Approaches for defining and assessing nursing informatics competencies: a scoping review protocol

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Review question: How are nursing informatics competencies defined or assessed in the literature?

Keywords Assessment; defining; informatics competencies; nursing


Introduction

Although information and communication technologies (ICTs), such as electronic health records and their applications, promise to improve care and patient outcomes,¹⁻⁵ the full benefits of these tools cannot be realized if health professionals lack the necessary knowledge and skills needed for optimal and meaningful use of these technologies. Addressing workforce readiness in informatics has become a key priority for healthcare policy makers and educators worldwide. Informatics is viewed as one core competency of health professionals’ practice and is often essential for fulfilling other core competencies, including the ability to work in interdisciplinary teams, provide patient-centered care, employ evidence-based practice and apply quality improvement.¹

In nursing, informatics refers to the “science and practice [that] integrates nursing, its information and knowledge, with management of information and communication technologies to promote the health of people, families, and communities worldwide.”⁶(Para.4) Given the integral role of informatics in nursing practice, it is essential to identify nursing informatics (NI) competency requirements. These ongoing efforts have largely been informed by the seminal work of Staggers et al.⁷,⁸ in the United States who emphasized the need for advancing nurses’ competencies beyond computer literacy to include knowledge and attitudes needed to perform informatics-related activities. Subsequent research on defining NI competencies, primarily for entry-to-practice nurses, has emerged in other countries, such as Canada, Australia, Brazil, Taiwan and many more.⁹⁻¹³ While there are variations in what constitutes NI competency across countries, there are similarities in competency elements with Staggers et al.’s framework.⁷⁻⁸ For example, in Canada, the Canadian Association of Schools of Nursing⁹ has articulated three competency domains and provided a set of indicators under each domain: (i) the ability to utilize relevant information and knowledge to support the delivery of evidence-informed practice, such as performing searches and critical appraisal of online literature, and documenting nursing and patient data using standardized languages; (ii) the ability to use ICTs in accordance with professional and regulatory standards and workplace policies, such as maintaining patient safety and exercising clinical judgment in the presence of ICTs; and (iii) the ability to use ICTs in the delivery of patient/client care, such as using ICTs for point-of-care systems and electronic health records. In Australia, domains include computer literacy, information literacy and information management.¹⁰ Hence, it can be concluded that these aspects are defining features of NI competency.

As nurses’ utilization of informatics expand, more role-specific NI competencies, such as those for nurse practitioners, managers and leaders, have been proposed.¹⁴⁻¹⁷ Furthermore, researchers have...
developed structured measurement tools based on defined competency lists to enhance nurses’ readiness in informatics. These tools can be used to guide curricular integration or for practicing nurses to actively engage in self-assessment to inform continuing NI competency development requirements.\textsuperscript{18, 22}

Given that research on NI competency development and measurement has evolved, it is important to synthesize this literature to inform education, clinical practice, policy and future research. An initial search of the literature using PubMed, Cochrane Database of Systematic Reviews, CINAHL and JBI Database of Systematic Reviews and Implementation Reports to identify systematic or scoping reviews on defining and assessing NI competencies was conducted; however, limited literature was found. Located literature examined different aspects, including defining and assessing NI competencies, and the integration of NI in nursing education.

With regard to defining NI, in 2009, Carter-Templeton \textit{et al.}\textsuperscript{23} searched the CINAHL and PubMed databases using the search terms “informatics competencies” and “nursing informatics competencies”, and identified 37 articles, only six of which met their inclusion criteria. The authors noted variations in the content, presentation and audience for these competencies, and emphasized the importance of developing a general list outlining the requirement for informatics knowledge, skills and attitudes to guide attainment and measurement of these competencies among nurses. Gonçalves \textit{et al.}\textsuperscript{24} updated this review in 2012 applying the same approach, but found little empirical work; however, they reiterated how NI competencies research will continue to evolve worldwide in response to changes in healthcare environments, recommending more research in this area.

For reviews on integration in nursing education in the United States, for example, Gracie\textsuperscript{25} reviewed the literature available between 2007 and 2011 to determine baccalaureate nursing students’ exposure to computer technology and informatics knowledge prior to graduation. This review revealed inconsistencies in how NI is defined among academic settings, and also suggested inadequate preparedness in computer and informatics skills among students. Kleib \textit{et al.}\textsuperscript{26} examined literature from 1990 to 2011 on the integration of NI in baccalaureate nursing education in Canada and identified variations in approaches for integration and in the content taught (i.e. primarily focusing on computer and information literacy, as opposed to comprehensively addressing all dimensions of NI competency, including the application of NI in clinical environments).

Concerning assessment of NI competencies, Hobbs\textsuperscript{27} conducted a review of published studies from 1988 to 2000 on computer knowledge, skills and attitudes of nurses and nursing students. This study reflects the focus of the literature at a time when proficiency in computers was a primary focus. As noted by Hart,\textsuperscript{28} this is not surprising because the informatics literature between 1999 and 2006 focused on assessment of attitudes and use of online resources, with a clear definition of computer and information competencies emerging in 2002. Findings from this work emphasized the need for job-specific competency development, evaluation tools for informatics competency components and the necessity for guidelines to inform the education and evaluation of these competencies in the clinical environment.

