Evaluating the beta version of the International Classification for Nursing Practice® for domain completeness, applicability of its axial structure and utility in clinical practice: a Norwegian project

C. M. Ruland RN, PhD

Institute of Nursing Science, University of Oslo, Oslo, Norway

1

Abstract

The purpose of this Norwegian project was to evaluate the International Classification for Nursing Practice® (ICNP®) beta version for domain completeness, applicability of its axial structure and utility in clinical practice. A subset of terms addressing the areas of circulation and elimination were abstracted from the nursing records of a cardiac intensive care unit and a nursing home. Abstracted terms were mapped to terms in the ICNP®. In the ICNP®, the same or similar terms were found for 47% of the documented circulation terms and 69% of the documented elimination terms that addressed nursing phenomena. For nursing interventions, 27% of the documented circulation terms and 35% of the documented elimination terms mapped to the ICNP®. The research team encountered difficulty in coding terms with the ICNP® that expressed patients' perspectives, preferences, behaviours and experiences, and terms that represented signs-and-symptoms. Recommendations for further development of the ICNP® include improvement in granularity, precision and conceptual definitions of terms; inclusion of time-related terms for representing nursing phenomena; and an easier method for navigating around the ICNP®.

Correspondence address:
Center for the Evaluative Clinical Sciences at Dartmouth, Department of Community & Family Medicine, Dartmouth Medical School, 7251 Strasenburgh Hall, Hanover, NH 03755-3863, USA
Tel.: (603) 650-1141
Fax: (603) 650-1225
E-mail: Cornelia.M.Ruland@ Dartmouth.EDU

Introduction

The need for development of standardized nursing terminologies, or nursing classifications systems, to describe nursing phenomena, interventions and outcomes, has been widely acknowledged (Werley & Lang 1988; Bulechek & McClosky 1995; Johnson & Maas 1997). Efforts are motivated by multiple reasons, such as:

1 a need for structured data capture, storage, multiple uses, retrieval and analysis of nursing data (Zielstorff et al. 1995),

2 a need for documentation of nursing contributions to patient care outcomes,

3 a need for enhancing the body of nursing knowledge,

4 a demand for evidence-based practice, and

5 a demand for concept-orientated technologies that can support rich descriptions of clinical encounters, data reuse and data comparisons across heterogeneous representations (Bakken et al. 2000). Standardized terminologies are also essential for the development of nursing information systems and for representing nursing in the computer-based patient record (CPR). The American Nurses Association (ANA) has developed criteria for recognition of nursing classifications that are useful in supporting clinical practice. Among the characteristics of good standardized terminologies identified by researchers are domain completeness, granularity, parsimony, non-ambiguity, non-redundancy, clinical utility and multiple axes, to provide not only maximum parsimony but also maximum flexibility and extensibility (Zielstorff 1998).

The International Classification for Nursing Practice (ICNP®)

Initiated by the International Council of Nurses (ICN) in 1989, the ICNP® is an international effort to develop a nursing terminology that can be used worldwide. The ICNP® is defined as a classification of nursing phenomena, nursing interventions and nursing outcomes that describe nursing practice (International Council of Nurses 1996). The alpha version was released in 1996. In the beta version, released in 1999, nursing phenomena and nursing intervention classifications are designed to be both multiaxial and hierarchical, allowing different concepts in clinical practice to be expressed as combinations of concepts from different axes or hierarchies included in the ICNP® (Nielsen & Mortensen 1998). The axes in the phenomena classification are: (a) focus; (b) judgement; (c) frequency; (d) duration; (e) body site; (f) topology; (g) likelihood; and (h) distribution. The intervention classification contains the following axes: (a) action type; (b) target; (c) means; (d) time; (e) location; (f) topology; (g) routes; and (h) beneficiary (International Council of Nurses 1999).

The ICNP® is a product as well as a programme with multiple objectives (International Council of Nurses 1999), which are:

· to establish a common language for describing nursing practice in order to improve communication among nurses and between nurses and colleagues,

· to describe the nursing care of people in a variety of settings, both institutional and non-institutional,

· to enable comparison of nursing data across clinical populations, settings, geographical areas and time,

· to demonstrate project trends on the provision of nursing treatments and care, and the allocation of resources to patients according to their needs, based on nursing diagnoses,

· to stimulate nursing research through links to data available in nursing information systems and health information systems, and

· to provide data about nursing practice in order to influence health care policy making.

