Review ◾

Collaborative Efforts for Representing Nursing Concepts in Computer-based Systems:

International Perspectives

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A b s t r a c t Current nursing terminology efforts have converged toward meeting the demand for a reference terminology for nursing concepts by building on the foundation of existing interface and administrative terminologies and by collaborating with terminology efforts across the spectrum of health care. In this article, the authors illustrate how collaboration is promoting convergence toward a reference terminology for nursing by briefly summarizing a wide range of exemplary activities. These include: 1) the International Classification of Nursing Practice (ICNP) activities of the International Council of Nurses (ICN), 2) work in Brazil and Korea that has contributed to, and been stimulated by, ICNP developments, 3) efforts in the United States to improve understanding of the different types of terminologies needed in nursing and to promote harmonization and linking among them, and 4) current nursing participation in major multi-disciplinary standards initiatives. Although early nursing terminology work occurred primarily in isolation and resulted in some duplicative efforts, the activities summarized in this article demonstrate a tremendous level of collaboration and convergence not only in the discipline of nursing but in multi-disciplinary standards initiatives. These efforts are an important prerequisite for ensuring that nursing concepts are represented in computer-based systems in a manner that facilitates multi-purpose use at local, national, regional, and international levels.

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Standardized terminologies exist for nursing diagnoses, nursing interventions, nursing-sensitive outcomes of care, and patient goals.[1–8] Most were developed in the English language in the United States and have subsequently been translated into other languages and, in some cases, modified by nursing experts in other countries. Historically, the primary motivation for developing nursing terminologies was to identify, name, and classify the major concepts of the domain for multiple purposes. These purposes include 1) implementation of computer-based systems in clinical settings, 2) the quest for reimbursement for nursing services delivered, 3) the education of students, 4) documentation of nursing contributions to patient care outcomes, and 5) development of nursing knowledge. Recently, however, expectations of standardized terminologies have become more stringent in response to increased

demands for health care information at local, national, regional, and international levels; constrained health care resources; multi-disciplinary models of care; and the evolution of information science methods and tools (see, for example, Cimino,[9] Campbell et al.,[10] and the Danish Institute of Health and Nursing Research[11]).

To address current and future demands, terminologies must be incorporated into computer-based systems in a manner that supports rich descriptions of clinical encounters, data re-use, and comparisons of data captured in different systems and even in different languages.[12–14] To achieve these more ambitious objectives requires a different kind of terminology from those previously developed in nursing. Such representations of terms have been referred to by various authors as concept-oriented terminologies,[14] reference terminologies,[15] formal terminologies,[16] or third-generation language systems,[17] and are designed to complement and support terminologies optimized for other purposes, e.g., statistical classification (administrative terminology) or end-user data entry (interface terminology). For consistency, "reference terminology" will be used throughout this article.

Standardized nursing terminologies have typically been designed to function as both administrative and interface terminologies and do not possess the characteristics and associated functionality of reference terminologies.[18,19] In addition to sets of terms (which may come from existing interface and administrative terminologies) for the concepts of interest, a reference terminology includes a terminology model that defines the manner in which atomic concepts are linked to create molecular expressions, and a knowledge formalism (i.e., representation language) supported by software tools for the management and manipulation of the terminology.

Functionally, a reference terminology facilitates mapping among standardized terminologies with terms at differing levels of granularity (e.g., interventions represented using the Omaha System and the Patient Care Data Set); decreases the maintenance burden of mappings for pairs of terminologies because each terminology need be mapped only to the reference terminology; and supports the transformation of interface terms into administrative terminologies for comparative statistical analyses. Recent studies in the medical domain have also demonstrated the effects of reference terminologies that support data sharing and re-use on significant aspects of care such as improving understanding of patient care data, accessing information resources relevant to specific patient care problems, applying expert systems to the care of patients, and improving the quality of the information retrieval of clinical findings.[20,21]

