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Use of standardized nursing terminologies in electronic health records for oncology care: the impact of NANDA-I, NOC, and NIC

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USE OF STANDARDIZED NURSING TERMINOLOGIES IN ELECTRONIC HEALTH RECORDS FOR ONCOLOGY CARE: THE IMPACT OF NANDA-I, NOC, AND NIC

by

Hui-Chen Tseng

An Abstract

Of a thesis submitted in partial fulfillment
of the requirements for the Doctor of
Philosophy degree in Nursing
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The University of Iowa

July 2012

Thesis Supervisor: Associate Professor Sue Moorhead

ABSTRACT

The purpose of this study was to identify the characteristics of cancer patients and the most frequently chosen nursing diagnoses, outcomes and interventions chosen for care plans from a large Midwestern acute care hospital. In addition the patients' outcome change scores and length of stay from the four oncology specialty units are investigated. Donabedian's structure-process-outcome model is the framework for this study. This is a descriptive retrospective study. The sample included a total of 2,237 patients admitted on four oncology units from June 1 to December 31, 2010. Data were retrieved from medical records, the nursing documentation system, and the tumor registry center. Demographics showed that 63% of the inpatients were female, 89% were white, 53 % were married and 26% were retired. Most patients returned home (82%); and 2% died in the hospital. Descriptive analysis identified that the most common nursing diagnoses for oncology inpatients were *Acute Pain* (78%), *Risk for Infection* (31%), and *Nausea* (26%). Each cancer patient had approximately 3.1 nursing diagnoses (SD=2.5), 6.3 nursing interventions (SD=5.1), and 3.7 nursing outcomes (SD=2.9). Characteristics of the patients were not found to be related to LOS (M=3.7) or outcome change scores for *Pain Level* among the patients with *Acute Pain*. Specifically, 88% of patients retained or improved outcome change scores.

The most common linkage of NANDA-I, NOC, and NIC (NNN), a set of standardized nursing terminologies used in the study that represents nursing diagnoses, nursing-sensitive patient outcomes and nursing interventions, prospectively, was *Acute Pain—Pain Level—Pain Management*. Pain was the dominant concept in the nursing care provided to oncology patients. *Risk for Infection* was the most frequent nursing diagnosis in the Adult Leukemia and Bone Transplant Unit. Patients with both *Acute Pain* and *Risk for Infection* may differ among units; while the traditional study strategies rarely demonstrate this finding. Identifying the pattern of core diagnoses, interventions, and

outcomes for oncology nurses can direct nursing care in clinical practice and provide direction for future research tot targets areas of high impact and guide education and evaluation of nurse competencies.

Abstract Approved: _____
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Graduate College
The University of Iowa
Iowa City, Iowa

CERTIFICATE OF APPROVAL

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PH.D. THESIS

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This is to certify that the Ph.D. thesis of

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has been approved by the Examining Committee
for the thesis requirement for the Doctor of Philosophy
degree in Nursing at the July 2012 graduation.

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To My Family,

My Grandmother (曾林水香), Father (曾茂田), Mother (曾廖梅英), Brothers (曾健華, 曾健禹, 曾健政), and Sisters-in-Laws (吳靜芳,張雅如, 張簡明芳)

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ABSTRACT

The purpose of this study was to identify the characteristics of cancer patients and the most frequently chosen nursing diagnoses, outcomes and interventions chosen for care plans from a large Midwestern acute care hospital. In addition the patients' outcome change scores and length of stay from the four oncology specialty units are investigated. Donabedian's structure-process-outcome model is the framework for this study. This is a descriptive retrospective study. The sample included a total of 2,237 patients admitted on four oncology units from June 1 to December 31, 2010. Data were retrieved from medical records, the nursing documentation system, and the tumor registry center. Demographics showed that 63% of the inpatients were female, 89% were white, 53 % were married and 26% were retired. Most patients returned home (82%); and 2% died in the hospital. Descriptive analysis identified that the most common nursing diagnoses for oncology inpatients were *Acute Pain* (78%), *Risk for Infection* (31%), and *Nausea* (26%). Each cancer patient had approximately 3.1 nursing diagnoses (SD=2.5), 6.3 nursing interventions (SD=5.1), and 3.7 nursing outcomes (SD=2.9). Characteristics of the patients were not found to be related to LOS (M=3.7) or outcome change scores for *Pain Level* among the patients with *Acute Pain*. Specifically, 88% of patients retained or improved outcome change scores.

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CHAPTER I

INTRODUCTION

A report of Institute of Medicine (IOM, 2011) revealed a call for nurses to take a leadership role to advance health care. This report stated that nurses' roles, responsibilities and education should have a substantial change to meet the increasing demand for care from the reform of the health care system and to advance improvement in the complex health system. There are four key messages in the report:

Nurses should practice to the full extent of their education and training.

Nurses should achieve higher levels of education and training through an improved education system that promotes seamless academic progression.

Nurses should be full partners, with physicians and other health care professionals, in redesigning health care in the United States.

Effective workforce planning and policy making require better data collection and information infrastructure.

All these messages describe nurses in a fundamental role for the transformation of the healthcare system that is seamless, affordable, focused on quality care and accessible to all and leads to improved health outcomes. A need of research to provide evidence supporting these four key messages and linking nursing care with quality patient care can never be over emphasized. Besides this, the nursing profession has been challenged to adapt to the impact of technology on the way nurses deliver patient care in each specialty.

Recognizing the benefits of electronic health records (EHRs) to improve communication, coordination and quality care, the United States (U.S.) government has

created a nationwide initiative to promote the adoption and use of EHRs. One financial initiative to promote use of EHRs was entitled ‘Meaningful Use’ and was a part of the American Recovery and Reinvestment Act of 2009 (ARRA). ‘Demonstrating meaningful use’ is key to receiving financial incentives in the context of the EHR incentive program directed primarily at physician providers. To define Meaningful Use (MU), demographics and a set of measures need to be captured and reported in a structured manner, relating to the improvement of quality, efficiency, and patient safety in healthcare systems through use of certified EHR technology. It is expected that by 2014 each U.S. citizen will have the ability to communicate electronically through a national health information network.

Nursing informatics specialists have been tailoring current EHRs to meet the MU incentive because of the need for evidence of the relationship between nursing care and patient outcomes (Madison & Staggers, 2011). Most nursing information systems are underdeveloped, without the capability to retrieve structured data, including quality of care measures related to nursing care such as nursing-sensitive patient outcomes. These challenges have presented an obstacle to meeting the MU incentive from a nursing perspective. In addition, current electronic nursing documentation systems are commonly fragmentary in design. For example, the separate applications for data entry, clinical notes, and care plans result in a dysfunctional documentation tool. Besides the unorganized design of the nursing documentation systems, the use of non-or-partially computerized nursing documentation or the lack of standardized languages in a variety of nursing documentation formats presents a significant challenge to capturing nursing care actually provided to patients and collecting information to improve quality. It is

imperative to process electronic nursing data that meets the criteria of MU to provide valuable insight into the nursing care provided to patients and to motivate vendors to advance the current nursing information systems to meet these needs.

Because of the current limitations in EHRs, few studies have identified a complete set of nursing diagnoses, interventions, and outcomes using standardized nursing terminologies for patient populations with complex conditions such as oncology patients (Ralston, Coleman, Reid, Hadley & Larson, 2010). It is important to identify symptom clusters for inpatient oncology patients using electronic standardized nursing terminologies (SNTs) for nursing diagnoses, interventions, and outcomes. This study describes: 1) current demographic characteristics of oncology inpatients, 2) length of stay (LOS) based on age, gender, treatment, and type of insurance, 3) frequently used nursing diagnoses, interventions, and outcomes on four oncology units, and 4) outcome change scores associated with selected patient demographics.

Background and Significance

The cost of providing cancer care to patients diagnosed with a variety of types of cancer is a tremendous burden in the U.S. In 2010, an estimated 569,490 individuals were expected to die of cancer, more than 1,500 a day. Approaching these statistics from another perspective, cancer accounts for nearly 1 out of every 4 deaths and it is estimated that 1 out of 5 individuals will develop cancer by 2030. The National Institutes of Health estimated the overall cost of cancer in the U.S. in 2007 to be $219.2 billion and 268.3 billion in 2010. In addition, the uninsured are likely to be diagnosed with cancer at a later stage, when treatment can be more expensive (American Cancer Society, 2010).

Nursing-sensitive patient outcomes have been emphasized in effectiveness research because of the importance of linking outcomes of patient care to nursing interventions. Over the last decade, numerous studies have focused on the organizational level to evaluate these relationships (Aiken, Clarke, Sloane, Sochalski, & Silber, 2002; Mark, Hughes, Belyea, Bacon, Chang, & Jones, 2008; Needleman, Buerhaus, Mattke, Stewart, & Zelevinsky, 2002). But few empirical studies have been conducted at the individual patient level and have included nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes from recognized American Nurses Association (ANA) classifications. Research using standardized nursing-sensitive patient outcomes at the individual patient level, is critical to help identify the contributions nursing makes to patient outcomes. In addition, previous research involving nursing-sensitive patient outcomes has tended to focus on negative outcomes such as falls, but a more complete description, including positive outcomes is critical to capture the contributions of nurses (Doran & Almost, 2003).

The linkages of Nursing Outcomes Classification (NOC) with NANDA-I diagnoses and Nursing Interventions Classification (NIC) (NNN) have been published to assist nurses with clinical reasoning and decision-making. The use of the linkages of NNN in the U.S. and internationally by nurses has provided additional information on the relationships among diagnoses, interventions and outcomes, and has helped to identify variations in practice across settings (Johnson, Moorhead, Bulechek, Butcher, Maas, & Swanson, 2012). Computerized SNTs are needed for nationwide data aggregation for effectiveness research. However, confusion about which SNTs to use to capture these data, capability of computerized systems, acceptance of SNTs by practicing nurses, lack

of education on nursing terminologies, and implementation costs have impeded adoption of computerized nursing care planning and documentation systems using SNTs.

Even though these issues exist, SNTs are very critical to nursing and research using SNTs in computerized nursing documentation systems is needed to demonstrate its advantages and subsequently increase the adoption and use of SNTs in nursing practice. A well-developed system that can link diagnoses, interventions, and outcomes improves the quality of documentation as well. But of critical importance is that linkages of nursing diagnoses, nursing interventions and nursing-sensitive patient outcomes in the computerized and standardized datasets mutually benefit nurses and patients and advance the development of the terminologies and further examine the relationships among research, theory, and practice. Additional research to identify the linkages for specific populations of patients and for specialty practice is relevant and can help build the knowledge base of nursing by capturing data from electronic health records.

Nursing phenomena associated with the care of oncology patients has not been comprehensively captured or explained in current nursing literature within the context of standardized nursing terminologies. Efforts to capture oncology nurses' practice patterns are an important endeavor to provide reliable and valid diagnoses, interventions, and outcomes for nurses to define their specialty and improve practice. The establishment of a comprehensive database in any specialty also facilitates the development of evidence-based practice and research. This is an important area because the care provided by nurses to cancer patients is complex and the educational needs for care continue to increase. Based on the statistics of cancer incidence, there is also a growing demand for nurses specializing in oncology.

Problem Statement and Purpose of the Study

The validation of SNLs has been emphasized in various settings and selected populations (Johnson et al., 2012); however, research on oncology nursing practice using SNTs, directly retrieved from EHRs, is limited. Understanding the practice standards for oncology nursing care is important for researchers to examine due to the increasing numbers of cancer patients and the cost the care. Additionally, the study of SNTs within oncology nursing is critical in both education and clinical practice. Nursing professionals are striving to document their contribution to the quality of patient care. However, both the traditional non-formatted nursing documentation in EHRs and formatted nursing documentations in written charts have proven to be obstacles in demonstrating nursing's contribution to quality care in an efficient manner. SNTs in EHRs may highlight more of the nursing professional role, by offering efficient examination of data from large databases. As 'Meaningful Use' for EHRs has been highlighted in recent years, measures for nursing care to improve the quality of patient care must be recognized as a part of 'Meaningful Use' and other measures of quality. It is essential to measure and document nursing-sensitive patient outcomes. The findings of the improvement of nursing-sensitive patient outcomes, such as using NOC change scores from outcome ratings, provide evidence of nursing's contributions to the quality of patient care. Therefore, studies of SNTs in EHRs are required not only to demonstrate the 'Meaningful Use' criterion but also to provide a solution for long existing issues on the invisibility of nursing care in health care delivery.

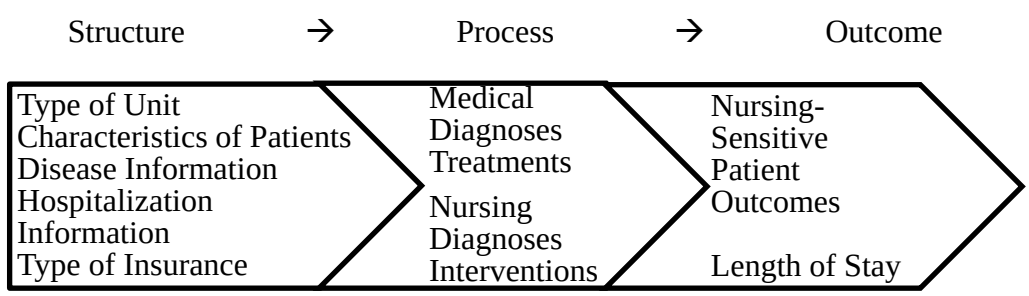
There are five aims of this study: 1) to describe the characteristics of oncology patients admitted to a large academic health center in the Midwest; 2) to describe the

length of stay for all units and by unit; 3) to identify frequently used nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes, using NANDA International diagnoses, NIC interventions, and NOC outcomes respectively, on selected oncology units; 4) to identify the pattern of the linkages of NNN; and 5) to examine outcome change scores by different groups (e.g., age, gender, race, treatments, and type of insurance).

Conceptual Model

The structure-process-outcome framework by Donabedian (2003) was used as the framework for this study. 'Structure' pertains to the conditions under which care is provided. It usually includes material resources, human resources and organizational characteristics. 'Process' pertains to activities that constitute health care, including prevention, diagnoses, treatment, rehabilitation, and patient education. 'Outcomes' pertains to desirable or undesirable changes in individuals and populations that can be attributed to health care. These outcomes would include changes in health status, knowledge, behavior, and satisfaction. The model is widely used in health care research and is well suited to describe nursing phenomena using NNN as the major concepts in the study. The 'structure' elements include characteristics of patients and type of unit. The 'process' elements encompass medical treatments chemotherapy, radiotherapy, surgery, and others), and nursing interventions. The 'outcomes' elements mainly focus on nursing-sensitive patient outcomes measured by NOC. Other intermediate 'outcomes', such as length of stay (LOS), are included.

Figure 1 Donabedian's Model



Donabedian, A. (2003). An introduction to quality assurance in health care [R. Bashshur, Ed.]. New York: Oxford University Press.

Research Questions

The specific research questions addressed in the study are:

Research Question One:

What are the characteristics of the patients in the four oncology units of a large hospital?

There are four categories of patient characteristics:

Demographics (age, gender, race, marital status, years of education, and employment status),

Disease information (site of tumor, duration of cancer since first diagnosed, stage of cancer, severity of illness, and risk of mortality),

Hospitalization information (site of initial admission, oncology unit, length of stay, and discharge status), and a

Cost-related variable (type of insurance).

Research Question Two:

What is the length of stay for patients in each of the four oncology units? Does length of stay differ by unit?

A there any differences in length of stay between ***age groups*** (over and under 65 years); ***medical treatment groups***, such as patients receiving surgery procedures (SP), radiotherapy (RT), chemotherapy (CT), other treatments such as hormone therapy, or a combination of treatments above; ***type of insurance*** (Medicare, Medicaid, self-pay/uninsured, or private insurance)?

Research Question Three:

What nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes are frequently used by nurses on each of the four oncology units and overall? What is the relationship between groups of patients defined by the length of stay (< 1 day, 1 day ≤ LOS < 3 days, LOS ≥ 3 days) and nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes overall and at each of the four oncology units?

Research Question Four:

What are the most frequently used linkages of NANDA-I, NIC, and NOC in oncology?

Research Question Five:

What patient characteristics are associated with positive, no change, or negative nursing-sensitive patient outcome change scores at discharge of the respective patient's most common nursing diagnoses?

Definitions of Variables

NANDA-I: A nursing diagnosis is defined as "a clinical judgment about individual, family, or community experience/responses to actual or potential health problems/life processes. A nursing diagnosis provides the basis for selection of nursing interventions to achieve outcomes for which the nurse has accountability" (Herdman, 2012, p. 515).

NIC: An intervention is defined as "any treatment, based upon clinical judgment and knowledge that a nurse performs to enhance patient/client outcomes" (Bulechek, Butcher, & Dochterman, 2008, p. 3).

NOC: A nursing-sensitive patient outcome is defined as "an individual, family, or community state, behavior, or perception that is measured along a continuum in response to a nursing intervention(s). Each outcome has an associated group of indicators that are used to determine patient status in relation to the outcome" (Moorhead, Johnson, Maas, & Swanson, 2008, p. 38).

For this study, an outcome change score is defined as the difference between the first and last outcome scores recorded during hospitalization. This rating system replaces traditional dichotomized outcomes with a clear and measurable presentation of outcome, such as outcome change score of two outcome ratings scores using a five-point Likert scale as opposed to the goal was achieved or not achieved (Moorhead et al., 2008).

Linkages of NNN

NANDA-I, NOC, and NIC (NNN) are terminologies recognized by the ANA for use in practice. NNN provides useful tools to document planned and provided care in a

computerized system and facilitates communication between nurses and other health care providers (Johnson et al., 2012).

Nursing-Sensitive Patient Outcomes

Of great significance is that NOC provides nursing-sensitive patient outcomes and measures both positive and negative outcomes, to enable nurses to capture the response of patients to nursing interventions. NOC outcomes can be represented as quantified outcomes, differing from the traditional approach of using the goal achievement method as a binary variable of "met or unmet," or "yes" or "no." The five-point scale used in NOC provides continuity in monitoring changes in the patient outcomes, from admission to discharge or until the resolution of the problem. Most studies have focused on nursing-sensitive patient outcomes that are negative, such as failure to rescue, falls, or other adverse events, except for the outcomes reflective of patient satisfaction with care. In contrast, the NOC includes many positive outcomes for individuals, families and communities, with only a few negative outcomes focused on adverse events (Moorhead et al., 2008).

Today, few empirical studies include these three nursing components of practice (diagnoses, interventions and outcomes) directly retrieved from computerized nursing documentation systems. This study provides the researcher with a great opportunity to examine the relationships of nursing diagnosis, nursing interventions, and nursing outcomes in the computerized documentation system and to examine documentation completeness within the computerized system for a group of oncology patients. In addition, this study focused on the relationship between nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes at the individual level. This study

helps to define the knowledge base of oncology nursing care using SNTs (NNN) in an acute setting by identifying the most frequently used nursing diagnoses, outcomes, and interventions in four oncology specialty units.

Planned Nursing Care

Planned nursing care is an important decision of the role and function of nurses in the care process. It is not only a product of nursing professionalism, demonstrating critical thinking and decision-making, it is also a legal record of nursing care provided through documentation of the nurses assessments, treatments, and outcomes of care. The development of an effective documentation system is impeded by the separation of care planning from the documentation of care delivered within some EHRs. Ultimately nurses need a system that combines planned care for a patient with documentation of care delivered within one system using standardized nursing terminologies (nursing diagnoses, interventions, and outcomes). We also need to be able to capture the 'dose' of an intervention. This includes the frequency of providing the intervention and the time needed to complete the activities associated with the intervention. In addition a graphing function of outcome scores in the system and calculation of change scores across the episode of care would be an important feature. Planned nursing care primarily consists of nursing diagnoses, nursing-sensitive patient outcomes and nursing interventions. In this study, NANDA-I, NOC, and NIC were recorded in the electronic records of patients in the study to represent nursing diagnoses, nursing-sensitive patient outcomes, and nursing interventions, respectively.

Length of Stay (LOS)

LOS is a commonly used indicator for patient quality care and cost. In the study, LOS is defined as hospitalization days between admission time and discharge time from one of the four oncology units. For patients admitted less than 24 hours will be reported by two decimals and use days as unit. NOC ratings and their change scores, and LOS are quality indicators for this study.

Oncology Nursing Care

Oncology is the study of cancer (American Cancer Society, 2010). The study focused on identifying and evaluating acute care oncology nursing care planning for cancer patients using nursing diagnoses, nursing interventions, and outcomes. To obtain the primary problems, interventions, and outcomes in oncology, nursing care allows researchers to evaluate oncology nursing care. Identifying patient characteristics also benefits nurses care delivery for specific needs of this population and provides a rationale for patient classification for appropriate oncology nursing care needs, based on other information such as the characteristics of nurse and units. For example, in the study of Cheung et al. (2011), younger patients with cancer experienced worse pain, whereas older patients reported poor appetite. A symptom cluster is defined as three or more concurrent symptoms that are related to one another. Age and gender impact symptom clusters experienced by patients with cancer. Breathlessness, fatigue, and anxiety are also distressing symptoms experienced by cancer patients (Chan, Richardson, & Richardson, 2011). Moreover, oncology patients' symptomatic problems were their main concern. In this research patients with cancer often experienced multiple symptoms concurrently. Appendix A describes the study variables and their definitions.

Summary

Due to increasing oncological cases and their tremendous medical cost, it is important to conduct research to identify nursing knowledge for current oncology patient care. Limited published studies using SNTs directly retrieved from EHRs in the general population are available, and few focus on a specific group, such as an oncology population. Subsequently, there are very few studies are available that identify core problems, nursing interventions, and nursing-sensitive patient outcomes for cancer patients. In addition, updated studies using SNTs in EHRs are required to identify current patient characteristics, planned nursing care, nursing sensitive patient outcomes, length of stay and other cost-related variables. The purposes of this study were to: 1). Describe patient characteristics on four oncology specialty units; 2). Examine length of stay (LOS) on four specialty units based on patient characteristics, such as demographics (gender, age), disease information (treatments and type of insurance); 3). Examine nursing process variables by identifying the frequently used nursing diagnoses, interventions, and outcomes for oncology patients in an acute care setting using standardized nursing terminologies (SNTs); 4). Examine common concurrent pattern of patient problems using nursing diagnoses (NANDA-I); and 5). Explore the relationship between outcome change scores and characteristics of patients. The next chapter focuses on a literature review of related publications and research that support this study.

CHAPTER II

REVIEW OF THE LITERATURE

Cost and Quality in Oncology Nursing Care

The need for research focused on current oncology nursing care is increasing due to the complexity of conditions experienced by oncology patients, changes in demographics of cancer patients, and longer survivorship because of new treatments and advanced technology. This explains a growing demand for nurses specializing in oncology. In 2011, the American Cancer Society reported a total of 1,596,670 new cancer cases in the United States (U.S.) and 571,960 deaths from cancer are projected to occur (Siegel, Ward, Brawley, & Jemal, 2011). Currently, cancer accounts for one in four deaths in the U.S. In addition, it is estimated that one out of five individuals in the U.S. will develop cancer by 2030. Based on a growing and aging society, the National Institutes of Health projected that the overall cost of cancer was $124.6 billion in 2010 and would increase to approximately $158 billion by 2020. However, additional analysis, accounting for new technologies and treatments, increased the projected costs to 173 billion and considering a 5% annual cost increase, the projected cost was raised to $207 billion by 2020 (Siegel, et al., 2011).

To lessen this burden, it is also critical to investigate current effective interventions and to relocate healthcare resource for appropriate oncology nursing care in order to optimize patient care, which will result in an expected reduction of unwanted medical waste of resources on ineffective treatments or interventions. Nurses have been the main workforce in oncology inpatient care. Nurses diagnose risk and problems based on patients' status, intervene to relieve symptoms, and evaluate outcomes by applying

their professional knowledge and skill beyond the administration of medication or other medical treatments. New treatments and advance in technology have speeded up treatment time frames and changed the environment in health care delivery. It is imperative to conduct cost-effective research while reinvestigating change in demographics, and to evaluate current oncology nursing care by using nursing-sensitive patient outcomes and other commonly used healthcare outcomes, such as length of stay (LOS). With the use of SNTs in EHRs, nurse researchers can study planned nursing care and delivered nursing care in an efficient manner and enhances cost-effective research. Moreover, in an era of increasing EHRs, SNTs such as NANDA-I, NIC and NOC provide a means of collecting nursing data that are systematically analyzed within and across healthcare organizations and provide essential data for cost/benefit analysis and clinical audit (Herdman, 2012).

