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Nursing Faculty Informatics Competencies

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It is essential that nurses can use technology and accurately record and interpret clinical data to deliver efficient and effective patient care. The purpose of this study was to determine the level of nursing faculty informatics competencies and to learn about barriers faculty find in teaching informatics. Using a cross-sectional design, faculty were surveyed about their knowledge and comfort in teaching informatics using the Self-Assessment of Informatics Competency Scale for Health Professionals instrument. The aggregate mean (SD) score of the Self-Assessment of Informatics Competency Scale for Health Professionals basic knowledge and skills competency subscale and role subscale were was 3.36 (0.437) and 3.35 (0.711), respectively, which showed overall proficiency with these competencies. The aggregate mean (SD) for the applied computer skills competency was 2.25 (0.842), which showed less proficiency in higher-level informatics skills. Reported barriers to integrating informatics into courses were technology issues (17.2%), lack of knowledge (15.5%), and a lack of resources (12.1%). Some faculty reported that the concept of informatics was confusing (3.5%) and students were not engaged in the concepts (3.5%). Faculty with informatics competence can help students advance the use of technology and informatics at the bedside to improve patient care.

KEY WORDS: Digital literacy, Faculty, Informatics competencies, Quality of information

FACULTY INFORMATICS COMPETENCIES

Nurses use informatics to provide the best quality of care for patients. One of the core responsibilities of nursing faculty is to ensure students can use informatics and technology to interpret clinical data to deliver efficient and effective patient care. The American Association of Colleges of Nursing (AACN), the National League for Nursing (NLN), and the Quality and Safety Education for Nurses have all recommended that informatics competencies be taught in nursing programs. There is no consensus, however, of how informatics should be taught across different levels of nursing education.[1] In addition, nurse educators have reported barriers to teach informatics to students, including their own knowledge.[1,2] In today's healthcare environment, however, it is critical that nurses are proficient with technology and informatics. Therefore, it is essential that nurse educators are adept with technology and informatics; barriers that impede this progress must be identified and removed.

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BACKGROUND AND SIGNIFICANCE

As identified in the Institute of Medicine's report *Health Professions Education: A Bridge to Quality*, healthcare requires a workforce that is skilled in information literacy and knowledge management.[3] The report identified five core competencies, one of which was informatics, defined as the ability to use informatics to "communicate, manage knowledge, mitigate error, and support decision making using information technology."[3(p4)] Multiple groups including the American Medical Informatics Association, the American Nurses Informatics Association, and the Healthcare Information and Management Systems Society have described informatics, which has made measuring competencies difficult. Hunter and colleagues[4] claim informatics requires three competencies that all nurses should have: (1) computer skills, (2) digital literacy, (3) and clinical data management. O'Connor and LaRue[5(p3)] further categorized informatics competencies into six domains, which include: (1) health service literacy; (2) information and communication technology literacy; (3) information management; (4) information systems literacy; (5) information systems management; and (6) patient/citizen digital health literacy. They added learning descriptors for each domain to make it easier to integrate informatics into nursing programs. Technology Informatics Guiding Education Reform, which focused on education reform, interprofessional community development, and global workforce development, identified informatics skills needed by practicing nurses. Technology Informatics Guiding Education Reform identified different informatics skills needed for three categories of nurses: (1) all nurses; (2) beginning nurses; and (3) experienced nurses.[6]

In 2008, the NLN published an informatics agenda and reported that it is imperative that graduates of today's nursing programs know how to interact with healthcare technology.[7] In 2015, they published an updated vision and added guidance for how faculty could prepare students for the technological world.[8] The 2021 AACN Essentials[9] included recommendations to incorporate informatics and healthcare technologies at the baccalaureate, master's, and doctoral levels of education. The informatics domain of the AACN

Essentials includes the use of information management systems along with standardized terminology to document and analyze nursing care outcomes, an understanding of the regulatory requirements for electronic data monitoring systems, as well as how to retrieve information from the EHR including access, evaluation of data, and application of relevant data to patient care.[9] Quality and Safety Education for Nurses defined informatics competencies as the "use information and technology to communicate, manage knowledge, mitigate error, and support decision making" and described skills and attitudes that supported the education of nurses in these competencies.[10(p8)]