Current nursing terminology efforts have converged toward meeting the demand for a reference terminology for nursing concepts by building on the foundation of existing interface and administrative terminologies and by collaborating with terminology efforts across the spectrum of health care. In this article, we illustrate how collaboration is promoting convergence toward a reference terminology for nursing by briefly summarizing a wide range of exemplary activities. These include 1) the International Classification of Nursing Practice (ICNP*) activities of the International Council of Nurses (ICN), 2) work in Brazil and Korea that has contributed to, and been stimulated by, ICNP developments, 3) efforts in the United States to improve understanding of the different types of terminologies needed in nursing and to promote harmonization and linking among them, and 4) current nursing participation in major multi-disciplinary standards initiatives, including work occurring in the Clinical LOINC (Logical Observation Names, Identifiers, and Codes) Committee, European Committee on Standardization (CEN), Health Level 7 (HL7), SNOMED International, and the International Standards Organization (ISO).

International Classification of Nursing Practice

The International Classification of Nursing Practice (ICNP) is a product and a program of the International Council of Nurses (ICN), a federation of national nurses associations, which currently has more than 120 country members. The recently reaffirmed objectives of the ICNP program are to:

- Establish a common language for describing nursing practice in order to improve communication among nurses, and between nurses and others

- Describe the nursing care of people (individual patients, families, and communities) in a variety of settings, both institutional and non-institutional

- Enable comparison of nursing data across clinical populations, settings, geographic areas, and time

- Demonstrate or project trends in the provision of nursing treatments and care and the allocation of resources to patients according to their needs, on the basis of nursing diagnoses

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* ICNP is a registered trademark

Table 1 ■

Examples of Activities Related to Clusters of the ICNP Program

Communication and marketing:
  ICNP Bulletin
  ICN Web site
  Clearinghouse for ICNP-related publications
  CD-ROM of ICNP beta version
  Educational materials

Research and development:
  Formal ICNP evaluation program
  Database of ICNP research and evaluation projects
  ICNP Evaluation Committee

Coordination and project management:
  ICNP Users Agreement
  Policy on ICNP translation, publication, reproduction,
  and distribution

ABBREVIATIONS: ICNP indicates International Classification of Nursing Practice; ICN, International Council of Nurses.

- Stimulate nursing research through links to data that are available in nursing information and health information systems

- Provide data about nursing practice to influence health policy making[22]

The ICNP product is defined as a classification of nursing phenomena, nursing actions, and nursing outcomes that describes nursing practice. Consistent with the ICN core values of inclusiveness and flexibility, ICNP development is based on the concept of a unifying framework. As a unifying framework, the ICNP builds on existing nursing interface and administrative terminologies, provides a structure into which existing terms in these terminologies can be cross-mapped, and supports continued use and development of the existing nursing terminologies.[22]

The development of the ICNP product is part of a larger program with three clusters of activities: 1) communication and marketing; 2) research and development; and 3) co-ordination and project management. Examples of these activities are provided in Table 1. Partnership is a core value of ICN, and thus formal partnerships as well as related country and regional projects play a key role in the ICNP Program. Although a list of all the ICNP partnerships and projects across the world is beyond the scope of this paper, selected examples are provided in Table 2.

The Telenurse projects (Telenurse and Telenurse ID) and the W. K. Kellogg Foundation are two major partnerships. The current Telenurse project, Telenurse ID (1998–2000), is a large European Union effort that is focused on use of the ICNP as a unifying framework for electronic documentation of nursing care in Europe.[8] Use of ICNP is promoted through

