step and method(s) utilized: (1) clarify the intended concepts to measure, (2) generate an item pool, (3) determine the format for measurement, and (4) have the initial item pool reviewed by experts, (5) consider inclusion of validated items, (6) administer items to a development sample, (7) evaluate the items

Table 1. *Eight-Step Scale Development Process and the Corresponding Methodologies Used in Developing the Nursing Informatics Competency Assessment—Nurse Leader Survey Instrument*

Development Phase	Instrument Development Process Steps	Method(s) Utilized
Competency identification	1. Clarify the intended concepts to measure 2. Generate an item pool 3. Determine the format for measurement	Environmental scan of indexed research databases using key terms to identify initial list of competencies for evaluation
	4. Have the initial item pool reviewed by experts	Delphi study in 3 rounds for content and face validity using a survey instrument and CVI
Factor analysis	5. Consider inclusion of validated items 6. Administer items to a development sample 7. Evaluate the items 8. Optimize scale length	Multivoting and survey instrument Exploratory factor analysis for scale optimization and factor identification

(item performance, factor analysis, α), and (8) optimize scale length.

We further separated the 8 steps into 2 phases: competency identification (steps 1-4) and factor analysis (steps 5-8). In order to provide details of the process, we published the study into 2 articles. In this article, we summarize the 1st phase of the scale development process: competency identification. Concurrently, we published the 2nd phase of the process, factor analysis, into a 2nd publication, entitled "Nursing Informatics Competency Assessment for the Nurse Leader: Instrument Refinement, Validation, and Psychometric Analysis,"[15] which details our development of a final validated instrument to measure informatics competencies specific to the Nurse Leader: Nursing Informatics Competency Assessment for the Nurse Leader.

The aim of this article is to identify the nursing informatics competencies perceived as relevant and required by today's nurse leader and/or manager.

Methods

We conducted an environmental scan to identify existing work related to nurse leaders' informatics competencies to inform development of our survey deployed using the Delphi method for nurse leader competency identification.

Environmental Scan

We performed an environmental scan during fall 2012, to identify existing work related to nurse leaders' informatics competencies (steps 1-3). We searched PubMed and CINAHL for literature with validated competency statements and self-assessment scales and used Google and Google Scholar search engines to find related educational resources and reports. The following search terms were used: "informatics" and/or "competency" and/or "health information technology" and/or "HIT" and/or "nursing" and/or "self-assessment scale."

Delphi Survey Method to Establish Content/Face Validity

In step 4, we aimed to understand the nursing informatics competencies perceived as relevant and required by today's nurse leader and/or manager. We conducted a Delphi survey to seek opinions of nursing leadership about HIT competencies critical for the nurse leader and at the same time establish the content/face validity of the survey instrument. We selected sets of competencies based on results of our environmental scan and closely replicated the methods used by Westra and Delaney.[16] The Delphi survey was developed using REDCap software and included 3 rounds. The survey was distributed using snowball sampling to nurse leaders and managers in the Organization of Nurse Leaders (ONL) (Massachusetts and Rhode Island) via e-mail, leveraging the ONL governance structure (ie, board and committee members) as targeted participants were also asked to forward the survey within their network of nurse leaders and managers. All study procedures were approved by Partners Healthcare System's institutional review board.

In rounds 1 and 2, we asked participants to vote on each competency as relevant or not relevant, using a binary response, yes or no. The respondents were also able to include comments as free text, such as suggested changes to the phrasing of the competency in an effort to provide unbiased feedback. This also provided a source of qualitative data for further evaluation of results and clarification of included competencies. For the final survey round, a 4-point Likert scale (1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, 4 = very relevant) was used so that a more sophisticated analysis and reduction of the competencies could be performed. During rounds 2 and 3, the results from the previous round, including all free-text comments, were anonymized and provided to the participants.

A content validity index (CVI) score was calculated to evaluate the ranked relevance of the competencies by participants.[17] The threshold to retain a competency was a CVI greater than 0.80, derived from the Likert scale votes of "quite important" or "very important," and was consistent with the work of Westra and Delaney.[16] We used Kruskal-Wallis analysis of variance to identify differences among groups (ie, different types of organizations and roles). We also evaluated criteria with a borderline CVI threshold of less than 0.80 using qualitative data but did not exclude any items with a CVI of greater than 0.80.