With all the different categorizations of informatics competencies, it was not surprising that Forman et al[1] found that nursing programs are not using any standard criteria when teaching nursing informatics competencies, although there is agreement that nursing informatics competencies are an important part of curricula. To ensure that nurses have the informatics skills required for practice, faculty need to be able to teach informatics competencies to students at all levels. Faculty, however, have identified barriers to teaching informatics that included a lack of time to learn technology, a lack of qualified informatics faculty, limited technology resources and faculty technology knowledge and skills, and a lack of familiarity with Technology Informatics Guiding Education Reform concepts.[2] The purpose of this article is to describe pilot study findings of faculty informatics competencies and discuss barriers and facilitators for faculty to provide informatics content in nursing programs.

METHODS

This pilot study aimed to determine faculty informatics competence using the Self-Assessment of Informatics Competency Scale for Health Professionals (SANICS). Additional aims were to determine if there were relationships between SANICS scores and faculty status, formal training, or self-assessed informatics competence as described by AACN and identification of barriers and aides to teaching informatics. This study used a cross-sectional design to examine informatics competencies among the school of nursing faculty members. All faculty in the school of nursing at a university in the southeastern United States were invited to participate in this pilot study. This school of nursing offers two undergraduate programs and three graduate programs, including a Doctor of Nursing Practice. Nursing faculty were sent an email invitation to participate in the research, which included the process, consent, and a link to an anonymous Qualtrics version XM (Qualtrics, Provo, UT, USA) survey. Two reminder emails were sent 7 and 14 days after the initial invitation. Consent was obtained before participants could access the rest of the survey questions. The survey contained 31 questions: 10 focused on demographics, status within the school of nursing, and teaching experience, and three were open-ended questions about how informatics was integrated into courses, and the identification of aids and barriers to implementing informatics. The other 18 questions were from the revised SANICS questionnaire used to measure informatics competence.[11] The SANICS was scored on a 5-point Likert scale for each item, where 0 = not competent, 1 = somewhat competent, 2 = competent, 3 = proficient, and 4 = expert. Items were then analyzed to capture three categories: (1) basic computer skills, (2) role, and (3) applied computer skills along with a total score.[11] The SANICS instrument has been used by numerous researchers to identify skills nurses and students need to practice in this ever-increasing technology-enabled healthcare world.[12–14] In this study, Cronbach's α for the SANICS was 0.91. Open-ended questions were analyzed using content analysis to identify themes and frequency and content. The study was approved by the universities' institutional review board.

RESULTS

Data were analyzed using IBM SPSS Statistics version 25 (IBM Inc., Armonk, NY, USA). Data analysis included descriptive statistics; mean scores were compared using *t* tests and analyses of variance. Items from the SANICS instrument were analyzed by item, category, and aggregate score.

Forty-three out of 132 faculty completed the survey, resulting in a response rate of 33%. Although only one-third of the faculty participated in the study, they were a representative sample of years teaching, rank, hours worked, and age. The participants had about a decade of teaching experience (mean [SD], 9.91 [8.51]) and were predominately full-time faculty (79.1%, n = 34), and more than half (53.5%, n = 23) had formal informatics training. Over 60% reported they were competent (n = 14), proficient (n = 10), or expert (n = 2) in informatics as described in the AACN Essentials informatics domain.[9] Yet, only 7% of participants indicated they had taught informatics in the past.

Participants scored at the competent level, or above, in the SANICS basic computer knowledge (Basic) subscale (mean [SD], 3.36 [0.437]), which scored the highest of the three subscales. Participants also scored the SANICS role subscale at the competent or higher level (mean [SD], 3.35 [0.711]). The lowest score was the SANICS applied computer skills: clinical informatics (Applied) subscale, with many participants rating themselves as less than competent (mean [SD], 2.25 [0.841]). The lowest scored item was "incorporate structured language into practice" (mean [SD], 1.28 [1.36]). The aggregate SANICS scores were a mean (SD) of 8.96 (1.54) (see Table 1).

