Nursing Informatics 2014
K. Saranto et al. (Eds.)

doi:10.3233/978-1-61499-415-2-298

The Use of Standardized Terminology to Represent Nursing Knowledge: Nursing Interventions relevant to Safety for Patients with Cancer

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Abstract. The study is to represent knowledge by identifying frequently used nursing interventions in term of standardized nursing terminology(SNT) in the Electronic Health Records (EHRs) relevant to Safety for Patients with Cancer. We include 2,237 patients and found 11,804 nursing interventions in total. There are 100 identical interventions in the study. We identify eleven nursing interventions from four oncology units over 7 month observation. For the most four frequent nursing interventions(Fall Prevention, Infection Control, Infection Protection, and Pressure Management), we also report the mean of age, the mean of length of stay, and their frequency of outcome rating , outcome rating at admission and at discharge that link to outcome. These studies demonstrate the strengths of SNT in clinical practice. The findings are valuable to clinical practice, education and future research.

Keywords. Standardized Terminology, nursing intervention, safety, NIC, NOC

Introduction

First paragraph Electronic health records (EHRs) become more integrated in health care settings all around the world. Since nurses are large contributors on the quality and effectiveness of health care, they must be involved in developing and refining EHRs. For involvement of developing EHRs, first of all, nurses need to identify contents of nursing workflows. The contents must be a standardized infrastructure using standardized nursing terminologies. American Nurses Association recognized 13 standardized nursing terminologies for contents of nursing workflows. These standardized nursing terminologies support interoperability, aggregation of data, use of evidence based practices, and integration of new evidence derived from research findings. In addition, these terminologies within EHRs support for outcomes reporting, improving performance, discovery health disparities, and the general use and reuse of information needed for quality, safety, and efficiency. It is important to understand the use of terminology in clinical setting for different population. In this study, we used NIC2 (Nursing Interventions classification) as presenting interventions for cancer

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patients relevant to safety to understand the current nursing interventions identified by nurses in four oncology units.

1. Purpose

First paragraph The study aims to identify nursing interventions that provide safety for oncology care by exploring recognized nursing intervention in the format of standardized terminology in electronic health records. We also report the frequencies of outcomes scoring, the outcome scores at admission and at discharge from NOC3 (Nursing Outcomes Classification) linked with the four frequent nursing interventions relevant to safety defined by NIC2. Nursing problems or nursing diagnoses represented as NANDA-I1 is also linked within EHRs, but we don't discuss in the study. We also report age and length of stay(LOS) for these most four frequent nursing interventions. Findings provide valuable resources for continuing education for nurses, managers and administrators.

2. Methods & Data Analysis

The study is secondary analysis from a parent study. Donabedian's structure-process-outcome is the framework for this parent study. In this descriptive retrospective study, we include patients with cancer admitted in four oncology units in a tertiary hospital over seven months. The study hospital has implemented the EHRs and nursing information system using NANDA-I1, NIC2, NOC3 , as presenting nursing diagnoses, interventions, and outcomes, respectively for years. Data collection for the parent study includes demographics, diagnoses, interventions, and outcomes. Data are retrieved from medical records, and the nursing documentation system from June to December, 2010. Only patients with planned nursing care documented and related to risk factor are analyzed in the study. The nursing interventions relevant to safety were included for analysis. The study applies the definition of Safety from the Nursing Interventions Classification(NIC2) and includes nursing interventions under the domain of safety defined by NIC2. IRB is approved. SAS 9.2 is used. Descriptive statics are applied for these findings.

3. Results

3.1. Demographics

Table 1 describes demographics from three studies. In first study, we include 2,237 cancer patients from four oncology units during June to December, 2010. The sample (2,237) was primary female (63%) and white (89%). The average age of the patients in the sample was 55 years (SD=17, range from 18 to 99).The average length of stay was 3.7 days.