The ultimate goal for the ICNP® is to be used as a tool for clinical decision making and documentation by fulfilling the following:

· providing the terminology to describe all possible types of nursing practice patterns and outcomes,

· allowing nursing to be described at the summary level as well as at the lowest level of abstraction,

· being applicable for structured data capture, storage, analysis and reporting,

· being statistically useful, and

· serving as a unifying framework around the globe.

As a unifying framework, the ICNP® recognizes the work of other existing nursing classifications and provides a framework into which existing terms in these classifications can be cross-mapped (Mortensen 1997).

Specific aims

Development of the ICNP® is an ongoing process. The ICN has encouraged its member countries to participate in evaluations and reviews of the evolving ICNP® (Coenen 2000). In 1998, the Norwegian Nurses Association (NNA) initiated an evaluation study in order to contribute to the further develop-

ment of the ICNP® (Ruland 1999a). Specific aims were to evaluate a subset of ICNP® terms for domain completeness, to assess the applicability of its axial structure and to judge its utility in clinical practice.

Methods

At the beginning of the study, the NNA established collaboration with the Institute of Nursing Science at the University of Oslo for scientific leadership. As the complete ICNP® is very comprehensive, the decision was made to limit the evaluation to a subset of ICNP® terms that addressed two areas central to nursing care: elimination and circulation. Also, as the beta version had been announced to be available shortly after the project group had started, the decision was made to postpone the evaluation until the beta version was released. Two clinical practice units served as data-collection sites: a cardiac intensive care unit at a university hospital; and a nursing home unit. The nursing documentation in 30 patient records was reviewed for terms and phrases that addressed circulation in the cardiac intensive care unit. In the nursing home, 60 patient records were reviewed for terms addressing elimination.

The purpose of the chart abstractions was to assess the degree to which it was possible to capture and represent documented nursing concepts related to circulation and elimination with terms in the ICNP®. As nurses document nursing care at several places in patients' charts, such as in care plans, flow sheets and progress notes, all possible data sources in the record were identified and included in the data collection. As one of the purposes of the project was to evaluate the ICNP® for domain completeness, it was decided that all terms used in the context of circulation and elimination would be included in the chart abstractions. Disagreements about which terms to include in the analysis were resolved through discussions of the project team.

All phrases and terms addressing circulation, or elimination, respectively, were abstracted from the nursing documentation according to a specially developed coding scheme. Composite phrases were decomposed, and the various nouns, adjectives and verbs in the data set were organized according to the axial structure of the phenomena and intervention sections of the ICNP®. Then, each abstracted term was coded according to the degree to which it could be matched with a term in the ICNP®. A term was coded as: (1), 'same', if an identical term in wording and definition was found in the ICNP®; as (2), 'similar', if a term in the ICNP® was comparable or alike in substance; as (3), 'narrower or broader concept', if the closest term to be found in the ICNP® was associated with the abstracted term but was either less specific or smaller in scope; and as (4), 'no match', if no term could be found that would fit those categories. All coding was performed independently by two trained coders who were expert nurses in the area of elimination and circulation and proficient in the English language. Coded terms were compared and inspected for agreement; disagreements were discussed and resolved in project meetings. Data were analysed using SPSS statistical software (SPSS 1999).

Results

Of the 30 patient records that were reviewed in the cardiac intensive care unit, 14 contained circulation terms. For these 14 patients, the length of stay was 1.9 days (range 1–9 days). A mean of 16.7 (range 1–103) data entries on circulation were recorded per patient. Seventeen of the 60 patient records reviewed in the nursing home contained elimination terms, with a mean of 3.9 (range 1–18) data entries per patient. Data on length of stay for nursing home patients were not available; all were long-term residents. Chart abstractions were performed retrospectively, for the past month of nursing home care.