Table 2 ■

Examples of ICNP Partnerships and Projects

Collaborator	Focus
Formal partnerships:	
Telenurse and TelenurseID	Dissemination, development and testing of ICNP
W.K. Kellogg Foundation, four African countries (Botswana, South Africa, Swaziland, and Zimbabwe), and four Latin American countries (Brazil, Chile, Columbia, and Mexico)	Expansion of ICNP in its representation of nursing concepts from primary health care and community-based practice; testing and establishing mechanisms that will keep the ICNP responsive to changes in nursing knowledge and practice
International Medical Informatics Association Special Interest Group—Nursing Informatics (IMIA-NI)	Development of International Standards Organization (ISO) standards for a reference terminology model for integration of nursing concepts
Projects:	
Taiwan Nurses Association	Testing of ICNP and dissemination
Norwegian Nurses Association	Relationship of ICNP to nursing documentation
Thailand Nurses Association and the Nursing Division of the Ministry of Public Health	Development of a nursing data set as integral part of health information system
Swiss Nursing Data Project	Development of a Swiss nursing minimum data set in partnership with the Swiss government, National Nurses Association, health care providers (private and public hospitals), and industry (software developers)
Korean Nurses Association	Cross-mapping terms from existing nursing classification systems to ICNP

ABBREVIATIONS: ICNP indicates International Classification of Nursing Practice.

dissemination activities[23,24] and demonstration projects related to electronic health records.[25,26] The ICNP country projects in the Latin American and Southern African regions that are funded by the W. K. Kellogg Foundation are listed in Table 2.

An alpha version of the ICNP was released in 1996 to stimulate research, feedback, and participation in the project.[27] In 1999, the substantially revised ICNP beta version was published and has subsequently been translated into more than 20 languages.[22] Work in Brazil, funded by the Kellogg Foundation and Telenurse partnerships, and in the Republic of Korea illustrates the range of research and testing that contributed to the development of the ICNP alpha and beta versions and will continue to feed into subsequent versions. This work is described in the following two sections.

Efforts in the United States to clarify the different types of terminologies needed in nursing and to promote harmonization among different nursing terminologies (described later in this paper) have also contributed to the evolution of ICNP. Although ICNP was originally conceptualized as a terminology that would primarily meet the purposes served by interface and administrative terminologies, the beta version incorporates some characteristics of a reference terminology. For instance, atomic terms from multiple axes can be combined to form a specific molecular expression based on a terminology model for defining that type of expression.[8] The nursing intervention "Assess adherence behavior after discharge," for example, would be formed with terms from four of eight ICNP axes relevant to nursing actions—specifically, 1) Action type: Assessing; 2) Target: Adherence behavior; 3) Beneficiary: Individual; and 4) Time: After discharge.[22]

The ICNP was initiated as an endeavor to collect all nursing concepts, to cover and complete the description of the nursing domain.[28,29] Several additional benefits have been realized through related research and development efforts. For example, through its multi-axial design, the ICNP has facilitated the creation of relevant and useful concepts that were not present in existing classification systems.[8,30,31] Moreover, although the ICNP was not initially conceptualized as a concept representation model, recent reports document the utility of the axes as a source of categories and semantic links in a terminology model to represent nursing activity concepts.[32,33]

As the ICNP evolves, the goal remains unchanged—to make the ICNP an information tool that will assist with communication about nursing practice and capture data representing nursing practice in comprehensive health information systems, thus providing a means to make the contribution of nursing clearly visible in health care systems worldwide.[22]

Nursing Terminology Work in Brazil

As in other countries, nursing terminology activities in Brazil first centered on translation of North American terminologies developed primarily for interface or administrative purposes. In 1990, the North American Nursing Diagnosis Association (NANDA) taxonomy was translated into Portuguese and introduced into Brazil. The Home Health Care Classification (HHCC) has been translated more recently. Brazil has also moved on to collaborative activities contributing to the development of ICNP and, under the aegis of the Pan American Health Organization (PAHO), to broader issues associated with developing standards-based nursing informa-

Table 3 ■

Brazilian Activities Related to Standardized Terminologies

Year	Project	Focus
1990	NANDA	Introduction of NANDA nursing diagnoses into clinical practice
1995	Classification for Nursing Practice in Collective Care	Development of community health nursing terms for incorporation into ICNP
1996	Telenurse	Translation, field testing, and implementation of alpha version of ICNP into an electronic patient record
2000	HHCC	Translation and testing of HHCC in the Brazilian home care setting
2001	Standards-based Nursing Information Systems	PAHO-sponsored publication directed to promotion of data standards in nursing information and management in Latin America and the Caribbean