Results

Environmental Scan

In 2002, Staggers et al[18] used the Delphi method to establish the 1st reliable and valid informatics competencies for nurses at 4 levels of practice (entry level to advanced informatics specialists). Since that research, knowledge related to nursing informatics competencies has grown as technology has moved closer to the bedside, and chair side, of clinical practice.

Westra and Delaney[16] defined competencies for nurse and health leaders in 2008 with a focus on informatics knowledge and skills. Gassert[19] recognized the potential of clinical informatics to transform clinical practice with the right tools and skills. Also in 2008, Hart[20] performed a review of the literature in an effort to define those competencies that would advance evidence-based practice and the use of HIT. That research revealed a history of research that focused

on attitudes and use of e-resources but not necessarily the competencies and skills needed by nurses to work in a technology-rich work environment.

Hart[21] later went on to focus on job-specific nursing informatics competencies for nurse managers, noting that this focus was too narrow because informatics competencies were not incorporated into specific jobs for nurses. In 2013, Simpson[7] emphasized the importance of job-specific nursing informatics competencies required by the CNE and how the lack of key competencies was a barrier to full engagement in HIT decision making. Some of his key findings went on to reveal that their role is often tactical (ie, functional) and that the CNE is often in a "recommender" role. The study also revealed an informatics competency deficit related to societal and technical trends as they relate to nursing.[7] The need for job-specific competencies continues to be recognized as a need for the future of nursing.[2] Based on these findings, we selected Westra and Delaney's[16] competencies with those more recently identified by Simpson[7] as the initial set of 108 competencies in the item pool for the Delphi survey.

Delphi Study to Establish Content/Face Validity

The Delphi study was performed to establish content/face validity of items that would later be used in the development of a validated self-assessment instrument. Three rounds of surveys were conducted: (1) June to July 2013, (2) September to October 2013, and (3) December 2013 to January 2014 (Figure 1). A high-level summary of the sample population and initial findings are available online (http://www.himss.org/ni-impact-survey; HIMSS 2015 Nursing Informatics Symposium).[22] There were 34 participants in round 1, 26 participants in round 2, and 41 participants in round 3 (Table 2). Most participants were executives, followed by directors and then managers and then those who were holding master's or doctoral degrees. The largest number of respondents came from community hospitals and then from academic medical centers. When asked about their HIT training, most respondents replied that their knowledge came from "on-the-job" training or self-learning.

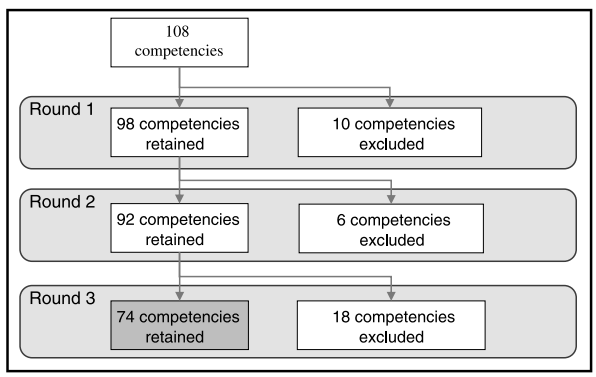

Figure 1. Delphi study: results after each round.

The Delphi survey began with 108 competency items. The list was reduced to 98 items when 10 items were excluded after round 1 and further reduced to 92 items when 6 additional items were excluded after round 2. During rounds 1 and 2, we rephrased 29 competencies based on feedback from the respondents. After the last round, a total of 74 competencies were retained when 18 items were excluded because of having a CVI of less than 0.80 (Figure 1).

The 74 retained competencies mapped into 15 broad informatics categories, based on modified Westra and Delaney's[16] competency categories (Table 3).

The top 15 competencies, in detail, were ranked by priority (Table 4). The 1st 2 items received 100% of the votes as "quite" or "very relevant": (1) the ability to ensure that nursing values/requirements are represented in HIT selection and evaluation and (2) inclusion of nursing information within HIT systems. The subsequent items focused on collaboration, communication, and advocacy.

