

Rethinking Healthcare Informatics: An Investigative Story

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Abstract

Nursing informatics combines nursing science, information science and computer science to facilitate communication and data management and information and knowledge management in nursing practice. The given narrative review will analyze the changing definition, conceptualization, and practical use of nursing informatics in the context of modern healthcare systems. It is also highlighted in terms of its contribution to clinical decision-making, better patient outcomes, and interprofessional collaboration. The review condenses the literature review to bring out the changes occurring in the nursing roles and competencies due to technological changes (e.g., the use of electronic health records, decision-support tools, and telehealth). Various challenges such as ethics, privacy of data, and the necessity to be continuously educated are pointed out as well as the possibilities to innovate and form policies. With the unification of several opinions, this study gives a better view of nursing informatics as a scientific field and an essential attribute of the contemporary nursing profession.

Keywords: *Nursing informatics, Health information technology, Electronic health records, Clinical decision support, Patient outcomes, Healthcare innovation, Telehealth, Data privacy, Interprofessional collaboration, Nursing education.*

1.Introduction

The healthcare world is experiencing an unprecedented transformation in the continuation of health services and this is mainly due to the pace of digital technology that has gone beyond the conventional one-dimensional approach. Infrastructures and what is known as infostructures; the systems and structures upon which health information can be collected, managed, and shared with has received considerable investment across different nations and includes Australia as well. The system of My Health Record, hospital-based clinical information system, and general practice management software are only some of the initiatives that reflect the prevalence of the use of digital solutions in healthcare delivery. Nurses are right at the centre of this digital change in part because they are the largest, and most steady workforce present in the health sector. This centrality position implies that adoption of information and communication technologies (ICT) is not optional anymore but imperative on proper involvement in modern healthcare settings(1).

Nevertheless, even despite this improvement, there are still a number of obstacles regarding the inclusion of digital technologies into the nursing practice. A striking solution to this is the fact that nurses have different levels of computer literacy skills and this situation may hinder the ability to confidently and effectively use digital health systems. Making this problematic is the fact that the provision of the specific occupation training and post-schooling education support is scarce. In most undergraduate nursing curricula, informatics-related skills development opportunities are limited and graduates often lack the skills necessary to succeed in the highly technological advanced workplace. There is even a deeper question of what definition of nursing informatics exists and in what actual ways the performance of nursing informatics might have a direct influence on the daily duties of the profession.

It has taken time but the progress toward the use of digital data systems to replace the use of paper based records has been accompanied by a tremendous change in the conception and delivery of healthcare. Along with emerging technologies comes an equally swift vocabulary, one that not everyone understands exactly how to use. That informatics is a term that has been labeled to be surrounded by an expanding cloud of chaos, a description that illustrates the misunderstanding about the extent and limit of the term. Lack of standardized taxonomy has been characterized by lack of consistency in language and interpretation in the field and there have been repeated demands in health informatics community to have a greater consensus. The sub-specialty of nursing informatics also suffers the same problem with numerous definitions of this sub-specialty mentioned in the literature over the previous forty years in over a dozen separate definitions.

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Such absence of unified definition has workable implication. The definitions used in the field of healthcare are not mere theoretical abstracts: they define role expectations, education needs and even guidelines to be followed by the policies. Ambiguity over the scope of a particular discipline may become a barrier to cooperation between professions because misunderstandings may hamper the implementation of new practices or, what is more important, the creation of unified training requirements(2). In the case of nursing informatics, it is extremely important, because the field incorporates both the knowledge of nursing and the ideas and instruments of computer science, information science and information management towards enhancing patient care outcomes. In the absence of agreed knowledge, any attempt to design an informatics curriculum or come up with a competency framework, or a measure of informatics proficiency can end up being inconsistent and contradictory.