When comparing different variables with SANICS scores, formal informatics training approached significance with those who received training having higher Applied subscale

Table 1. Aggregate SANICS Scores

SANICS Competency	N	Mean (SD)	Not Competent (0)	Somewhat Competent (1)	Competent (2)	Proficient (3)	Expert (4)
Basic computer knowledge and skills, aggregate mean (SD)		3.36 (0.437)					
Demonstrate basic technology skills (eg, turn the computer off and on, load paper, change toner, remove paper jams, print documents)	43	3.77	0 (0%)	1 (2.3%)	1 (2.3%)	5 (11.6%)	36 (83.7%)
Use email	43	3.81	0 (0%)	0 (0%)	0 (0%)	8 (18.6%)	35 (81.4%)
Conduct online literature searches (eg, PubMed)	43	3.56	0 (0%)	0 (0%)	2 (4.7%)	15 (34.9%)	26 (60.5%)
Use applications to manage aggregated data (eg, Excel, database, statistical software)	43	2.30	1 (2.3%)	10 (23.3%)	14 (32.6%)	11 (25.6%)	7 (16.3%)
Role, aggregate mean (SD)		3.35 (0.711)					
Recognize that the computer is only a tool to provide better healthcare and that there are human functions that cannot be performed by the computer	43	3.44	0 (0%)	1 (2.3%)	4 (9.30%)	13 (30.2%)	25 (58.1%)
Recognize the value of clinician involvement in the design, selection, implementation, and evaluation of applications and systems in healthcare	43	3.26	1 (2.3%)	0 (0%)	5 (11.6%)	18 (41.9%)	19 (44.2%)
Applied computer skills: clinical informatics, aggregate mean (SD)		2.25 (0.842)					
Extract data from clinical data sets (eg, Clinical Data Warehouse, Minimum Data Set)	43	1.70	10 (23.3%)	7 (16.3%)	14 (32.6%)	10 (23.3%)	2 (4.7%)
Incorporate structured languages into practice (eg, ICD-9 or ICD-10 codes, *CPT* codes, diagnoses codes)	43	1.28	18 (41.9%)	9 (20.9%)	5 (11.6%)	8 (18.6%)	3 (7.0%)
Describe ways to protect data	43	2.44	3 (7.0%)	6 (14.0%)	12 (27.9%)	13 (30.2%)	9 (20.9%)
Assess accuracy of health information on the Internet	43	2.93	0 (0%)	4 (9.3%)	10 (23.3%)	14 (32.6%)	15 (34.9%)
Identify, evaluate, and apply the most relevant information	43	2.95	0 (0%)	3 (7.0%)	8 (18.6%)	20 (46.5%)	12 (27.9%)
Use applications to document patient care	43	2.86	2 (4.7%)	2 (4.7%)	10 (23.3%)	15 (34.9%)	14 (32.6%)
Identify, evaluate, and use electronic patient education materials appropriate to language and literacy level at the point of care	43	2.93	0 (0%)	3 (7.0%)	9 (20.93%)	19 (44.2%)	12 (27.9%)
Use decision support systems, expert systems, and aids for differential diagnosis	43	1.88	10 (23.3%)	6 (14.0%)	13 (30.2%)	7 (16.9%)	7 (16.3%)
Act as an advocate of system users including patients and colleagues	43	2.47	3 (7.0%)	3 (7.0%)	15 (34.9%)	15 (34.9%)	7 (16.3%)
Participate as a content expert to evaluate information and assist others in developing information structures and systems to promote their area of practice	43	1.79	8 (18.6%)	8 (18.6%)	16 (37.2%)	7 (16.3%)	4 (9.30%)
Apply monitoring system appropriately according to the data needed	43	1.72	8 (18.6%)	11 (25.6%)	12 (27.9%)	9 (20.9%)	3 (7.0%)
Describe general applications/systems to support clinical care	43	2.02	5 (11.6%)	10 (23.3%)	11 (25.6%)	13 (30.2%)	4 (9.30%)
Total aggregate SANICS score		8.96 SD, 1.54					

Abbreviations: *CPT*, *Current Procedural Terminology*; ICD-9, International Classification of Diseases, Ninth Revision; ICD-10, International Classification of Diseases, Tenth Revision.

scores (mean [SD], 29.70 [10.96]) than those with no training (mean [SD], 23.85 [8.19]) (t_{41} = 1.96, P = .06).

