Research in Nursing Informatics 2014

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This article reflects the work done in the third year of the Nursing Informatics Year in Review project. This project seeks to search and analyze articles written by nurses as first author on the subject of nursing informatics, published August 2013-August 2014. Each year we also seek recommended articles from our American Medical Informatics Association–Nursing Informatics Work Group (AMIA-NIWG) members that meet the same criteria as the search and most influenced their thinking and scholarship. Twenty-seven articles emerged from the literature review, and our AMIA-NIWG members recommended 32 articles. We analyzed the articles by journal of publication, country of first author, source of funding, research method, research setting, and area of focus. The purpose of this article was to present the results of this project for 2014. **Key words:** *informatics, literature review, nursing informatics, research*

NURSING INFORMATICS research holds great promise to help nurses address challenges in education, research, leadership, and policy related to health information technology (IT). Health IT, in turn, can potentially reengineer nursing for the future and, ultimately, transform care. Thus, the role of knowledge building through nursing informatics research is essential. An important step in this process is to characterize the existing nursing informatics research. The purpose of this article was to present the findings of a nursing informatics literature review and highlight those publications seen as most influential to the specialty by a group of experts in the last year. We systematically reviewed the literature to identify common topics and emerging themes in nursing informatics.

BACKGROUND

Nursing informatics research is well into its fourth decade yet remains a young specialty. In 1986, Schwirian[1] characterized the volume of nursing research as "sparse" and in need of focus, direction, and cumulative properties. Although the actual volume of research was not enumerated at that time, research was characterized as prescriptive and descriptive since this was prior to the implementation of electronic medical records. With a greater volume, we now have the opportunity to examine trends and identify future areas for research.

In 2003, Effken[2] identified the lack of overarching models or theories guiding nursing informatics research that has made it difficult to identify concepts that can be used broadly to develop the science of nursing informatics. Bakken et al[3] (2008) noted that a nursing informatics research agenda for 2008-2018 must reflect changes in context, notably, genomic health care, shifting research paradigms, and

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social technologies. Both of these works serve as a call to examine this evolving field of nursing research.

The goals of this systematic review project were (1) to quantify the number of nursing informatics research articles in the last year, (2) to identify topics and themes, and (3) to solicit influential works from nursing informatics colleagues.

METHODS

A 2-part method was designed for this project. Each method had the same inclusion criteria: (1) the first author is a nurse; (2) scholarly research in nature; and (3) published between August 2013 and August 2014. First, a structured systematic review of the literature was conducted on published nursing informatics studies. Both automated and manual search methods were used to compile an annotated bibliographical database. For the automated search, MeSH key words were used in both title and abstract to search for the terms "nursing informatics" and "informatics." The automated search was conducted in the following databases: CINAHL, PubMed, Academic One, and ScienceDirect. Twenty-seven articles met the inclusion criteria.

The second part to our method included articles recommended by our American Medical Informatics Association–Nursing Informatics Work Group (AMIA-NIWG) members. To be included, not only did the articles need to meet the project inclusion criteria but also the recommenders were required to supply a rationale for these articles to be included. This year we had 32 recommended articles that met criteria. These articles were reviewed by topic, continuing body of work, and with emphasis on the rationale for recommendation.

RESULTS

Part 1 analysis

Our initial search resulted in 35 articles, 17 from Academic One, 4 from CIHAHL, 7 from PubMed, and 7 from ScienceDirect. The data set was then prepared, removing duplicate articles and those that on further examination did not meet criteria. This resulted in 27 articles, 14 from Academic One, 4 from CINAHL, 6 from PubMed, and 3 from ScienceDirect (Table 1). This final data set was then analyzed according to the journal of publication, country of first author, source of funding, research method, research setting, and area of focus. Table 2 presents the journals in which nursing informatics research was published. Fifteen journals were represented with 1 article for the search year; only 3 journals had more than 1 article. Five articles were published in the *International Journal of Medical Informatics*, the most represented journal this year. Four articles were published in *Nurse Education Today*. AMIA symposium and *Journal of Professional Nursing* each published 3 of the articles.