Being aware of this dilemma, the current narrative review was conducted with the aim of charting the existing concepts of nursing informatics as it is identified in three key healthcare settings, such as Australia, the United States, and Canada. The two countries were selected on two grounds. To start with, they contain some of the first attempts at defining nursing informatics in the literature with a valuable history viewpoint. Second, all of their health systems have undergone significant digital health transformation, which would make them interesting cases to study in the context of changing definitions with the use of technologies.

The review is pragmatic both in terms of historic sources offered there and in terms of modern sources offered there. This study will record the history of definitions both influences and in the opposite direction by tracking them back to their earliest formulations and forward to the latest ones, in the hope of describing the path of definitions in the form that helps to draw attention to the convergence and diverging tendencies. The approach draws on existing guidelines on carrying out narrative reviews that focus on synthesis of existing body of knowledge to demystify controversies, review the status quo and recognize any knowledge gap. In this manner, the review further recognizes the fact that nursing informatics must be iterative by nature, wherein the definitions and the conceptual boundaries of the field are defined through the continuous technological innovation, evolution of care delivery models, and the continual transformation of the nursing profession itself.

The need to bring understanding in nursing informatics has become more and more urgent with the ever-increasing importance of data-driven decision-making in healthcare in all countries across the globe. Electronic health records (EHRs), telehealth services, mobile health applications, and clinical decision-support systems are becoming a frequent occurrence in most care environments(3). These might demand nurses to use not only digital systems, but also to critically think and respond to the data they generate. Such paradigm is challenging which is why this complexity needs to be addressed through conceptual guidance that defines the nature of nursing informatics, its integration with clinical judgment, and the expertise expected to prove proficient.

At the Australian level, the digital health policy has been advanced through undertakings like the creation of the Australasian Institute of Digital Health (AIDH) that was created by the amalgamation of the Health Informatics Society of Australia and the Australasian College of Health Informatics. Nursing informatics has been legitimized in terms of frameworks and position statements that connect the issue of technological literacy and professional competence. The same trends have been realized in the United States and Canada, however, the model of professional organizations and the language of definitions differs as a consequence of illegal policy priorities and healthcare system formats. Although certain national organizations have incorporated the definition advanced by the International Medical Informatics Association (IMIA), other organizations have upheld country specific adapted definitions based on the previous models.

Such differences of definition are not academic. They are able to shape the way nursing informatics is introduced into the education process, the evaluation of the competencies, and the process of setting research priorities. In a state where definitions lay great stress on the technological nature of informatics, the training courses can also put great stress on the working of a system and usage of software. Conversely, other definitions that emphasize the combination of nursing knowledge and ICT might give more weight to logical thinking, issues of morality, and using information on patients. Consequently, a nurse prepared in one context might introduce different strengths it may also come with gaps to work with interdisciplinary teams, thus troubling the possible standardization of best practices as required at the global level(4).

The main purpose of this review is to become more Oriental by offering transparency through a comparison of the definitions given in Australia, United States, and Canada, as well as the common factors they have to cope with and peculiarities they grasp. Through this, it aims to help form a more intelligible view of nursing informatics as a field--one not ignoring its technological foundations but putting into perspective its core issue, the improvement of patient treatment via intelligent, efficient, and thoughtful deployment of information.

Finally, defining it more coherently and internationally applicable may accommodate the diverse needs of many professionals, such as enhancing educational uniformity or reinforcing collaboration across national borders or altogether equipping nurses to be able fully to adapt to the needs of a digitally integrated healthcare system. Because the process of digital transformation continues to transform healthcare, the relevance of this activity will only increase, which contributes to the necessity of continued dialogue, research, and consensus-building in the informatics area of nursing.

2.Methods

This review was based on pragmatic methodology that aims to include, analyze, and synthesize various forms of definitions of nursing informatics across time and health care practices. This was done purposely to merge historical investigation with modern analysis in an effort to present a complete picture of how nursing informatics has been thought about and explained; both historically and in modern times. Definitions were not just sought, but the purpose went beyond that: to learn how they have changed over time, and why, and what their outcomes are in terms of nursing education, practice, and policy.