Table 1. Demographics, Age and Length of Stay)

Study population	variable	n	Mean ± SD (Range)
Cancer	**age**	2,237	54.5 ± 16.9 (19–99)
	length of stay	2,237	3.8 ± 4.7 (0–76)

3.2. Frequently Recognized NIC relevant to Safety

Table 2. Eleven nursing interventions under the domain of safety

Class ((*n*=2)	NIC[2] (*n*=11)	n^1	$\%^1$ (N=11,804)	n^2	$\%^2$ (N=2,237)
Risk Management	Fall Prevention	742	6.28	387	17.35
	Infection Protection	708	6.00	708	31.73
	Infection Control	697	5.90	697	31.24
	Pressure Management	398	3.37	386	17.30
	Delirium Management	36	0.30	34	1.52
	Environmental Management	12	0.10	12	0.54
	Latex Precautions	6	0.05	6	0.27
	Hallucination Management	4	0.03	4	0.18
	Surveillance: Safety	2	0.02	2	0.09
	Health Screening	1	0.01	1	0.04
Crisis Management	Suicide Prevention	2	0.02	2	0.09

In the seven-month observation in four oncology units, there are 11,804 nursing interventions documented in 2,237 identical patients' electronic health records(EHRs). We found 100 identical nursing interventions and 11 nursing interventions in the domain of safety of NIC. In the study, two classes were identified in the domain of safety: Risk Management and Crisis Management. Risk Management includes ten nursing interventions listed in Table 2 and Crisis Management has only Suicide Prevention. Table 2 reports that Fall Prevention is the most frequently found intervention and followed by Infection Protection and Infection Control. Pressure Management is related to skin care, which is common for patient with cancer. These interventions are not logically specified for patients with cancer. Table 2 reports the frequencies of the 11 nursing interventions identified by nurses and they are in the two classes under the domain of safety. We present two frequencies and percentages in the table 2. The first frequency(n^1) represents the count of nursing intervention and the second one(n^2) represent the amount of patients receiving this intervention. The discrepancy comes from a patient may be documented the same interventions for different nursing diagnosis. The first percentage($\%^1$) is the count divided by the total nursing interventions(N=11,804), and the second percentage($\%^2$) is the count divided by the total patients(N= 2,237). Therefore, two percentages have their own values. Nurses recognized the first frequency represent the need of the interventions in the

process of clinical decision making. The second percentage reports the exact the amount of patients receiving the particular intervention over all observed participants.

3.3. Four nursing interventions and their relationship to age, LOS, frequency of outcome rating, rating at admission and at discharge

Table 3. Four nursing interventions and their relationship to age, LOS, frequency of scoring for their outcomes at admission and at discharge

NIC[2]	Frequency of Outcome Rating		Rating at Admission		Rating at Discharge		Age		LOS	
	n	Mean ± SD (Range)	n	Mean ± SD (Range)	n	Mean ± SD (Range)	n	Mean ± SD (Range)	n	Mean ± SD (Range)
Fall Prevention (742)	569	2.6 ± 2.4 (1-16)	569	3.6 ± 1.0 (1-5)	322	3.8 ± 1.0 (1-5)	742	61.2 ± 16.7 (18-96)	742	5.2 ± 6.9 (0-63)
Infection Control (697)	584	2.8 ± 2.7 (1-22)	584	3.8 ± 1.0 (1-5)	343	3.9 ± 0.9 (1-5)	697	54.4 ± 15.9 (18-96)	697	4.8 ± 6.2 (0-63)
Infection Protection (709)	595	2.8 ± 2.7 (1-22)	595	3.8 ± 1.0 (1-5)	353	3.9 ± 0.9 (1-5)	708	54.4 ± 15.9 (18-96)	708	4.8 ± 6.1 (0-63)
Pressure Management (397)	317	2.8 ± 3.2 (1-35)	317	3.4 ± 0.8 (1-5)	182	3.6 ± 0.9 (1-5)	397	55.3 ± 15.5 (18-99)	397	4.1 ± 5.2 (-44)

Table 3 describes age and length of stay(LOS) for the four nursing intervention in the domain of safety and frequency of rating outcomes and their rating at admission and at discharge linked with the four nursing interventions. The mean age for patients with cancer receiving Fall Prevention is 61, and patients receiving Infection Control, Infection Protection or Pressure Management are around the age of 54 to 55, which are closer to the mean age of all study sample. The mean of length of stay is four to five day for these common nursing interventions relevant to safety in oncology units. We also include frequency of outcome rating, rating at admission and rating at discharge linking to these four nursing interventions. We report the pattern of nursing diagnoses, nursing interventions and outcomes in table 4 for better understanding of rating scores of outcomes in table 3.

