Capability of Using Clinical Care Classification System to Represent Nursing Practice in Acute Setting in Taiwan

Rung-Chuang Feng, RN, PhD Candidate[1,2], Kuan-Jui Tseng, RN, MS[2], Hsiu-Fang Yan, RN [2], Hsiu-Ya Huang, RN, MSN[2], Polun Chang, PhD[1]

[1]Institute of Biomedical Informatics, National Yang-Ming University, Taipei, Taiwan

[2]Department of Nursing, Taipei Veterans General Hospital, Taipei, Taiwan

Abstract

This study examines the capability of the Clinical Care Classification (CCC) system to represent nursing record data in a medical center in Taiwan. Nursing care records were analyzed using the process of knowledge discovery in data sets. The study data set included all the nursing care plan records from December 1998 to October 2008, totaling 2,060,214 care plan documentation entries. Results show that 75.42% of the documented diagnosis terms could be mapped using the CCC system. A total of 21 established nursing diagnoses were recommended to be added into the CCC system. Results show that one-third of the assessment and care tasks were provided by nursing professionals. This study shows that the CCC system is useful for identifying patterns in nursing practices and can be used to construct a nursing database in the acute setting.

Introduction

The use of standardized terminology in practice has been crucial for the future of nursing. Most experts on nursing tend to agree that standard nursing terminology will improve patient care and play an important role in building a body of evidence-based outcomes for the nursing profession. Evidence of the nursing care provided must be included in each application, whether it is an expert rule to support clinical decisions, or data collected in electronic form.[1, 2] This will also help ensure that the patient data are captured in the system using standardized terminology.

The nursing documentation for health care institutes in Taiwan is voluminous, and is traditionally presented in a free-text rather than a structured format using discipline-specific terms. Since the 1980s, most clinical nurses were taught to use the Chinese version of NANDA when describing patient health problems for signs, symptoms, and nursing diagnoses. Since the 1990s, some hospitals developed their own electronic nursing care plan system inserted by the NANDA diagnoses concept structure. However, because of the lack of a systematic coding structure in these care plan systems, the data cannot be retrieved and analyzed and even generalized for nursing knowledge presentation.

The CCC system was specifically designed as a clinical information system to facilitate nursing documentation at the point-of-care. In 2004, Feeg et al.[3] conducted a study to develop and test a bedside personal computer (PC) CCC system for nursing students using Microsoft Access. This study demonstrated that the software application was efficient and effective in recording the planned nursing care using standardized terminology. Moss, Damrongsak, and Gallichio[4] evaluated the ability of the CCC to represent data in an intensive care setting. They explored all recorded nursing actions related to the care of adult coronary bypass (CABG) research patients during their first 24 hours postoperation. There were 274,957 documented entries. Their results show that 79.8% of the documented terms could be mapped to the CCC, 40.01% of the documentation was related to physical regulations, and 31.14% of the documentation was related to fluid volume. The most frequent type of actions in nursing interventions was monitoring (81.34%), followed by assessment (17%).

In conclusion, these studies proved the value of the CCC system for documenting the nursing care of patients in the EHR. However, relatively few studies have focused on CCC applications in acute or critical clinical settings, and lack strong evidence-based proof that CCC can be fully used in the entirely clinical setting, especially in non-U.S. countries. The existing vocabulary must be tested and refined to provide a standardized language for computer-based patient records in the future, and to facilitate clinical and outcomes research. Therefore, the purpose of this study is to test the ability of the Clinical Care Classification to represent clinical nursing data in a medical center in Taiwan.

Methods and Materials

This study uses a variation of content analyses and knowledge discovery in data sets (KDD) methods. Knowledge discovery in data sets (KDD) was defined as utility in domain-independent and can be used in any large collection of data. This approach also uses discovery-based approaches in which pattern recognition and matching, classification or clustering schemas, and other algorithms are used to detect key relationships in the data. The KDD process includes data extraction, data preprocessing, data mining, and pattern interpretation and presentation. The researchers were authorized by Virginia Saba to translate the content of the Clinical Care Classification (CCC) from English to Mandarin, and the translation was verified by three nursing experts.

• Sample

The study data set was taken from a home-made computerized nursing care plan (CNCP) system in a 2800-bed medical center that has been a pioneer in developing nursing information systems in Taiwan. The data set included all the nursing care plan records for the period of December 1998 to October 2008. This data set totaled 2,060,214 care plan entries, with 2,060,178 available data after excluding rare frequency items.