ABBREVIATIONS: NANDA indicates North American Nursing Diagnosis Association; HHCC, Home Health Care Classification; PAHO, Pan American Health Organization.

tion systems. Table 3 summarizes Brazilian nursing terminology projects that illustrate the significant progress of Brazilian nurses in promoting implementation of standardized terminologies in nursing practice in national, regional, and international nursing contexts and in addressing the relationship between terminologies and information models in nursing information systems. Projects involving the ICN and PAHO are described here.

Stimulated by the ICN, several national nursing associations in Latin America and Southern Africa initiated a collaborative research project to expand the primary health care and community nursing terms in the ICNP. Since 1996, Brazil has participated in this ICN project, supported by the W. K. Kellogg Foundation. Specific aims of the ICNP country projects include 1) to elicit and disseminate model processes that can be used by nurses in any country to elucidate the language of nursing in primary health care and community-based systems, 2) to collect and ensure the insertion of primary health care and community-based nursing terms into the ICNP, 3) to have a mechanism in place at the country level that will enable participating countries to continue to contribute terms and recommendations to the ICNP after the end of the project, and 4) to increase recognition by the nursing profession and health authorities in the countries involved of the need to include data that relate to nursing practice in health information systems. As a consequence of the Brazilian project, Classification for Nursing Practice in Collective Health, new terms and recommendations for revision and refinement of the ICNP have been submitted.

In a second ICNP-related activity, the Nursing Informatics Center of the Federal University of Sao Paulo (NIEn/UNIFESP) is a sponsored partner in the Telenurse consortium. The responsibilities of NIEn/UNIFESP are to 1) translate the alpha version of ICNP into the Brazilian Portuguese language, 2) field-test the alpha version of ICNP to identify possible matches with the local terms in the patient record, and 3) implement the ICNP in an electronic patient record.[34] The first two activities have been completed. The Brazilian translation of the ICNP is available on the Web (www.epm.br/enf/nien/cipe). The field test, conducted at the Sao Paulo Hospital, a teaching hospital of the Universidade Federal de São Paulo, found that the nurses were using only a small number of ICNP terms in clinical documentation.[34]

Brazilian nurses have also played a leadership role in a project organized by PAHO which has three goals—to characterize how nursing informatics and

the use of standards can improve nursing practice and management; to take advantage of information technology resources to improve nursing care; and to produce a guidebook describing how nursing informatics and standards can improve nursing care practice and management. The role of different types of standardized terminologies in both paper-based and computer-based systems is a major component of the guidebook, which is being developed by an international group of experts in nursing, informatics, and standards. In addition, in the context of standards-based nursing information systems, the guidebook addresses the relationships between various types of nursing terminologies and other standards of relevance to representing nursing concepts in computer-based systems.

Nursing Terminology Work in the Republic of Korea

In 1997, the Health Technology Planning and Evaluation Board, Korean Ministry of Health and Welfare, Republic of Korea, funded a research team from Seoul National University and the Korean Nurses Association to address the need for a standardized nursing terminology, to support data compatibility, clinical documentation, and outcome research. Activities supported by this three-year grant include Korean translation and cross-validation of standardized nursing terminologies developed in North America; translation, validation, and cross-mapping activities related to alpha and beta versions of the ICNP; and standardization of documentation forms and related interface terminology. These activities illustrate collaboration toward the development of interface, administrative, and reference terminologies for use in Korea and internationally, as well as the linkage between documentation forms and terminologies.