A narrative review design was selected because of its adaptability and similarity when researching an area containing a high diversified cluster of concepts but no global consensus framework. Narrative reviews are more specifically efficient in study areas where body of knowledge is diffused, distributed and ranging in scope and contain both theoretical and applied literature as compared to systematic reviews which follow tight inclusion and exclusion criteria in order to provide focused question. The inclusion of a broad variety of scholarly, professional, and policy-oriented sources is possible with the help of this method, which makes the comprehension of the topic matter more comprehensive(5).

The choice of narrative review structure was predetermined by such methodological recommendations of Baumeister and Leary, and Ferrari that narrative reviews have three primary functions: to incite a discussion, critically evaluate the field in a state, and determine the gaps that one should address in scholarship. Since there is definitional ambiguity of nursing informatics, this review has attempted all the three roles of the review which include providing an informed synthesis, critiquing the coherence of existing definitions and mentioning areas where sufficient clarity is lacking.

Data sources and Search Strategy

The review procedure started by locating two major chronological movements that exist:

A forward research of probably the first known definitions of nursing informatics, and the evolution of the language, scope and conceptual priorities in the following decades.

Retrospective tracing to later definitions in print sources, tracing back their historical progenitors in order to discover influences, borrowings, turning points of emphasis.

In order to seek this two-way search, a focused literature search was done in various databases with a reputation of indexing applicable nursing, health informatics and interdisciplinary research. These were PubMed, CINAHL, Scopus and some grey literature databases such as policy documents, statement of professional associations, and education systems.

Search words such as combinations and variations of the following were important:

nursing informatics definition

- “health informatics AND nursing”
- “informatics competencies”
- “nursing AND digital health”

nursing AND data-information-knowledge-wisdom model

The terms used to search were adjusted to the way the database being investigated indexed its contents to make retrieval thorough. Such tools as Boolean operators and truncation were used to retrieve both singular and plural entities, and various spellings (e.g. organisation and organization).

Snowballing Technique

Particularly, due to the history of the topic under study, the snowball technique was used as a deliberate approach, where after obtaining an article, a scrupulous analysis of the reference list of the obtained article is carried out to find further relevant articles. This tool is especially effective when searching for foundational articles, older session publications and seminal policy reports which might not be completely indexed in more contemporary databases. Once a particular source was identified, references were checked as well, and this became a recursive relationship

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that has to stop at some point because nothing new to the relevant definitions is revealed, and it creates a point of saturation in the search process(6).

TABLE 1 Methods

Methodological Component	Description
Review Type	Narrative review, chosen for flexibility and suitability in synthesizing diverse conceptual definitions of nursing informatics.
Search Strategy	Bidirectional approach: forward from earliest definitions, backward from most recent definitions. Multiple databases searched (<i>PubMed</i> , <i>CINAHL</i> , <i>Scopus</i>) plus grey literature.
Keywords	“nursing informatics definition,” “health informatics AND nursing,” “informatics competencies,” “digital health AND nursing,” “nursing AND data-information-knowledge-wisdom model.”
Supplementary Technique	Snowball method—systematic review of reference lists to identify additional relevant sources until saturation.
Inclusion Criteria	Explicit definition of nursing informatics; relevance to Australia, USA, or Canada; publication in scholarly, professional, or policy contexts.
Exclusion Criteria	Non-specific to nursing; purely technical focus; implicit definitions without direct citation.
Data Extraction	Recorded citation details, country, year, verbatim definition, associated frameworks, and source organization.
Classification	Definitions categorized as technology-oriented, conceptually oriented, or role-oriented (per Staggers & Thompson typology).

Inclusion / exclusion criteria

This was a multi-staged screening. Titles and abstracts were consulted to discard those works that are obviously not linked to the core purpose of what the definition of nursing informatics involves. Second, the entire texts of the potentially relevant articles were evaluated with respect to the following inclusion criteria:

There was a clear definition of nursing informatics in the document.