A one-way analysis of variance was also conducted to explore the impact of self-reported comfort level with the AACN informatics competencies on the SANICS scores based on identification as novice, advanced beginner, competent, proficient, or expert. There was a significant effect of rated comfort level on total SANICS score ($F_{4,38}$ = 5.99, P = .001). Post hoc comparisons using the Tukey honestly significant difference (HSD) test indicated that the mean score for expert (mean [SD], 69.00 [4.24]) was significantly different than the mean scores for beginner (mean [SD], 38.33 [6.02]) and advanced beginner (mean [SD], 40.64 [13.25]). A marginally significant effect was detected based on current knowledge and the role subscale score ($F_{4,38}$ = 2.50, P = .06). However, post hoc comparisons using the Tukey HSD did not reveal significant differences among the groups. Additionally, there was a significant effect of current knowledge on the applied subscale SANICS score ($F_{4,38}$ = 5.53, P = .001). Like the total SANICS score, post hoc comparisons using the Tukey HSD test indicated that the mean score for expert (mean [SD], 46.00 [2.83]) was significantly different than those for beginner (mean [SD], 19.00 [5.66]) and advanced beginner (mean [SD], 22.00 [11.51]).

In analyzing the open-ended questions, we found that faculty most frequently (49.3%, n = 36) identified activities such as using an EMR, using a learning management system (LMS), or literature searches as ways they integrated informatics into their courses, whereas 13.7% (n = 10) indicated they did not currently integrate informatics into their course. When asked about barriers preventing them from integrating informatics into their courses, 29.3% (n = 17) did not identify any barriers. Of those faculty that did identify barriers, the most frequently reported barriers were technology issues (17.2%, n = 10), followed by a lack of knowledge (15.5%, n = 9) and then a lack of resources (12.1%, n = 7). Two faculty reported that the concept of informatics was confusing (3.5%) and students were not engaged in the concepts (3.5%). Many faculty (28.7%, n = 21) considered teaching online and using technology, such as an LMS or email, the same as informatics.

When asked what has helped faculty integrate informatics into their courses, the most frequently reported (34.4%, n = 21) method was the use of an EMR, whereas close to a third of faculty (29.1%, n = 18) did not report any methods. About a quarter of faculty (24.6%) reported using informatics resources such as the eLearning or library staff support (9.8%, n = 6), another informatics faculty (6.56%, n = 4), or informatics continuing education (8.2%, n = 5) to help them.

DISCUSSION

This study aimed to understand faculty competencies using the SANICS instrument. The SANICS instrument has been used to measure informatics competency for students, including our nurse educator master's and Doctor of Nursing Practice students as part of their informatics courses. It has had limited use with faculty but was chosen for this pilot so that faculty can be prepared to teach the needed competencies, and we can eventually compare faculty and student informatics competencies. Lilly and colleagues[15] used the original SANICS instrument to assess administrators of 31 accredited Doctor of Nursing Practice programs' informatics competencies. In addition to completing the survey, administrators were asked to share the questionnaire with their faculty, although only 17 faculty responded, so they did not include faculty responses in the analysis.[15]

According to the 2021 AACN Essentials, "Informatics has increasingly been a focus in nursing education, correlating with the advancement in sophistication and reach of information technologies; the use of technology to support healthcare processes and clinical thinking; and the ability of informatics and technology to positively impact patient outcomes."[9(p7)] They also recognized that "work will be required to achieve full integration of core information and communication technologies competencies into nursing curricula."[9(p7)] Part of this work will require faculty education in informatics and increased faculty competencies.

The NLN's 2008 informatics vision found that 60% of the faculty surveyed had a computer literacy component and 40% had an information literacy component in courses.[7] Less than 60%, however, reported integrating informatics into their curriculum at that time. Most, but not all, faculty in the present study reported integrating informatics into their courses. The NLN task force also found that faculty had trouble differentiating between education technology and practice technology; they equated taking an online course with being competent in informatics. Faculty in the present study also listed tasks such as teaching online and online survey instruments as ways they incorporated informatics into their courses.

The current NLN vision identified four key issues that are changing the face of healthcare delivery: (1) consumer engagement in health such as mobile health initiatives; (2) advanced technological applications such as big data analysis and genomics; (3) virtual healthcare such as telehealth; and (4) informatics competencies that "facilitate interdisciplinary communication, reduce error and improve clinical decision making."[8(p3)] Their main recommendation was to incorporate technology to improve active teaching strategies, engagement, and evaluation of outcomes.