In the first year of the three-year project, HHCC, NANDA, the Nursing Intervention Classification (NIC), the Nursing Outcomes Classification (NOC), the Omaha System, and the ICNP alpha version were translated and subsequently validated by an expert panel. The validity of each term was tested using a five-point Likert-like scale ranging from 1 (very inappropriate) to 5 (very appropriate). Almost 99 percent of terms from the North American standardized terminologies received a rating of 3.5 or higher. Of the total 294 nursing phenomena analyzed in the ICNP alpha version, all had a score higher than 3.5. For nursing actions, a total of 1,002 terms were analyzed. Only two actions had a score lower than 3.5. The

Korean translation of the terms was modified on the basis of rater suggestions.[35]

The beta version of the ICNP was subsequently translated and validated. No terms received a score of less than 3.5. The Korean translation of the ICNP beta version is available on the Web at http://nis.snu.ac.kr.

In a related activity, alpha and beta versions of ICNP were cross-mapped with selected standardized nursing terminologies developed in North America. The cross-mapping of ICNP beta version with HHCC, NANDA, and the Omaha System led to the suggested addition of 76 new terms to the ICNP phenomena classification. To cross-map the interventions from NIC, HHCC, and Omaha to ICNP, 166 new terms were required. Recommendations for additions or modifications to the ICNP were submitted to ICN.

Standardization of nursing documentation forms and related terminology was another significant area addressed in the three-year project. The motivation for this aspect of the project was the variation in nursing documentation across settings and within a single setting. For example, documentation forms with the same title were being used for different purposes with different data elements, and both English and Korean languages were used in the documentation forms. In addition, the manner in which each item was recorded differed even within a single hospital. To address these issues, nursing documentation forms were collected and analyzed. On the basis of the analysis, prototype forms with standardized data elements (e.g., interface terms) were developed along with instruction manuals for completing the forms. Nurses in clinical settings tested the validity of forms and manuals through their use with actual patients. Subsequently, forms and guidelines were modified and a public hearing was held. Following the public hearing, forms and manuals were again modified, and the final results were disseminated via the Web (http://nis.snu.ac.kr.).

A number of new activities that build on these achievements are currently under way in the Republic of Korea, including the development of a Korean Unified Nursing Language System using the ICNP framework, categorization of ICNP terms into existing semantic types from the Unified Medical Language System (UMLS), and cross-mapping of ICNP with nursing terminology used in nursing records in a cardiology unit and an intensive care unit at a tertiary hospital in Seoul. Testing the use of ICNP in electronic patient records that support nursing practice is a priority for the future.

U.S. Work to Define Nursing Terminology Requirements and Promote Harmonization

In addition to work on the development of administrative and interface terminologies that informed the creation of the ICNP and collaboration with other countries wishing to translate these terminologies, U.S. nurses are playing leading roles in efforts to define the range of needed nursing terminologies and promote harmonization among existing nursing terminologies. Groups in the United States that are working on these goals include the American Nurses Association (ANA), the Nursing Working Group of AMIA, and the Nursing Vocabulary Summit Conference. There is considerable cross-representation and synergy among the participants in these groups.

For more than a decade, the ANA has promoted the notion of a unified nursing language system based on standardized nursing terminologies that meet the criteria for ANA recognition.[36] Recently, the recognition criteria were revised and expanded to reflect the development of standardized terminologies (e.g., reference terminologies) that differ in structure and content from the nursing classification systems (typically designed as interface and administrative terminologies) recognized with the original criteria; the revised criteria also reflect improvements in the methods and tools for computable concept representations and harmonization with the efforts of recognized standards bodies.[37] To date, 12 systems have been recognized—the Complete Complementary Alternative Medicine Billing and Coding Reference, HHCC, ICNP, NANDA, NIC, NOC, Nursing Management Minimum Data Set (NMMDS), Nursing Minimum Data Set (NMDS), Omaha System, Patient Care Data Set (PCDS), Perioperative Nursing Data Set (PNDS), and SNOMED-RT.[1–7,15,22,38–40]