Frequencies of terms: nursing phenomena and nursing interventions

Tables 1 and 2 display the total number of data entries, or phrases, abstracted from the nursing documentation, and their decomposition into axes of the ICNP®. For example, the phrase: 'strong peripheral pulse in right foot' was decomposed into four terms: peripheral pulse (a focus term), strong (a judgement term), right (a topology term) and foot

Table 1 Frequency of terms: nursing phenomena

Nursing phenomena	Circulation (n = 14)	Elimination (n = 17)
Number of phrases abstracted	234	61
A. Focus	228	56
B. Judgement	148	39
C. Frequency	26	14
D. Duration	1	13
E. Body site	76	7
F. Topology	20	1
G. Likelihood	1	0
H. Distribution	11	1

Table 2 Frequency of terms: nursing interventions

Nursing phenomena	Circulation (n = 14)	Elimination (n = 12)
Number of phrases abstracted	59	43
A. Action type	50	42
B. Target	41	14
C. Means	11	26
D. Time	21	16
E. Location	4	2
F. Topology	1	0
G. Routes	8	1
H. Beneficiary	4	12

(a body site term). Table 1 displays the total number of data entries and decomposed terms that were classified within the nursing phenomena classification of the ICNP®. Table 2 displays the total number of data entries and decomposed terms that were classified within the intervention classification.

Nursing phenomena

Table 1 shows that a total of 234 nursing phenomena related to circulation were abstracted from the patient records, and 61 phenomena related to elimination were abstracted. Almost all data entries in both the circulation and elimination data sets included at least one term that could be classified within the 'focus' axis; about two-thirds of the data entries in the circulation subset also included a term that could be classified within the 'judgement' axis. As shown Table 1, the percentage of abstracted terms that fit in different axes varied between the two clinical areas.

Nursing interventions

Table 2 displays the numbers of abstracted terms coded according to the axes in the intervention section of the ICNP®. The majority of data entries in both data sets included at least one term that could be classified within the 'action type' axis, defined in the ICNP® as 'the deed performed by a nursing action' (International Council of Nurses 1999). About two-thirds of the data entries in the

circulation subset also included terms that could be classified within the 'target' axis, where a target in the ICNP® is defined as the entity that is either affected by the nursing action or provides the content of the nursing action (International Council of Nurses 1999).

Domain completeness: nursing phenomena and nursing interventions

Domain completeness refers to a classification's ability of complete and comprehensive coverage of the clinical spectrum with sufficient granularity (depth and level of detail) to depict the clinical process (Henry et al. 1998). To determine domain completeness, the numbers and percentages of abstracted terms were calculated for which a same or similar term could be found and could be classified within the axes of the ICNP®. Results are displayed in Tables 3 and 4.

Nursing phenomena

The circulation nursing phenomena phrases abstracted from the records were broken down or decomposed into 618 discrete terms. The same or similar terms were found within the axes of ICNP® for 426 (69%), of these terms. Eighty-five terms (13.7%) were either broader or narrower in concept, or had no match. For example, when the phrase 'strong peripheral pulse in right foot' was decomposed into four axes of the ICNP®, the

Table 3 Domain completeness: nursing phenomena

Nursing phenomena	Circulation (n = 14)	Elimination (n = 17)
Identical or similar terms in the ICNP®	69% (426)	47% (67)
Broader or narrower concept, or no match	13.7% (85)	46% (64)
Could not be mapped within the ICNP®	17.3% (107)	7% (9)
Total	618	140
A. Focus	75% (n = 228)	64% (n = 56)
B. Judgement	95% (n = 148)	44% (n = 39)
C. Frequency	80% (n = 26)	21% (n = 14)
D. Duration	0% (n = 1)	8% (n = 13)
E. Body site	78% (n = 76)	100% (n = 7)
F. Topology	100% (n = 20)	100% (n = 1)
G. Likelihood	100% (n = 1)	0% (n = 0)
H. Distribution	100% (n = 11)	100% (n = 1)

ICNP®, International Classification for Nursing Practice®.