The most represented country of the first author was the United States, with 17 (63%)

Table 1. Databases and Nursing Informatics Articles

Databases and Results of Search	Initial Search No.	Initial Search,[a] %	Final Database No.	Final Database, %
Academic One	17	23.3	14	23.3
CINAHL	4	5.5	4	6.7
PubMed	7	9.6	6	10
ScienceDirect	3	4.1	3	5
Recommended	38	52.1	33	55
Total	73	100	60	100

[a]Rounded to the nearest whole number.

Table 2. Journals in Which Nursing Informatics Articles Were Published

Journal	n (%)
International Journal of Medical Informatics	5 (8.3)
Nursing Education Today	4 (6.7)
AMIA Symposium Proceedings	3 (5)
Journal of Professional Nursing	3 (5)
Other	45 (75)

articles. The next country of representation by first author was Singapore, with 2 articles (7.0%). Australia, Korea, Brazil, Finland, Japan, the United Arab Emeritus, and China were each included with 1 article.

Consistent with the funding climate of recent years, 17 of the articles (63%) were either based on unfunded research or the funding source was not mentioned. Ten articles (3.0%) were based on funded work from the National Cancer Institute and internal mechanisms.

The research methods used this year varied from literature reviews (3 articles, or 11%) to exploratory designs (4 articles, or 15%). Ten of the articles used qualitative methods such as interviews (individuals and focus groups) and ethnography. Four articles (15%) used surveys, consistent with quantitative research methodology. Two articles (7.0%) used mixed-methods design.

Of the 27 articles that emerged from our search, 10 of the studies (10%) took place in acute care and 10 were in education. Three of the studies were performed in the home setting and 3 in public health. Six of the articles (22%) focused on competencies and 4 (15%) on clinical, electronic health record (EHR), and terminologies. Two articles (7.0%) focused on mobile health.

Presentation of recommended articles

The second part of our project methods was to include recommended articles from our AMIA-NIWG members that both met the initial criteria and included a rationale as

to how these articles significantly influenced their research or scholarship. We list them in alphabetical order by first author:

Abbott et al[4] reported the results of a literature review on implementation. The authors identified 6 best practices, which they then sought to apply to 2 diverse implementation settings to assess their applicability. Results suggest that "one size fits all" in health technology implementation is a "fallacy." Interaction of the human-technology interface with organizations and their individual complexities require different strategies for managing the change or implementation. The authors further identify several models and best practices that can be used as "scaffolding" for those implementing technology to adapt to their environment.

Alexander et al[5] reported results from a usability evaluation of American Nurses Association Web sites. The researchers' methodology resulted in excellent usability through rigorous evaluation of the Web sites in every state and suggests that this type of evaluation is needed to maximize the experiences of its membership that uses resources on the Web sites.

Kelley et al[6] address the concept of "knowing the patient" from an informatics perspective. The authors asked the question, "What does it mean to know the patient and what information support that knowledge?" The key finding was that the most valuable information source for nurses is their piece of paper (eg, report sheet, "brain") that contains the information needed to support knowing the patient.

"Big data" has become an emphasis in health care and nursing informatics. The article by Maughan et al[7] served to strengthen our understanding of the importance of big data in informatics research. The authors also demonstrated the value of big data toward creating policy.

An AMIA-NIWG member recommended the article by Reynolds and Maughan,[8] stating that the authors presented evidence of the use of technology in schools to support nurses providing care for students. The authors

reported that using technology improved patient (student) outcomes and helped facilitate school nurses to better meet the needs of their students.

The competencies of chief nurse executives (CNEs) were the focus of the article by Simpson.[9] A multisite ethnographic study was undertaken to explore informatics competencies of CNEs. Simpson reported leadership understanding and engagement in moving innovation into the thoughts and practices of CNEs.

A study by Topaz et al[10] was recommended because the authors demonstrated a novel process for gaining consensus on a guideline for home care patients with heart failure and then creating a method for designing an electronic clinical decision support tool.

Unlike other usability studies for technology in developing countries, the Vélez et al[11] research examined nurses and midwives, the end users, evaluation of mHealth applications. This article reports evidence of the value of testing technology with the end user.