Nursing Nomenclature

Nursing nomenclature, nursing classifications, standardized nursing terminologies (SNTs), and standardized nursing languages (SNLs), are usually considered interchangeable concepts. These terms when used in an EHR aim to facilitate local, national, and international data sharing and comparison of nursing care provided to patients across settings. The terminologies/languages help communicate the focus of nursing care, support documenting nursing decisions, and increase shared decision documental making processes among healthcare providers, patients, and their families. Their use increases patient-centered healthcare of populations of patients across the care continuum because NANDA-I nursing diagnoses support documenting patients' human response to disease; the NOC outcomes reflect the patients' preferences for outcomes and

support collaboration or mutual setting of desired outcomes and the measurements of the outcomes; and the NIC interventions are performed by nurses with the involvements of patients and family.

NANDA International, NOC, and NIC: The NNN Linkages

A Brief Description of the NNN Linkages

In 1973, the first Conference on the Classification of Nursing Diagnoses took place to classify health problems within the nursing domain and formed the North American Nursing Diagnosis Association (NANDA), now known as NANDA International (NANDA-I) (Herdman, 2012). Work on the Nursing Interventions Classification (NIC) (Bulechek et al., 2008), began in 1987, followed by the Nursing Outcomes Classification in 1991 (NOC) (Moorhead et al, 2008). Both classifications are developed and continually updated by the authors in the Center for Nursing Classification and Clinical Effectiveness (CNC) at University of Iowa. NANDA-I, NIC, and NOC (NNN) are three of the thirteen recognized American Nursing Association (ANA) recognized terminologies (Dochterman & Jones, 2003; Rutherford, 2008).

NANDA International

The NANDA-I Taxonomy II (2012-2014) has 13 domains, 47 classes, and 216 labels for nursing diagnoses. Each diagnosis comprises a label or name for the diagnosis, a definition, defining characteristics, risk factors or related factors. It also provides core references and levels of evidence for each diagnosis (Appendix B). Accurate and valid nursing diagnoses guide the selection of interventions that are likely to produce the desired treatment effects and determine nurse-sensitive outcomes. Nursing diagnoses are

keys to the future of evidence-based knowledge, professionally-led nursing care – and to more effectively meeting the need of patients (Herdman, 2012).

Nursing Interventions Classification

The taxonomy of NIC (5th ed.) has seven domains, 30 classes, and 542 labels for nursing interventions. The seven domains are: Physiological: Basic, Physiological: Complex, Behavioral, Safety, Family, Health System, and Community. Each intervention comprises a label or name for the intervention, a definition, and a list of activities. It also provides background readings for each intervention (Appendix C). "The Nursing Interventions Classification (NIC) is a comprehensive, research-based, standardized classification of interventions that nurses perform" (Bulechek et al., 2008, p. 3).

Nursing Outcomes Classification

The NOC Taxonomy (4th ed.) has seven domains, 31 classes, and 385 labels for nursing-sensitive patient outcomes. Each outcome has a label or name for the outcome, a definition, a list of indicators that can be used to evaluate patient status in relation to the outcome, a target outcome rating, a place to identify the source of data, a five-point Likert scale to measure patient status, and a short list of references (Appendix D). "The Nursing Outcomes Classification (NOC) is a comprehensive, standardized classification of patient/client outcomes developed to evaluate the effects of nursing interventions" (Moorhead et al., 2008, p. 26).

The NNN Linkages

The nursing classifications NANDA-I, NIC, and NOC are language systems designed to represent three interacting and cyclical elements of nursing care: diagnoses, interventions, and outcomes (Dochterman & Jones, 2003). Nursing diagnoses describe

actual, potential and health promotion needs. Nursing interventions are nursing actions that assistant a patient through a process to a desired outcome. Unlike nursing diagnoses or patient outcomes whose core concern is for the patients, the focus of nursing interventions is on nursing behavior. Patient outcomes serve as the criteria against which to judge the success of a nursing intervention. The outcomes have been developed to be used in all settings, all specialties, and across the care continuum. The linkages between these SNTs facilitates the use of SNTs in practice, education and research (Johnson et al., 2012).

The third edition of the book focused on NNN linkages, *NOC and NIC linkages to NANDA-I and Clinical Conditions: Supporting Critical Reasoning and Quality Care*, was released in 2011 (Johnson et al., 2012). In this book, the relationships between the NNN linkages are described from aggregated data and expert opinion to assist nurses and students with clinical decision-making. The links between the NANDA-I diagnoses and the NIC (5th ed.) interventions suggest the relationship between a patient's problem and the nursing actions that will resolve or diminish the problem or risk. The relationship between the NANDA-I diagnoses and NOC (4th ed.) outcomes suggest the relationships between a patient's problem or risk and health care status and those aspects of the problem or status that are resolved or improved as expected by one or more interventions. The links between the NOC outcomes and the NIC interventions suggest a similar relationship focused on the resolution of a problem and the nursing actions directed at a problem resolution. This means the outcome is expected to be influenced by the interventions provided by the nurse. The descriptive relationships assist nurses in

defining and gaining nursing knowledge using SNTs, and enhancing their clinical judgment by providing a good resource to improve their critical thinking skills.

Three Theory Explanations of the NNN Linkage

Margaret Lunney provided theoretical explanations for the NNN linkages from three different perspectives: Hayakawa's linguistics theory, critical thinking perspectives, and the concept of accuracy of nurses' diagnoses and thereby enhances their competence in the nursing process. Linguistics theory explains that naming a scientific phenomenon is important for knowing about that phenomenon. Use of the SNL facilitates improvements in nursing care by fostering collaboration and cooperation among nurses, consumers, and other providers. Critical thinking processes and outcomes are also enhanced by nurses:

1. Identifying and challenging assumptions central to critical thinking.
2. Challenging the importance of context to critical thinking.
3. Imagining and exploring alternatives.
4. Imagining and exploring alternative leads to reflective skepticism (Dochterman & Jones, 2003).

Critical thinking leads to accurate interpretation of clues in a clinical situation in order to identify patient problems, risk states, or readiness for health promotion. Many studies of the NNN linkages strengthen the ability of critical thinking by applying the Outcome Present state Test Model (OPT model) are available in the literature (Kautz et al., 2009; Kautz, Kuiper, Pesut, & Williams, 2006; Kautz, Kuiper, Pesut, Knight-Brown, & Daneker, 2005; Kautz & van Horn, 2008; Kuiper, Kautz, & Williams, 2005; Kuiper, Kautz, & Pesut, 2004). Accuracy of interpreting the cues in a clinical sitiation in order to

identify clinical problems, risk factors, or health promotion is an outcome of critical thinking (Dochterman & Jones, 2003). Accuracy of diagnoses is important because it guides the selection of interventions and outcomes. Without critical reasoning, nurses are unable to select appropriate interventions and outcomes linking to the nursing diagnoses. Therefore, developing the ability to think critically is the essence of learning nursing knowledge across academic nursing programs. However, awareness of the need of SNTs has not been the focus of all nursing academic programs in spite of the inclusion in most text books. More studies are required to provide evidence of the benefits in using SNTs in EHRs in order to alter the current academic environment and increase their use in practice. The harmonization of NANDA-I, NIC and NOC facilitates the use of each SNT and identification of the most appropriate categories of diagnoses, interventions and outcomes.

Standardized Nursing Terminologies in EHRs

Meaningful Use for the Nursing Profession

SNTs are required for a successful innovation of EHRs in the nursing profession (Jha, 2010). SNTs in EHRs may potentially address ‘Meaningful Use’ (MU) for the nursing profession by linking quality measures within the EHRs, such as NOC outcome ratings to their relevant NNN linkage, and thereby demonstrating the change in outcome scores that were improved by nursing interventions. The term MU comes from the Medicare and Medicaid EHR Incentive Programs, which provides a financial incentive for the “meaningful use” of certified EHR technology to achieve health and efficiency goals. To demonstrate MU for the financial incentives, it requires a report of measures related to quality improvement through EHRs. Nursing-sensitive patient outcomes, as

quality measures, should also be emphasized in order to visualize nurses' independent contribution to patient quality care. These nursing-sensitive patient outcomes have to be viewed as quality measures not only by the nursing profession but also by other healthcare disciplines. SNTs in EHRs can provide a way to demonstrate Meaningful Use (MU) from a nursing perspective, but has not been included in the financial incentive at the current time.

Nursing's Contribution to Quality Patient Care

Nurses face two challenges: First, it is difficult to differentiate the contributions of nurses to the quality of patient care from other health providers. Secondly, it is a challenge to incorporate standardized terminologies of nursing care into Electronic Health Records (EHRs) without sacrificing individualized patient-centered care (Rutherford, 2008). The use of SNTs within EHRs is the key to capturing the independent contributions of nurses and differentiate the uniqueness nursing care provides from other disciplines. For example, NANDA-I (Herdman, 2012), NOC (Moorhead et al, 2008), and NIC (Bulechek et al., 2008), recognized terminologies by ANA, were developed for use in practice and research and have demonstrated their use in different studies (Head et al., 2011; Lee, Park, Nam, & Whyte, 2011; Müller-Staub, Lavin, Needham, & van Achterberg, 2007; Müller-Staub, Needham, Odenbreit, Lavin, & van Achterberg, 2008; Müller-Staub & Paans, 2011; Müller-Staub, 2009; Müller-Staub, Lavin, Needham, & van Achterberg, 2006; Müller-Staub et al., 2008; Müller-Staub Lunney, Odenbreit, Needham, Lavin, , & van Achterberg., 2009; Müller-Staub, Needham, Odenbreit, Lavin, & van Achterberg, 2007; Thoroddsen, Ehnfors, & Ehrenberg, 2010).

Additionally, NANDA-I represents nursing diagnoses, NIC encompasses nursing interventions, and NOC encompasses patient outcomes. Therefore, the NNN linkages provide useful tools to document planned care in computerized systems, to evaluate the care provided, and facilitate communication between nurses and other health care providers. Importantly, NOC outcomes capture the response of the patient to nursing interventions to evaluate care with patients' progression or decline. Rather than a traditional approach of outcome "met or unmet", outcome ratings with a five-Likert point scale can be used to monitor changes in patient outcomes from admission to discharge or to the resolution of a problem (Moorhead et al., 2008). The magnitude of change scores from outcome ratings presents a patient's status and it is important for nurses to notice these changes in real time situation, then altering care interventions over time to improve patient outcomes.

Benefits of SNTs in EHRs

Menachemi and Collum (2011) reported advantages of EHRs in three categories: clinical, organizational, and societal outcomes. First, EHRs improve clinical outcomes by providing guided standardized care for decision-making, so that it leads providers to an increased level of adherence to evidence-based clinical practices. Secondly, researchers can focus on overall cost reduction by timely, accurate charting in a paperless world from an organizational perspective. Finally, the societal benefit relates to advantages resulting from the broad implementation of EHRs and shared patient information, thus decreasing duplication of information in the Health Information Exchange (HIE) resources. HIE is the act of transferring health information electronically between two or more entities. For example, EHR warehouses provide an improved ability to conduct research and also

enable individuals to aggregate data to be aggregated across settings or populations in order to contribute to the needs of the society (Menachemi & Collum, 2011).

Specifically, well-developed SNTs within EHRs benefit by providing: 1) better communication among nurses and other healthcare providers (Lundberg et al., 2008; Rutherford, 2008), 2) increased visibility of the nursing care process (Muller-Staub et al., 2008; Rutherford, 2008), such as nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes, 3) increased adherence to standards of care, which may promote evidence-based practice care as well (Bruner, Corbett, Gates, & Dupler, 2012; Kautz & van Horn, 2008; Rutherford, 2008), 4) facilitation of evaluation of nursing competencies (Rutherford, 2008), 5) increased quality improvement, patient satisfaction, shorter LOSs, and cost reduction (Jansson, Pilhammar-Andersson, & Forsberg, 2010; Muller-Staub, Lavin, Needham, & van Achterberg, 2006; Saranto & Kinnunen, 2009), and 6) increased legibility and accessibility of data (Holroyd-Leduc, Lorenzetti, Straus, Sykes, & Quan, 2011).

Effective Communication and Quality of Documentation

SNTs support effective communication in terms of the presentation of patient problems, interventions, and outcome changes (Lundberg et al., 2008). However, inconsistent documentation challenges researchers to interpret and understand the results of nursing care (Neiman, Rannie, Thrasher, Terry, & Kahn, 2011). Studies of SNTs in EHRs reported inconsistent findings, in such factors as time for documentation (Vizoso, Lyskawa, & Couey, 2008); but in another review, the documentation time was shorter after allowing for an expected learning curve (Holroyd-Leduc et al., 2011). Therefore, it

is necessary to conduct research on any inconsistent finding generated and then guide the clinical practice for improvement of patient care.

Comprehensive Planned Care

SNTs not only enhance clinical thinking (Dochterman & Jones, 2003) but also promote a better plan of care. In a study of SNTs by Müller-Staub and her colleagues, the use of SNTs promoted more comprehensive nursing care plans. This not only led to more visible nursing care in the nursing process documentation, but also resulted in more reliable nursing data available to impact personnel and budget planning (Müller-Staub, Needham, Odenbreit, Lavin, & van Achterberg, 2007). In addition, the use of NANDA-I nursing diagnoses was found to improve the quality of documented patient assessments across the domain of nursing practice (Muller-Staub, Lavin, Needham, & van Achterberg, 2006, 2007). The NNN linkages assist nurses in decision-making for a better patient care (Johnson et al., 2012). NANDA-I diagnoses supported the holistic patient care by using an assessment framework, which guides to support nurses in comprehensively care planning (Herdman, 2012). Moreover, NOC outcome ratings provide measurable indicators for nurses to evaluate their patient care. The function of NOC ratings enables nurses to easily monitor the changes of patients' health status using a one-to-five point Likert scale.

Evidence-Based Practice (EBP)

Bruner and colleagues analyzed the concept of clinical significance (CS) in relation to evidence-based practice (EBP) and concluded that a standardization of terminology is essential to disseminating best practices in the nursing profession (Bruner et al., 2012). A study of the NNN linkages to enhance EBP was published (Kautz & van

Horn, 2008). The Hartford Center at University of Iowa has developed evidenced-based guidelines incorporating to NIC and NOC. These evidence-based protocols provide nurses with good resources for research, education, and practice.

Quality Improvement, Patient Satisfaction, Cost Reduction and a Shorter LOS

Jansson et al (2010) reported planned nursing care may impact patient satisfaction by providing individualized care, participation, and shorter lengths of stay. Saranto and Kinnunen (2009) also found in reviewing 41 studies that structured standardized terminologies may improve the quality of patient care and shorten patients' length of stay in 41 of their reviewed studies from 2000 to 2007. Use of SNTs can facilitate the measurement of nursing's contribution to care and thereby for a potential benefits in relocating the charge of nursing care in an appropriate categories instead of room fee (Muller-Staub et al., 2006).

Legibility and Accessibility

Holroyd-Leduc et al (2011) reviewed 30 articles related to EHR use in a structure-process-outcomes framework and concluded that legibility and accessibility is the only clear advantage that EHRs have over traditional paper-based records. The findings focused on the advantages of EHRs usually did not report massive improvements in healthcare due to design limitations.

Low Adoption Rate of SNTs in EHRs

Just as standardized terminologies within EHRs for physicians have been commonly used with the application of ICD-10 and diagnostic related groups (DRGs), SNTs have been emphasized by nursing informatics specialists as a required element

within in the data to describe care provided by nurses. Yet, a lack of consensus by the nursing profession on the importance of including SNTs in EHRs impedes the development and implementation of a comprehensive nursing information system for documentation. This has resulted in a low adoption rate in practice, lack of awareness of the importance for nursing research, and minimal focus of nursing informatics content in curriculum design across different specialties in nursing. A recent survey of 1,268 nurses reported a low adoption rate of SNTs in clinical practice and academic settings (Schwiran & Thede, 2011). Specifically, 10.8% of nurses charted with NANDA-I, 7.5% with NIC, 6.9% with NOC, and less than 5% with remaining SNTs. In this sample, more than one third of students (39%) were enrolled in master's programs (n=219, students in total) (Schwiran & Thede, 2011). Christopher et al., reviewed 50 charts and found only 28% of the charts used a standardized care plan (Christopher, Flood, Carlson, Delaney, & Krch-Cole, 2011). This report identified the demand for education related to SNTs in clinical settings and academic curriculums. In addition, funding for EHRs that supports nursing process content is needed to ensure that the care nurses provide is part of the EHR in the U.S. It also needs to be mentioned, there is a critical lack of funds available to support use of SNTs in nursing in contrast to Medicine.

Nursing Research Focused on Health Systems, Technology, and Nursing Specialties

The perspective of health systems and organizational policy cannot be ignored because they influence study results. One particular nursing policy is that the plan of care has to be initiated within 24 hours after admission. This policy can impact the amount and quality of data available for very short lengths of stays. The scope of Information

system applications implemented in the organization are another factor that might alter the findings or data available to describe the care provided to patients (Brender, 2006; Friedman & Wyatt, 2006). For example, an underdeveloped information system may cause duplicative documentation by the nurse for the same patient and without warning messages, thus duplicative information could vary from prior entry. Additionally, after decades of development of nursing specialties, nurses in each specialty focuses on the development in their own specific knowledge, rather than involving a broader scope of practice that may influence their practice. For example, few nursing oncology studies discuss the impact from technology and directions of future studies. A broader focus across each specialty is necessary to examine any emerging issues that are beyond the scope of specialty practice, such as the impact of technology. These new emerging issues, such as health systems, technology, and language classifications, have to be discussed for each specialty.

Ehealth or eNursing is an emerging term, describing the discipline of technology in the health care delivery system and in the nursing profession. There is a need for this emerging specialist of nursing informatics and these individuals should be involved in the development of a nursing information system. In practice, underdeveloped nursing documentation systems have impeded the innovation of eNursing and have become common issues in all clinical settings in the U.S. One potential reason is that organizations have insufficient knowledge of the essential elements of nursing information systems and the characteristics of what represents an effective nursing documentation tool in current health care systems. Moreover, without SNTs, an effective nursing documentation tool will never exist. Current underdeveloped nursing information

systems have been an obstacle for efficiently documenting nursing care in each specialty. Few grants have been announced to support this type of study. The lack of support further delays development of eNursing applications to support practice.

Few nursing studies illustrate organizational factors or system-wise variables in their findings by using SNTs. Aiken and colleagues' work on systematic variables such as staffing or skill mix in health care did not emphasized SNTs in their findings. However, organizational information is useful in providing accurate interpretation of findings in research because more and more studies support that system factors have to be concerned when studies occurs in an organization, for example, the policy of completion of nursing diagnosis in the care plan within 24 hour admission. Donabedian's structural process outcome model has provided a commonly used framework in healthcare and a macro-view perspective as well for health science research.

In summary, nursing researchers have to use SNTs as well as other concerns, such as health systems or context of care, and technology in their study interests, in order to advance the nursing profession and influence and bring about health policy change in the era of eNursing.

Oncology Nursing Care

Nurses working in oncology care for patients with a variety of problems and symptoms that impact quality of life and then require nursing interventions.

Cancer Symptom and Symptom Cluster

The terms of symptom, symptom experience, symptom prevalence, symptom severity, symptom intensity, and symptom distress are frequently studied in oncology care (Badger, Segrin, & Meek, 2011; Gilbertson-White, Aouizerat, Jahan, & Miaskowski,

2011). Pain and most other symptoms are treatable for patients with cancer and patients often concurrently experience multiple symptoms (Karabulu, Erci, Özer, & Özdemir, 2010; Kirkova, Walsh, Aktas, & Davis, 2010). Measuring symptom burden is required for these patients (Cleeland & Reyes-Gibby, 2002). Gilbertson and colleagues (2011) reviewed 22 studies focused on palliative care of patients with advanced cancer and found pain, dyspnea, and nausea were all identified as important symptoms for these patients. Other symptoms evaluated in at least 50% of the studies reviewed were depression, constipation, anorexia, sleep disturbance, anxiety, vomiting, fatigue, weight loss, cough, dysphagia, and drowsiness. Due to the diversity of measures and approaches used in the 22 studies reviewed, the researcher could not identify a reliable summary of the prevalence of symptoms in cancer patients.

Karabulu and colleagues (2010) reported that most symptoms were fatigue, difficulty remembering, sadness, poor appetite, lack of enjoyment of life, pain, distress, difficulty walking, and dry mouth. The least experienced symptoms were shortness of breath and vomiting. In general, 37.5% of the patients experienced moderate symptoms and 12.5% experienced severe symptoms. Since the shift to symptom clusters has occurred, clinical and research foci has changed to clusters to the experience of the whole human being rather than one specific symptom. This shift aids in identifying the most effective interventions for patient care (Matthews, Schmiege, Cook, & Sousa, 2012). For example, pain, depression, and fatigue were reported as an identifiable symptom cluster and associated with declining physical functioning (Laird et al., 2011; Thornton, Andersen, & Blakely, 2010; Torta & Munari, 2010). A symptom cluster is defined as

three or more concurrent symptoms that are related to one another (Kirkova et al., 2010; Xiao, 2010).

Characteristics of Patients and Oncology Nursing Care

Studies reported that the demographics of patients, disease, and individual characteristics were associated with symptom/symptom clusters (Matthews et al., 2012). Few studies in nursing have addressed the association between demographics or other variables and symptom clusters. Cheung and colleagues (2011) found that younger patients with cancer experienced worse pain, whereas older patients reported poor appetite (Cheung, Le, Gagliese, & Zimmermann, 2011). Matthews et al., (2012) reported demographic characteristics, individual characteristics and mood were significantly associated with the three symptom clusters of pain-insomnia-fatigue, cognitive disturbance-outlook, and gastrointestinal problems. Karabulu et al. (2010) also reported demographics and disease information had influence on experience of symptom of the disease. The findings of this study suggest more studies on the relationship between demographics and symptom clusters are needed to explore evidence-based interventions useful to treat these symptom clusters. Psycho-education interventions have been found to be effective for patients with cancer suffering from breathlessness, fatigue, and anxiety (Chan et al., 2011). Moreover, symptom clusters were also associated with patient distress and poor outcomes, such as functional status, quality of life, and mood (Matthews et al., 2012).

NOC and Measurement of Symptom Clusters

The importance for symptom cluster evaluation in oncology has been highlighted (Esper, 2010). Few nursing studies focus on symptom clusters due to a lack of daily used

measures of symptom severity and intensity in nursing documentation. Use a questionnaire of symptom intensity that is separated from nursing documentation will increase the burden of data collection. A standardized profile of symptoms to enable nurses to focus on effective approaches to alleviate symptom clusters is required. Health providers should also evaluate the frequency and severity of symptoms (Karabulu et al., 2010). Therefore, a standardized scale of nursing-sensitive nursing outcomes, such as Nursing Outcomes Classification (NOC) scores, will provide a potential tool to evaluate symptom clusters, including symptom frequency and symptom intensity across populations and settings.

Kirkova and colleagues (2006) reviewed 21 studies and concluded that an ideal symptom assessment instrument should capture symptom prevalence, severity, distress, and assess symptom clusters. In the area of validity and reliability the instrument should be precise and stable among raters over time. In terms of measurement, the scale used in the instrument should be easy to understand, complete, have clinical utility, capture changes over time, and commensurate for statistical analysis. The use of the instrument should have minimal burden for the patient and staff and provide enough information for decision-making. Finally, it should have a tool for evaluation purposes. Based on Kirkova's criteria for a good tool for measurement, a study using SNTs, specifically NOC, is required to evaluate the ability of SNTs to measure symptom severity in cancer patients.