• Mapping and Coding Instructions

The researchers retrieved the nursing documentations from the CNCP database, identifying 580 diagnosis items. After listing, classifying, grouping the similar diagnoses (73 diagnoses), and clearing and defining items, all the diagnoses items were mapped to the CCC. The nursing interventions were retrieved and analyzed from 43 standard nursing diagnoses, generating 6,074,292 nursing documentations accounting for 989 nursing actions (Fig. 1). The nursing documentation was mapped using the full list of nursing diagnoses and interventions from the CCC system. Categories were taken from the CCC of nursing diagnosis and intervention taxonomy. Thus, the definitions of the CCC diagnoses and interventions functioned as the coding instructions for the documentation. The inclusion and exclusion criteria for categorizing words and phrases into specific categories were clearly defined.

• Reliability and validity of coding

Following a group meeting discussion, the task of establishing the procedure for content analysis was assigned to three members of the research group. The investigators and content experts discussed the coding scheme until they reached 100% agreement. If they could not reach an agreement, the study investigators dissected and mapped the interventions from the study data set to the intervention codes of the CCC until a CCC code was assigned to each code of the original documentation. The coding scheme was then applied to the entire data set to decompile and categorize each diagnosis and intervention based on the CCC taxonomy.

• Data analysis

The frequencies of the nursing diagnoses and interventions were mapped to the CCC categories and evaluated to determine the ability of the taxonomy to accommodate the terms. Where possible, the diagnoses or interventions that could not be mapped to the CCC taxonomy were recommended to be added to future terminology.

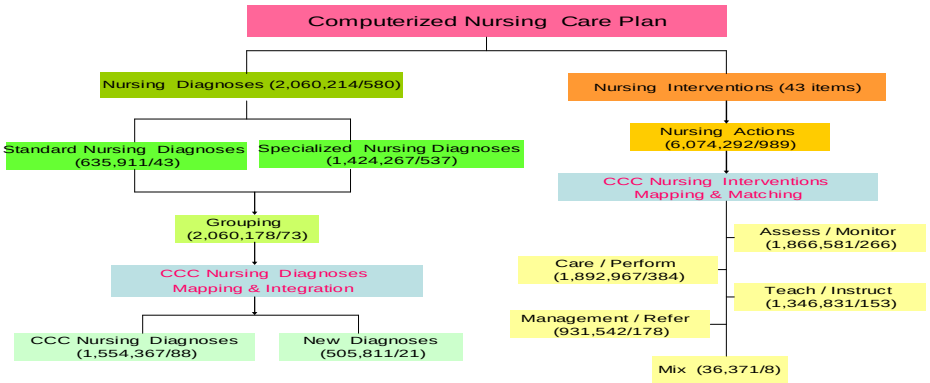

Figure 1. CCC and CNCP content mapping flowchart.

Note: (Number of documentations/category of nursing diagnosis items)

Table 1. Twenty-one new diagnoses were established from CNCP data set

Components	Coding	Nursing diagnosis	Components	Coding	Nursing diagnosis
Physical	I 22.1	Blood sugar imbalance	Health behavior	N33.9	Seizure risk
Physical	R46.6	Unspecified mucous impairment	Functional	Q45.4	Itching
Physical	S48.1	Peripheral perfusion dysfunction	Functional	J55.1	Effective breast feeding
Physical	S48.2	Cardiac perfusion dysfunction	Functional	J55.2	Ineffective breast feeding
Physical	S48.3	Brain tissue perfusion dysfunction	Functional	J55.3	Interrupted breast feeding
Physical	R63	Tissue integrity alteration	Functional	F62	Electrolyte alteration
Physical	I64	Unspecified metabolic alteration	Functional	F62.1	Potassium imbalance
Psychological	D09.2	Wandering	Functional	F62.2	Sodium imbalance
Health behavior	N33.6	Bleeding risk	Functional	F62.3	Calcium imbalance
Health behavior	N33.7	Fall risk	Functional	F62.4	Unspecified electrolyte imbalance
Health behavior	N33.8	Tube dislocation risk			

Results

- **Care components**

Only 88 items (48.4%) of the categories in the CNCP database could be mapped to the CCC nursing diagnoses. Of these, 24 items (40.1%) were related to major categories, and 64 items (52%) were related to the subcategories in the CCC system. The mapping using the CCC conceptual structure shows that 28 items matched in the physical pattern (46.7%), 24 items matched in the psychological pattern (46.2%), 29 items matched in the functional pattern (70.7%), and 7 items matched in health behavior pattern (24.1%). Twenty-one new nursing diagnoses were created in addition to those from the CCC system listed in Table 1, which were created by the researchers. These diagnoses included seven physical diagnoses, one psychological diagnosis, four health-behavior diagnoses, and nine functional diagnoses. Considering the frequency of the nursing diagnoses mapped using the CCC conceptual structure (Table 2), the data showed that 26.8% were related in the physical pattern, 15.3% related in the psychological pattern, 25.9% related in the functional pattern, and 12.3% related in the health behavioral pattern. In addition, 19.8% of the nursing diagnoses were related to newly created diagnoses that were not included in the CCC. The five most common frequencies of nursing diagnoses were shown to be knowledge deficit, acute pain, infection risk, fall risk, and bleeding risk (Table 3).