As research on defining and assessing NI competencies has evolved since these reviews were published, there is a need to examine the literature to understand development and progress in competency development and assessment. Scoping reviews are appropriate for this evolving field of research to understand the nature of emerging evidence, identify gaps in knowledge and provide direction for future research.\textsuperscript{29} Therefore, the aim of this scoping review is to map the literature on defining and assessing informatics competencies for nurses and nursing students. It is anticipated that this scoping review will serve as preliminary work to conducting a systematic review on this topic.

\textbf{Inclusion criteria}

To systematically examine the research question proposed for this review, we are defining inclusion and exclusion criteria to guide the process of selecting sources to be considered in this review. These criteria will be revisited as appropriate after we become familiar with the literature. This review will consider studies presenting approaches/methods for defining or assessing NI competencies. Included studies must conceptually define NI competency as a combination of several dimensions, including knowledge, skills and attitudes pertinent to
informatics. Studies that only examine a dimension of competency, such as computer or information literacy, will be excluded.

Participants
The current scoping review will consider studies that include registered nurses in a variety of roles, such as nurses in direct patient care, nurse leaders, managers, administrators, executives, educators, telehealth nurses and nurses holding graduate or postgraduate education. In addition, nursing students within registered undergraduate and graduate programs are also included in this review. There will be no limitations regarding age, sex or ethnicity of participants. Licensed practical nurses, licensed vocational nurses and nursing assistants will be excluded from this scoping review. This decision is due to differences in informatics competency expectations for these categories of nursing care providers compared with registered nurses.

Concept
The concept being examined in this scoping review pertains to defining and assessing NI competencies. Although there is no internationally accepted definition for NI competencies, NI scholars have embraced the framework of knowledge, skills and attitudes in their conceptualization of informatics competency dimensions and indicators. This emphasizes that nurses’ informatics competency is no longer about proficiency in computer skills or technical skills that nurses engage in. Rather, it is a core requirement of nurses’ roles in all domains, including practice, education, research and administration. Such a comprehensive view serves to inform continuing education needs and curriculum development, with a goal that nurses have NI competencies needed by employers and consumers of health care.

Context
Worldwide studies conducted in any health care or educational setting where registered nurses are practicing or nursing students are learning will be considered in this study.

Types of studies
The current review will consider the following studies for inclusion: quantitative studies with any experimental or quasi-experimental study design, including randomized controlled trials, non-randomized controlled trials, before and after studies and interrupted time-series studies; and observational designs, including prospective and retrospective cohort studies, case-control studies and cross-sectional studies. Qualitative studies including, but not limited to, phenomenology, grounded theory and ethnography designs, will also be considered. Descriptive reports, such as opinion pieces or editorials that discuss the importance of informatics for nurses will not be included in this review. Gray literature sources, such as conference proceedings, will be included in the review.

Methods
Joanna Briggs Institute (JBI) methodology will be used as a guide for this scoping review, as described in the JBI Reviewer’s Manual.

Search strategy
The search strategy will aim to find published and unpublished literature employing a three-step search strategy. An initial search limited to CINAHL and MEDLINE will be undertaken on this topic, followed by analysis of the text words contained in the title and abstract, and of the index terms used to describe the articles. Initial keywords will be nurses/nursing students, informatics and competency/assessment/literacy. We will start with the broader term “informatics,” as opposed to “nursing informatics,” because the latter term has recently been defined in the literature and may not capture all potential research available. The second search using all identified keywords and index terms will be undertaken across all included databases. Third, reference lists of identified reports and articles will be searched for additional studies not retrieved through the database search. No language, date or methodology limits will be applied to the database searches. A detailed search strategy is presented in Appendix I.

The following databases will be searched: Ovid MEDLINE, epub ahead of print, in-process and other non-indexed citations; Ovid MEDLINE Daily and Ovid MEDLINE <1946 to present>; Ovid Embase, 1974-current; Ovid PsycINFO, 1806-current; Ovid HaPI (Health and Psychosocial Instruments); CINAHL Plus with full-text, 1937-current; ProQuest ERIC, 1966-current; ProQuest Australian Education Index, 1977-current; ProQuest Education Database, 1988-current; ProQuest Dissertations and Theses Global, 1743-current; Scopus, 1960-current;
Web of Science Core Collection, 1899-current; Cochrane Central Register of Controlled Trials; and OCLC PapersFirst, 1993-current.

The following sources will be searched for gray literature: ProQuest Dissertations & Theses Global, OCLC PapersFirst, MedNar and Google. In addition, the following organizations’ websites will be searched: the Canadian Nursing Informatics Association, the Ontario Nursing Informatics Group, the American Nursing Informatics Association and the Healthcare Information and Management Systems Society. Experts in the field of NI will be contacted to determine whether they are aware of any new or unpublished studies. In the event that the analysis of findings was not feasible within six months after the initial search was carried out, the literature search will be updated using the same search strategy to ensure that no recently published papers were missed in this review.