Cost-Effectiveness Research

SNTs are expected to benefit the care process so research in cost-effectiveness and a study of SNTs may potentially provide staffing and budget planning information

(Müller-Staub et al., 2007). It is critical to conduct studies focusing on nursing care process using SNTs in EHRs, although EHRs have been widely studied to improve quality of care and reducing cost by saving nursing time and shortening the length of stay (Hillestad et al., 2005).

LOS in Oncology Units

Length of stay (LOS) is a common outcome in research studies and is associated with health care cost (Gupta, Vashi, Lammersfeld, & Braun, 2011; Laky, Janda, Kondalsamy-Chennakesavan, Cleghorn, & Obermair, 2010; Youngwerth, Bartley, Yamashita, & Kutner, 2011). It also serves as a proxy quality indicator. For example, correcting malnutrition is recommended before surgery and serves as a better predictor for LOS (Gupta et al., 2011). Laky et al. (2010) found malnutrition, low quality of life scores, and advanced cancer in gynecological cancer patients to be associated with prolonged lengths of stay (Laky et al., 2010).

Fogh and colleagues found elderly people undergoing induction of radiotherapy before resection for treatment of esophageal cancer had no prolonged LOS compared to younger patients (Fogh et al., 2011). Patients on an oncology acute care unit for elders require nutritional consults 2.1 times more often and are 2.5 times more likely to have nutrition supplements ordered than usual care cancer units (Flood, Brown, Carroll, & Locher, 2011). Patients with malnutrition status had prolonged LOS, and were likely to be readmitted within 15 days, and suffered increased mortality (Lim et al., 2011). In a study, oncology patients had a LOS median of 7 days, with a range from two to 20 days and 12 % of patients died while in the hospital (Mansour, Simcock, & Gilbert, 2011)

Defining Nursing Knowledge

In a cross-sectional review of nursing records (*n*=265) in four specialties, SNTs, particularly, NNN, were capable of distinguishing between specialties and defining knowledge for each specialty. It also reported that the most frequent nursing diagnoses focused on basic human needs of patients across specialties. Further studies with large data sets are required to explore the relationships between nursing diagnoses and nursing interventions in order to make explicit the knowledge in each nursing specialty (Thoroddsen et al., 2010).

NANDA-I, NIC, and NOC in Oncology Nursing Care

Studies of oncology nursing care using SNTs were mostly focused on nursing diagnoses and were published in the 1990s in journals mostly relevant to SNTs (Courtens & Abu-Saad, 1998; Tiesinga, Dassen, & Halfens, 1996). In general journals, use of SNTs is seldom indicated. Most recent studies of SNTs occurred outside the United States (U.S). In a Delphi study, Speksnijder and colleagues identified 64 NANDA-I diagnoses relevant to hematology oncology in Europe. Experts agreed on the importance of these 11 diagnoses: *Imbalanced Nutrition: Less Than Body Requirements, Diarrhea, Fatigue, Risk for Bleeding, Risk for Infection, Impaired Oral Mucous Membrane, Risk for Impaired Skin Integrity, Impaired Skin Integrity, Hyperthermia, Nausea, Acute Pain,* and the health problem *Pruritis* (Speksnijder, Mank, & van Achterberg, 2011).

Courtens and Abu-Saad studied 15 nursing records of leukemia patients. The subjects were73% female with an average age of 46 years (range of age from 24 to 69). Their length of stay (LOS) in the hospital averaged 42 days. In relation to the number of diagnoses, there were 16 per patient with a range of diagnoses from 1 to 24. Yet, the

researchers identified 36 different diagnoses classified into nine functional health patterns (Courtens & Abu-Saad, 1998) (Appendix E). In the study of Cpirtens and Abu-Saad, the most frequent diagnoses were *Sleep Disturbance, Risk For Bleeding, Fluid Volume Excess, Skin Problems, Fatigue, Pain, Altered Nutrition: Less Than Body Requirements, Nausea, Altered Oral Mucous Membrane, Risk For Infection, Diarrhea,* and *Self-Care Deficit* related to hygienic care (67% of patients). The problem of pruritus, nausea, vomiting, tingling, and dizziness were not listed as NANDA-I diagnoses.

Chronic Pain, Risk for Infection, and Activity Intolerance were reported as the most frequent used nursing diagnoses (*n*=539) in a study of patients with breast cancer in Japan (Ogasawara et al., 2005). *Anxiety* was reported to be experienced by patients in varied levels and required assessment at different points during care for patients undergoing Bone Marrow Transplant (Young, Polzin, Todd, & Simuncak, 2002). The NOC outcome *Anxiety Level* is able to meet this requirement for consistent monitoring. *Disturbed Body Image* and *Grieving* were described in a study of chemotherapy-induced alopecia/hair loss. The study recommended that relevant nursing interventions (NIC) and nursing-sensitive patient outcomes (NOC) should be identified and developed to address these problems (Dougherty, 2007).

Summary

Cancer burden is a well-known problem in the United States. Nurses are the main health care workforce that provides cost-effective oncology care using SNTs within EHRs. Studies found that SNTs within EHRs benefit the care process by providing comprehensive planned care, better decision-making, evidence-based practice, increased patient satisfaction, quality improvement, and a shorter LOS, reducing cost and time in

repetitive documentation. However, only a few studies using SNTs focused on oncology nursing care in the U.S. SNTs may potentially benefit future research exploring symptom clusters using NNN. NANDA-I diagnoses, NOC outcomes, and NIC interventions could be used to describe the symptom clusters experienced by cancer patients. Moreover, NOC and change outcome ratings can provide consistent monitoring of symptoms that may fluctuate by stage of cancer or type of treatment. SNTs within EHRs may also provide further insight toward reducing the burden of cancer. In conclusion, SNTs, such as NNN, provide a beneficial tool in advancing nursing knowledge in oncology and promoting quality patient care.

CHAPTER III

RESEARCH DESIGN, METHODS, AND DATA ANALYSIS

Research Design

This research used a descriptive retrospective design to identify demographic characteristics and planned care of cancer patients on four oncology specialty units. The descriptive design was selected to capture current demographics in oncology acute care and undocumented nursing planned care using SNTs in EHRs (Brink & Wood, 1998). Descriptive research designs are used to describe "what exists" with respect to variables or conditions in a situation. A retrospective study looks backward for a relationship between selected phenomenon that may have occurred in the past (Houser, 2012). In addition, descriptive studies can make two distinct contributions to nursing research. Complete descriptions of specific phenomena within a population are critical to theory building (inductive) as well as to theory testing (deductive) (Brink & Wood, 1998). In other words, the data collected will either contribute to the development of theory or explain phenomena from the perspective of the population being studied (Houser, 2012). Without the interference of an investigator, descriptive studies always examine the variables or sample as they currently exist (Brink & Wood, 1998; Houser, 2012).

The ideal sample for a descriptive design is either the total available population (particularly with small populations) or a randomized sample from a target population (Brink & Wood, 1998). This study selected first admission for each patient during the study period for the puspose of maintaining a sufficient sample size and independence of the sample. This was important because not all patients had a plan of care and some individuals had mutiple admissions. Randomization may cause reduction in the sample

size and questionable issues on independence of the sample may result in bias of the findings. Data presentation in this type of design is usually in the form of descriptive statistics (such as frequencies) and occasionally correlations or differences between groups may be presented but this does not alter the type of design (Brink & Wood, 1998). The use of available data, one of the methods of data collection for descriptive designs was applied in this study. It suggests that research with a descriptive design use available data and requires that the investigator check data carefully to confirm data quality from the resources used in the research (Brink & Wood, 1998).

Setting and Sample

The data were retrieved from the records of patients discharged from four oncology units in a 762-bed Midwest tertiary care hospital from June 1, 2010 through December 31, 2010. The start date for data extraction was selected one year after an HER update to the computerized nursing documentation system, which was NANDA-I, NOC, and NIC (NNN), implemented in May, 2009. NNN is used in the electronic nursing documentation system of this hospital that uses an Epic software application. The four units selected for the study were Medical-Surgical Oncology Unit (Unit M) with 24 beds, Hematology Oncology Unit (Unit H) with 19 beds, including 4 beds designed for Hospice care, Gynecology Oncology Unit (Unit G) with 21 beds, and Adult Leukemia and Bone Marrow Transplant Unit (Unit A) with 26 beds. To be included in the study during the time period, patients had to be discharged from the four oncology units from June 1, 2010 through December 31, 2010. Pediatric patients were excluded because this is a study focusing on adult oncology patients.

Variables and Measures

This study included the structural variables (characteristics of the patient population and disease information including severity of illness, and risk of mortality), the process variables (medical diagnosis, planned medical treatments, nursing diagnosis, and planned nursing interventions), and the outcome variables (length of stay, nursing-sensitive patient outcomes, and change scores using NOC). In addition, datum related to type of insurance was collected. The definitions of the variables used in this study can be found in Appendix A and includes two parts. The first part includes characteristics of patients: demographics (age, gender, race, marital status, years of education, and employment status), disease information (medical diagnosis, site of tumor, duration since first cancer diagnosed, stage of cancer, severity of illness, and risk of mortality), hospitalization information (initial admission site, discharge unit, admission dates, discharge date, and length of stay), and one cost-related variable (type of insurance). The researcher retrieved demographics and cancer information directly from electronic health records (EHRs) and the local Tumor Registry. The second part includes SNTs (NANDA-I, NIC, and NOC) and the start dates and end dates of care, and NOC outcome ratings. The SNTs, NANDA-I as nursing diagnosis, NIC as nursing interventions, and NOC as nursing-sensitive patient outcomes, are coded in multiple levels in plan of care documentation in EPIC. A sample of the NANDA-I nursing diagnosis, *Acute Pain*, is presented in Appendix B.

Although this is a retrospective descriptive design, performed medical treatments and planned nursing interventions were used as process indicators. Medical treatments were surgery procedures related to cancer (SP), chemotherapy (CT), radiotherapy (RT)

and other types of treatments. Nursing intervention labels (NIC) were collected from plan of care documentation in EPIC. A sample of the NIC intervention, *Pain Management*, is presented in Appendix C.

Outcomes variables include NOC outcomes and their outcome rating, and length of stay (LOS). NOC outcome ratings and the date assessed were collected from plan of care documentation in Epic. The ratings at admission and at discharge were calculated as the outcome change scores. The change scores based on the most common linkages of NNN was applied to answer Research Question Five. A sample of the NOC outcome, *Pain Level*, is presented in Appendix D. Besides NOC outcome change scores, length of stay (LOS) was used as another outcome in Research Question Two. To obtain accurate LOS and age, SAS function INTCK is basically used to get the number of time intervals between two dates. Time intervals were specified in minutes for LOS and in month for age. The date or time of admission to oncology unit was used to obtain LOS and age. Two decimal was used to present the unit of day for LOS. To be specific and prevent from a zero value for LOS, admission time to oncology unit was used (data collected from the hospital was coded as MM/DD/YYYY XX:XX). The SAS codes were: LOS = round ((INTCK ('minute', admission time to oncology unit, discharge time))/1440, 0.01); Age = floor (INTCK ('month', date of birth, admission date to oncology unit) – (day (admission date to oncology unit) < day (date of birth)))/12) (Cody, R. P., & SAS Institute, 2010).

Data Collection and Management

Inclusion criteria are: all records of patients who were discharged from the four oncology units –Gynecology, Oral Surgery, and Otolaryngology (Unit G), Medical

Surgical Oncology Unit (Unit M), Hematology/Oncology and Palliative Care Unit (Unit H), and Adult Leukemia and Bone Marrow Transplant Unit (Unit A) during June1st, 2010 through December 31st, 2010 were included in the study. Adult patients that fit the inclusion requirements were included in the study. Patient identifications in the hospital data base were scrambled and a unique identifier was created by the researcher for the purpose of patient confidentiality. The completeness and accuracy of the data was randomly checked on each 100th file to ensure the data quality. Data collection was completed in one year. Data management and data preparation for analysis was completed by the researcher. Several strategies were performed to confirm the data quality. First, for data from electronic medical records, (e.g., age, gender, LOS) were confirmed with another resource, the Tumor Registry. Secondly, the variables for planned care (e.g., NANDA-I diagnoses, NIC interventions, and NOC outcomes) were confirmed for accuracy by three strategies: use function of data validation in EXCEL as the initial entry, randomly data recheck per 100 records during data entry, and use of the data filter function in SAS Enterprise Guide 4.3 with SAS 9.3 after the completion of data collection (Davis, 2007).

Data Analysis and Interpretation

The data were analyzed using Enterprise Guide 4.3 with SAS 9.3 (Davis, 2007). Data analysis was performed according to each research question.

Research Question One:

What are the characteristics of the patients in the four oncology units of a large hospital?

There are four categories of patient characteristics:

Demographics (age, gender, race, marital status, years of education, and employment status),

Disease information (site of tumor, duration of cancer since first diagnosed, stage of cancer, severity of illness, and risk of mortality),

Hospitalization information (site of initial admission, oncology unit, length of stay, and discharge status), and a

Cost-related variable (type of insurance).

Demographics, disease information, hospitalization information, and cost-related variables are described. Two collected variables, site of initial admission and Medicare Severity-Diagnosis Related Group (MS-DRG), are not described in the study due to their variability and difficulties in grouping them into categories for analysis.

To answer **Question One**, a descriptive analysis were reported by using (a) frequencies and percentages for categorical variables, and (b) means, standard deviation, and ranges for continuing variables, in each unit and for the overall sample in the oncology population.

Research Question Two:

What is the length of stay for patients in each of the four oncology units? Does length of stay differ by units compared to overall length of stay for the other three units?

At the unit level and overall, are there any differences in length of stay between ***age groups*** (over and under 65 years); ***medical treatment groups***, such as patients receiving surgery procedures (SP), radiotherapy (RT), chemotherapy (CT), other

treatments such as hormone therapy, or a combination of treatments above; ***type of insurance*** (Medicare, Medicaid, self-pay/uninsured, or private insurance)?

To answer **Question Two**, frequencies of nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes were analyzed and percentages were presented within and across units. Means, standard deviations, and ranges of length of stay in the oncology population were analyzed, within and across units for age group, treatment group and type of insurance. Normality tests were performed first. Parametric methods, such as ANOVA, were preferred for the study. Data transformation was performed since the dependent variable, LOS, violates the assumption of normality. A significant violation of the assumption of normality can seriously increase the chances of the researcher committing either a Type I (overestimation) or Type II (underestimation) error, depending on the nature of the analysis and the non-normality. Data transformations are the application of a mathematical modification to the values of a variable. Logarithmic transformations are common procedure for positive skewed data such as LOS (Moran & Solomon, 2012). Non-parametric methods, such as Kruskal-Wallis, may be selected only when normality is severely violated for the sample. Since the sample size is sufficient to perform a parametric analysis (n=2,237), Box-Cox correction was applied in the study (Box & Cox, 1964). The findings of Box-Cox correction suggest the best power is the same as the logarithmic transformations (Moran & Solomon, 2012). A t-test was applied to examine the relationship of LOS and two age groups (over and under 65 years old). Analysis of Variance (ANOVA) was applied to examine the relationships between LOS and race, treatments, type of insurance and a Tukey test was also applied (Box & Cox, 1964; Kutner, 2005; Moran & Solomon, 2012).

Research Question Three:

What nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes are frequently used by nurses on each of the four oncology units and overall? What is the relationship between groups of patients defined by the length of stay (<1 day, 1 day ≤ LOS < 3 days, LOS ≥ 3 days) and nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes overall and at each of the four oncology units?

To answer **Research Question Three**, most frequently used NANDA-I diagnoses, NIC intervention, and NOC outcomes in oncology units were analyzed by descriptive analyses using frequencies and percentages. Chi-square tests were used to examine whether the most frequently used NANDA-I diagnoses, NIC intervention, and NOC outcomes differ by unit or by the three groups of LOS.

Research Question Four:

What are the most frequently used linkages of NANDA-I, NIC, and NOC in oncology?

To answer **Research Question Four**, most frequently used linkages of NANDA-I, NIC, and NOC in oncology were analyzed by descriptive analyses using frequencies and percentages. Any pattern for nursing diagnoses, nursing interventions, or outcomes selected from the top 15 commonly used list from each were explored by a Chi-square tests with Fisher's exact tests (Der & Everitt, 2006), and a multiple comparisons, Bonferroni's method (Bailar & Hoaglin, 2012), was applied for adjusted p value.

Research Question Five:

What patient characteristics are associated with positive, no change, or negative nursing-sensitive patient outcome change scores at discharge associated with patient's most common nursing diagnoses?

To answer **Research Question Five**, a descriptive analysis was applied to address the distribution of outcome change scores for the most common selected NOC outcomes. *Pain Level* and *Infection Severity* were selected and analyzed for all units and by unit. These two NOC outcomes were selected because *Pain Level* was the most common used NOC outcomes in Unit G, Unit M and Unit H, and *Infection Severity* was the top NOC outcome in Unit A. For NOC outcome, *Pain Level*, the top NOC outcome for all units, its relationship with gender, age group, race, treatments, and type of insurance are also reported in a descriptive table.

Human Subjects

The proposed involvement of human subjects consists of participants discharged from four oncology units in the study hospital from June 1 to December 31, 2010. The data were retrieved from a computerized system and stored in a security data base. Patient identification information was protected and all data retrieved from the hospital records were stored in secure location by using a password protected in online drive at University of Iowa. None of data was stored in a hard copy. Identities were removed and replaced with an automated number. The approval from the University of Iowa Institutional Review Board (IRB) was granted for the study in March, 2011 (Appendix E).

Summary

This was a descriptive retrospective study. The descriptive design is useful for documenting various characteristics in an oncology population to nursing to gather baseline data on these populations (Brink & Wood, 1998). The data were analyzed with Enterprise Guide 4.3 with SAS 9.3 (Davis, 2007). Data analysis was performed according to each research question. Characteristics of patient (Question One) were addressed by (a) frequencies and percentages for categorical variables, and (b) means, standard deviation, and ranges for continuing variables, each unit and for the overall sample in the oncology population. Box-Cox correction was performed for transforming value of LOS which is not normal distributed. ANOVA was performed and Tukey post hoc test was conducted to examine LOS by unit (Question Two) (Box & Cox, 1964; Kutner, 2005; Moran & Solomon, 2012). Commonly used nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes each unit and for the overall sample (Question Three), were analyzed by using frequencies of percentage. Differences of nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes each unit and for the overall sample, were analyzed using Chi-square tests. Descriptive statistics were described using (a) frequencies and percentages for each NANDA-I, NOC, and NIC each unit and for the overall sample in the oncology population. Frequencies of nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes were reported in percentages for all of the patients as well as by the individual units. The commonly used linkages of NNN (Question Four) were also analyzed by using frequencies or percentages. Chi-square tests with Bonferroni's method (Bailar & Hoaglin, 2012) for multiple comparisons were applied for examining pair patterns in each two NANDA-I

labels, two NOC labels, and two NIC labels. NOC outcome change scores for the most common NOC outcomes **(Question Five)** were analyzed using descriptive statistics. Chapter IV provides the results of the research.

CHAPTER IV

DATA ANALYSIS AND RESULTS

The results of the data analysis are presented in this chapter. Descriptive statistical analysis was used to report patient demographics for Question One. Three methods were considered when LOS as dependent variable was not normal distributed. Box-Cox correction was finally selected to answer whether length of stay (LOS) differs among units to address Question Two. To answer Question Three, descriptive statistical analysis was performed to determine the frequently used nursing diagnoses (NANDA-I), nursing interventions (NIC), nursing-sensitive patient outcomes, (NOC). A Chi-square method was applied to examine any difference of these frequently used SNTs among units and three groups with different LOS. Descriptive statistics and a Chi-square method were also applied to answer Question Four. The descriptive analysis was used to address the most frequent NNN linkages (NANDA-I —NOC—NIC) and a Chi-square method was used to examine a pattern among two of top 15 nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes. Descriptive analysis was applied to address outcome change scores by different groups: unit, age, treatment, and type of insurance.

The study consisted of three informational resources: medical records, tumor registry, and nursing care plan summaries from a 762-bed Midwestern tertiary hospital. Planned nursing care (nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes) were manually retrieved from nursing care plan summaries in the nursing information system. The other two resources were directly retrieved from the EHRs (Electronic Medical Records and local Tumor Registry data). All data were stored

in Microsoft Office 2010 Excel spreadsheets and were analyzed by SAS, Enterprise Guide 4.3 with SAS version 9.3.

Sample

A total of 3,335 hospitalizations provided 2,671 unique patients since some of the 3, 335 patients having multiple admissions over the study period (June1st, 2010 through December 31st, 2010). Patients in the seven-month study period had an average of 1.2 admissions (*SD*=0.7, range= 1–11). Only first admissions for patients with a care plan were entered into the study for analysis. A total of 2,237 individual patients with a care plan, discharged from four specialty units with a diagnosis of cancer or who were under investigation for a possible cancer diagnosis were included in the data analysis.

Analysis of the Research Questions

Research Question One:

What are the characteristics of the patients in the four oncology units of a large hospital?

There are four categories of patient characteristics:

Demographics (age, gender, race, marital status, years of education, and employment status),

Disease information (site of tumor, duration of cancer since first diagnosed, stage of cancer, severity of illness, and risk of mortality),

Hospitalization information (site of initial admission, oncology unit, length of stay, and discharge status), and a

Cost-related variable (type of insurance).

To answer Question One, a descriptive analysis approach was used. Continuous variables, such as age, length of stay (LOS), and length of cancer diagnosis, were reported using means, standard deviation, and range. Categorical variables, such as race, oncology unit, etc., were reported by frequencies and percentage. Table 1 describes the demographics, disease information, hospitalization information, and cost-related variables for all oncology patients. Two variables collected for the study, site of initial admission and Medicare Severity-Diagnosis Related Groups (MS-DRGs) that were identified in the patient record and were not described in the study due to difficulties to identify them into meaningful categories for analysis.

Demographics of Patients

The average age of the patients in the sample was 55 years (*SD*=17, range from 18 to 99). The sample consisted of 1,408 females (63%) and 829 males (37%). The patients were primarily Caucasian (89%), female (63%), married (53%), with 12 to 16 years of education (61%), and retired (26%).

Disease Information

There were 1,300 (58%) patients with a documented cancer diagnosis (ICD-9 CM) in their medical records and 937 (42%) of patients were under investigation for a possible cancer diagnosis. Data from the Tumor Registry, such as length of time since first diagnosis, type of treatment(s) related to cancer, and stage of cancer were limited to malignant tumors and first records for patients documented in the Tumor Registry (*n*=541). Most patients had only one diagnosis of cancer (97%). There were 541 patients with a newly diagnosed malignant cancer within three months of diagnosis (*M*=3.3 months, SD=14.1 months, range = this admission to 18 years since cancer was first

diagnosed). Among these 541 patients, each patient received an average of 2.7 cancer treatments (*SD*=0.8, range=1 – 6). Only six categories of treatments related to cancer were collected. They were chemotherapy, radiotherapy, surgery, hormone therapy, immunotherapy, and/or other treatments. In the data analysis, hormone therapy, immunotherapy, and other therapies were grouping in one category due to fewer patients underwent these treatments.

Only one fourth of the sample had documentation of the site of the tumors because the data were collected from the Tumor Registry and not all patients discharge from oncology units meet the criteria to be included in the Tumor Registry. For example, the Tumor Registry only collects information from patient with malignant cancer. No one cancer site dominated the data, The most common primary site of the cancer for the patients in this study was the head and neck (*n*=137, 6%) but this only accounted for 6 % of the patients. Other cancer sites included the digestive system (*n*=121, 5%), genitourinary sites (*n*=121, 5%), lymphoma (*n*=103, 5%), Leukemia/Other (*n*=76, 3%), Neuroendocrine(*n*=31, 1%), other site (*n*=5, <1%), benign(*n*=164, 7%), carcinoma in Situ (*n*=16, <1%), metastasis (*n*=8, <1%), unknown primary (*n*=8, <1%), with cancer history (*n*=81, 4%), and under investigation (*n*=937, 42%) . Only a total of 548 records from the Tumor Registry with malignant cancer were documented the stage of cancer. Among these patients, the frequencies for patients' stage of the tumor were recurrent cancer or non-specified type (*n*=141, 26%), stage I (*n*=130, 24%), stage III (*n*=89, 16%), not applicable (*n*=83, 15%), stage IV (*n*=44, 10%), stage II (*n*=42, 8%) and stage 0 (*n*=8, 1%). The rest of patients discharged from the four oncology units were either under investigation for a cancer diagnosis, newly diagnosed or had benign results that were not

documented in the Tumor Registry. Based on severity of illness, 68% of patients were mildly to moderately ill; based on risk of mortality, 80% were located in the mild to moderate categories.