3.4. Pattern of NANDA-I, NIC, and NOC

Table 4. Pattern of NANDA-I, NIC, and NOC in the study

NANDA-I[1]	NOC[3]	NIC[2]
Risk for Falls	Fall Prevention: Behavior	Fall Prevention
Risk for Falls	Knowledge: Fall Prevention	Fall Prevention
Risk for Infection	Infection Severity	Infection Protection
Risk for Infection	Infection Severity	Infection Control
Impaired Skin Integrity	Tissue Integrity: Skin and Mucous Membranes	Pressure Management

Table 4 reports patterns of all linking with nursing diagnoses or problems(NANDA-I), nursing interventions(NIC), and patient sensitive patient outcomes(NOC)(NNN). We identified five linkages of NNN for the four common nursing interventions relevant to

safety described in table 3. We report average rating for both Fall Prevention: Behavior and Knowledge: Fall Prevention that link to Fall Prevention in table 3. The rating at admission (3.6) is close to the rating at discharge(3.8). Patients receiving nearly 3 times(2.8) assessment for rating in hospitalization. The frequency of rating at admission and at discharge drop from 569 to 322, which mean 247 patients do not receive following evaluation for rating outcome. In the table 4, Infection protection and Infection Control both linked to Risk for Infection(NANDA-I) and Infection Severity(NOC). Their values for the frequencies of outcome rating, ratings at admission and at discharge are similar. There are 17% of patients receiving Pressure Management for their problems(Impaired Skin Integrity), the rating at admission(3.6) and at discharge(3.8) on the one-to-five scale do not largely differ. However, 135 patients (43%) receiving Pressure Management do not have second rating score.

4. Discussion

We found patients in oncology units present a large variety in age and length of stay. Patients receiving Fall Prevention as nursing interventions show older and longer length of stay than those receiving Infection Control, Protection, or Pressure Management or the overall sample. None of identified nursing interventions in the study are concerned as cancer-specific approach. For example, none of these interventions are relevant to safety for injection of Chemotherapy. The percentage of patients receiving Fall Prevention(17%) as nursing interventions which is lower than that of our expectation. Unfortunately, no performance time for these interventions is documented in the system. The frequency of rating outcomes linked to the interventions or length of stay do not replace the accurate documented the start point and the end point of intervention. The rating for outcomes linking to interventions should be analyzed for each possible pattern of NNN. In the study, we also found not each patient receiving an intervention have been rated for outcome. Moreover, the rate of follow-up evaluation is largely dropping.

5. Conclusion

The study suggests the needs: (1) to identify core nursing care components: problems, interventions, and outcomes for specified population, such as patient with cancer, (2) to establish the ‘dose’ of nursing interventions that can be documented with the SNT with exact start points and end points, and (3) to form the policy of follow-up evaluation before discharge for each nursing intervention. The study has shown some strengths of the use of SNT in representing nursing knowledge with its organized structure in the EHRs. Their relationship between patients’ demographics or length of stay could provide valuable information for clinical practice or future research. For example, the frequently recognized problems related to different age group or length of stay. However, not a lot of nursing professionals in other specialty has recognized the importance of the SNT in research, education, and practice. The study should make efforts in bring SNT in other population and other settings. The study provides valuable information to direct the future research in the development of electronic nursing documentation. The study also provides information for current clinical nursing intervention in oncology care relevant to safety. Nurse leaders in specialty units, such

as oncology units, should pay attention to all nursing interventions can be appropriately described in their electronic documentation system. In addition, the study provides resources for nursing leaders to train their naïve nurses for problems, interventions, outcomes for their specific setting or population.

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