The definition itself, or at least that definition had some relevance to one or more of the targeted healthcare settings: Australia, United States, or Canada.

The definition appeared in the scholarly article, book or conference papers, or official policy/professional statement.

Those works that:

- Talked about informatics at large instead of talking about the nursing application of informatics.
- Tuned only on technical systems without the conceptualization of the role of nursing.
- Only gave implicit definitions incapable of being cited or paraphrased to analyze.
- When multiple definitions appeared in a document (eg alluding to other authors as well as an original sentence) the multiple definitions were extracted individually in order to retain the sensitivity of differing voices.

Extraction and Organization of Data

Key information was recorded systematically in each of the sources that were included:

- Completely sourced information.
- Healthcare setting and home nation.
- Publication year.
- The literal meaning of nursing informatics.

Any observed theoretical frameworks/ or models related to the definition (e.g. the Data beschininputcom --> organizations to build on our knowledge to deliver knowledge products to the people who need them most.

The definition applicable by a professional body or organization and so on(7).

Definitions have then been classified into the typology of Staggers and Thompson that differentiate technologically oriented definition, conceptually oriented definition, and role-oriented definition. This category assisted in the mapping of patterns over time and space, like in how countries preferred to conceptualize nursing informatics as tool and systems, theoretical construct, or professional roles and duties.

Analytical Framework

This was done in two stages of analysis:

- Descriptive synthesis--a structured account of the definitions of each of the countries, with major similarities and differences in terms of terminology, scope and focus.
- Using the comparative thematic analysis, a method of interpretation focused attention on conceptual priorities underlying each of the definitions with the identification of trends, whether the shift toward patient-centric over technology-centric frames of reference, or the greater inclusion of ethical or decision support considerations.
- The comparative approach made it possible not only to preserve national specificity, but also to discern the transnational convergences which could be used to develop more coherent global definition.

Security of Rigor and Credibility

Although narrative reviews cannot be subjected to the same rules of rigid reproducibility as systematic reviews, a range of actions was undertaken to increase the plausibility of the results:

- It was done to permit transparency, and the information about search strategy was made in detail, database search strings, and dates were included.
- Decisions of inclusion/exclusion were occurred relative to stipulated criteria which lowered subjective bias.
- The paraphrasing or analysis came after the recording of definitions in their original forms in order to remain faithful to the source.

The academic sources of written literature, as well as those resources of professional bodies of authority, were used and this helped balance between the scholarly perspective on the one hand and the practice perspective on the other.

Reasons to Pick a Country

The three main countries selected to partake in the research are Australia, the United States and Canada because of their historical and current relevance to the field of nursing informatics. Every country has contributed greatly to the field by being early adopters, being leaders in professional organizations, as well as developing educational and competency models. Also, their English language literature gave them a common ground as far as analyses were concerned in terms of language, since the aspects of translation tend to take away the meanings given in definitions. Consideration of the three contexts allowed the review to be able to explore common themes as well as adaptations in nations.

Ethical Considerations

Since this review has been scrutinising publicly available literature and policy documents, formal ethical approval was unnecessary. Nonetheless, care was taken on how to cite and acknowledge all firsthand writers and business institutions. The use of a definition is especially imperative in a discipline such as nursing informatics whose definitions may frequently begin with a consensus of the profession and reflect the intellectual effort of more than one contributor of stakeholders.

Summary of methodological approach

Altogether, the research strategy was a chronologically multi-directional search, snowballing method, and a systematic framework of extraction and categorization. Through the combination of the historical definition with the modern significance, the review managed to develop a worldwide map of nursing informatics denominations with three significant healthcare settings. Critical reflection on conceptual evolution along with maintaining the awareness of practical implications on the nursing education, practice and policy were possible provided the chosen narrative review format was used. The outcome is a basis of analysis that subsequent progress of defining worldwide harmony can be further based on.