Table 4 Domain completeness: nursing interventions

Nursing phenomena	Circulation (n = 14)	Elimination (n = 12)
Identical or similar terms in the ICNP®	35% (69)	27% (10)
Broader or narrower concept, or no match	24% (48)	57% (20)
Could not be mapped within the ICNP®	41% (82)	16% (6)
Total	199	36
A. Action type	48% (n = 50)	48% (n = 42)
B. Target	44% (n = 41)	14% (n = 14)
C. Means	91% (n = 11)	11.5% (n = 26)
D. Time	24% (n = 21)	0% (n = 16)
E. Location	75% (n = 4)	100% (n = 2)
F. Topology	100% (n = 1)	0% (n = 0)
G. Routes	100% (n = 8)	100% (n = 1)
H. Beneficiary	100% (n = 2)	67% (n = 8)

ICNP®, International Classification for Nursing Practice®.

ICNP® focus term closest to 'peripheral pulse' was the broader term 'cardiac output' (term A.1.1.1.2.1.1). To express the judgement term 'strong' with the ICNP® would have required a modification of the term to, e.g. 'not compromised' (ICNP® term 1B.7.2), or 'not decreased' (ICNP® term 1B.10.2) or 'not impaired' (ICNP® term 1B.33.2). These terms are again broader in concept than 'strong'. However, identical terms were found in the INCP® for 'right' (topology term) and 'foot' (body site term), and were coded as such.

Of the remaining terms, 17.3% (107) did not conceptually fit within any of the axes (see below). For between 75 and 100% of the terms that conceptually fit under any of the axes, the same or a similar term was found in the ICNP®. For example, 75% of the terms that conceptually fit under the 'focus' axis, under which most of the terms were classified, were represented with the same or a similar term in the ICNP®.

The 61 phrases of phenomena related to elimination could be broken down into 140 discrete terms.

However, the number and percentage of terms that could be represented with the same or similar terms in the elimination subset were lower than in the circulation subset (47%).

Nursing interventions

The percentage of the same or similar nursing intervention terms that could be mapped to terms within the axes of the ICNP® for the circulation and the elimination subset was less than the percentage for nursing phenomena. The same or similar terms were found in the intervention axes of the ICNP® for 35% of the circulation terms and for 27% of the elimination terms.

Axial structure

To analyse whether the axial structure of the ICNP® can appropriately represent nursing concepts used in clinical practice, the numbers and percentages of terms that conceptually could be classified within the axes of the ICNP®, regardless of the degree of 'match', were calculated. Obviously, all terms for which the same, similar, or related terms with broader or narrower concept definitions that could be found in the ICNP® could also be classified according to its axial structure, as could some of the terms with no matching terms in the ICNP®. For example, the term 'meanwhile' is not found in the ICNP®, yet it represents a time dimension and can therefore appropriately be assigned to the time axis in the intervention classification. Therefore, this term could be represented within one of the ICNP® axes and was coded as such.

A total of 107 (17.3%) out of 618 discrete circulation phenomena terms and nine (7%) out of 140 discrete elimination phenomena terms could not appropriately be classified within any of the nursing phenomena axes. In the intervention section of the ICNP®, 41% of the circulation intervention terms and 16% of the elimination intervention terms could not be appropriately classified within any of the intervention axes of the ICNP®. Examples of terms that coders had difficulty in classifying were signs-and-symptoms and modifiers, such as hard, cold, wheat, frightened and hot.

The 'focus of practice' axis is defined as 'the area of attention as described by the social mandates and professional and conceptual nursing practice'. Pain (a symptom), violence (a behaviour), or poverty (a state) were given as examples (International Council of Nurses 1999). This definition does not provide a clear guideline. For example, the phrase 'hard, tense abdomen' (a symptom) could be interpreted as a focus for practice in the context where it was used. However, 'abdomen' is found under the body site axis. Therefore, if nurses had to use the ICNP® for documentation, they would need an in-depth knowledge of where different terms could be found and how they were organized.