Hospitalization Information

Length of stay (LOS) in an oncology unit was used to answer Question Two and Question Five in this study. Length of stay (LOS) was defined as the duration of the hospitalization from the date admitted to an oncology unit until the date of discharge (*SD*= 3.8, range= 4.7–6 days). The Gynecology, Oral Surgery, and Otolaryngology Unit (Unit G) had the highest volume of patients in this study (*n*=1022, 46%), followed by the Medical Surgical Oncology Unit (Unit M, *n*=707, 32%), the Hematology/Oncology and Palliative Care Unit (Unit M, *n*=463, 21%), and the Adult Leukemia and Bone Marrow Transplant Unit (Unit A, *n*=45, 2%). Four categories were used to describe the discharge status of patients: The majority of patients returned to home or self-care (82%, *n*=1840,); 4% (*n*=84) returned to home with health care support services; 10% (*n*=205) were referred to other facilities; and 4% (*n*=98) died during the hospitalization. Additionally, 29% patients were admitted for surgery and 59% received more than two treatments related to cancer.

Type of Insurance

The main types of insurance used by patients in this study was private insurance companies (*n*= 1190, 52%), Medicaid (*n*=785, 35%), followed by Medicare (*n*=241, 11%), and self-pay/uninsured (*n*=21, 1%). Medical Service - Diagnosis Related Group (MS-DRG), another cost-related variable collected, was not addressed to answer this research question due to the variety of categories assigned to these patients.

Research Question Two:

What is the length of stay for patients in each of the four oncology units? Does length of stay differ by units compared to overall length of stay for the other three units?

Are there any differences in length of stay between ***age groups*** (over and under 65 years); ***medical treatment groups***, such as patients receiving surgery procedures (SP), radiotherapy (RT), chemotherapy (CT), other treatments such as hormone therapy, or a combination of treatments above; ***type of insurance*** (Medicare, Medicaid, self-pay/uninsured, or private insurance)?

LOS for All Units and by Unit

To answer Question Two, length of stay (LOS) in oncology unit was used as a dependent variable and a normality test was performed. LOS in this study appeared as a positive skewed distribution and a reverse J-shaped curve (See Figure 2). In order to deal with the violation of the assumption of a normal distribution, three methodologies were applied (Box Correction, negative binomial regression model, and non-parametric analysis). The sample size was sufficient to perform ANOVA with violation of assumption of normal distribution after Box correction. Box-Cox data transformation using SAS 9.3 was performed. The Box-Cox procedure results in best lambda (λ=-0.03), which suggested a logarithmic data transformation (λ=0 as defined). To prevent a negative value, a parametric constant was used (log (LOS+1)). Figure 3 shows the

distribution after data transformation (Box & Cox, 1964; Kutner, 2005; Moran & Solomon, 2012).

Figure 2 shows distribution of length of stay (LOS) as positive skewed to the right (N=2,237, M=3.7, SD=4.6, Q1=1, Median=2, Q3=4, Mode=1, Skewness=4.4, Kurtosis=32.1, Kolmogorov-Smirnov <.01). It is common that LOS showed skewness to the right. Data transformations (e.g., logarithmic methods, square root) would be commonly applied when assumption of normality was violated (Box & Cox, 1964; Kutner, 2005; Moran & Solomon, 2012).

Figure 3 shows the histograph for distribution of LOS after Box-Cox correction (Box & Cox, 1964; Kutner, 2005; Moran & Solomon, 2012). The Box-Cox procedure suggests the best power for data transformation as $\lambda = 0$, which is the same as the logarithmic transformation. To simplify the procedure of data transformation and avoid a negative value, a constant value 1 was used. Logistic data transformation, LOG (LOS+1), was used. After data transformation, Sknewness and Kurtosis for the distribution of LOS were corrected into an inacceptable range (N=2,237, M=1.3, SD=0.6, Q1=0.7, Median=1.1, Q3=1.6, Mode=0.7, Skewness=0.9, Kurtosis=0.6, Smirnov <.01). However, the distribution of LOS is still asymmetric.

Table 2 and Table 3 report descriptive statistics of LOS with different groups based on age, treatment, race, and type of insurance in all and within units. A t-test was applied to the two age groups (18 years $\leq$ age < 65 years, and $\geq$ 65 years) and Analysis of Variance (ANOVA) was conducted on groups with different units, treatments, race, and type of insurance groups. Tukey post-tests were selected for pairwise comparisons. Type of unit (p<.0001), and treatment (p<.0001), age group (p=.01), and type of insurance

(p=.001) were found significant in the sample (Table 2 and Table 3). Unit A had significant longer LOSs than the other three units. Unit M had longer LOSs than Unit G. Patients admitted to oncology units and those whose age was over or equal to 65 had longer LOSs than younger adults. For LOS by the groups with different treatments, the patients received combined treatments with surgery related to cancer (SP), chemotherapy (CT), radiotherapy (RT), and had longer LOSs than those patients receiving other treatments. Patients on Medicaid had longer LOSs than those with other types of insurance.

Figure 2 The Distribution of Length of Stay (LOS) Before Data Transformation

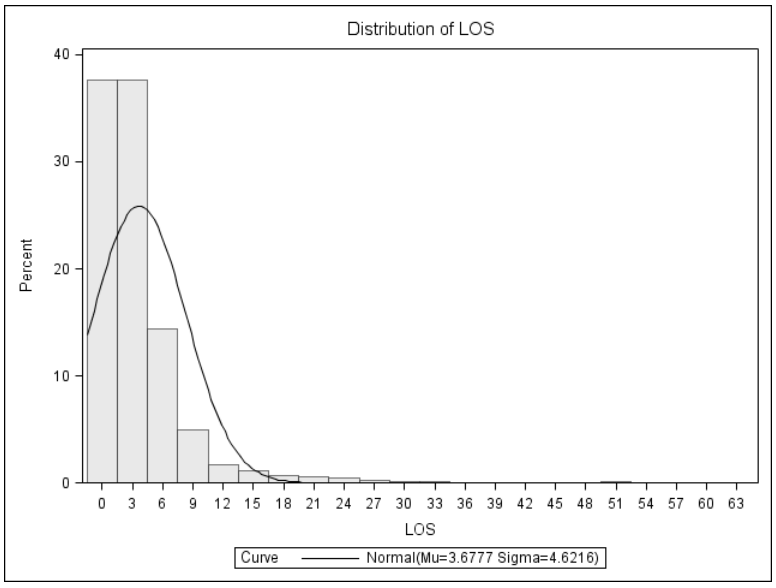
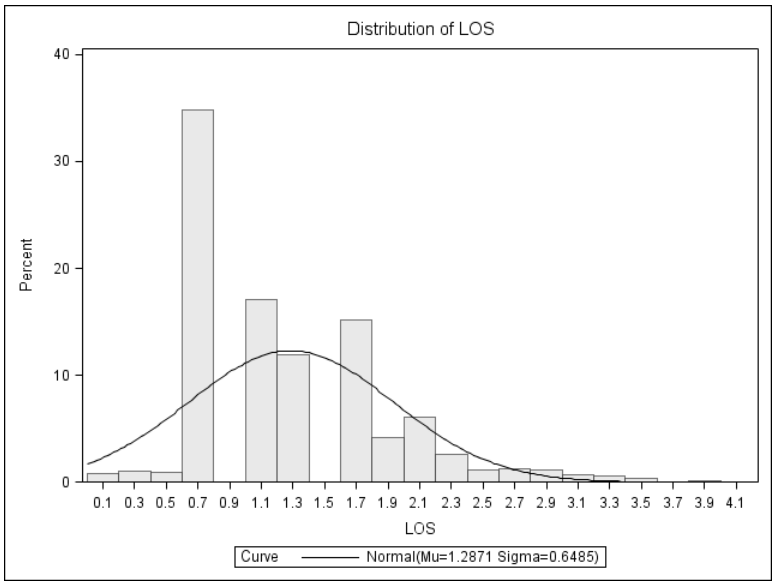


Figure 3 The Distribution of Length of Stay (LOS) After Data Transformation



Research Question Three:

What nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes are frequently used by nurses on each of the four oncology units and overall? What is the relationship between groups of patients defined by the length of stay (≤ 1 day, 1 day ≤ LOS < 3 days, LOS ≥ 3 days) and nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes overall and on each of the four oncology units?

Modified Nursing Diagnoses, Interventions, and Outcomes in the EHRs

'Modified' nursing diagnoses, interventions, and outcomes refer to SNTs used in the study hospital while are not labels in current version of NANTA-I, NIC, or NOC. The existing modified nursing diagnosis, interventions, and outcomes were resulted from two reasons: out-of-date application system for nursing documentation system, and the

specific need of these SNTs in the study hospital. The study hospital has a history of using NANDA-I diagnoses, NIC interventions and more recently, NOC outcomes. The versions in use for NNN in the information system of the study hospital were implemented and updated in 2009, and are based on the following versions: NANDA-I (2007-2008), NIC (5th ed.), and NOC (4th ed.). However, the latest version of NANDA-I nursing diagnoses was released in the spring, 2012, and the hospital has not updated the system to incorporate the new NANDA-I diagnosis. The study hospital modified several labels for NANDA-I diagnoses, NIC interventions and NOC outcomes with additional diagnosis concepts and limited to what was essential for their practice sites to meet the needs.

For example, the study hospital uses a NANDA-I nursing diagnosis as a global term, *Deficient Knowledge,* and delineated it into three more specific nursing diagnoses: *Deficient Knowledge Pre/Post Procedure/Surgery, Deficient Knowledge, Disease Process,* and *Deficient Knowledge, Insulin Therapy.* The first one is a NANDA-I nursing diagnosis and the other four specify the deficient knowledge related to the patient. Based on NANDA-I taxonomy, *Self-Care Deficit* is divided into four concepts: *Bathing: Self-Care Deficit, Dressing: Self-Care Deficit, Feeding: Self-Care Deficit*, and *Toileting: Self-Care Deficit*; while the study hospital included a global diagnosis: *Self-Care Deficit*, which was not approved as a NANDA-I nursing diagnosis.

Several nursing diagnoses were retired from the current edition of NANDA-I classification (Herdman, 2012) but were since being used in the in the hospital software application. These nursing diagnoses were *Disturbed Thought Processes*, and *Disturbed Sensory Perception* and the more specific ones of: *Disturbed Sensory Perception, Visual,*

Disturbed Sensory Perception, Kinesthetic, and *Disturbed Sensory Perception, Auditory. Ineffective Tissue Perfusion* is a diagnosis which specifies an area of focus such as *Cerebral, Cardiac, Pulmonary, Renal* or *Peripheral.* In the current edition only *Ineffective Tissue Perfusion Peripheral* is an accepted NANDA-I nursing diagnosis. Four nursing diagnoses used in the study hospital, *Mood Alteration: Depression, Mood Alteration Mania, Inadequate Oral Food Beverage Intake,* and *Risk for Withdrawal: Alcohol/Drugs,* have never been approved NANDA-I nursing diagnosis. The modifications for nursing interventions or nursing-sensitive patient outcomes are also described when reporting their frequencies. Variations in the use of terms were expected in this study since the data were from 2010. In many cases it took considerable time for the vendor system to update the content as new editions of the classifications were published.

A descriptive analysis was used to answer Question Three: the most frequently used nursing diagnoses, interventions, and outcomes for all units, by unit, and by three groups with different LOSs. First, the average number of nursing diagnoses (NANDA-I), nursing interventions (NIC), nursing-sensitive patient outcome (NOC), and frequencies of NOC outcome ratings for a patient are reported in Table 3. Several tables for nursing diagnoses (NANDA-I), nursing interventions (NIC), and nursing-sensitive patient outcome (NOC) are reported in order: domain and class (Table 4, Table 6, and Table 8), ranking for all units (Table 5, Table 7, and Table 9), ranking by unit (Table 10, Table 12, and Table 14), and ranking found significantly different by unit (Table 11, Table 13, and Table 15). Three tables (Table 16, Table 18, and Table 20) report frequencies and percentage of nursing diagnoses (NANDA-I), nursing interventions (NIC), and nursing-

sensitive patient outcome (NOC) by three groups based on LOS and another three tables (Table 17, Table 19, and Table 21) report significantly found different by LOS group from the earlier three tables. Table 22 reports the top ten NNN linkages. Three appendixes report the links between NANDA-I and NIC, the links between NANDA-I and NOC, and the links between NOC and NIC. Table 23, Table 24, and Table 25 report pattern between two nursing diagnoses, two nursing interventions, or two outcomes, respectively. Table 26 and Table 27 report outcome change scores for *Pain Level* and *Infection Severity.*

In these four oncology specialty units, only 84% of patients (*n*=3,335) had a plan of care documented in the care plan summaries retrieved from the EHRs. In Table 3, nurses on average identified 3.1 nursing diagnoses (*SD*=2.5, range=1–28), 6.3 nursing interventions (*SD*=5.1, Range=2–56), and 3.7 nursing-sensitive patient outcomes (*SD*=2.9, range=1–31) for a patient. Nurses also rated the outcomes of their patients 9.3 times on average (*SD*=13.4, range=1–197) but this varied greatly across different outcomes. Table 4 reflects all nursing diagnoses, interventions, and outcomes. Even though 'modified' SNTs are not labels in current version of NAN-I, NIC, or NOC, they were used in these four oncology units as SNTs. These modified nursing diagnoses, interventions, and outcomes will be noted by superscript letter a or b in relevant tables and are also described in the notes after the tables.

NANDA-I Nursing Diagnoses: All Units

Table 4 describes ranking of frequently used nursing diagnoses by domains and classes; while Table 5 describes the ranking of nursing diagnoses for all units. Two type of percentages were both used. The rankings of both tables are all decided by the amount

of nursing diagnoses for all units for the seven-month study period. A total of 2,237 patients had 7,002 nursing diagnoses over the 7-month study period. A total of 88 different NANDA-I nursing diagnoses were found for these four units. Table 5 describes ranking by frequencies of NANDA-I nursing diagnoses for the four units.

Acute Pain was the top ranked NANDA-I nursing diagnosis. In Table 5, it accounted for 25% of all nursing diagnoses and 78% of the patients in the study were diagnosed with *Acute Pain*. *Risk for Infection* (*n*=710) accounted for 10% of all nursing diagnoses, and 32% of the patients and ranked second. Other nursing diagnoses in the top 10 frequency list were *Nausea, Impaired Skin Integrity, Risk for Falls, Deficient Knowledge: Pre/Post Procedure/Surgery, Activity Intolerance, Deficient Knowledge: Disease Process, Anxiety,* and *Imbalanced Nutrition: Less than Body Requirements*, based on overall percentages of the total list of nursing diagnoses across all units.

The two modified nursing diagnoses, *Deficient Knowledge: Pre/Post Procedure/Surgery* (rank: 6), and *Deficient Knowledge: Disease Process* (rank 8), were more frequently reported than its global term of *Deficient Knowledge* (rank 26) in this study sample. The rest of the modified nursing diagnoses appeared to be 1% or less of the total nursing diagnoses selected. Nurses had used *Ineffective Tissue Perfusion: Pulmonary* on 97 patients (1% of all nursing diagnoses, 4% of all patients, rank: 17) over the seven-month study period. There is no current NANDA-I relevant to *Ineffective Tissue Perfusion: Pulmonary*. Another retired group of diagnoses was selected in the study was *Disturbed Sensory Perception* specified as *Visual, Kinesthetic,* and *Auditory.* A total of seven patients had been diagnosed with these diagnoses. *Disturbed Thought*

Process is another retired NANDA-I nursing diagnosis and was used on 15 patients in the study.

In addition, nurses used nearly 1% of a global descriptive term of *Deficit Self-Care,* rather than approved and specific NANDA-I nursing diagnoses, such as *Bathing: Self-Care Deficit, Dressing: Self-Care Deficit, Feeding: Self-Care Deficit,* and *Toileting: Self-Care Deficit.* The four nursing diagnoses, *Risk for Withdrawal: Alcohol/Drugs* (*n*=10), *Mood Alteration*: *Depression* (*n*=2), *Mood Alteration: Mania* (*n*=1), *Inadequate Oral Food Beverage Intake* (*n*=1), are non-NANDA-I nursing diagnoses.

NIC Interventions: Domains and Classes

Table 6 reports domains and classes of the taxonomy of NIC. Two types of percentages were used and their calculated were the same as the nursing diagnoses. The first percentage ($\%^1$, a sum of nursing interventions on the basis of all units or cumulative frequencies of any time of nursing interventions have been documented even though it can be on the same patients) were calculated twice, while the second percentage ($\%^2$, a nursing intervention that individual had received, and any documented duplicated nursing interventions would be counted as one) was calculated once. Therefore, a discrepancy may occur in $\%^1$ and $\%^2$. Moreover, in Table 4, only one column report as the number of diagnosis or the number of patient had that specific nursing diagnosis; while there were two columns of numbers are reported in Table 6. The discrepancy of numbers was due to duplicate interventions documented under different diagnoses in the same individual. In a word, some patients may have the same interventions linked with different nursing diagnoses, for example, Pain Management for both Acute Pain and Chronic Pain. The first number (n^1), which refers to the count all interventions applied to each diagnoses in

independent patient, including duplicate interventions linked to different diagnoses; and the second number (n^2), which means the count of any of 105 interventions presented in individual patient, excluding duplicate interventions. For example, a patient had the nursing diagnoses of Acute Pain and Chronic Pain. Pain Management were both documented and linked to either Acute Pain or Chronic Pain. Additionally, *Health Education*, was found the only 'modified' nursing intervention and was marked with superscripted letter a in the Table 6.

The taxonomy of NIC has seven domains: Physiological: Basic, Physiological: Complex, Behavioral, Safety, Family, Health System, and Community. In the study, none of the 100 unique NIC interventions were from the Health System or Community domains.

Table 6 reports the distribution of the NIC interventions in their domains (*n*=5) and classes (*n*=22). Ranking of domains for NIC intervention were Behavioral, Physiological: Complex, Physiological: Basic, Safety, and then Family by using the frequencies of NIC labels in domains. However, if individual NIC label is concerned, the most frequently performed NIC interventions was *Fall Prevention* (*n*=742), which is relevant to patient safety. Although domain of Safety had fewer numbers of NIC intervention labels in domains than that in the domain of Behavioral, Physiological: Complex, and Physiological. It is obvious that *Fall Prevention*, *Infection Protection*, *Infection Control*, and *Pressure Management* in the class of Risk Management under the domain of Safety showed higher frequencies, which implies that safety has been emphasized in the four oncology units.

NIC Interventions: All Units

The top nursing interventions identified across four oncology units are described in Table 7. These nursing interventions were selected and based on the nursing diagnoses identified for the patient and the outcomes that were chosen. Two types of percentage (*%*[1] and *%*[2]) were used to describe frequencies of NIC interventions: the first percentage (*%*[1]) was calculated from a frequency of the intervention over a total of frequencies of all interventions for all units (*N*=11,804), and the second percentage (*%*[2]) was calculated from a person with an intervention over total patients (*N*=2,237). The top ten nursing interventions are: *Pain Management, Fall Prevention, Infection Protection, Infection Control, Nausea Management, Nausea Management, Teaching: Procedure/Treatment, Analgesic Administration, Skin Surveillance, Wound Care,* and *Pressure Management*.

There are six NIC interventions relevant to patient safety or risk management in the top ten. They are *Fall Prevention, Infection Protection, Infection Control, Skin Surveillance, Wound Care,* and *Pressure Management*. There only 2% of patients received nursing interventions of *Oral Health Restoration*. There are 18% of patients who received nursing interventions relevant to nutrition: Nutrition Management (8%), Nutrition Therapy (8%) and Nutritional Monitoring (2%).

NOC Outcomes: Domains and Classes

The NOC taxonomy has seven domains at the highest level of abstraction. They are Functional Health, Physiologic Health, Psychosocial Health, Health Knowledge & Behavior, Perceived Health, Family Health, and Community Health. Table 8 presents the NOC outcomes selected for patients in this study in their Domain and Class structure. Two types of percentages are also reported and their calculations are similar with nursing

diagnoses and outcomes. Two types of percentage (*%*[1] and *%*[2]) were used to describe frequencies of NOC outcomes: the first percentage (*%*[1]) was calculated from a frequency of the outcome over a total of frequencies of all outcomes for all units (*N*=8,197), and the second percentage (*%*[2]) was calculated from a person with an outcome over total patients (*N*=2,237). Some patients may have same outcomes linked with different nursing diagnoses, for example, *Pain Level* for Acute Pain and Chronic Pain. Therefore, the column of number ($n^{1)}$ refers to the count all outcomes applied to each o in independent patients (N=2,337) including duplicate outcomes linked to different diagnoses; the column of number ($n^{2)}$ refers to the count of any of 81 outcomes presented individual patient, excluding duplicate outcomes. Therefore, a discrepancy may occur in n^1 and n^2. In addition, *Oral Intake* was the only modified outcomes in the study.

The study identified 81 individual NOC outcomes and a total of 8,197 NOC among 2,237 patients over the seven-month study period. NOC outcomes selected were distributed over six domains of NOC. No outcomes from the Community Health domain were selected by nurses. The 8,197 outcomes were distributed in the six domains of Physiologic Health (*n*=2613, 32%), Perceived Health (*n*=2472, 30%), Health Knowledge & Behavior (*n*=1793, 22%), Functional Health (*n*=947, 12%), Psychosocial Health (*n*=337, 4%), and Family Health (*n*=35, <1%). The top domains that contained the most outcomes selected in this study were: Physiologic Health (*n*=37), Health Knowledge & Behavior (*n*=14), Functional Health, (*n*=12), Psychosocial Health (*n*=12), and Perceived Health (*n*=5), and Family Health (*n*=2). Symptom Status, one of the classes under the domain of Perceived Health had 30% of all NOCs (such as *Pain Level*) selected for oncology patients in the study. Eighty-one of the outcomes were distributed across 24 of

the 31 NOC classes. The class of Cardiopulmonary had the most individual outcomes (*n*=9, Table 8), but the frequencies (6%) were less than the class of Symptom Status (7%) which had four individual outcomes.

NOC Outcomes: All Units

The ranking of the 81 NOCs identified in the study can be found in Table 10. The top three NOC outcomes were *Pain Level*, *Infection Severity*, and *Nausea and Vomiting Severity*, corresponding to the top NANDA-I diagnoses, which were *Acute Pain*, *Risk for Infection*, and *Nausea*. Instead of *Tissue Integrity: Skin and Mucous Membranes* corresponding to the 4th rank diagnosis in NANDA-I, *Impaired Skin Integrity*, the 4th NOC was *Knowledge: Treatment Procedure.* The difference was slightly over 3% evaluated by the nursing-sensitive outcomes of *Knowledge: Treatment Procedure* then *Tissue Integrity: Skin and Mucous Membranes.* In general, NIC and NOC would have been corresponding to their relevant NANDA-I if nurses had made correct decision in planning care for patients. For Example, the nursing intervention, *Pain Management* and outcome, *Pain Level* are associated with the nursing diagnoses, *Acute Pain*, but *Risk for Infection*.