3.Results

It was observed that definitions of nursing informatics have changed extensively, with initial concepts provided by pioneers like Hannah, Graves and Corcoran and Saba and McCormick and systematized into technology oriented, conceptually oriented and role oriented definitions through Staggers and Thompson. The initial definitions, such as the meaning given by Scholes and Barber that was focused on the application of the computer technology to all disciplines in nursing implied more of a tool-based understanding, whereas more recent definition versions, such as the Nelson and Joos definition that included the concept of wisdom, and QSEN focus on using

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information and technology to assist in a decision making approach implied a transition to a framework that integrates nursing judgment with ICT. Since then, the international medical informatics association (IMIA) widely referred to international definition has been adopted or adapted in different forms by Australia, the United States and Canada which is a global definition that has integrated nursing knowledge and information management with technology to foster global health.

TABLE 2 Results

Country	Key Source(s)	Core Definition	Emphasis / Orientation
Australia	Staggers & Thompson (2004); ANMAC adaptation of Graves & Corcoran	Integration of nursing science with information and analytical sciences to manage data, information, knowledge, and wisdom in nursing practice.	Balance of technical skills and professional nursing application; retains early scholarly frameworks.
United States	ANA (1992, revised 2008); TIGER; ANIA; AMIA	Specialty integrating nursing science with multiple information and analytical sciences, using the DIKW model to support practice, education, research, and administration.	Combines national definitions with global perspectives; strong focus on competencies and standards.
Canada	Hannah (1985); CNIA; CNA; CASN	Any use of information technology by nurses for patient care or education; later aligned with IMIA's definition of integrating nursing knowledge and ICT to promote health.	International harmonization with IMIA; emphasis on competencies and professional standards.

Formally, nursing informatics emerged in the mid-1980s in Australia through the professional networks that grew into the Australasian Institute of Digital Health; the main national definitions acquired in that environment were based on the framework by Staggers and Thompson and an adaptation of the description by Graves and Corcoran both of which focused on nursing, computer, and information sciences integration. In the United States, the definition developed by the American Nurses Association in 1992 was revised in 2008 to reflect the DataInformation KnowledgeWisdom (DIKW) concept and has been adopted by both the TIGER initiative and ANIA, whereas the AMIANursingInformatics Working Group has accepted the IMIA definition(9). The Canadian trail started in 1987 with a COACH Nursing Special Interest Group that paved the way to Kathleen Hannah in 1985 having a broad conceptualization to COACH Canadian Nursing Informatics Association (CNIA), where CNIA, Canadian nurses association (CNA) and Canadian association of schools of nursing (CASN) all signed a Common posting of the IMIA definition. Although each of the three countries recognizes nursing informatics as the unification of nursing science and ICT to improve care, minor distinctions exist within the definitions with Australia resonating towards earlier scholarship level contexts, the U.S. referring to a position of unique national and global definitions with a focus of building competencies and Canada slightly gravitating to the position of international harmonization with considerations of community and country integration.

4. Conclusion

This narrative review has reviewed and compared the recent definitions of nursing informatics within three powerful healthcare settings- Australia, the United States and Canada without overlooking the similarities of conceptual frameworks and the subtle changes of the same brought by national histories, professional organization and policy priorities. The results of this study validate that though the unifying view of numerous experts centers around an agreement that nursing informatics involves the incorporation of nursing science with information and communication technologies (ICT) in an effort to enhance the quality, safety and efficacy of care, there is still no universal and operational definition. Rather, there is a plurality of forms, basing some on prior academia and others on internationally based standards like those of the International Medical Informatics Association (IMIA). The fact that the variations have continued to persist is an indication of how rich the intellectual tradition of the field is, and how difficult it is to anchor the needs of a local context in a global consensus.