Table 2. Frequency of CNCP nursing diagnoses that were mapped using the CCC conceptual structure

Health patterns	Frequency	Percentage
Physical	615,829	29.89
Psychological	390,806	18.96
Functional	529,817	25.71
Health behavior	17,915	0.86
New Diagnosis	505,811	24.55
TOTAL	2,060,178	

Table 3. Five most common nursing diagnoses

Coding	CNCP Dx	Frequency	Percentage
D08	Knowledge deficit	328,621	15.83
Q45.1	Acute pain	324,412	15.63
K25.5	Infection risk	228,073	10.99
N33.7	Fall risk	171,883	8.28
N33.6	Bleeding risk	113,046	5.45

- **Nursing intervention qualifiers**

Table 4 shows that 31% of these qualifiers related to assess/monitor actions, 31% related to care/perform actions, 22% related to teach/instruct actions, and 15% related to manage/refer actions, and 1% related to two or more type of actions. Table 4 shows that 31% of these qualifiers related to assess/monitor actions, 31% related to care/perform actions, 22% related to teach/instruct actions, and 15% related to manage/refer actions, and 1% related to two or more type of actions.

Discussion

- **Mapping**

The majority (75.06%) of the documented diagnosis terms could be mapped to the CCC. These results are similar to those of Moss, Damrongsak, and Gallichio (2010), who presented the critical care data of adult CABG patients for the first 24 hours postoperation. Their results show that 79.8% of the documented terms could be mapped to the CCC system. However, the CCC system is based on the Home Health Care Classification (HHCC), which was developed for home care practice and was not developed as a classification for inpatient care. Therefore, the CCC cannot cover all the situations in an acute care setting, such as a medical center. Because the researchers collected some nursing diagnoses that are not included in the CCC, they should be added to the CCC scheme. Of the 21 new nursing diagnoses, three nursing diagnoses were classified as major categories, and the remaining 18 nursing diagnoses were all classified as subcategories. The new diagnoses were specific events in an acute medical setting, and only the three diagnoses of breastfeeding, tissue integrity, and peripheral perfusion dysfunction were similar. These diagnoses were transferred from the NANDA terminology system. To determine the difference between the qualifiers of nursing interventions, the researchers reviewed every word of the content of care plans, and classified the words as four types of nursing actions. One-third of assess/monitor and care/perform tasks were provided by nursing professionals, including the rare occasion of manage/refer actions. Only 1% of the nursing tasks combined more than one qualifier and subsequently classified as a combination qualifier.

Table 4. Occurrence of type action qualifiers

Qualifier descriptor	Frequency	Percentage
Assess/monitor	1,866,581	31
Care/perform	1,892,967	31
Teach/instruct	1,346,831	22
Manage/refer	931,542	15
Mix	36,371	1

- **Classification level of clinical nursing work**

This study maps all the nursing documentation entered in the clinical information system of patients hospitalized in a medical center from 1998 to 2008. Based on the results of this study, the five most common nursing diagnoses were identified as knowledge deficit, acute pain, infection risk, risk of falling, and bleeding risk, which are the most common health problems in an acute-care setting. However, the diagnoses of risk of falling and bleeding risk do not exist in the clinical care classification.

Conversely, mapping the nursing documentation of this study to the CCC resulted in substantial granularity, and the measurement of the patient outcomes was not described in the results. This is because no measurement for nursing outcomes was devised for the homemade electronic nursing care system in medical centers. Consequently, clinical nurses used free text to evaluate and document the nursing outcomes.

Conclusion

The CCC system can accommodate the majority of the nursing care records from a pioneering clinical information system in Taiwan. This study shows that the CCC system is useful for identifying patterns in nursing practices.

References

1. Ackley BJ and Ladwig GB. Nursing diagnosis handbook: An evidence-based guide to planning care (9th Ed.) 2011;St. Louis: Mosby Elsevier
2. Brokel JM. Capture, exchange and use data, information and knowledge within electronic health records. The Iowa Nurse Reporter 2007; 20(1) ,24~27.
3. Feeg VD, Saba VK & Feeg, A. Testing of bedside personal computer (PC) Clinical Care Classification System (CCCS) nursing students using Microsoft Access. Comput Inform Nurs. 2008 ;26(6) ,339-49.
4. Moss J. Damrongsak M. & Gallichio K. Representing critical care data using the clinical care classification. AMIA Annual Symposium Proceedings 2005;545~549.
5. Saba VK. Clinical care classification system manual: A guide to nursing documentation 2007; LLC: Springer Publishing Company.