Discussion

This initial study identified 74 competencies with a CVI of greater than 0.80 specific to nurse leaders and nurse managers from an initial list of 108 competencies. The large number of competencies identified as "important" speaks to the urgent need for informatics education and the increasing complexity of the nursing leadership role. We observed a changing emphasis on competencies focused on outcomes, quality, and cost compared with studies conducted in past years[16]; these new areas of focus could be attributed to an ever increasing volume of patient data that require new tools for nurse managers to use to effectively evaluate care. Skills in managing large outcomes, quality, and cost data sets are needed to ensure nursing is "at the table" and is able to advocate for nursing-specific needs. The current on-the-job nature of informatics education identified in the survey responses is inadequate to meet this need. Too often, HIT leadership and strategic decisions are based within IT versus at the provider leadership level, although this trend may be changing.[12] Nursing must be in a position to lead and participate in HIT selection, development, and optimization. Our data showed that this need is not limited to large health systems but is consistent across all organization types and nursing leadership roles. There is a clear educational gap around nursing informatics exemplified by the large number of competencies identified in our data and the majority of on-the-job training noted. A validated self-assessment tool, the next step in our research, will provide nursing with

Table 2. Delphi Round Sample Sizes and Demographics

Delphi Round Samples		Round 1 Total n = 34	Round 2 Total n = 26	Round 3 Total n = 41
Participant characteristics				
Highest education level	Doctoral	7 (20.6%)	4 (16%)	11 (26.8%)
	Master	24 (70.6%)	21 (84%)	23 (56.1%)
	Bachelor	2 (5.9%)	0 (0%)	5 (12.2%)
	Associate	1 (2.9%)	0 (0%)	2 (4.9%)
Years of experience	>25	14 (41.2%)	15 (60%)	19 (46.3%)
	16-25	11 (32.4%)	4 (16%)	8 (19.5%)
	11-15	3 (8.8%)	2 (8%)	8 (19.5%)
	6-10	5 (14.7%)	3 (12%)	6 (14.6%)
	3-5	1 (2.9%)	1 (4%)	0 (0%)
	1-2	0 (0%)	0 (0%)	0 (0%)
	<1	0 (0%)	0 (0%)	0 (0%)
Role	Executive	18 (52.9%)	10 (40%)	13 (31.7%)
	Director	8 (23.5%)	7 (28%)	13 (31.7%)
	Manager	6 (17.6%)	6 (24%)	11 (26.8%)
	Staff nurse	0 (0%)	1 (4%)	0 (0%)
	Researcher	0 (0%)	0 (0%)	1 (2.4%)
	Other	2 (5.9%)	1 (4%)	4 (9.8%)
Self-rated HIT knowledge	Above average	13 (39.4%)	11 (44%)	23 (59%)
	Average	16 (48.5%)	14 (56%)	15 (41%)
	Below average	4 (12.1%)	0 (0%)	0 (0%)
HIT education received	Formal education	5 (14.7%)	7 (28%)	12 (29.3%)
	On-the-job training	33 (97.1%)	22 (88%)	40 (97.6%)
	Self-learner	16 (47.1%)	11 (44%)	22 (53.7%)
	Other	0 (0%)	0 (0%)	2 (4.9%)
Participants' organization characteristics				
Type of organization	Community Hospital	17 (50%)	10 (40%)	16 (39%)
	Critical-access hospital	2 (5.9%)	0 (0%)	2 (4.9%)
	Academic medical center	10 (29.4%)	9 (36%)	11 (26.8%)
	Integrated delivery network	2 (5.9%)	4 (16%)	4 (9.8%)
	Academic/university	0 (0%)	1 (4%)	4 (9.8%)
	Other	3 (8.8%)	2 (8%)	6 (14.6%)
Magnet™ status	Yes	6 (17.6%)	6 (24%)	6 (14.6%)
	No	28 (82.4%)	19 (76%)	35 (85.4%)

Percent for each item may not sum to 100% because of multiselect answer choice options. Total counts for each item may not sum to total sample because of missing responses.

a means to identify need and then develop appropriate and responsive informatics education.