Wilbanks et al[12] reported results of a study that is the first to explore documentation interface and accuracy of documentation. This research impacts communication of patient information and leads to increased patient safety and quality outcomes.

Yen et al[13] successfully examined a customizable health IT usability evaluation scale (Health-ITUES). Also, presented in this article is a demonstration of a series of rigorous scale development strategies and provided references for other studies. The authors also proposed a longitudinal study plan for usability survey research.

The following recommended articles shared authorship. These articles are grouped by project theme but are presented within the theme in no particular order.

Patient-centered care

Berry et al[14] reported the primary outcome of a multisite randomized control trial using Web-based patient-centered intervention. Wolpin et al[15] presented another article on this project and reported a rigorous, mixed-methods approach to develop and test a patient-centered technology.

Role of nurses in HL7 structure, scaling, and documentation

Goossen and Langford[16] summarize in their article what HL7 v3 standard can do for continuity of care, in particular for ongoing care in which more than 1 institution and multiple care professionals are involved simultaneously in the patients' care. Goossen and Oemig[17] continued this work and described how to express assessment scales to fit in HL7 v3 messages, HL7 clinical documentation architecture documents, and EHRs.

Duim et al[18] furthered their work and went beyond the existing approach to create documents in HL7 and "throw them over the line." Messages really follow up on each single data element if required, such as ordered interventions. These can be auto-populated into care plan functions of EHR systems. The series not only addresses nursing-led sets of projects but also speaks to more than 10 years dedicated to the development of HL7 standards in organizations.

The overall structure of the care record (ie, the clinical statement) requires up to hundreds of thousands clinical models. This work is undertaken for more than 10 years and is now in need of critical analysis. The article by Blobel et al[19] demonstrates evidence of this much-needed analysis in progress. Goossen and Goossen-Baremans[20] are contributors to this body of work. Goossen and Goossen-Bateman are working on proper governance of the artifacts that arise from HL7 v3 messages providing added assurances as to the reliability of the messages.

Communication tools and technology

Dykes et al[21] have published the first article that looks at organizational readiness to share plan of care data and information to

support care transitions across multiple levels of care. Collins et al[22] build on this work by having identified the need for universal and configurable multidisciplinary rounding tool views across settings and users with the provision of messaging capability. These authors recommend leveraging existing standards to support continuity of care across acute and critical care settings.

In the first article to report on the prevalence of errors associated with patient controlled analgesia pumps, Ohashi et al[23] share errors rated and categorized using the National Coordinating Council for Medication Error Reporting Prevention index to provide a foundation for future evaluation studies.

Impact of technology with wound care and data

The study by Westra et al[24] demonstrates the value of reusing EHR data to address comparative effectiveness research questions for clinical and administrative problems. This study is an applied nursing informatics study using a retrospective cohort design. Data were electronically extracted and normalized for nearly 450 000 episodes of care from a national convenience sample of 785 home health care agencies' EHRs.

Bliss et al[25] used the same data set as the aforementioned study compare patient outcomes with or without care that included a wound, ostomy, and continence nurse.

Treatment fidelity of mobile applications for patients seeking weight loss

This collection of recommended articles reported results from the work on fidelity in mobile health and an application designed to support patients seeking weight loss. The team of Shaw et al[26] is the first to address the issue of treatment fidelity in the rapidly expanding field of mobile health. Shaw et al[27] reported findings from testing a mobile health intervention based on evidence-based content, frequency, and timing to help people sustain weight loss.

Impact of nursing informatics on implementation, configuration, and decision support for enhanced patient safety

These articles report findings from experiences where the inclusion of nursing informatics experts contributed to the EHR implementation and work to strengthen decision support tools to increase patient safety. Collins et al[28] presented evidence of what nursing informatics experts bring to EHR configurations and clinical content development. These professionals have expert understanding of barriers, facilitators, and lessons learned related to collaborative clinical content development in large-scale EHR implementation.