In addition to representation of the profession of nursing in standards groups such as HL7 and the SNOMED International Editorial Board, the ANA has served as a voice for nursing terminology developers as a group in U.S. government activities such as the development of the UMLS[41] and implementation of the standards-related provisions of the Health Insurance Portability and Accountability Act of 1996.[42]

Since 1997, the AMIA Nursing Working Group has sponsored activities to facilitate communication between those with nursing terminology expertise and those with informatics expertise, including software developers and system implementers. Activities have included tutorials, workshops, and panels at the AMIA Annual Symposium and the pub-

lication of a series of articles in JAMIA.[18,43–45] Systematic efforts have been made to ensure that both introductory and advanced content (e.g., concept representation methods, Unified Modeling Language) are presented at each symposium, to inform those with a general interest and to increase the knowledge and skill levels of those working with aspects of nursing concept representation.

The 1999 Nursing Vocabulary Summit Conference brought together stakeholders with expertise in different areas, such as terminology development, concept representation, software development and implementation, and standards.[46,47] Participation in the 2000 Summit was expanded to include additional international representatives from the ICNP, Telenurse, CEN, and the International Medical Informatics Association Special Interest Group—Nursing Informatics (IMIA-NI). Consistent with the aims of consensus development, convergence among nursing terminologies, and congruence with national and international efforts to develop clinical terminology standards, the conference participants initiated work items related to the development and evaluation of reference information models and reference terminology models for nursing diagnoses, nursing interventions, standardized assessments, and goals.[46–50] Such activities are an essential step toward the development of a reference terminology that supports nursing concepts. In addition, the Summit is the primary venue in which the relationship between the attributes of the HL7 Reference Information Model (RIM) and standardized nursing terminologies is being critically examined.

Nursing Participation in Multi-disciplinary Standards Initiatives

The collaborative, discipline-specific activities described thus far are necessary, but not sufficient, to meet the demand for a reference terminology for nursing concepts that is consistent with evolving standards for health care information models and reference terminologies. This demand requires nursing participation in integrative health care standards initiatives. The Clinical LOINC Committee, HL7, SNOMED International, CEN, and ISO are illustrative examples of such initiatives.

LOINC

Development of LOINC originally focused on a public use set of codes and names for electronic reporting of laboratory test results.[51,52] With minor extensions to the original definitions, but not to the elements of the semantic structure, LOINC content continues to expand, especially in the area of direct patient measurements and clinical observations (e.g., blood pressure, symptoms). This expansion is commonly known as Clinical LOINC. Support for the utility of the semantic categories of Clinical LOINC as a terminology model for standardized assessments including those specifically designated as sensitive to nursing care was recently documented.[48] Subsequently, nursing assessment terms from two nursing terminologies in the public domain (i.e., HHCC and the Omaha System) and three research-based standardized assessments were incorporated into the LOINC database. The Clinical LOINC Committee will determine priorities for inclusion of additional standardized assessment terms on the basis of perceived utility and availability for inclusion in the LOINC database.

Health Level 7

Health Level 7 is a not-for-profit, ANSI-accredited standards development organization whose mission is to provide standards for the exchange, management, and integration of data that support clinical patient care and the management, delivery, and evaluation of health care services. Activities of the HL7 Patient Care and Vocabulary technical committees (TCs) are particularly relevant to the topic of standardized terminologies for nursing concepts. Consequently, participation in HL7 by nursing terminology developers and the ANA liaison has focused on these two TCs. For example, the HL7 Reference Information Model (RIM),[53,54] requires that specific terminologies be designated as the source of allowable values for any coded attributes for RIM classes. The primary focus for Patient Care TC activities in the near future is to select the terminologies that may be used for assessments (e.g., goals, outcome evaluations). These are elements of the patient care process that are well-represented in nursing terminologies; therefore, terms from nursing systems have the potential to be specified as the allowable values.