Study selection
Records identified through database searching will be uploaded into the Covidence software (Covidence, Melbourne, Australia) and duplicates removed. Two reviewers will independently screen titles and abstracts against the inclusion criteria to identify studies to be selected in this review.29 Full-text articles will be retrieved and assessed for eligibility, and reasons for excluding studies will be provided in an appendix in the final report. Disagreements that might arise between the reviewers will be resolved through discussion or with a third reviewer. Records identified through other sources, that is gray literature, will be screened applying the same approach, ensuring no duplication with database searches. Quality appraisal of included studies will not be performed in this review. The results of the search and study selection will be reported in the final scoping review report and presented in the recommended JBI-adapted flow diagram for scoping review.

Data extraction
The extracted data will be charted in a table to record the key information of the selected studies as indicated by the JBI methodology for scoping reviews.29 Data will be entered using an open access spreadsheet, Google Sheets, according to author and journal information (year and publication), aim, population (role of the nurse), concept (defining/assessment of NI competencies), context (country), definition of informatics or informatics competency if provided, categories/identified competency dimensions, assessment methods/approaches (e.g. instrument/tool, number of items), key findings and comments (Appendix II). The proposed data extraction elements may be revised and/or expanded during the review. These modifications will be detailed in the final scoping review report. Two reviewers will independently extract data from the full-text articles. Any disagreement will be noted and resolved by consensus. If disagreement cannot be resolved, a third review author will be consulted. Authors of papers will be contacted to request further information and clarification of the data where required.

Data synthesis
Findings will be synthesized in both narrative and tabular formats, as recommended by the JBI methodology for scoping reviews.29 Discussion of findings and recommendations for policy, research and practice will be provided.

References
## Appendix I: Search strategy

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<thead>
<tr>
<th>Database</th>
<th>Proposed search strategy</th>
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| Ovid MEDLINE epdb ahead of print, in-process and other non-indexed citations, Ovid MEDLINE Daily and Ovid MEDLINE <1946 to Present> | 1 (exp nurses/ or nursing staff/ or exp Students, Nursing/ or nurs*.ti,ab,kf.) and informatic.mp.  
  2 Nursing Informatics/  
  3 1 or 2  
  4 exp Professional Competence/ or Competency-Based Education/ or (competenc* or literacy).mp.  
  5 3 and 4 |
| Ovid Embase <1974 to 2017 May 22>             | 1 exp nurse/ or exp nursing staff/ or nurs*.af. informatic.mp.  
  2 informatic.mp.  
  3 1 and 2 (3687)  
  4 nursing informatics/  
  5 3 or 4  
  6 competence/ or clinical competence/ or nursing competence/ or professional competence/ or (competenc* or literacy).mp.  
  7 5 and 6 |
| Ovid PsycInfo <1806 to May week 3 2017>       | 1 nurs*.af. and informatic.mp.  
  2 (competenc* or literacy).mp.  
  3 1 and 2 (61) |
| OVID HAPI, 1985-current                        | nurs* and informatic*                                                                     |
| CINAHL Plus with full-text                    | S1 (MH “Nurses+”) OR (MH “Nursing Staff, Hospital”) OR (MH “Students, Nursing+”) OR nurs*  
  S2 informatic*  
  S3 S1 AND S2  
  S4 (MH “Nursing Informatics”)  
  S5 S3 OR S4  
  S6 (MH “Professional Competence+”) OR (MH “Competency Assessment”) OR (MH “Education, Competency-Based”) OR competen* or literacy  
  S7 S5 AND S6 |
| Cochrane Library                              | #1 [mh nurses] or [mh “nursing staff"] or [mh “students, nursing"] or nurs*:ti,ab,kw  
  #2 [mh informatics] or informatic*:ti,ab,kw  
  #3 #1 and #2  
  #4 [mh “nursing informatics”]  
  #5 #3 or #4  
  #6 [mh “professional competence"] or [mh “competency-based education"] or (competenc* or literacy):-ti,ab,kw |
<p>| Scopus                                        | TITLE-ABS-KEY(nurs*) AND TITLE-ABS-KEY(-informatic”) AND TITLE-ABS-KEY(competen* OR literacy) |</p>
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<td>ProQuest Dissertations &amp; Theses Global</td>
<td>nurs' AND informatic' AND competen' OR literacy</td>
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<td>ProQuest ERIC/Australian Education Index/ Education Database</td>
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### Appendix II: Draft study details, characteristics and data extraction instrument

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<th>Study details and characteristics</th>
<th>Study 1</th>
<th>Study 2</th>
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<tbody>
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<td>Aim</td>
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<td>Population (nurses in various roles, nursing students or both)</td>
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<td>Concept (defining/assessing nursing informatics competencies)</td>
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<td>Context (any setting/country)</td>
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<tr>
<td>Definition of informatics or nursing informatics competency, if provided</td>
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<td>Categories/identified competency dimensions</td>
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<td>Assessment approach/method (e.g. instrument)</td>
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<td>Key findings</td>
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<td>Comments</td>
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