There might be one or two NOC outcomes concurrently linked to the same NANDA-I for a person and also several NOC outcomes linked to a NIC intervention (range=1–4). Therefore, the ranking may be slightly altered due to the second NOC, especially for those linked to the most frequently identified NANDA-I diagnoses, such as *Acute Pain*. However, if the second NOC was not always frequently followed by the first NOC, or not always paired with the first NOC, the ranking between the first and second NOC could be far away from each other in the ranking list, or vice versa. For example,

Pain Level and *Pain Contro*l were common NOC outcomes used for *Acute Pain*, the top NANDA-I diagnosis. *Pain Level* ranked first and *Pain Control* ranked 6th. More patients (57%) had the NOC, *Pain Level*, without *Pain Control.* If two NOC outcomes for the same NANDA-I diagnosis were almost always selected together, the rank may be closer or even next to each other in the ranking list, such as the outcomes, *Knowledge: Fall Prevention* and *Fall Prevention: Behavior* (ranked 7th and 8th) and their relevant NANDA-I diagnosis, *Risk for Falls* (ranked 5th in NANDA-I). In the study, patients with the same nursing diagnoses may have different combinations of nursing interventions and outcomes, and these combinations were easily recognized and represented by the format of SNTs.

Another potential factor for the change of the top NIC interventions or NOC outcomes rankings corresponding to their NANDA-I diagnosis was different NOC outcomes were selected for frequent NANDA-I diagnoses. For patients who experienced *Acute Pain* or *Chronic Pain*, their common NOC outcome was *Pain Level*. *Pain Control* was the second common NOC outcome selected, corresponding to the diagnosis *Acute Pain*, and *Pain: Disruptive Effects* was second common NOC outcome, corresponding its *NANDA-I diagnosis of Chronic Pain*. The outcome *Pain: Disruptive Effects* ranked 33th and its corresponding NANDA-I diagnosis, *Chronic Pain*, ranked 18th. Other well-known problems that patients with cancer usually experience had the following rankings: *Nutritional Status* (8%, rank: 11), *Sleep* (<1%, rank: 36), *Spiritual Health* (<1%, rank: 38), and *Depression Level* (<1%, rank: 71). *Anxiety Level* was the only top ten NOC outcome relevant to the patient's psychosocial dimension that oncology nurses selected for their patients, which account for only 9 % for the overall sample. Malnutrition can be

an issue for hospitalized oncology patients (Gupta et al., 2011, Laky et al, 2010, Lim et al., 2011). In the study, only 9% of patients' *Nutritional Status*, as a nursing-sensitive patient outcome, had been evaluated by nurses. In addition, only 2% of oncology patients in the four units had been evaluated with their *Oral Hygiene*. In the acute setting with LOS equal to 3.7 days on the average in the study sample, it was shorter than the LOS reported in similar oncology populations. Compared to LOS (Range =2-20) in the study of Mansour et al (2011), LOS in the study is slightly shorter.

NANDA-I, NIC, and NOC by Unit

NANDA-I Nursing Diagnoses by Unit

In Table 10, Chi-square tests with Fisher's exact tests (Der & Everitt, 2006) were performed to answer question Three: Do frequencies of NANDA-I diagnoses differ by unit? A post-test Bonferroni's method (Bailar & Hoaglin, 2012) for multiple comparisons (n=105) was applied to adjust the p value at .05. Table 10 shows frequencies and percentage of nursing diagnoses for patients in the four units that were statistically significant. For example, 92% of the patients admitted to the Gynecology, Oral Surgery and Otolaryngology Unit (Unit G) had significantly more patients with *Acute Pain* than the other units. *Acute Pain* was the top nursing diagnosis in Gynecology, Oral Surgery, and Otolaryngology Unit, Hematology/Oncology and Palliative Care Unit, and Medical Surgical Oncology Unit. However, *Risk for Infection* was the most commonly used nursing diagnosis in the Adult Leukemia and Bone Marrow Transplant with *Acute Pain* ranked fourth in this unit. *Acute Pain, Risk for Infection*, and *Nausea* were all in the top five list of nursing diagnoses in the four units. In general, the top ten lists of nursing diagnoses in the four units were similar to each other.

Table 11 provides the ranking of the 87 nursing diagnoses in each unit. There were 32 nursing diagnoses found significant by unit in Table 10. Compared to the ranking of percentages for patients with nursing diagnoses in the other three units in Table 10, in Unit A, the NANDA-I diagnosis, *Impaired Skin Integrity,* is less frequently used, while *Fatigue,* and *Impaired Oral Mucous* were more often in the plan of care.

Among the NANDA-I diagnoses that were significantly different by unit, *Acute Pain* was the top NANDA-I diagnosis in Unit G, Unit H and Unit M and had a higher rank than Unit A (rank 4, Table 11). The nursing diagnosis, *Risk for Falls* in Unit H rank ranked third but was ranked higher in Unit M, Unit A and Unit G.

NIC Interventions by Units

In Table 12, Chi-square tests with Fisher's exact tests (Der & Everitt, 2006) were performed to answer question Three: Do NIC interventions differ by unit. A post-test Bonferroni's method (Bailar & Hoaglin, 2012) for multiple comparisons (n=105) was applied to adjust the p value at .05. The frequencies and percentage of overall nursing interventions on each unit are reported in Table 12. There were 43 nursing interventions found significantly different by unit. Table 13 reports the ranking of the 43 nursing interventions.

Table 13 shows the ranking of the 43 NIC interventions on each unit. *Pain Management* was the top NIC intervention in Unit G, Unit H, and Unit M. *Infection Protection* and *Infection Control* were the top one and two interventions selected in Unit A. The findings corresponded to the NANDA-I diagnoses *Pain Management*, *Infection Protection, and Infection Control* were the most frequently chosen interventions for the plan of care on these units. *Nausea Management* ranks second in Unit G and third in Unit

A, seventh in Unit H, and tenth in Unit M. *Nausea Management* was more frequently used in the plans of care on Unit G and Unit A. *Teaching Procedure/Treatment* was the top interventions in Unit A, with a higher ranking than *Pain Management*, which means this *Deficient Knowledge* may be emphasized in this specialty unit (Adult Leukemia and Bone Marrow Transplant).. It also is very common in the other three (Unit G: rank 5, Unit H: rank 4, Unit M, rank 6). *Skin Surveillance* and *Wound Care* have higher ranks (between rank 5 to rank 7) in Unit G and Unit M. It is surprising that *Skin Surveillance (rank 23)* and *Wound Care (rank 29)* was in a lower rank for patients that had a longer LOS in Unit A. This may be because there were only two patients in Unit A that had the NANDA-I diagnoses, *Integrity Skin Integrity* and none of patients in this Unit had a problem with *Physical Mobility Intolerance*. In Unit A, the interventions *Energy Management*, and *Activity Therapy* were ranked higher than in other three units. *Oral Health Restoration* is another intervention provided by nurses in Unit A that has a higher rank than the other units. *Fall Prevention* was more frequently planned in Unit H and Unit A than Unit M and Unit G. One common feature for the four units is that *Nutrition Management* is not in the top ten ranking of NIC interventions found significantly different by unit.

NOC Outcomes by Unit

A Chi-square test with Fisher's exact test (Der & Everitt, 2006) was performed to answer Question Three: Do frequencies of NOC outcomes differ by unit? Table 14 reports the frequencies and percentages for NOC outcomes by unit. The order of NOC outcomes in Table 15 was the same ranking as Table 14. There were 46 NOC outcomes reported differently by unit. In Gynecology, Oral Surgery, and Otolaryngology Unit,

compared to overall ranking, there were seldom changes. In Hematology/Oncology and Palliative Care Unit, compared to the other three units there was a slight decline in the percentage of use of *Tissue Integrity: Skin and Mucous Membranes.* In this unit the percentage of use increased with *Pain Control*, *Knowledge: Fall Prevention* and *Fall Prevention Behavior* and declined again on the outcome of *Activity Tolerance.* In the *Medical Surgical Oncology Unit*, the percentage of use compared to the other three units but use declined on *Nausea and Vomiting Severity* and use increased on *Knowledge: Treatment Procedure*. It revealed that this unit had a greater priority or more frequent outcomes on *Knowledge: Treatment Procedure* than *Nausea and Vomiting Severity*.

Table 15 reports the ranking of NOC outcomes found significantly different by unit. *Pain Level* was the top NOC outcome on three units but on the Unit A, *Pain Level* ranked third. *Infection Severity* ranked first on Unit A and *Knowledge: Treatment Procedure* was the second ranked NOC outcome due to those patients admitted for procedures on this specialty unit. In Unit G and Unit A, *Nausea and Vomiting Severity* was in the second and third rank, however, in the other two units, Unit H and Unit M, it ranked in seventh and eighth place.

NANDA-I, NIC, and NOC by LOS

To answer Question Three: Do frequencies of nursing diagnoses, interventions, and outcomes differ by LOS groups, Chi-square tests with Fisher's exact tests (Der & Everitt, 2006) were performed. A post-test Bonferroni's method (Bailar & Hoaglin, 2012) was applied to adjust the p value at .05. Chi-square tests for those observations less than 20 were not applied and *p* value were not calculated. Therefore, only frequencies and percentages were presented. Since the distribution of LOS was skewed to the right, instead of using the mean of LOS (M=3.7) as a cutoff time, two cutoff points for LOS (24

hours and 3 days), were selected. The first cutoff point was chosen because of study interests and the second cutoff was because it was close to the mean and equalizes the number between patients with less and more than three-day LOSs. Patients were categorized in three groups.

1) Group One were patients admitted less than 24 hour,

2) Group Two were patients hospitalized from one to three days, and

3) Group Three were patients that stayed more than three days.

Table 16, Table 17, and Table 18 describe the frequencies of nursing diagnoses (NANDA-I), interventions (NIC), outcomes (NOC), and their relationship with LOS.

NANDA-I Nursing Diagnoses by LOS

Table 16 shows that nurses had planned care for 61 patients (3%) who were admitted for less than 24 hours (Group One). Specifically, 40 (66%) of patients in this group had a nursing diagnosis of *Acute Pain.* Nearly 80% of patients had *Acute Pain* in Group Two, and 76% in Group Three. *Acute Pain* did not show any different percentage across the three LOS groups, which means human response to *Acute Pain* for cancer patients was consistent across hospitalizations regardless of length of stay. There were 15 out of the 88 NANDA-I diagnoses that had a significant relationship related to LOS in the three categories. Among the 15 diagnoses, they all appeared in the same pattern. The patients with longer LOSs had higher frequencies of those specific nursing diagnoses (Group Three > Group Two> Group One) except for the diagnosis of *Diarrhea* which was documented in the same number in the Group One and Group Two (n=3). For these 15 nursing diagnoses, there was a significant difference in three LOS groups: three related to the respiratory system (*Ineffective Airway Clearance*, *Impaired Gas Exchange*, and *Ineffective Tissue Perfusion: Pulmonary)*, three related to the gastrointestinal system

(*Nausea, Risk for Constipation,* and *Diarrhea),* two related to physical activities *(Impaired Physical Mobility and Activity Intolerance), and others(Deficient Knowledge, Disease Process, Anxiety, Imbalanced Nutrition: Less than Body Requirements, Risk for Impaired Skin Integrity, Chronic Pain, Risk for Imbalanced Fluid Volume, and Diarrhea)*

However, 12 of them showed percentages (column%) in Group One that were greater than Group Two. They were *Activity Intolerance, Deficient Knowledge, Disease Process, Anxiety, Imbalanced Nutrition: Less than Body Requirements, Ineffective Airway Clearance, Impaired Gas Exchange, Risk for Impaired Skin Integrity, Impaired Physical Mobility, Ineffective Tissue Perfusion: Pulmonary, Chronic Pain, Risk for Imbalanced Fluid Volume, and Diarrhea.* Three nursing diagnoses related to the respiratory system were found significantly related to LOS and were all in this category.

NIC Interventions by LOS

In Table 18, 20 out of the 100 NIC interventions demonstrated significant relationships between the three LOS groups. These nursing interventions were aligned with nursing diagnoses also found to be related to LOS. They *were Fall Prevention, Infection Protection, Infection Control, Nausea Management, Energy Management, Activity Therapy, Exercise Promotion: Strength Training, Anxiety Reduction, Nutrition Management, Nutrition Therapy, Ventilation Assistance, Teaching: Disease Process, Bowel Management, Diet Staging, Airway Management, Airway Suctioning, Acid-Base Management: Respiratory Acidosis, Acid-Base Management, Fluid Monitoring,* and *Circulatory Care: Venous Insufficiency.* They also showed the same pattern with higher frequencies in longer LOSs. However, 14 out of 20 showed higher column percentage in Group One (less than 24 hour admission) than in Group Two (Stayed one to three days).

They were *Fall Prevention, Energy Management, Activity Therapy*, *Exercise Promotion: Strength Training, Anxiety Reduction, Nutrition Management, Nutrition Therapy, Ventilation Assistance, Teaching: Disease Process, Airway Management, Airway Suctioning, Acid-Base Management: Respiratory Acidosis, Acid-Base Management*, and *Fluid Monitoring.* LOS was not associated with patients who received the intervention *Pain Management*.

NOC Outcomes by LOS

In Table 20, 15 NOC outcomes showed significant differences in the three groups based on LOS. Since nursing interventions and nursing-sensitive patient outcomes aligned with nursing diagnoses, similar findings were expected. They were *Infection Severity, Nausea and Vomiting Severity, Knowledge: Treatment Procedure, Knowledge: Fall Prevention, Fall Prevention: Behavior, Activity Tolerance, Anxiety Level, Nutritional Status, Knowledge: Illness Care, Gastrointestinal Function, Respiratory Status: Airway Patency, Respiratory Status: Gas Exchange, Tissue Perfusion: Pulmonary, Hydration,* and *Bowel Elimination.*

Frequencies of these NOC outcomes and their association with LOS also showed the same patterns: higher frequencies in longer LOSs. However, 12 NOC outcomes appeared to have higher percentage (column%) in Group One (less than 24 hour admission) than in Group Two (Stayed one to three days). While certain outcomes tended to be reported in patients with longer LOSs, such as *Infection Severity,* and *Nausea and Vomiting Severity, Gastrointestinal Function*. Some outcomes tended to be addressed in patients with either shorter LOS (< 24 hours) or longer LOS (>3 days). This can be described as the More-Less-Medium or the Less-More-Medium pattern. The first pattern

includes *Knowledge: Fall Prevention*, *Fall Prevention: Behavior*, *Activity Tolerance, Anxiety Level, and Nutritional Status.* The latter pattern includes *Respiratory Status: Airway Patency* and *Respiratory Status: Gas Exchange,* and *Tissue Perfusion: Pulmonary* and *Knowledge: Illness Care, and Bowel Elimination.*

Patients evaluated with *Pain Level* had no significant difference based on LOS. Patients with longer LOSs tended to have *Infection Severity* as an outcome. Patients with LOSs of less than 24 hours tended to have outcomes related to the respiratory system, such as *Respiratory Status: Airway Patency* and *Respiratory Status: Gas Exchange,* and *Tissue Perfusion: Pulmonary.* Patients with longer hospitalizations tended to have outcomes related to the gastrointestinal system. Outcomes including *Knowledge: Illness Care, Hydration,* and *Bowel Elimination* were reported most frequently on patients admitted either less than 24 hours or longer than three days.

Table 20 reports the top ranking of NOC outcomes found significant in the LOS groups. For patients with less than a 24 hour LOS, *Knowledge: Treatment Procedure* was the most commonly used NOC. Moreover, in the top five, three outcomes (*Respiratory Status: Airway Patency, Respiratory Status: Gas Exchange, Tissue Perfusion: Pulmonary*) were related to respiratory system. *Infection Severity* was the top NOC outcome when LOS was longer than one day. *Nausea and Vomiting Severity* was ranked as tenth when LOS was less than 24 hours; however, when admitted for more than one day, it moved up to the second place followed by *Infection Severity*. *Anxiety Level* was the only NOC outcome related to the psychosocial perspective. As LOS increased the ranking order of *Anxiety Level* moved from the 11th, then 6th and then to 8th place. *Knowledge: Fall Prevention* and *Fall Prevention: Behavior* were ranked in the 6th and 7th places, and then moved up to the

3rd and the 4th, and then the 4th and 5th places as LOS increased. *Nutritional Status* was first ranked in 12th place, and then stayed at 7th if LOS was more than one day. *Hydration* stayed in the 13th or 14th placement. *Knowledge: Illness Care* ranged from 8th to 10th place in different groups of LOS. *Bowel Elimination* was stable in the 14th or 15th places in the different groups based on LOS. In general, the ranking of the NOC outcomes changed as LOS changed, however, the content of the top 15 NOC outcomes in the list were similar in the three LOS groups.

Pattern of NNN Linkages

Research Question Four:

What are the most frequently used linkages of NANDA-I, NIC, and NOC in oncology?

To answer Question Four, a descriptive analysis was used to report the top ten NNN linkages and Chi-square tests with Fisher's exact test (Der & Everitt, 2006) were performed to examine any two top 15 NANDA-I diagnoses, any two top 15 NIC interventions or any top 15 NOC outcomes that showed in the same patient in the study sample. The selected NANDA-I diagnoses, NIC interventions, and NOC outcomes were based on each of its own ranking over a total number of nursing diagnoses, nursing interventions, or nursing-sensitive patient outcomes for all units (Table 5, Table 7, and Table 9). If two of selected nursing diagnoses were either in a similar scope or both are frequently relevant to the same diagnoses, the second nursing diagnosis was excluded from the list. The same criterion was applied to selection of the top 15 NIC interventions, and the top NOC outcomes in the analysis. Bonferroni's method (Bailar & Hoaglin, 2012) for multiple comparisons (n=105) were applied to adjusted p value at .05.

Table 21 reports the most frequently used linkages of NANDA-I, NIC, and NOC (*n*=1,735) by a descriptive analysis. Three tables from descriptive analyses report the links between nursing diagnoses, nursing intervention and nursing sensitive patient outcomes in detail are reported in Appendixes (APPENDIX E. LINKS OF NANDA-I AND NIC, APPENDIX F. LINKS OF NANDA-I AND NOC, and APPENDIX G. LINKS OF NOC AND NIC). The linkages of NANDA-I, NIC, and NOC were also reported from a descriptive analysis. The linkages of rank two and rank three are *Risk for Infection* and their two different NIC interventions (*Infection Protection* and *Infection Control*) and a NOC outcome (*Infection Severity*), whose frequencies are both less than half of the most frequent linkage combination. The linkage of *Nausea* (NANDA-I), *Nausea Management* (NIC) and *Nausea and Vomiting Severity* (NOC) rank fourth. The top five was another variation of *Acute Pain*, linking with the same NIC intervention (*Pain Management)* but a different NOC outcome (*Pain Control).* The top six and seven are the NANDA-I diagnosis of *Impaired Skin Integrity*, linking with two different NIC interventions (*Skin Surveillance*, and Would Care), and the same NOC outcome (Tissue Integrity: Skin and Mucous Membranes). The top eight and nine are the NANDA-I diagnosis of *Risk for Falls*, linking with the same NIC intervention (*Fall Prevention),* and two different NOC outcomes (*Knowledge: Fall Prevention,* and *Fall Prevention: Behavior).* The tenth rank is the NANDA-I diagnosis of Deficient *Knowledge Pre/Post Procedure/Surgery, linking with a NIC intervention* (Teaching: Procedure/Treatment), and a NOC outcomes *(Knowledge: Treatment Procedure). In the top ten links, there are only six different nursing diagnoses (Acute Pain, Risk Infection, Impaired Skin Integrity,* and *Risk for Falls),* and their links with either two different NIC interventions or two

different NOC outcomes. In the study, the NANDA-I *diagnosis of Impaired Skin Integrity* reports the most consistent links with four NIC interventions (*Wound care, Pressure Management, Skin Surveillance,* and *Pressure Ulcer Care*). There were plenty of examples of two NOC outcomes linked to a NANDA-I diagnoses and will be detail in the study, for example, *Pain Level* and *Pain Control.*

To examine any two combinations from the top 15 nursing diagnoses, interventions, and outcomes from Table 5, Table 7 and Table 9, Chi-square tests with Fisher's exact test (Der & Everitt, 2006) were applied and 105 comparisons were conducted with Bonferroni's method (Bailar & Hoaglin, 2012) for *p* value at .05. Frequencies, cell percentages, row percentages and column percentages of 105 comparisons between two nursing diagnoses, two nursing interventions and two outcomes are reported in Table 23, Table 24, and Table 25, respectively. Row percentages are the percentages for that value of the row variable corresponding to each of the column variable values. Colum percentages are the percentages for that value of the column variable corresponding to each of the row variable values. For example, in a cross-tabulation analysis (two-way table or 2 X 2 table) for two nursing diagnoses, *Acute Pain* (row variable) and *Risk for Infection* (column variable) in Table 23, there are 24% (cell percentage) of patients both with *Acute Pain* and *Risk for Infections*. For all patients with *Acute Pain*, there are 30% (row%) of them with *Risk for Infection*. For all patients with *Risk for Infection*, there are 74% (column%) of them with *Acute Pain*.

In this study, two concurrent nursing diagnoses, or two concurrent nursing interventions, or two concurrent nursing-sensitive patient outcomes will be reported in the following sections. For example, there are 15 diagnoses selected (A to N) in the

analysis for concurrent pattern. The findings are addressed as one has nursing diagnosis A and then he or she may have the second one (B, or C, or D, or D, ……or N) if the findings are significant by Chi-square tests with Fisher's exact test. After a completion of diagnosis A, repeat the same procedure on diagnosis B and the second concurrent diagnosis with the Chi-square tests with Fisher's exact test from diagnosis B to diagnosis N.

Patterns of Nursing Diagnoses (NANDA-I) Combinations

In Table 23, in a total sample of 2,237 patients, 528 patients (24%) had the nursing diagnoses of *Acute Pain* and *Risk for Infection*. For patients having a nursing diagnosis of *Acute Pain*, 30% (row %) of them had a nursing diagnosis of *Risk of Infection*; and for patients having a diagnosis of *Risk of Infection*, 74% (col %) of them had a nursing diagnosis of *Acute Pain*. The finding is not significant after adjusted p at .0005. This means that patients having a nursing diagnosis of *Acute Pain* did not have a significant association with having the diagnosis of *Risk for Infection*. No association was found between patients with *Acute Pain* and other common nursing diagnoses, such as *Risk for Falls, Activity Intolerance, Anxiety, Ineffective Airway Clearance, Risk for Imbalanced Fluid Volume,* and *Grieving).* The findings of two concurrent nursing diagnoses on the same patients in the study may assist an initial interpretation of symptom cluster for this oncology population.

Table 23 shows the patterns of nursing diagnoses. Patients with *Acute Pain* usually had additional diagnoses of *Nausea, Impaired Skin Integrity, Deficient Knowledge Pre/post Procedure/Surgery, Imbalanced Nutrition: Less than Body Requirement, Fatigue, Risk for Constipation, or Urinary Retention.* Patients with *Risk for*

Infection usually had *Impaired Skin Integrity, Risk for Falls, Deficient Knowledge Pre/post Procedure/Surgery, Activity Intolerance, Anxiety, Imbalanced Nutrition: Less than Body Requirement, Fatigue, Risk for Constipation,* and *Risk for Imbalanced Fluid Volume.* Patients with *Nausea* usually had *Activity Intolerance, Anxiety, Imbalanced Nutrition: Less than Body Requirement, Fatigue, Risk for Constipation,* or *Urinary Retention*. Patients with *Impaired Skin Integrity* usually had *Risk for Falls, Deficient Knowledge Pre/post Procedure/Surgery, Activity Intolerance, Anxiety, Fatigue, Risk for Constipation,* or *Risk for Imbalanced Fluid Volume*. Patients with *Risk for Falls* usually had *Deficient Knowledge Pre/post Procedure/Surgery, Activity Intolerance, Anxiety, Imbalanced Nutrition: Less than Body Requirement, Risk for Constipation, Risk for Imbalanced Fluid Volume,* or *Grieving*. Patients with *Deficient Knowledge Pre/post Procedure/Surgery* usually had *Activity Intolerance, Anxiety, Risk for Constipation, Risk for Imbalanced Fluid Volume,* or *Urinary Retention*. Patients with *Activity Intolerance* usually company with *Anxiety, Imbalanced Nutrition: Less than Body Requirement, Fatigue, Risk for Constipation, Risk for Imbalanced Fluid Volume, Urinary Retention*, or *Grieving*. Patients who experienced *Anxiety* also along with *Imbalanced Nutrition*: *Less than Body Requirement, Fatigue, Ineffective Airway Clearance, Risk for Imbalanced Fluid Volume*, or U*rinary Retention*. Patients who suffered from *Imbalanced Nutrition: Less than Body Requirement* also experienced *Risk for Imbalanced Fluid Volume*, or *Urinary Retention*. Patients who were diagnosed for *Risk for Constipation* also had problems with *Risk for Imbalanced Fluid Volume*, or *Urinary Retention*. Nursing diagnoses for *Ineffective Airway Clearance* or *Grieving* were often selected together. *Risk*

for Imbalanced Fluid Volume and *Urinary Retention* were also frequently diagnosed on the same patients.