The author would like to make a special note regarding the time axis of the ICNP® that currently is only included in the intervention classification. However, nursing phenomena occur almost always within a time dimension. For example, patients may have an increased body temperature after vaccination, or a low haemoglobin level after chemotherapy. In this sample, a total of 23 out of 234 abstracted phrases on circulation phenomena included a time reference. Examples of time-related terms are: meanwhile, immediately after, at arrival, in connection with or during another event, so far, over the last days, or in the evening. The lack of time-related terms in the nursing phenomena section limits the ability to represent clinical data appropriately. One solution may be to 'borrow' terms from the time axis in the intervention classification to represent time-related nursing phenomena. However, the time axis in the intervention classification also has shortcomings. For example, there are no time-related terms that facilitate the documentation of duration of a phenomenon, such as 'over the last days' or intermittent occurrences, such as 'pain is most severe in the evenings'.

Utility for practice

Terms abstracted from the nursing documentation that matched with the ICNP® terms were relatively easy to classify. However, the coders reported that it was time consuming to look up terms and not always easy to find their way around the ICNP®. To use the ICNP® in clinical practice, nurses would

have to map their concepts into the concepts of the ICNP® and to spend time searching for the 'right' ICNP® code. Recording structured data often requires more user time than entry of free-text information (McDonald 1997). For example, to document the simple intervention phrase from our data set: 'applied ointment to patient's heel' would require the retrieval of terms from four different intervention axes. Also, nurses often expressed themselves in a different format than what would be required with the ICNP®, e.g. 'patient wishes to wait with pain medication'. The closest term in the ICNP® is the nursing action term 'awaiting'. However, this term does not really cover the meaning of the original phrase that reflects the perspective of the patient.

Coders in this study also encountered problems when they tried to classify phrases that combined phenomena and interventions, or interventions and outcomes; for example, 'good effect of morphine'. This implies that morphine has been administered (an intervention) but the phrase really reflects a patient outcome.

In documenting nursing practice, nurses may wish to state the reasons of why they think a phenomenon has occurred and specify the defining characteristics of a nursing diagnosis, or they may justify why they have chosen a particular intervention. However, defining characteristics and reasons for interventions appear to be difficult to code with the ICNP®. To be useful as a tool for clinical decision making, a nursing classification system should also be able to represent the reasoning process and rationale behind selected nursing diagnoses and interventions.

Recent literature has focused on the importance of including patient preferences in decisions regarding their care (Kasper et al. 1992; Gerteis et al. 1993; Kassirer 1994). Also, there is increased emphasis on shared decision making between health care providers and patients, and on their collaboration to select the best care decisions (Gerteis et al. 1993; Deber 1994; Ruland 1999b). Findings in the literature emphasize that judgements about health care decisions cannot be made without including the patients' own perspectives about their perceived health care needs and preferences for health outcomes. In this study, classifying phrases that expressed patients' perspectives, preferences, decisions and experiences was difficult. The ICNP® is a classification system for supporting nursing practice. The intervention classification is built around terms to support what nurses do on behalf of, or for, a patient. However, it is often also important to document patients' own health-related actions, decisions, experiences and health-promoting behaviours, and in turn this can guide decisions about further nursing interventions. A stronger patient orientation would strengthen the usefulness of the ICNP® for clinical practice.

3

Conclusion and recommendations

The percentages of terms in the data set in this study that could be matched with the same or similar terms in the ICNP® suggests that the phenomena classification is better developed than the intervention classification. Between 27 and 35% of the abstracted intervention terms could be classified within the ICNP®, as compared to 47–69% of nursing phenomena terms in the elimination and circulation subsets, respectively. To increase the ICNP®'s representation of terms used in nursing practice, our evaluation suggests that more developmental work, including more granularity and precision, is required to adequately document nursing in clinical practice.

Other recommendations emerging from this study for this very important developmental work include the addition of:
1 terms that provide an opportunity to document time-related nursing phenomena with the ICNP®,
2 terms that allow nurses to better express patients' perspectives, preferences, decisions and experiences,
3 terms that represent signs, symptoms and defining characteristics, especially for nursing diagnoses, and
4 development of an easier method to navigate around the ICNP®.
Finally, developers may revisit the multiple purposes of the ICNP®. A classification system designed to describe nursing care in relation to individuals must meet different requirements in regard

to the level of detail than a classification system designed to represent aggregated data on groups and trends (Hoy 1998).

Acknowledgements

References

Bakken, S., et al. (in press) Standardized Terminologies for Nursing Concepts: Collaborative Activities in the United States. *Proceedings of the Nursing Informatics Post Conference,* Waikato, New Zealand.