The biggest barriers that faculty identified in the present study were they do not know exactly what informatics is and how to integrate it into the curriculum, nor do they have the resources to do so. Kinnunen and colleagues[16] also identified these as some of the major challenges for nurse educators. Using technology such as LMSs, EMRs, and e-simulation

in coursework has required faculty to gain computer skills, but there has been limited education for faculty on how to teach informatics.[16]

Faculty can also benefit from knowing how the integration of informatics competencies affects the workforce. Al-Hawamdih and Ahmad[17] found a positive correlation between informatics competencies and the quality of information processing, which can result in faster information access, improved care documentation, and enhanced decision making. Faculty can help students understand these correlations to better prepare the nursing workforce. Brown et al[12] found that although students have digital literacy in everyday settings, they are not able to translate those skills into nursing practice and need competent faculty to help them through education. Students with informatics content in their programs were also found to do better in practice than those who did not.[12] Creating curricula that address gaps in digital skills can help support the transfer of these skills into the workforce. Nurses with greater digital literacy are more likely to embrace and use technology at the bedside.[12] Exposure to digital learning, LMSs, and EHRs can help students learn to apply digital skills in the workplace.

The Self-Assessment of Informatics Competency Scale for Health Professionals and other instruments measure student competencies, but practice competencies vary based on how advanced and available technology is in schools and healthcare facilities where the students study and eventually practice.[17] Faculty can help improve student informatics competencies by using a realistic EHR, assessing student competencies with a validated instrument such as SANICS, and teaching regulatory standards, limitations, and ways to reduce errors at the bedside when using informatics and communication technology.[1]

With a small sample in the present study, it was not surprising that there was little significance when comparing SANICS scores by age, years of teaching, and rank, but it was good to learn that those who reported as "experts" in the AACN core competencies had higher SANICS scores.

LIMITATIONS

The sample in this study was limited to one university and was also limited in age and gender diversity. Future research could be expanded to more nursing schools to be able to compare more diversity and experience. Faculty competencies could also be compared with student competencies to determine if there is a relationship.

IMPLICATIONS FOR PRACTICE

Today's nursing practice involves the use of technology, which requires competence in informatics to provide optimal patient care. Students gaining digital literacy and informatics competencies in their education can integrate the use of technology and informatics at the bedside. Although practicing nurses often leave informatics to specialists, patient care can be improved when nurses actively participate with systems that affect workflow and patient data communicate issues with systems, impacted workflows, and data.

Implementing the updated AACN Essentials will require nursing faculty to become proficient and confident in their mastery of informatics. By using the SANICS instrument, we can assess faculty's comfort with informatics core principles. Faculty must be at least proficient in digital literacy and technology so they can understand how informatics affects practice and embed the content into their curriculum. Informatics, at its basis, is the understanding of how technology functions and how nurses can apply it in their practice to enhance patient care. Having both computer and information literacy skills is necessary for nursing practice today.

CONCLUSIONS

Faculty in this study reported barriers similar to those in previous studies, including technology issues, lack of time, experience and needed resources, and confusion about informatics competencies.[1,2] Reducing barriers to teaching informatics starts with increased comfort with technology.[8] Basic comfort with work (ie, Microsoft Office), practice (ie, an EMR), and education (ie, LMS) technology should be a requirement for all faculty. Offering courses in the basic computer skills expected of faculty and providing work time to participate, as well as partnering faculty with informatics experts with those who have less competence, can help improve comfort level.

Faculty may also benefit from training on what informatics is,[16] which at its core is the use of data to improve outcomes. Faculty should be taught how to use analytics built into the LMS and EMR systems. This can help improve faculty competence and be added to courses to provide students with more information about how to use informatics. Faculty can use a variety of methods to teach informatics content including peer teaching, especially digital natives to older students; peer mentoring from those with more digital skills to those with less; and involvement of clinical informatics specialists to provide expertise.[12] Providing faculty with informatics training, specifically on how to incorporate informatics into coursework, can also help to increase their competencies.

The AACN, NLN, and informatics organizations have tools available to faculty to help improve informatics competence. Faculty may not be aware of these tools, so providing information about them and time to use them can help. Faculty with informatics competence can help students advance the use of technology and informatics at the bedside to improve patient care.

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