Pattern of Nursing-Sensitive Patient Outcomes (NOC) Combinations

To answer Question Four: patterns of two nursing outcomes combinations, Chi-square tests with Fisher's exact tests (Der & Everitt, 2006) and Bonneroni's connection for a multiple comparison (Bailar & Hoaglin, 2012) were applied to explore two concurrent nursing-sensitive patient outcomes for the same patient. The 15 top NOC outcomes were selected after excluding the second outcomes that describe a similar scope or outcomes that are relevant to the same diagnosis. For example, *Pain Control* was excluded if *Pain Level* was selected. All the procedures were identical to previous methods for identifying patterns of NANDA-I diagnoses and patterns of NIC interventions. Table 26 shows the frequently paired nursing-sensitive patient outcomes (NOC). The findings are similar to the patterns of NIC interventions since they were based on related nursing diagnoses (NANDA-I).

Patients with a NOC outcome of *Pain Level* had an additional outcome in the study sample. They are *Nausea and Vomiting Severity, Tissue Integrity: Skin and Mucous Membranes, Nutritional Status, Urinary Elimination,* or *Coping*. Patients with a NOC outcome of *Infection Severity* had an additional outcome, such as *Knowledge: Treatment Procedure, Tissue Integrity: Skin and Mucous Membranes, Knowledge: Fall Prevention, Activity Tolerance, Anxiety Level, Nutritional Status, Hydration, and Oral Hygiene*. Patients with a NOC outcome of *Nausea and Vomiting Severity* also had an additional NOC outcome, such as *Activity Tolerance, Anxiety Level, Nutritional Status, Respiratory Status: Airway Patency, Urinary Elimination,* or *Oral Hygiene*. Patients with a NOC

outcome of *Knowledge: Treatment Procedure* had an additional outcome, such as *Tissue Integrity: Skin and Mucous Membranes, Knowledge: Fall Prevention, Activity Tolerance, Anxiety Level, Nutritional Status, Hydration,* and *Oral Hygiene*. Patients with a NOC outcome of *Tissue Integrity: Skin and Mucous* had an additional outcome, such as *Knowledge: Fall Prevention, Activity Tolerance, Anxiety Level, and Hydration*. Patients with a NOC outcome of *Knowledge: Fall Prevention* had an additional outcome, such as *Anxiety Level, Nutritional Status, Hydration,* and *Grief Resolution.* Patients with a NOC outcome of *Activity Tolerance* had an additional outcome, such as *Anxiety Level, Nutritional Status, Hydration, Urinary Elimination, Coping,* or *Oral Hygiene*. Patients with a NOC outcome of *Anxiety Level* also had an additional NOC outcome, such as *Activity Tolerance, Nutritional Status, Urinary Elimination,* or *Oral Hygiene*. Patients with a NOC outcome of *Nutritional Status* had an additional outcome, such as, *Hydration, Urinary Elimination, Coping,* or *Oral Hygiene*. Patients with a NOC outcome of *Respiratory Status: Airway Patency* had an additional outcome, such as *Grief Resolution*. *Hydration and Urinary Elimination* are also chosen together in the patients of the study.

Patterns of Nursing Interventions (NIC) Combinations

To answer Question Four: any patterns of two NIC intervention combinations, Chi-square tests Fisher's exact tests (Der & Everitt, 2006) were applied or Bonferoni's correction (Bailar & Hoaglin, 2012) was used. All selection procedures or criteria were the same as those for the previous questions related to pattern of two nursing diagnoses combinations. Table 24 reports 105 multiple comparisons from top unique NIC interventions. NICs were selected from the top rankings; however, the researcher

excluded any second NIC with a similar concept. For example, *Wound Care* was excluded since *Skin Surveillance* was selected due to the study interest was between pairs with different concepts. Table 24 lists nursing interventions (NICs) frequently selected for the same patients. The findings were not different from what was found for nursing diagnoses due to nursing interventions were based on related nursing diagnoses (NORA-I).

Table 24 describes the patterns of nursing interventions combinations. The patient who received the intervention *Pain Managements* also had *Infection Protection, Nausea Management, Skin Surveillance, Energy Management, Nutrition Management, Bowel Management, Fluid Management, Urinary Retention Care.* Patients received a nursing intervention as *Fall Prevention,* had also *Infection Protection, Teaching: Procedure/Treatment, Skin Surveillance, Energy Management, Anxiety Reduction, Nutrition Management, Temperature Regulation, or Oral Health Restoration.* Patients receiving a nursing intervention as *Infection Protection* also had *Teaching: Procedure/Treatment, Skin Surveillance, Energy Management, Anxiety Reduction, Nutrition Management, Bowel Management,* or *Urinary Retention Care*. Patients receiving the nursing intervention *Nausea Management* also had an additional intervention: *Anxiety Reduction, Ventilation Assistance, Bowel Management,* or *Urinary Retention Care*. Patients receiving the nursing intervention *Teaching: Procedure/Treatment* had an additional nursing intervention. They are *Skin Surveillance, Energy Management Temperature Regulation, Anxiety Reduction, Nutrition Management,* or *Temperature Regulation*. Patients receiving the nursing intervention *Skin Surveillance* also had an additional intervention: *Anxiety Reduction, Bowel*

Management, Fluid Management, or *Temperature Regulation*. Patients receiving the nursing intervention *Energy Management* also had *Anxiety Reduction, Nutrition Management, Ventilation Assistance, Bowel Management, Fluid Management, Urinary Retention Care, Ventilation Assistance, or Temperature Regulation*. Patients receiving the nursing intervention *Anxiety Reduction* also had *Nutrition Management, Ventilation Assistance,* or *Oral Health Restoration*. Patients receiving the nursing intervention *Nutrition Management* also had *Bowel Management, Fluid Management*, or *Temperature Regulation*. Patients receiving the nursing intervention *Bowel Management* also had *Urinary Retention Care, or Temperature Regulation. Patients receiving* the nursing intervention *Fluid Management* also had *Temperature Regulation* in this study sample.

Research Question Five:

What patient characteristics are associated with positive, no change, or negative nursing-sensitive patient outcome change scores at discharge associated with patient's most common nursing diagnoses?

The study hospital selected several outcome indicators for each NOC outcome. Nurses document an overall rating from one to five based on these selected indicators.

Outcome Change Scores for Pain Level

To answer Question Five, a descriptive analysis for both *Pain Level* and *Infection Severity* for all units and by unit and a chi-square test for *Pain Level* by unit were performed. The outcome *Pain Level* was selected because it was associated with the primary nursing diagnosis selected for oncology patients in the study. *Infection Severity* was the most common NOC outcome in Adult Leukemia and Bone Marrow Transplant (Unit A). An outcome change score is calculated from two outcome rating scores (an

outcome change score = outcome rating at discharge – a baseline outcome rating at admission). Outcome change scores require two scores. In this study, outcome ratings at admission and at discharge were selected to examine outcome change scores. The calculation of an outcome change score requires that a patient must have at least two outcome ratings. Since the NOC scores are from one to five, an outcome change scores may range from negative four to positive four. Finally, six categories of outcome change scores were used (≤-3, -2, -1, 0, 1, ≥2). There were two collapsed categories due to few observations in those categories.

Table 27 shows the distribution of outcomes change scores for *Pain Level* in patients with the diagnosis of *Acute Pain* by different characteristics of patients: gender, age, treatment and LOS. A total of 1,057 patients had at least two NOC outcome ratings for *Pain Level*. Overall, the majority of change scores of patients either remained the same (*n* = 415, 35%), or had a +1 change score (*n*=366, 35%). There were 11% of patients (*n*=118) had a +2 change score and 3% had a +3 or higher change scores (*n*=2.93). There were 10% of patients (*n*=105) that had a -1 outcome change score and 2 % (*n*=22) that had a -2 or lower change score.

Outcome change scores for the majority of females and males remained the same score or have +1 increase in rating. Generally, the Caucasians had full range of change scores from -4 to +4. Specifically, 35% (*n*=366) of them remained the same, 30% (*n*=316) had +1 outcome change score improvement, and 10% (*n*=101) had +2 outcome change score improvement. The majority of African Americans had no change (*n*=23, 2%) or a +1 change score improvement (*n*=9, 1%).

Adults between 18 years and 65 years old remained the same or had a +1 outcome change score improvement (27 % for each). Adults older than 65 years old frequently had the same outcome scores and positive outcome change scores (20% in total). For all recorded *Pain Level* and treatments for cancer, there were no outcomes documented less than negative two. There were 60% surgical patients had either no change or had positive change scores for Pain Level. There were only four patients under mixed treatments and they had either a negative one or remained the same change scores. There were four patients under radiotherapy and four had positive one outcome scores. Three had negative one outcome change score for mix treatment and only one remained the same.

For patients who stayed less than 24 hours, they seemed to have less outcome score documented. A smaller percentage of those patients had apparent improvement of outcome change scores in this group. The outcome change scores for this group who stayed less than 24 hours ranges from <= -2 to +1. Majority of patients had outcome scores located with the same score or positive one. There were 23% patients with LOS more than one day and less than the average LOS (*M*=3.7) that had outcome scores remain the same outcome scores.

Figure 4 shows the distribution of outcomes change scores for *Pain Level*. It shows nearly half of patients (49%) discharged from the four oncology units had less pain, 39% had no change in Pain Level outcomes change scores, and 12% reported more pain than at admission. Most patients who reported less pain had a change score of a positive one (35%). Most patients discharged from Unit G, Unit H, and Unit A reported no change in the NOC outcome, *Pain Level*. Unit M is the only unit where the percentage of patients had a positive change score was higher than that of patients retain the same

outcome ratings. The most patients in the other three units, Unit G, Unit H, and Unit A had no change in the scores based on the difference between the first rating and last rating in the hospitalization. Unlike the histograms for Unit G, Unit H, and Unit M, the one for Unit A had a greater spread in these six categories of change scores, which means their patients, were more evenly distributed to each category. Unit H, Unit M, and Unit A show less spread, or a higher percentage of patients discharged from these three units were located in the categories of either the same or have +1 in change scores. There may be a potential bias due to its smaller sample of unit A than other three units.

Outcome Change Scores for Pain Level

Table 27 and Figure 5 show outcome change scores for patients who had the NOC outcome, *Infection Severity*. There were 42% of patients that had less severity at discharge for the NOC outcome, *Infection Severity*, 38% had no change and 20% infection became more severe at discharge for all units. Figure 5 provides a visual tool to explore the distribution of frequencies of outcome change scores for all units and for each. Instead of the number of patients who are grouped in six categories for different outcome change scores, the distribution of percentages for each unit was used to compare the improvement of a NOC outcome. This is because the number of patients differs hugely from a unit to another unit. Therefore, the percentage of outcome change scores was used for a unit comparison.

Compared to the distribution of percentage for each unit itself, both Unit M and Unit A reported a higher percentage of patients had less pain at discharge. Unit M had higher percentage (56%) of discharge patients reporting less severity of infection, and followed by Unit H (40%), Unit A had (37%) and Unit G (31%). Unit G had 47% of

patients who had not changed in their severity of infection as the highest percentage of 'No Change' in four units, Unit H had 41%, Unit M had had 30%, and unit M had 28%. In Unit M, there is twice of the number of patients who had decrease their infection severity than patients who had a greater degree of no change. Regarding the ranking of percentage of patients with more severity of infection at discharge, Unit A was the top, followed by Unit H (3.2%), Unit M (3.8), and Unit G (3.2%). Based on the percentage of patients that had infection severity at discharge, Unit A is in the top rank (33%), followed by Unit A (3.8), Unit M (4.2%) and Unit G (3.2%). Unit M had a higher percentage of patients with much less degree of infection severity and the lowest percentage of patients with more infection severity at discharge. Therefore, generally, Unit M had better performance in outcome change scores in NOC outcome, *Infection Severity* that relevant to NANDA-I diagnosis of *Risk for infection*. Unit A, compared to other three units, had higher percentage (6.7% and 23.3%, respectively) in the extreme positive (≥3) and negative outcome change scores ≤ (-2).

In general, on a basis of outcome change scores for *Pain Level* and *Infection Severity*, most patients in Unit G tended to have no change in their scores at discharge, compared to the status at admission. Unit M had a higher percentage of patients that improved their pain and decreased the severity of infection scores than the other three units. Unit A had a lower percentage of patients showing improvements and a higher percentage of worsening situations at discharge than the other three units in most cases. Additionally, the histogram for Unit A shows much less discrepancy of percentages of change scores among the six categories of outcome change scores for *Pain Level* and it also had a likely W-shaped histogram for *Infection Severity*.

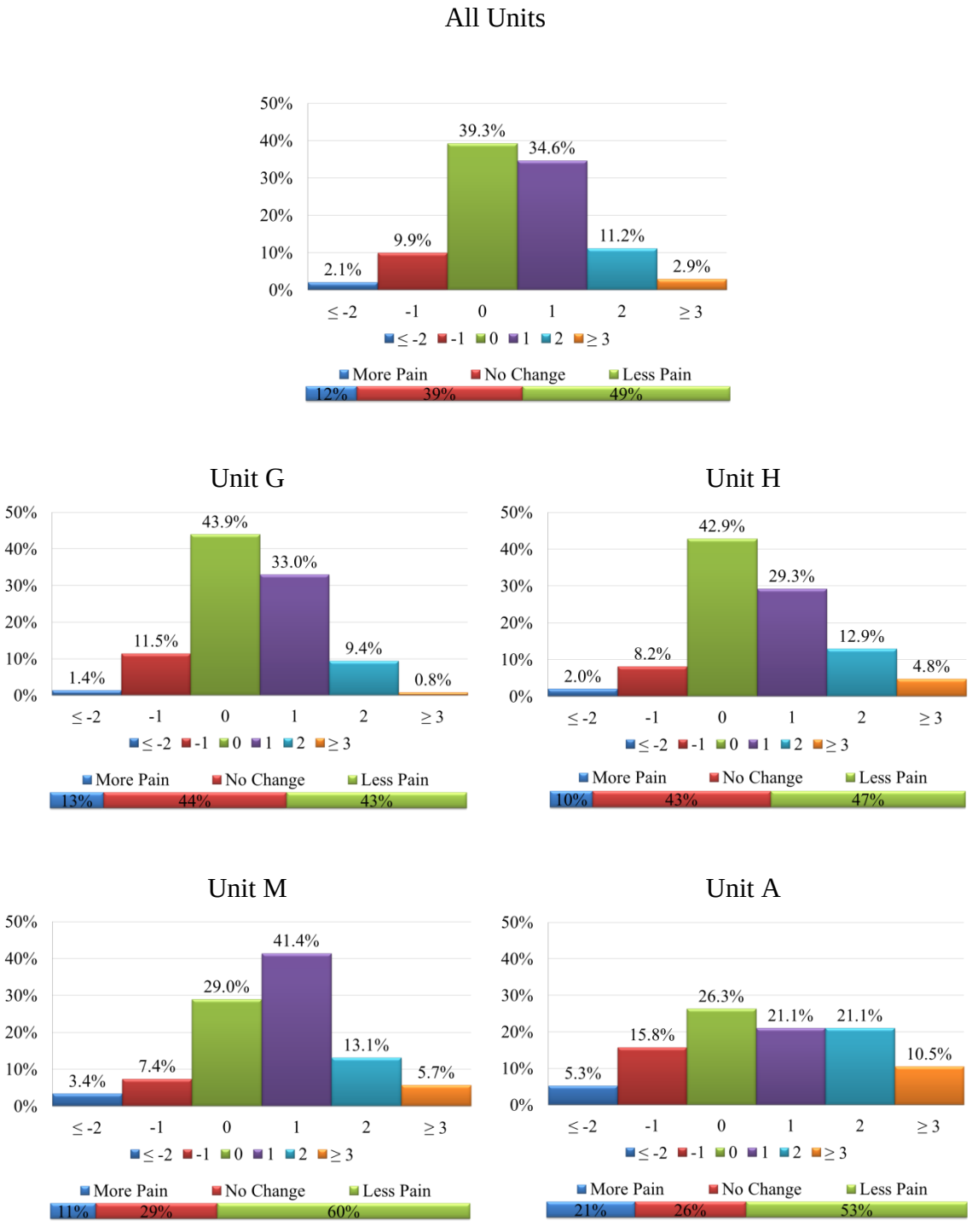
Summary

The study sample was on average 55 years old, mainly Caucasian, married, retired, and had private insurance coverage. The majority of the inpatients were newly

diagnosed with cancer or undergoing investigation. Most of their risk of mortality (80%) was mild to moderate. Nearly four fifths returned to their home with self-care and 4% of them expired in hospital.

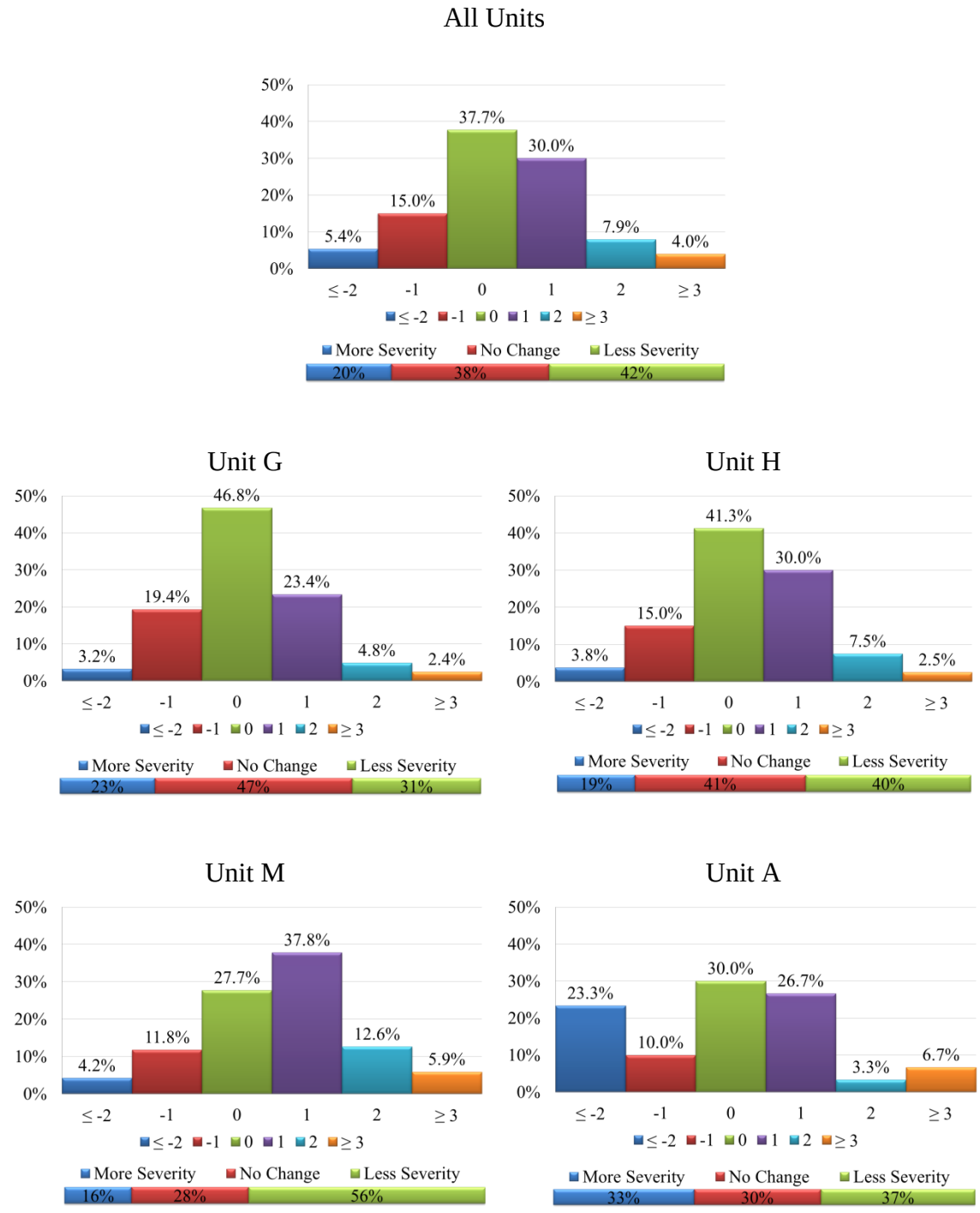
Patients in Unit A tend to have longer LOSs than the rest of the three units. Patients with combined SP, RT and CT had longer LOS than the patients who received other treatments. Except for the Unit A whose top ranked nursing diagnosis was *Risk for Infection, Acute Pain* was reported as the most frequent nursing diagnosis in the other three units. The most frequent linkages of NNN was *Acute Pain—Pain Management—Pain Level*. For most patients diagnosed with *Acute Pain*, their percentages of NOC outcome change scores in six categories (≤-2, -1, 0, 1, 2, ≥3) were not changed by gender, age group, race, treatment, and type of insurance. However, from the histograms for distribution of two NOC outcomes, *Pain Level* and *Infection Severity*, their distribution of change scores portrayed in different shapes by unit. Patients in the Unit A tend to have less improvement in their change scores for the outcome *Infection Severity* compared to the other three units. The final chapter will discuss the results of this study and suggest implications for practice, education and research

Figure 4 NOC Outcome Change Scores for Pain



Note. n=1,057

Figure 5 NOC Outcome Change Scores for Infection Severity



Note. *n*=353

Table 1 Demographics, Disease Information, Hospitalization Information, and Type of Insurance

Demographics	*n*	Mean ± SD (Range)
Age (years)	2,237	54.5 ± 16.9 (18–99)
	n	*%*
Gender		
Female	1,408	63
Male	829	37
Race		
Caucasian	1,982	89
African American	86	4
Asian	16	1
American Indian	12	1
Other	135	5
Marital status		
Married	1,173	53
Life partner	7	<1
Divorced	221	10
Separated	53	2
Single	572	26
Widowed	205	9
Education		
< 12 years	21	13
12 years ≤ education < 16 years	99	61
16 years ≤ education < 20 years	25	15
≥ 20 years	17	11
Employment		
Retired	575	26
Unemployed	271	12
Disabled	263	12
Service	261	12
Homemaker	217	10
Administrator/Manager	212	10
Student	77	3
Nurse and Physician	40	2
Other	315	15

Table 1–continued

Disease Information	*n*	Mean ± SD (Range)
Duration since first cancer diagnosis (month)	541	3.3 ± 14.2 (0–215)
	n	*%*
Primary site of tumor		
Head and Neck Sites	137	6.12
Thyroid	42	*1.88*
Tongue	26	*1.16*
Larynx	23	*1.03*
Mouth	16	*0.72*
Oropharynx	13	*0.58*
Parotid	5	*0.22*
Hypopharynx	4	*0.18*
Paranasal Sinus/Nasal Cavity	4	*0.18*
Lip and Oral Cavity	2	*0.09*
Gum	1	*0.04*
Pharynx	1	*0.04*
Digestive System	134	5.98
Pancreas	29	*1.30*
Liver	24	*1.07*
Stomach	19	*0.85*
Large Intestine	13	*0.58*
Rectum	13	*0.58*
Peritoneum	12	*0.54*
Extra-hepatic Bile Duct	11	*0.49*
Esophagus	9	*0.4*
Small Intestine	3	*0.13*
GI Tract	1	*0.04*
Thorax	58	2.59
Lung	55	*2.46*
Trachea/Pleura/Mediastinum	3	*0.13*
Musculoskeletal	20	0.89
Soft Tissues/Retroperitoneum	15	*0.67*
Bone and Joints	5	*0.22*
Skin	16	0.72
Breast	42	1.88
Central Nervous System	6	0.26
Benign Brain	5	*0.22*
Brain/Meninges/Spinal Cord	1	*0.04*

Table 1 Continued

Gynecologic Sites	158	7.07
Ovary	63	*2.82*
Uterine leiomyoma	59	*2.64*
Vulva	22	*0.98*
Cervix	14	*0.63*
Genitourinary Sites	108	4.92
Renal Pelvis/Ureter/Other	83	*3.71*
Kidney	8	*0.36*
Urinary Bladder	6	*0.27*
Prostate	5	*0.22*
Testis	4	*0.18*
Adrenal	1	*0.04*
Penis	1	*0.04*
Ophthalmic Sites	15	0.67
Malign. Melanoma Ophthalmic	13	*0.58*
Eye	2	*0.09*
Lymphomas	103	4.60
Non-Hodgkins Lymphoma	75	*3.35*
Lymph Nodes	28	*1.25*
Leukemia/Other	76	3.40
Leukemia	57	*2.55*
Myelo Disorders/Other	19	*0.85*
Neuroendocrine	31	1.39
Other Sites	5	0.22
Benign	164	7.33
Carcinoma in Situ	16	0.72
Metastasis	72	3.22
Unknown Primary/Other	8	0.36
Neoplasm of Uncertain Behavior	50	2.23
V-History of CA	81	3.62
Under investigation for cancer diagnosis	937	41.89
Pathologic Tumor Stage		
Stage 0	8	1
Stage I	130	24
Stage II	42	8
Stage III	89	16
Stage IV	55	10
Recurred, unstaged, unknown, or stage X	141	26
Not applicable	83	15

Table 1 Continued

Severity of Illness		
Minor	783	35
Moderate	748	33
Major	512	23
Extreme	194	9
Risk of Mortality		
Minor	1,246	56
Moderate	529	24
Major	286	13
Extreme	176	8
Hospitalization Information		Mean ± SD
	n	(Range)
Length of stay (LOS) in oncology unit	2,237	3.7 ± 4.6 (0–63)
	n	*%*
Discharge Units		
Gynecology, Oral Surgery, and Otolaryngology	1,022	46
Hematology/Oncology and Palliative Care	463	21
Medical Surgical Oncology	707	32
Adult Leukemia and Bone Marrow Transplant	45	2
Discharge status		
Home or self-care	1,840	82
Deceased	98	4
Home with home health care	84	4
Other facilities	205	10
Treatment		
Surgery	159	29
Chemotherapy	53	10
Radiotherapy	11	2
Surgery and Radiotherapy	32	6
Chemotherapy and Radiotherapy	51	9
Surgery, Chemotherapy, and Radiotherapy	135	24
Others	115	21

Table 1 Continued

Cost-Related Variable	*n*	*%*
Primary Insurance		
Medicaid	785	35
Medicare	241	11
Self-pay/uninsured	21	1
Private insurance	1,190	52
Blue Cross Blue Shield	*567*	*25*
Commercial Insurance	*282*	*13*
Local Insurance Company	*299*	*13*
Veterans Administration, special program, worker compensation, Tricare	*42*	*2*

Note. Percentages may not sum to 100% due to rounding.