Practice Implications for the Nurse Executive

It is clear that nursing informatics and HIT knowledge should no longer be delegated to a specialist, but should be an expected core competency of professional practice. This research engaged expert nurse leaders to identify areas of nursing informatics that are important in their practice as leaders. Identification of these areas can bring greater specificity, in discussion with the information technology community, about domains that are ripe for development. This work can also provide a foundation for engagement plans that are developed and revised to support the healthcare delivery system of tomorrow.

The competencies identified here have application for the design of residency programs, continuing education programs, and curriculum development for nurse executives, leaders, and nurse managers. The level of

Table 3. Categories of Competencies Retained in Round 3 Results (CVI > 0.80)

Category	No. of Competencies Retained
Management concepts	9
Requirements and system selection	9
Ethical/legal concepts	8
Information systems concepts	7
Advanced software applications	6
Executive leadership	5
Financial	5
Implementation/management	5
Patient-related applications	5
Data issues	4
Technical knowledge	4
Collaboration	2
Electronic communications	2
HIT selection	2
Standardization	1
Total	74

Table 4. Top 15 Competency Priority Ranking

Final Competencies to Be Retained by Priority	Not Relevant, %	Somewhat Relevant, %	Quite Relevant, %	Very Relevant, %	CVI
1. Ability to ensure that nursing values/requirements are represented in HIT selection and evaluation	0	0	35	65	1
2. Inclusion of nursing information within HIT system	0	0	22	78	1
3. Budgeting using technology	0	2	39	59	0.98
4. Data-based planning and decision making through the utilization and synthesis of HIT system data	0	3	54	44	0.98
5. Ability to collaborate with other departments regarding project management and resource allocation for HIT system implementation	0	3	47	50	0.97
6. Ability to collaborate with chief medical officer peers related to HIT and needs of nurses and physicians	0	3	37	61	0.98
7. Ability to collaborate with interprofessional team in HIT selection process	0	3	38	59	0.97
8. Ability to advocate for the development (or purchase) and use of integrated, cost-effective HIT systems within the organization	0	3	35	62	0.97
9. Communicating a system and nursing vision about the benefits of HIT	0	3	30	68	0.98
10. Ability to involve frontline staff in the evaluation of HIT systems related to their practice	0	3	32	65	0.97
11. Ability to involve frontline staff in the development of HIT system requirements	0	3	24	73	0.97
12. Ability to involve frontline staff in appropriate aspects of HIT design, implementation, and testing related to their practice	0	3	24	73	0.97
13. Ability to see HIT as a top priority and strategic decision	0	3	31	67	0.98
14. Recognition of value of clinicians' involvement in all appropriate phases of HIT	0	5	36	61	0.97
15. Quality assurance using technology	—	5	38	58	0.96

detail within the description of each competency provides additional opportunities to close education and skill gaps as we look to support ongoing professional education, optimize HIT to improve patient care outcomes, enhance the patient experience, and optimize nursing workflow. In addition to psychometric validation of these competencies, future work should explore opportunities to develop interprofessional programs and partnerships with organizational CIOs to identify and specify nursing requirements for tomorrow's real-time healthcare system (ie, value cases) and evaluation of EHR impact on outcomes and patient satisfaction.

Limitations

Our findings are limited to the experiences of the survey responders who may have a specific interest in informatics or an already identified need. To limit bias, we used a comprehensive compilation of existing competencies identified from our environmental scan. In addition, no new competencies were identified by respondents during the Delphi process. We are unable to report a response rate because of our snowball sampling methodology.

Conclusions

This research begins to identify the competencies nurse leaders have identified as relevant to their practice in today's rapidly evolving, technology-rich healthcare delivery system. The nursing profession is quickly moving beyond EHR implementation work as a major focus toward the optimal use of EHR tools and data. We expect that as information technology continues to mature nursing practice will move beyond "on-the-job informatics training" to a more competency-based model of nursing informatics education and practice. This competency identification research can serve as a pragmatic foundation to advance nursing informatics practice.

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