Collins et al[29] demonstrated information needs for improving family support among the poor and underserved. Family and social support is critical to human health status. Patients whose families and social supports live abroad leverage various low-cost technologies for family communication. However, these families have multiple information needs and benefit from decision support tools to simplify choosing among the many communication tools available.

Increased safety with sensor technology and enhanced care models

These articles were recommended for their demonstrated success using sensor technologies for increased resident safety and multidisciplinary model development that focuses on care coordination. Rantz et al[30] evaluated health changes from early illness warning systems providing a mechanism to monitor residents in independent living environments. These sensors provide early illness warning to health care providers when events occur. Data from the sensors can also be collected to provide a rich source of information including activities of daily living, bed restlessness, and bathroom activity. Alexander et al[31] reported the influence of collecting early illness warning data to provide an excellent synopsis of the underlying meaning of the data illness

detection that can facilitate interventional decision making.

Rantz et al[32] reported on model testing results. Their model is designed to reduce avoidable hospitalizations among residents of a nursing facility. The authors managed financial, human, and technological resources to implement this multidisciplinary model in nursing care home that incorporates a focus on care coordination, health information exchange, and advanced care planning.

The article by Alexander et al[33] was recommended because it demonstrated how increasing technology decreases the total number of clinician interactions about skin risk assessment in nursing homes.

Technology to assist men at risk for and with HIV infection

While many HIV prevention interventions have traditionally been delivered face-to-face, the review conducted by Schnall et al,[34] suggests that digital outreach efforts delivered via text messages, interactive games, chat rooms, and social networks may be an effective way to reach at-risk younger men. The authors reported that eHealth interventions are associated with reductions in risky sexual behaviors and increases in HIV testing among men who have sex with men.

The article by Schnall et al[35] focuses on the development and testing of a Web-based system for the delivery of symptom management strategies to persons living with HIV infection. The authors reported that eHealth interventions have been developed for a number of diseases but this is one of the first to focus on self-management strategies for persons living with HIV infection who are racial and ethnic minorities from low-income/underserved communities.

LIMITATIONS

Our study had several limitations. Our search criteria were minimal and we recognize that by limiting the MeSH terms to "nursing informatics" and "informatics," there is a strong likelihood that additional nursing informatics research articles were not included. To address this known limitation, we asked the AMIA-NIWG members to submit citations via e-mail in order to capture any that may have been missed with the automated search. However, this did not yield many submissions and we hope to find better ways to solicit and capture citations from members in the future. In addition, some of our search criteria relied on interpretation, most specifically that the first author is a registered nurse. The degree of the first author was not always evident, which led to further Internet searches or exclusions. Finally, because of the limited number of nursing informatics literature reviews, our year-to-year comparison only captures 2 years. Moving forward, it will be helpful for informaticians to see trends over multiple years for greater comparisons.

DISCUSSION

We have reported findings from a review of literature focusing on informatics and nursing informatics, published August 2013-August 2014. We have also presented articles recommended by our AMIA-NIWG members that meet the original search criteria and include a rationale for inclusion. Compared with prior years, we have observed a shift in journals in which the articles are published, research setting, and topic. The *International Journal of Medical Informatics* emerged this year as the most common journal of article publications from the search. The acute care setting has decreased this year to 10 articles, from 34 in 2012 per Carrington and Tiase[36] and 18 in 2013. The topic of education has increased this year to 10 articles, from 3 in 2012 and 8 in 2013 according to the article by Carrington et al.[37] A surprise was the funding status of the authors of the articles. This year, 10 articles reported funding sources, compared with 44 in 2012 and 54 in 2013.

This article represents the third year of this project. We again received recommendations for extraordinary articles to include from our AMIA-NIWG members. The articles

presented in the recommended results represent the depth and breadth of nursing informatics science and demonstrate the infusion of technology toward increased patient safety and quality for improved outcomes.

CONCLUSION

This article represents work published from August 2013 to August 2014, with a nurse as first author, in informatics or nursing informatics. This year we found early indication of a shift in research setting and topic. The impact of the funding climate is now apparent in the research articles as more research is being performed with little or no financial support. We look forward to the next year of this project and the discovery of future trends in nursing informatics research.

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