0 day for LOS in the study is defined as LOS less than 24 hour after admission (the exact minimum LOS in oncology units was 0.01 day), 0 day for duration of a cancer diagnosis in the study is defined as a patient was diagnosed in the specific visit.

Carcinoma in situ is an early form of cancer that is defined by the absence of invasion of tumor cells into the surrounding tissue, usually before penetration through the basement membrane.

The term "neoplasm of uncertain behavior" is a specific pathologic diagnosis. This is a lesion whose behavior cannot be predicted. It's currently benign, but there's a chance that it could undergo malignant transformation over time.

Table 2 Length of Stay (LOS) and Its Relationship with Type of Unit, Age Group, Race, Medical Treatment Group, and Type of Insurance

Variable	*N*	*M* ± *SD*	*Range*	*p*
Overall	2,237	3.68 ± 4.63	0.01−63.00	
Unit				<.0001
Unit G	1,022	3.09 ± 3.33	0.19–34.00	
Unit H	463	3.61 ± 4.36	0.01–52.00	
Unit M	707	3.88 ± 4.72	0.19–51.00	
Unit A	45	14.69 ± 11.76	1.00−63.00	
Treatment group				<.0001
SP	159	4.15 ± 4.22	0.01−28.00	
CT	53	4.40 ± 3.49	1.00−16.00	
RT	11	8.45 ± 7.46	1.00−22.00	
RT & CT	51	4.24 ± 3.72	1.00−13.00	
SP, RT & CT	135	6.89 ± 7.89	0.22−44.00	
Others	115	4.95 ± 7.12	1.00−52.00	
Age group				.011
18≤age<65	1,603	3.62 ± 4.86	0.04−63.00	
≥65	632	3.84 ± 3.95	0.01−30.00	
Race				.576
White	1,982	3.75 ± 4.71	0.01−63.00	
African American	86	3.46 ± 4.65	0.55−32.00	
Asian	16	3.31 ± 4.06	1.00−17.00	
American Indian	12	2.58 ± 2.54	1.00−9.00	
Other/unknown/denied	133	3.06 ± 3.40	0.18−29.00	
Type of Insurance				.001
Medicare	241	4.21 ± 5.82	0.20−52.00	
Medicaid	785	3.83 ± 4.26	0.01−44.00	
Self-pay/uninsured	21	1.92 ± 1.43	0.32−7.00	
Private Insurance	1,190	3.50 ± 4.60	0.19−63.00	

Note. SP=Surgery procedures; CT=Chemotherapy; RT=Radiotherapy; Others=Hormone therapy, immunotherapy or other treatments that are not specified

Unit G=Gynecology, Oral Surgery, and Otolaryngology Unit;
Unit H=Hematology/Oncology and Palliative Care Unit
Unit M=Medical Surgical Oncology Unit
Unit A=Adult Leukemia and Bone Marrow Transplant Unit

Table 3 Count of Nursing Diagnoses (NANDA-I), Nursing Interventions (NIC), and Nursing-Sensitive Patient Outcomes (NOC) Per Person (N=2,237)

Variable	*Mean ± SD*	*Range*
Count of all nursing diagnoses (NANDA-I)	3.1 ± 2.5	1–28
Count of all nursing interventions (NIC)	6.3 ± 5.1	2–56
Count of all nursing sensitive patient outcomes (NOC)	3.7 ± 2.9	1–31
Frequencies of NOC outcome ratings	9.3 ± 13.4	1–197

Table 4 Domains and Classes of the Unique 88 Nursing Diagnoses (NANDA-I)

Domain: Activity/Rest					
Class (*n*=5)	NANDA-I (*n*=14); Modified NANDA-I (*n*=6)	*n*	*%*[1]	*%*[2]	#
Activity/Exercise	Impaired Physical Mobility	99	1.41	4.43	15
	Impaired Bed Mobility	12	0.17	0.54	48
Cardiovascular/Pulmonary Responses	Activity Intolerance	263	3.76	11.76	7
	Ineffective Tissue Perfusion: Pulmonary[b]	87	1.24	3.89	17
	Ineffective Breathing Pattern	45	0.64	2.01	24
	Ineffective Tissue Perfusion, Cerebral[b]	23	0.33	1.03	35
	Ineffective Tissue Perfusion: Cardiac[b]	18	0.26	0.8	39
	Decreased Cardiac Output	15	0.21	0.67	43
	Impaired Spontaneous Ventilation	13	0.19	0.58	46
	Risk for Activity Intolerance	13	0.19	0.58	47
	Ineffective Tissue Perfusion, Renal[b]	11	0.16	0.49	50
	Ineffective Tissue Perfusion[b]	9	0.13	0.4	58
	Ineffective Tissue Perfusion, Peripheral	7	0.1	0.31	65
	Dysfunctional Ventilatory Weaning Response	2	0.03	0.09	74
Energy Balance	Fatigue	87	1.24	3.89	16
Self-Care	Self-Care Deficit[a]	21	0.3	0.94	36
	Bathing/Hygiene Self-Care Deficit	17	0.24	0.76	41
	Feeding: Self-Care Deficit	11	0.16	0.49	49
	Toileting Self-Care Deficit	1	0.01	0.04	89
Sleep/Rest	Sleep Deprivation	27	0.39	1.21	30
Domain: Safety/Protection					
Class (*n*=5)	NANDA-I (*n*=14); Modified NANDA-I (*n*=1)	*n*	*%*[1]	*%*[2]	#
Defensive Process	Risk for Latex Allergy Response	6	0.08	0.26	74
Infection	Risk for Infection	710	10.14	31.74	2

Table 4 Continued

Physical Injury	Impaired Skin Integrity	410	5.86	18.33	4
	Risk for Falls	387	5.53	17.3	5
	Ineffective Airway Clearance	134	1.91	5.99	12
	Risk for Impaired Skin Integrity	111	1.59	4.96	14
	Impaired Oral Mucous Membrane	53	0.76	2.37	21
	Risk for Bleeding	45	0.64	2.01	25
	Risk for Aspiration	34	0.49	1.52	27
	Risk for Injury	10	0.14	0.45	53
	Risk for Peripheral Neurovascular Dysfunction	10	0.14	0.45	54
	Disturbed Sensory Perception, Auditory[b]	2	0.03	0.09	73
Thermoregulation	Risk for Imbalanced Body Temperature	34	0.49	1.52	28
Violence	Risk for Suicide	2	0.03	0.09	78
	Risk for Self-Directed Violence	1	0.01	0.04	87
Domain: Perception/Cognition					
Class (*n*=4)	NANDA-I (*n*=7); Modified NANDA-I (*n*=6)	*n*	*%*[1]	*%*[2]	#
Attention	Unilateral Neglect	8	0.11	0.36	63
Cognition	Deficient Knowledge Pre/Post Procedure/Surgery[a]	353	5.04	15.78	6
	Deficient Knowledge, Disease Process[a]	206	2.94	9.21	8
	Deficient Knowledge	39	0.56	1.74	26
	Acute Confusion	33	0.47	1.48	29
	Disturbed Thought Processes[b]	15	0.21	0.67	44
	Deficient Knowledge, Insulin Therapy[a]	9	0.13	0.4	56
	Impaired Memory	8	0.11	0.36	61
	Chronic Confusion	4	0.06	0.18	70
Communication	Impaired Verbal Communication	15	0.21	0.67	45

Table 4 Continued

Sensation/Perception	Disturbed Sensory Perception, Visual[b]	6	0.09	0.27	67
	Disturbed Sensory Perception, Kinesthetic[b]	3	0.04	0.13	72
Sensation/Perception	Impaired Social Interaction	2	0.03	0.09	75
Domain: Coping/Stress Tolerance					
Class (*n*=2)	NANDA-I (*n*=9)	*n*	*%*[1]	*%*[2]	#
Coping Responses	Anxiety	192	2.74	8.58	9
	Grieving	49	0.7	2.19	57
	Readiness for Enhanced Family Coping	24	0.34	1.07	22
	Disabled Family Coping	9	0.13	0.4	62
	Ineffective Coping	8	0.11	0.36	85
	Readiness for Enhanced Coping	1	0.01	0.04	34
Neurobehavioral Stress	Decreased Intracranial Adaptive Capacity	19	0.27	0.85	38
	Autonomic Dysreflexia	1	0.01	0.04	80
	Risk for Autonomic Dysreflexia	1	0.01	0.04	86
Domain: Elimination and Exchange					
Class (*n*=3)	NANDA-I (*n*=7)	*n*	*%*[1]	*%*[2]	#
Gastrointestinal Function	Risk for Constipation	138	1.97	6.17	11
	Diarrhea	26	0.37	1.16	32
	Constipation	16	0.23	0.72	42
	Bowel Incontinence	4	0.06	0.18	69
Respiratory Function	Impaired Gas Exchange	122	1.74	5.45	13
Urinary Function	Impaired Urinary Elimination	7	0.1	0.31	64
	Urinary Retention	61	0.87	2.73	20
Domain: Nutrition					
Class (*n*=3)	NANDA-I (*n*=7)	*n*	*%*[1]	*%*[2]	#
Hydration	Risk for Imbalanced Fluid Volume	77	1.1	3.44	19
	Risk for Deficient Fluid Volume	48	0.69	2.15	23
	Deficient Fluid Volume	26	0.37	1.16	31
	Excess Fluid Volume	26	0.37	1.16	33

Table 4 Continued

Ingestion	Imbalanced Nutrition: Less than Body Requirements	192	2.74	8.58	10
	Impaired Swallowing	20	0.29	0.89	37
Metabolism	Risk for Unstable Blood Glucose	11	0.16	0.49	51
Domain: Comfort					
Class (*n*=2)	NANDA-I (*n*=3)	*n*	*%*[1]	*%*[2]	#
Physical Comfort	Nausea	591	8.44	26.42	3
	Chronic Pain	80	1.14	3.58	18
Social Comfort	Social Isolation	7	0.1	0.31	66
Domain: Life Principles					
Class (*n*=1)	NANDA-I (*n*=3)	*n*	*%*[1]	*%*[2]	#
Beliefs	Spiritual Distress	18	0.26	0.8	40
	Noncompliance	9	0.13	0.4	59
	Readiness for Enhanced Spiritual Well-Being	9	0.13	0.4	60
Domain: Role Relationships					
Class (*n*=2)	NANDA-I (*n*=2)	*n*	*%*[1]	*%*[2]	#
Family Relationships	Interrupted Family Process	1	0.01	0.04	83
Domain: Self-Perception					
Class (*n*=2)	NANDA-I (*n*=2)	*n*	*%*[1]	*%*[2]	#
Body Image	Disturbed Body Image	10	0.14	0.45	52
Self-Esteem	Situational Low Self-Esteem	1	0.01	0.04	88
Domain: Growth/Development					
Class (*n*=1)	NANDA-I (*n*=1)	*n*	*%*[1]	*%*[2]	#
Development	Delayed Growth and Development	1	0.01	0.04	81
Domain: Health Promotion					
Class (*n*=1)	NANDA-I (*n*=1)	*n*	*%*[1]	*%*[2]	#
Health Management	Ineffective Health Maintenance	4	0.06	0.18	71

Table 4 Continued

Non-NANDA-I Diagnoses					
	Nursing diagnoses	*n*	*%*[1]	*%*[2]	#
	Risk for Withdrawal: Alcohol/Drugs[c]	10	0.14	0.45	55
	Impaired Tissue Integrity[c]	2	0.03	0.09	76
	Mood Alteration: Depression[c]	2	0.03	0.09	77
	Mood Alteration: Mania[c]	1	0.01	0.04	84
	Inadequate Oral Food Beverage Intake[c]	1	0.01	0.04	82

Note. %[1]*:* denominator is total nursing diagnoses; *%*[2]*:* denominator is total patient with this nursing diagnosis

: ranking of nursing diagnoses using *%*[1] for all unit
Nursing diagnoses are modified global nursing diagnoses[a] , retired NANDA-I nursing diagnoses[b] or not recognized nursing diagnoses[c] by NANDA-I.

Resource: Herdman, T. H. (Ed.). (2012). *NANDA International nursing diagnoses: Definitions and classification 2012-2014*. Chichester, U.K: Wiley-Blackwell.

Table 5 Ranking of Nursing Diagnoses (NANDA-I) for All Units

#	NANDA-I	*n*	*%*[1]	*%*[2]
1	Acute Pain	1,746	24.94	78.05
2	Risk for Infection	710	10.14	31.74
3	Nausea	591	8.44	26.42
4	Impaired Skin Integrity	410	5.86	18.33
5	Risk for Falls	387	5.53	17.30
6	Deficient Knowledge Pre/Post Procedure/Surgery[a]	353	5.04	15.78
7	Activity Intolerance	263	3.76	11.76
8	Deficient Knowledge, Disease Process[a]	206	2.94	9.21
9	Anxiety	192	2.74	8.58
10	Imbalanced Nutrition: Less than Body Requirements	192	2.74	8.58
11	Risk for Constipation	138	1.97	6.17
12	Ineffective Airway Clearance	134	1.91	5.99
13	Impaired Gas Exchange	122	1.74	5.45
14	Risk for Impaired Skin Integrity	111	1.59	4.96
15	Impaired Physical Mobility	99	1.41	4.43
16	Fatigue	87	1.24	3.89
17	Ineffective Tissue Perfusion: Pulmonary[b]	87	1.24	3.89
18	Chronic Pain	80	1.14	3.58
19	Risk for Imbalanced Fluid Volume	77	1.10	3.44
20	Urinary Retention	61	0.87	2.73
21	Impaired Oral Mucous Membrane	53	0.76	2.37
22	Grieving	49	0.70	2.19
23	Risk for Deficient Fluid Volume	48	0.69	2.15
24	Ineffective Breathing Pattern	45	0.64	2.01
25	Risk for Bleeding	45	0.64	2.01
26	Deficient Knowledge	39	0.56	1.74
27	Risk for Aspiration	34	0.49	1.52
28	Risk for Imbalanced Body Temperature	34	0.49	1.52
29	Acute Confusion	33	0.47	1.48
30	Sleep Deprivation	27	0.39	1.21
31	Deficient Fluid Volume	26	0.37	1.16
32	Diarrhea	26	0.37	1.16
33	Excess Fluid Volume	26	0.37	1.16
34	Readiness for Enhanced Family Coping	24	0.34	1.07
35	Ineffective Tissue Perfusion, Cerebral[b]	23	0.33	1.03
36	Self-Care Deficit[a]	21	0.30	0.94

Table 5 Continued

37	Impaired Swallowing	20	0.29	0.89
38	Decreased Intracranial Adaptive Capacity	19	0.27	0.85
39	Ineffective Tissue Perfusion: Cardiac[b]	18	0.26	0.80
40	Spiritual Distress	18	0.26	0.80
41	Bathing/Hygiene Self-Care Deficit	17	0.24	0.76
42	Constipation	16	0.23	0.72
43	Decreased Cardiac Output	15	0.21	0.67
44	Disturbed Thought Processes[b]	15	0.21	0.67
45	Impaired Verbal Communication	15	0.21	0.67
46	Impaired Spontaneous Ventilation	13	0.19	0.58
47	Risk for Activity Intolerance	13	0.19	0.58
48	Impaired Bed Mobility	12	0.17	0.54
49	Feeding: Self-Care Deficit	11	0.16	0.49
50	Ineffective Tissue Perfusion, Renal[b]	11	0.16	0.49
51	Risk for Unstable Blood Glucose	11	0.16	0.49
52	Disturbed Body Image	10	0.14	0.45
53	Risk for Injury	10	0.14	0.45
54	Risk for Peripheral Neurovascular Dysfunction	10	0.14	0.45
55	Risk for Withdrawal: Alcohol/Drugs[c]	10	0.14	0.45
56	Deficient Knowledge, Insulin Therapy[a]	9	0.13	0.40
57	Disabled Family Coping	9	0.13	0.40
58	Ineffective Tissue Perfusion[a]	9	0.13	0.40
59	Noncompliance	9	0.13	0.40
60	Readiness for Enhanced Spiritual Well-Being	9	0.13	0.40
61	Impaired Memory	8	0.11	0.36
62	Ineffective Coping	8	0.11	0.36
63	Unilateral Neglect	8	0.11	0.36
64	Impaired Urinary Elimination	7	0.10	0.31
65	Ineffective Tissue Perfusion, Peripheral	7	0.10	0.31
66	Social Isolation	7	0.10	0.31
67	Disturbed Sensory Perception, Visual[b]	6	0.09	0.27
68	Risk for Latex Allergy Response	6	0.09	0.27
69	Bowel Incontinence	4	0.06	0.18
70	Chronic Confusion	4	0.06	0.18
71	Ineffective Health Maintenance	4	0.06	0.18
72	Disturbed Sensory Perception, Kinesthetic[b]	3	0.04	0.13

Table 5 Continued

73	Disturbed Sensory Perception, Auditory[b]	2	0.03	0.09
74	Dysfunctional Ventilatory Weaning Response	2	0.03	0.09
75	Impaired Social Interaction	2	0.03	0.09
76	Impaired Tissue Integrity	2	0.03	0.09
77	Mood Alteration: Depression[c]	2	0.03	0.09
78	Risk for Suicide	2	0.03	0.09
79	Autonomic Dysreflexia	1	0.01	0.04
80	Delayed Growth and Development	1	0.01	0.04
81	Inadequate Oral Food Beverage Intake[c]	1	0.01	0.04
82	Interrupted Family Process	1	0.01	0.04
83	Mood Alteration: Mania[c]	1	0.01	0.04
84	Readiness for Enhanced Coping	1	0.01	0.04
85	Risk for Autonomic Dysreflexia	1	0.01	0.04
86	Risk for Self-Directed Violence	1	0.01	0.04
87	Situational Low Self-Esteem	1	0.01	0.04
88	Toileting Self-Care Deficit	1	0.01	0.04

Note. (Nursing Diagnoses, N=7,002; Patients, N=2,237)

%[1]: denominator is total nursing diagnoses; *%[2]:* denominator is total patient with this nursing diagnosis

Nursing diagnoses are modified global nursing diagnoses[a] , retired NANDA-I nursing diagnoses[b] or not recognized nursing diagnoses[c] by NANDA-I.