Although each domain committee (e.g., Patient Care, Patient Administration/Financial Management) is responsible for terminology selection for the HL7 RIM classes for which it serves as steward, the Vocabulary TC has overall responsibility for the development of a process and database for registering terminologies for use in HL7.[55] The ANA liaison to HL7 and other nursing representatives participated in the development of this process, including the

definition of principles for HL7-compliant terminologies and HL7-sanctioned terminology integration efforts. Moreover, four ANA-recognized nursing terminologies (HHCC, NIC, NOC, and SNOMED) were among the initial terminologies registered.

SNOMED-RT

SNOMED-RT is a reference terminology designed to represent a broad array of health care concepts. The Convergent Terminology Group for Nursing (CTGFN) is a subgroup of the SNOMED International Editorial Board and was originally charged with the task of developing principles, processes, and strategies for enhancing the nursing content in SNOMED RT. The charge has been extended to include the new collaborative work of SNOMED International and National Health Service Clinical Terms Version 3, SNOMED Clinical Terms (CT).[56] Core members of CTGFN include representatives from the ANA, Royal College of Nursing in the United Kingdom, and Convergent Medical Terminology Project, SNOMED staff, and the nursing consultant to the SNOMED International Editorial Board. Toward the goal of integration of nursing concepts into SNOMED-RT and SNOMED-CT (a terminology with both reference and interface characteristics), CTGFN activities have focused on two areas. First, a series of studies have evaluated terminology models to support representation of nursing concepts in SNOMED-RT and SNOMED-CT. [32,57] Second, CTGFN has facilitated collaborative agreements between the developers of nursing terminologies and the SNOMED-RT and SNOMED-CT developers.[32,58]

European Committee on Standardization (CEN)

Work by CEN related to the development of a system of concepts for nursing[59] has built on the significant accomplishments of the Telenurse,[8,60] ICNP,[30] and Galen-in-Use (now OpenGALEN)[61,62] projects. In 1999, CEN undertook a short strategic study to develop a strategy for progress toward a system of concepts for nursing.[59] Current efforts are intended to develop a European pre-standard and to provide a foundation for the scope of work for an ISO standard related to integration of a reference terminology model for nursing as described in the next section.[49]

International Standards Organization

The ICN and IMIA-NI are co-leading a project to develop an ISO standard related to a reference terminology model for nursing concepts.[63] This scope of work will proceed in collaboration with CEN under the Vienna Agreement, with ISO as the designated lead, and will also build on the existing work of other groups that did not directly participate in the creation of the CEN pre-standard (e.g., HL7, SNOMED-RT). The intent is that the model will not only support representation of nursing concepts and mediation among representations but also integrate with other ISO models for health care concepts.

Conclusions

Although early nursing terminology work occurred primarily in isolation and resulted in some duplicative efforts, the activities summarized in this article demonstrate a tremendous level of collaboration and convergence not only within the discipline of nursing but with multi-disciplinary standards initiatives. These efforts are an important prerequisite to ensuring that nursing concepts are represented in computer-based systems in a manner that facilitates multipurpose use at local, national, regional, and international levels. However, there are additional prerequisites.

A larger cadre of nurses with specialized knowledge in concept representation is necessary for both discipline-specific and multi-disciplinary purposes. Given the importance of collaboration and convergence of nursing concept representation efforts with multi-disciplinary standards initiatives, it is essential that more nurses are prepared with the relevant knowledge and skills to effectively communicate the needs of the nursing discipline to others and are supported for participation in standards activities.

Additional research related to nursing concept representation is needed. Studies evaluating the utility of reference terminology models and reference terminologies for nursing concepts (see, for example, the article by Hardiker and Rector in this issue[64]) must be conducted and disseminated in the peer-reviewed literature. The relationships among clinical document architecture, information models, and reference terminologies for nursing concepts also warrant further examination.

For decades, authors of papers appearing in the nursing literature have purported that standardized nursing data are essential to support the delivery of nursing services, to build nursing knowledge, to apply knowledge to nursing practice, and to document the effects of nursing on care outcomes. Activities such as those reviewed in this article represent another step toward achievement of those goals.

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