Bulechek, G.M. & McClosky, J.C. (1995) *Nursing Interventions: Essential Nursing Treatments,* edn 2. W. B. Saunders, Philadelphia.

Coenen, A. (2000) International Classification for Nursing Practice (ICNP) Program. *Nursing Informatics Post Conference,* Waikato, New Zealand.

Deber, R.B. (1994) Physicians in Health Care Management. The Patient-Physician Partnership: Changing Roles and the Desire for Information. *Canadian Medical Association Journal*, **151** (2), 171–176.

Gerteis, M., et al. (1993) *Through the Patients' Eyes. Understanding and Promoting Patient-Centered Care*. Jossey-Bass Publishers, San Francisco, CA.

Henry, S.B., et al. (1998) The ICNP's Relevance in the US. *International Nursing Review*, **45** (5), 153–159.

Hoy, D. (1998) *Managing Expectations: User Requirements and the International Classification for Nursing Practice*. National Health Service in Scotland, Edinburgh, Scotland, UK.

International Council of Nurses (1996) *The International Classification for Nursing Practice: a Unifying Framework (Alpha Versions)*. International Council of Nurses, Geneva, Switzerland.

International Council of Nurses (1999) *The International Classification for Nursing Practice: a Unifying Framework (Beta Versions)*. International Council of Nurses, Geneva, Switzerland.

Johnson, M. & Maas, M., eds. (1997) *Nursing Outcome Classification (NOC) Iowa Outcome Project*. Mosby, St. Louis.

Kasper, J.F., et al. (1992) Developing Shared Decision-Making Programs to Improve the Quality of Health Care. *Quality Review Bulletin*, **18**, 183–190.

Kassirer, J.P. (1994) Incorporating Patients' Preferences Into Medical Decisions. *New England Journal of Medicine*, **330**, 1895–1896.

McDonald, C.J. (1997) The Barriers to Electronic Medical Record Systems and How to Overcome Them. *Journal of the American Medical Informatics Association*, **4** (3), 213–221.

Mortensen, R.A. (1997) *ICNP – an Overview of the Nursing Domain.* Telenurse, The ICNP in Europe.

Nielsen, G. & Mortensen, R.A. (1998) The Architecture of the ICNP. *International Nursing Review*, **45** (1), 27–31.

Ruland, C.M. (1999a) Evaluating ICNP (International Classification for Nursing Practice). An Initiative of the Norwegian Nurses' Association. *Newsletter of ACENDIO (Association of Common European Diagnoses, Interventions and Outcomes), 7.* R. ••, ••.

Ruland, C.M. (1999b) Decision Support for Patient Preference-Based Care Planning: Effects on Nursing Care and Patient Outcomes. *Journal of the American Medical Informatics Association*, **6** (4), 304–312.

SPSS (1999) Statistical Package for the Social Sciences (Version 9.01) [Statistical software]. SPSS Inc., Chicago, IL.

Werley, H. & Lang, N.M., eds. (1988) *Identification of the Nursing Minimum Data Set*. Springer, New York.

Zielstorff, R.D. (1998) *Characteristics of a Good Nursing Nomenclature from an Informatics Perspective*. Online Journal of Issues in Nursing, ••. Available: http://www.nursingworld.org/ojin/tpc7/tpc7_4htm

Zielstorff, R.D., et al. (1995) *Toward a Uniform Language for Nursing in the US: Work of the American Nurses Association Steering Committee on Databases to Support Clinical Practice*. MEDINFO95, ••.

AUTHOR QUERY FORM

Dear Author,

During the preparation of your manuscript for publication, the questions listed below have arisen. Please attend to these matters and return this form with your proof.

Many thanks for your assistance.

Query References	Query	Remarks
1	**Au: please provide the title of the author**	
2	Au: Is the text OK: **are designed to be both**	
3	Au: Is the text OK: **clinical**	
4	**Au: please update this reference**	
5	Au: Please provide details of the publisher and town.	
6	**Au: Please provide details of the publisher of the: Online Journal of Issues in Nursing**	
7	**Au: Please provide details of the publisher of: MEDINFO95**	