Professional bodies have had a significant part to play in defining and endorsing in all the three nations. The incorporation of informatics into the Australian national nursing schemes, most importantly the Australian College of Nursing, the Australasian Institute of Digital Health and the Australian Nursing and Midwifery Accreditation Council, has also been able to adapt a definition that should not only focus on professional expertise but also on

demonstrating how technology can be implemented in the daily nursing practice. The US has pursued a similar but different line, where the enduring definition put forward by the American Nurses Association alongside the restatement facilitated by the Data Information Knowledge Wisdom (DIKW) construct is the nationally agreed definition, and a standard that is shaping education reform including in TIGER. The evolution of Canada, as illustrated by the transformation of Kathleen Hannah broad (general) conceptualizations to its formal adoption of the IMIA definition, follows a very conscious attempt to match international views, as sanctioned by Canadian Nursing Informatics Association, Canadian Nurses Association and Canadian Association of Schools of Nursing. These successes aside, absence of a common definition still poses difficulties. A difference in terminology and emphasis may lead to vagueness amongst nurses, teachers and policymakers concerning the extent and the role of nursing informatics. This lack of consensus has some practical implications: it makes it harder to develop standardized curricula in the field of informatics, makes it more difficult to assess informatics skills across institutions and has the potential to increase the time it takes to take up new technologies by introducing ambiguity regarding professional roles and functions. Coming full circle back to a definition based on technical skills with less emphasis on the analytical and ethical components may mean you create a workforce that knows how to operate the system, but struggles to interpret and use data critically in a complex care situation. On the other hand, definitions which give more attention on conceptual or theoretical synthesis can fail to realize that it will also require practical skills in technical adequacy.

The results of the review indicate that the global relevant and operationally defined definition is possible and even necessary. This definition would have to be general but allowing for a variety of healthcare systems, technological infrastructure and workforce capacity in the essay yet specific as to allow the development of curriculum, professional growth and policy. IMIA definition already forms a quite useful basis of this endeavor as is already evidenced by adoption or adaptation (in part or whole) in the U.S. and Canada or influence in Australia. Nonetheless, the transition of adoption to global standardization will demand intentional cooperation between national nursing associations, international society of informatics, academic studies, and policymaking.

In addition to the clarity of definition, an urgent need is identified to integrate nursing informatics further into nursing education and practice around the world. The reviewed literature highlights the obstacles that still exist and are most pronounced namely inadequate formal preparation, little exposure to informatics at the undergraduate level and variable access to continuing professional education. These gaps will need to be addressed by incorporating informatics skills into accreditation requirements so that every graduate nurse has a baseline level of both the technical and analytical aspects of digital health. Furthermore, with the trend in data-driven healthcare, the availability of continuing education options should be provided to enable nurses to remain ready to adopt the evolving technologies, including artificial intelligence and predictive analytics and the use of telehealth platforms. The future of nursing informatics rests on more than just an agreed-upon definition, but on a workforce that is confident, capable and ready in the digital terrain. This goes beyond the instruction of nurses to work with technology and becomes the creation of critical thinking and reasoning, ethics, and the skill to structure data into meaningful patient-centered resolutions. In that regard, the role of the wisdom aspect of the DIKW model becomes especially important in this case because technology can never be as effective as the human judgment people base their usage on.

Summing up, it is possible to say that this review confirms the predominant role of nursing informatics in contemporary health care and the necessity of a common global definition of its scope. Although there is slight difference in each of Australia, the United States, and Canada in their different perspectives based on their respective historical contexts, through a common theme of integrating nursing knowledge with ICT, their trajectory is converging. An agreed upon, internationally accepted definition would not only make professional identity more secure but also facilitate the provision of consistent educational standards, research agendas and policy initiatives. The bottom line is that, by definitively addressing what nursing informatics is, (and what it is not), the nursing profession will be able to better utilize digital innovations to offer patients improved outcomes, interprofessional relationships and address the needs presented by the rapidly changing realities of healthcare in the 21st century.

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Conflicts of interest

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The authors have no conflicts of interest to declare

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