Table 6 Domain and Class of the Nursing Interventions (NIC)

Domain: Behavioral						
Class (*n*=6)	NIC (*n*=33)	n^1	$\%^1$	n^2	$\%^2$	#
Behavior Therapy	Activity Therapy	257	2.18	257	11.52	13
	Substance Use Treatment: Alcohol Withdrawal	11	0.09	10	0.45	63
	Mutual Goal Setting	9	0.08	9	0.40	69
	Self-Responsibility Facilitation	8	0.07	8	0.36	74
	Substance Use Treatment: Drug Withdrawal	7	0.06	7	0.31	76
	Behavior Management: Self-Harm	5	0.04	4	0.18	79
	Mechanical Ventilatory Weaning	2	0.02	2	0.09	89
	Impulse Control Training	1	0.01	1	0.04	88
Cognitive Therapy	Cognitive Stimulation	26	0.22	14	0.63	48
	Cognitive Restructuring	25	0.21	13	0.58	49
	Seizure Precaution	17	0.14	17	0.76	57
	Memory Training	8	0.07	8	0.36	72
	Reality Orientation	8	0.07	8	0.36	73
Communication Enhancement	Communication Enhancement: Speech Deficit	13	0.11	13	0.58	59
	Active Listening	11	0.09	11	0.49	62
	Socialization Enhancement	9	0.08	9	0.40	70
	Communication Enhancement: Hearing Deficit	4	0.03	4	0.18	81
	Communication Enhancement: Visual Deficit	4	0.03	4	0.18	82
Coping Assistance	Coping Enhancement	52	0.44	48	2.15	32
	Grief Work Facilitation	49	0.41	49	2.20	34
	Emotional Support	32	0.27	31	1.39	44
	Dying Care	18	0.15	18	0.81	54
	Spiritual Support	14	0.12	14	0.63	58
	Spiritual Growth Facilitation	10	0.08	10	0.45	67

Table 6 Continued

	Body Image Enhancement	9	0.08	9	0.40	68
	Self-Esteem Enhancement	2	0.02	1	0.04	91
	Mood Management	1	0.01	1	0.04	97
Patient Education	Teaching: Procedure/Treatment	547	4.63	532	23.85	6
	Teaching: Preoperative	307	2.60	307	13.71	12
	Teaching: Disease Process	143	1.21	141	6.32	19
	Teaching: Individual	40	0.34	40	1.79	39
	Health Education	36	0.30	36	1.61	42
Psychological Comfort Promotion	Anxiety Reduction	200	1.69	196	8.79	15
Domain: Physiological: Complex						
Class (*n*=6)	NIC (*n*=27)	n^1	$\%^1$	n^2	$\%^2$	#
Drug Management	Analgesic Administration	521	4.41	517	23.17	7
Electrolyte and Acid-Base Management	Acid-Base Management: Respiratory Acidosis	112	0.95	112	5.02	24
	Acid-Base Management	98	0.83	88	3.94	25
	Hyperglycemia Management	11	0.09	10	0.49	64
	Hypoglycemia Management	10	0.08	10	0.45	65
Neurologic Management	Neurologic Monitoring	43	0.36	38	1.7	37
	Cerebral Perfusion Promotion	20	0.17	20	0.90	52
	Cerebral Edema Management	18	0.15	18	0.81	53
	Peripheral Sensation Management	10	0.08	10	0.45	66
	Unilateral Neglect Management	8	0.07	8	0.36	75
	Seizure Management	4	0.03	4	0.18	85
	Dysreflexia Management	2	0.02	1	0.04	87
Respiratory Management	Ventilation Assistance	156	1.32	130	5.83	18
	Airway Management	132	1.12	132	5.92	22

Table 6 Continued

	Airway Suctioning	129	1.09	129	5.78	23
	Aspiration Precautions	73	0.62	49	2.20	29
	Artificial Airway Management	12	0.10	12	0.54	60
Skin/Wound Management	Skin Surveillance	516	4.37	461	20.66	8
	Wound Care	409	3.46	397	17.79	9
	Pressure Ulcer Care	21	0.18	21	0.94	51
Tissue Perfusion Management	Fluid Management	98	0.83	93	4.17	26
	Fluid Monitoring	77	0.65	77	3.45	28
	Temperature Regulation	58	0.49	34	1.52	31
	Bleeding Precaution	44	0.37	44	1.97	36
	Cardiac Care: Acute	33	0.28	24	1.08	43
	Circulatory Care: Venous Insufficiency	31	0.26	31	1.39	45
	Circulatory Care: Arterial Insufficiency	28	0.24	28	1.26	46
Domain: Physiological: Basic						
Class (n=6)	NIC (n=26)	n^1	$\%^1$	n^2	$\%^2$	#
Activity and Exercise Management	Energy Management	357	3.02	311	13.94	11
	Exercise Promotion: Strength Training	248	2.10	247	11.07	14
	Exercise Promotion	93	0.79	93	4.17	27
	Exercise Therapy: Balance	3	0.03	3	0.13	86
Elimination Management	Bowel Management	134	1.13	134	6.01	20
	Urinary Retention Care	60	0.51	60	2.69	30
	Diarrhea Management	38	0.32	38	1.70	40
	Constipation/Impaction Management	17	0.14	17	0.76	56
	Urinary Habit Training	6	0.05	6	0.27	78
	Bowel Incontinence Care	1	0.01	1	0.04	94
Immobility Management	Positioning	18	0.15	18	0.81	55

Table 6 Continued

Nutrition Support	Nutrition Management	190	1.61	188	8.43	16
	Nutrition Therapy	186	1.58	186	8.34	17
	Diet Staging	133	1.13	133	5.96	21
	Nutritional Monitoring	43	0.36	43	1.93	38
	Nutrition Education[a]	1	0.01	1	0.04	98
Physical Comfort Support	Pain Management	2,351	19.91	1,799	80.64	1
	Nausea Management	584	4.95	583	26.13	5
Self-Care Facilitation	Oral Health Restoration	52	0.44	52	2.33	33
	Self-Care Assistance	48	0.41	32	1.43	35
	Sleep Enhancement	27	0.23	27	1.21	47
	Self-Care Assistance: Feeding	5	0.04	5	0.22	80
	Foot Care	4	0.03	4	0.18	83
	Self-Care Assistance: Toileting	2	0.02	2	0.09	90
	Self-Care Assistance: Bathing/Hygiene	1	0.01	1	0.04	99
	Self-Care Assistance: Dressing/grooming	1	0.01	1	0.04	100
	Domain: Safety					
Class ((*n*=2)	NIC (*n*=11)	*n*[1]	*%*[1]	*n*[2]	*%*[2]	#
Crisis Management	Suicide Prevention	2	0.02	2	0.09	92
Risk Management	Fall Prevention	742	6.28	387	17.35	2
	Infection Protection	708	6	708	31.73	3
	Infection Control	697	5.90	697	31.24	4
	Pressure Management	398	3.37	386	17.30	10
	Delirium Management	36	0.30	34	1.52	41
	Environmental Management	12	0.10	12	0.54	61
	Latex Precautions	6	0.05	6	0.27	77
	Hallucination Management	4	0.03	4	0.18	84
	Surveillance: Safety	2	0.02	2	0.09	93
	Health Screening	1	0.01	1	0.04	96

Table 6 Continued

Domain: Family						
Class (*n*=1)	NIC (*n*=3)	n^1	$\%^1$	n^2	$\%^2$	#
Lifespan Care	Family Support	25	0.21	25	1.12	50
	Family Therapy	8	0.07	8	0.36	71
	Family Process Maintenance	1	0.01	1	0.04	95

Note. n^1 =Count all interventions applied to each diagnoses in independent patient (*N*=2,337) including duplicate interventions linked to different diagnoses. n^2 =Count any of 105 interventions presented in individual patient, excluding duplicate interventions. $\%^1$ (a sum of nursing interventions on the basis of all units or cumulative frequencies of any time of nursing interventions have been documented even though it can be on the same patients) were calculated twice, while $\%^2$ (a nursing intervention that individual had received, and any documented duplicated nursing interventions would be counted as one)was calculated once. # is the ranking of nursing interventions using % for all units

Nutrition Education[a] is a modified nursing intervention by the study hospital, which is not NIC intervention.

Table 7 Ranking of NIC Nursing Interventions for All Units

		Interventions for all units		Patient with interventions	
#	NIC	*n*[1]	%[1]	*n*[2]	%[2]
1	Pain Management	2,351	19.91	1,799	80.64
2	Fall Prevention	742	6.28	387	17.35
3	Infection Protection	708	6.00	708	31.73
4	Infection Control	697	5.90	697	31.24
5	Nausea Management	584	4.95	583	26.13
6	Teaching: Procedure/Treatment	547	4.63	532	23.85
7	Analgesic Administration	521	4.41	517	23.17
8	Skin Surveillance	516	4.37	461	20.66
9	Wound Care	409	3.46	397	17.79
10	Pressure Management	398	3.37	386	17.30
11	Energy Management	357	3.02	311	13.94
12	Teaching: Preoperative	307	2.60	307	13.71
13	Activity Therapy	257	2.18	257	11.52
14	Exercise Promotion: Strength Training	248	2.10	247	11.07
15	Anxiety Reduction	200	1.69	196	8.79
16	Nutrition Management	190	1.61	188	8.43
17	Nutrition Therapy	186	1.58	186	8.34
18	Ventilation Assistance	156	1.32	130	5.83
19	Teaching: Disease Process	143	1.21	141	6.32
20	Bowel Management	134	1.13	134	6.01
21	Diet Staging	133	1.13	133	5.96
22	Airway Management	132	1.12	132	5.92
23	Airway Suctioning	129	1.09	129	5.78
24	Acid-Base Management: Respiratory Acidosis	112	0.95	112	5.02
25	Acid-Base Management	98	0.83	88	3.94
26	Fluid Management	98	0.83	93	4.17
27	Exercise Promotion	93	0.79	93	4.17
28	Fluid Monitoring	77	0.65	77	3.45
29	Aspiration Precautions	73	0.62	49	2.20
30	Urinary Retention Care	60	0.51	60	2.69
31	Temperature Regulation	58	0.49	34	1.52
32	Coping Enhancement	52	0.44	48	2.15
33	Oral Health Restoration	52	0.44	52	2.33
34	Grief Work Facilitation	49	0.41	49	2.20

Table 7 Continued

35	Self-Care Assistance	48	0.41	32	1.43
36	Bleeding Precaution	44	0.37	44	1.97
37	Neurologic Monitoring	43	0.36	38	1.70
38	Nutritional Monitoring	43	0.36	43	1.93
39	Teaching: Individual	40	0.34	40	1.79
40	Diarrhea Management	38	0.32	38	1.70
41	Delirium Management	36	0.30	34	1.52
42	Health Education	36	0.30	36	1.61
43	Cardiac Care: Acute	33	0.28	24	1.08
44	Emotional Support	32	0.27	31	1.39
45	Circulatory Care: Venous Insufficiency	31	0.26	31	1.39
46	Circulatory Care: Arterial Insufficiency	28	0.24	28	1.26
47	Sleep Enhancement	27	0.23	27	1.21
48	Cognitive Stimulation	26	0.22	14	0.63
49	Cognitive Restructuring	25	0.21	13	0.58
50	Family Support	25	0.21	25	1.12
51	Pressure Ulcer Care	21	0.18	21	0.94
52	Cerebral Perfusion Promotion	20	0.17	20	0.90
53	Cerebral Edema Management	18	0.15	18	0.81
54	Dying Care	18	0.15	18	0.81
55	Positioning	18	0.15	18	0.81
56	Constipation/Impaction Management	17	0.14	17	0.76
57	Seizure Precaution	17	0.14	17	0.76
58	Spiritual Support	14	0.12	14	0.63
59	Communication Enhancement: Speech Deficit	13	0.11	13	0.58
60	Artificial Airway Management	12	0.10	12	0.54
61	Environmental Management	12	0.10	12	0.54
62	Active Listening	11	0.09	11	0.49
63	Substance Use Treatment: Alcohol Withdrawal	11	0.09	10	0.45
64	Hyperglycemia Management	11	0.09	10	0.49
65	Hypoglycemia Management	10	0.08	10	0.45
66	Peripheral Sensation Management	10	0.08	10	0.45
67	Spiritual Growth Facilitation	10	0.08	10	0.45
68	Body Image Enhancement	9	0.08	9	0.40
69	Mutual Goal Setting	9	0.08	9	0.40
70	Socialization Enhancement	9	0.08	9	0.40
71	Family Therapy	8	0.07	8	0.36

Table 7 Continued

72	Memory Training	8	0.07	8	0.36
73	Reality Orientation	8	0.07	8	0.36
74	Self-Responsibility Facilitation	8	0.07	8	0.36
75	Unilateral Neglect Management	8	0.07	8	0.36
76	Substance Use Treatment: Drug Withdrawal	7	0.06	7	0.31
77	Latex Precautions	6	0.05	6	0.27
78	Urinary Habit Training	6	0.05	6	0.27
79	Behavior Management: Self-Harm	5	0.04	4	0.18
80	Self-Care Assistance: Feeding	5	0.04	5	0.22
81	Communication Enhancement: Hearing Deficit	4	0.03	4	0.18
82	Communication Enhancement: Visual Deficit	4	0.03	4	0.18
83	Foot Care	4	0.03	4	0.18
84	Hallucination Management	4	0.03	4	0.18
85	Seizure Management	4	0.03	4	0.18
86	Exercise Therapy: Balance	3	0.03	3	0.13
87	Dysreflexia Management	2	0.02	1	0.04
88	Impulse Control Training	1	0.01	1	0.04
89	Mechanical Ventilatory Weaning	2	0.02	2	0.09
90	Self-Care Assistance: Toileting	2	0.02	2	0.09
91	Self-Esteem Enhancement	2	0.02	1	0.04
92	Suicide Prevention	2	0.02	2	0.09
93	Surveillance: Safety	2	0.02	2	0.09
94	Bowel Incontinence Care	1	0.01	1	0.04
95	Family Process Maintenance	1	0.01	1	0.04
96	Health Screening	1	0.01	1	0.04
97	Mood Management	1	0.01	1	0.04
98	Nutrition Education	1	0.01	1	0.04
99	Self-Care Assistance: Bathing/Hygiene	1	0.01	1	0.04
100	Self-Care Assistance: Dressing/grooming	1	0.01	1	0.04

Note. Nursing Interventions (N=11,804); Patients (N=2,237); n^1 =Count all interventions applied to each diagnoses in independent patient including duplicate interventions linked to different diagnoses. n^2 =Count any of 105 interventions presented in individual patient, excluding duplicate interventions. $\%^1$ (a sum of nursing interventions on the basis of all units or cumulative frequencies of any time of nursing interventions have been documented even though it can be on the same patients) were calculated twice, while $\%^2$ (a nursing intervention that individual had received, and any documented duplicated nursing interventions would be counted as one)was calculated once. # = ranking of nursing interventions using *%* for all units; Nutrition Education[a] is a modified nursing intervention by the study hospital, which is not NIC intervention.

Table 8 Domains and Classes of Nursing Outcomes (NOC)

Domain: Perceived Health						
Class (*n*=8)	NOC (*n*=37)	*n*[1]	*%*[1]	*n*[2]	*%*[2]	#
Cardiopulmonary	Respiratory Status: Airway Patency	136	1.66	135	6.03	14
	Respiratory Status: Gas Exchange	133	1.62	120	5.36	15
	Tissue Perfusion: Pulmonary	87	1.06	87	3.89	18
	Blood Loss Severity	45	0.55	45	2.01	28
	Respiratory Status: Ventilation	45	0.55	45	2.01	29
	Tissue Perfusion: Cerebral	21	0.26	21	0.94	39
	Tissue Perfusion: Cardiac	18	0.22	18	0.80	44
	Tissue Perfusion: Peripheral	16	0.20	16	0.72	45
	Cardiac Pump Effectiveness	15	0.18	15	0.67	46
Digestion & Nutrition	Nutritional Status	192	2.34	192	8.58	11
	Gastrointestinal Function	138	1.68	138	6.17	13
	Swallowing Status	19	0.23	19	0.85	42
	Nutritional Status: Food and Fluid Intake	5	0.06	5	0.22	65
Elimination	Urinary Elimination	63	0.77	63	2.82	21
	Bowel Elimination	46	0.56	45	2.01	27
	Kidney Function	11	0.13	11	0.49	52
	Urinary Continence	6	0.07	6	0.27	64
Fluid & Electrolytes	Hydration	77	0.94	77	3.44	19
	Fluid Balance	74	0.90	73	3.26	20
	Fluid Overload Severity	26	0.32	26	1.16	37
Immune Response	Infection Severity	710	8.66	710	31.74	2
	Allergic Response: Systemic	6	0.07	6	0.27	62
Neurocognitive	Acute Confusion Level	33	0.40	33	1.48	32
	Cognitive Orientation	19	0.23	17	0.76	40
	Neurological Status	19	0.23	19	0.85	41
	Communication	15	0.18	15	0.67	47
	Cognition	12	0.15	12	0.54	49
	Neurological Status: Peripheral	10	0.12	10	0.45	54
	Heedfulness of Affected Side	8	0.10	8	0.36	60
	Memory	8	0.10	8	0.36	61
	Communication: Receptive	2	0.02	2	0.09	70
	Neurological Status: Autonomic	2	0.02	1	0.04	72

Table 8 Continued

Sensory Function	Sensory Function: Vision	6	0.07	6	0.27	63
Tissue Integrity	Tissue Integrity: Skin and Mucous Membranes	526	6.42	476	21.28	5
	Oral Hygiene	53	0.65	53	2.37	24
	Burn Healing	10	0.12	10	0.45	53
	Oral Intake	1	0.01	1	0.04	79
Domain: Health Knowledge & Behavior						
Class (*n*=3)	NOC (*n*=14)	n^1	$\%^1$	n^2	$\%^2$	#
Health Behavior	Pain Control	520	6.34	520	23.25	6
	Seizure Control	14	0.17	14	0.63	48
	Compliance Behavior	9	0.11	9	0.4	57
	Diabetes Self-Management	9	0.11	9	0.4	58
	Health Seeking Behavior	4	0.05	4	0.18	67
Health Knowledge	Knowledge: Treatment Procedure	547	6.67	540	24.14	4
	Knowledge: Fall Prevention	382	4.66	382	17.08	7
	Knowledge: Illness Care	145	1.77	145	6.48	12
	Knowledge: Treatment Regimen	39	0.48	39	1.74	30
	Knowledge: Personal Safety	9	0.11	9	0.40	59
Risk Control & Safety	Aspiration Prevention	54	0.66	48	2.15	22
	Risk Control: Hyperthermia	32	0.39	32	1.43	34
	Risk Control: Hypothermia	27	0.33	27	1.21	35
	Risk Control	2	0.02	2	0.09	73
Domain: Functional Health						
Class (*n*=6)	NOC (*n*=11)	n^1	$\%^1$	n^2	$\%^2$	#
Energy Maintenance	Activity Tolerance	263	3.21	263	11.76	9
	Endurance	100	1.22	97	4.34	17
	Sleep	27	0.33	27	1.21	36
Growth & Development	Growth	1	0.01	1	0.04	77
Mobility	Mobility	101	1.23	101	4.51	16
	Body Positioning: Self-Initiated	11	0.13	11	0.49	51
	Balance	3	0.04	3	0.13	69

Table 8 Continued

Risk Control & Safety	Fall Prevention: Behavior	380	4.64	380	16.99	8
	Self-Care: Activities of Daily Living(ADL)	48	0.58	31	1.38	26
	Self-Care Status	2	0.02	2	0.09	74
Therapeutic Response	Blood Glucose Level	11	0.13	11	0.49	50
Domain: Psychosocial Health						
Class (*n*=4)	NOC (*n*=11)	*n*	*%*	*n*	%	#
Psychological Well-Being	Body Image	9	0.11	9	0.4	56
	Depression Level	2	0.02	2	0.09	71
	Mood Equilibrium	1	0.01	1	0.04	78
	Self-Esteem	1	0.01	1	0.04	80
Psychosocial	Coping	53	0.65	50	2.24	23
	Grief Resolution	49	0.60	49	2.19	25
	Dignified Life Closure	18	0.22	18	0.8	43
Self-Control	Suicide Self-Restraint	2	0.02	2	0.09	75
	Self-Mutilation Restraint	1	0.01	1	0.04	81
Social Interaction	Social Involvement	5	0.06	5	0.22	66
	Social Interaction Skills	4	0.05	4	0.18	68
Domain: Perceived Health						
Class (*n*=2)	NOC (*n*=5)	*n*	*%*	*n*	%	#
Health & Life Quality	Spiritual Health	24	0.29	20	0.89	38
Symptom Status	Pain Level	1,815	22.14	1,793	80.15	1
	Nausea and Vomiting Severity	591	7.21	591	26.42	3
	Pain: Disruptive Effects	32	0.39	32	1.43	33
	Substance Withdrawal Severity	10	0.12	10	0.45	55
Domain: Family Health						
Class (*n*=1)	NOC (*n*=2)	*n*	*%*	*n*	%	#
Family Well-Being	Family Coping	34	0.41	28	1.25	31
	Family Integrity	1	0.01	1	0.04	76

Note. n^1 refers to count all outcomes applied to each o in independent patients (N=2,337) including duplicate outcomes linked to different diagnoses. n^2 refers to count any of 81 outcomes presented individual patient, excluding duplicate outcomes. # refers to the ranking of outcomes using % for all units

Oral Intake is a modified nursing-sensitive patient outcome used in the study hospital. This is not a recognized NOC outcome.

Table 9 Ranking of Nursing -Sensitive Patient Outcomes (NOC) for All Units

#	NOC	Outcomes for all units		Patient with Outcome	
		n[1]	*%*[1]	*n*[2]	*%*[2]
1	Pain Level	1,815	22.14	1,793	80.15
2	Infection Severity	710	8.66	710	31.74
3	Nausea and Vomiting Severity	591	7.21	591	26.42
4	Knowledge: Treatment Procedure	547	6.67	540	24.14
5	Tissue Integrity: Skin and Mucous Membranes	526	6.42	476	21.28
6	Pain Control	519	6.33	520	23.25
7	Knowledge: Fall Prevention	382	4.66	382	17.08
8	Fall Prevention: Behavior	380	4.64	380	16.99
9	Activity Tolerance	263	3.21	263	11.76
10	Anxiety Level	192	2.34	192	8.58
11	Nutritional Status	192	2.34	192	8.58
12	Knowledge: Illness Care	145	1.77	145	6.48
13	Gastrointestinal Function	138	1.68	138	6.17
14	Respiratory Status: Airway Patency	136	1.66	135	6.03
15	Respiratory Status: Gas Exchange	133	1.62	120	5.36
16	Mobility	101	1.23	101	4.51
17	Endurance	100	1.22	97	4.34
18	Tissue Perfusion: Pulmonary	87	1.06	87	3.89
19	Hydration	77	0.94	77	3.44
20	Fluid Balance	74	0.90	73	3.26
21	Urinary Elimination	63	0.77	63	2.82
22	Aspiration Prevention	54	0.66	48	2.15
23	Coping	53	0.65	50	2.24
24	Oral Hygiene	53	0.65	53	2.37
25	Grief Resolution	49	0.60	49	2.19
26	Self-Care: Activities of Daily Living(ADL)	48	0.58	30	1.38
27	Bowel Elimination	46	0.56	45	2.01
28	Blood Loss Severity	45	0.55	45	2.01
29	Respiratory Status: Ventilation	45	0.55	45	2.01
30	Knowledge: Treatment Regimen	39	0.48	39	1.74
31	Family Coping	34	0.41	28	1.25
32	Acute Confusion Level	33	0.40	33	1.48
33	Pain: Disruptive Effects	32	0.39	32	1.43
34	Risk Control: Hyperthermia	32	0.39	32	1.43
35	Risk Control: Hypothermia	27	0.33	27	1.21

Table 9 Continued

36	Sleep	27	0.33	27	1.21
37	Fluid Overload Severity	26	0.32	26	1.16
38	Spiritual Health	24	0.29	20	0.89
39	Tissue Perfusion: Cerebral	21	0.26	21	0.94
40	Cognitive Orientation	19	0.23	17	0.76
41	Neurological Status	19	0.23	19	0.85
42	Swallowing Status	19	0.23	19	0.85
43	Dignified Life Closure	18	0.22	18	0.80
44	Tissue Perfusion: Cardiac	18	0.22	18	0.80
45	Tissue Perfusion: Peripheral	16	0.20	16	0.72
46	Cardiac Pump Effectiveness	15	0.18	15	0.67
47	Communication	15	0.18	15	0.67
48	Seizure Control	14	0.17	14	0.63
49	Cognition	12	0.15	12	0.54
50	Blood Glucose Level	11	0.13	11	0.49
51	Body Positioning: Self-Initiated	11	0.13	11	0.49
52	Kidney Function	11	0.13	11	0.49
53	Burn Healing	10	0.12	10	0.45
54	Neurological Status: Peripheral	10	0.12	10	0.45
55	Substance Withdrawal Severity	10	0.12	10	0.45
56	Body Image	9	0.11	9	0.40
57	Compliance Behavior	9	0.11	9	0.40
58	Diabetes Self-Management	9	0.11	9	0.40
59	Knowledge: Personal Safety	9	0.11	9	0.40
60	Heedfulness of Affected Side	8	0.10	8	0.36
61	Memory	8	0.10	8	0.36
62	Allergic Response: Systemic	6	0.07	6	0.27
63	Sensory Function: Vision	6	0.07	6	0.27
64	Urinary Continence	6	0.07	6	0.27
65	Nutritional Status: Food and Fluid Intake	5	0.06	5	0.22
66	Social Involvement	5	0.06	5	0.22
67	Health Seeking Behavior	4	0.05	4	0.18
68	Social Interaction Skills	4	0.05	4	0.18
69	Balance	3	0.04	3	0.13
70	Communication: Receptive	2	0.02	2	0.09
71	Depression Level	2	0.02	2	0.09
72	Neurological Status: Autonomic	2	0.02	1	0.04

Table 9 Continued

73	Risk Control	2	0.02	2	0.09
74	Self-Care Status	2	0.02	2	0.09
75	Suicide Self-Restraint	2	0.02	2	0.09
76	Family Integrity	1	0.01	1	0.04
77	Growth	1	0.01	1	0.04
78	Mood Equilibrium	1	0.01	1	0.04
79	Oral Intake	1	0.01	1	0.04
80	Self-Esteem	1	0.01	1	0.04
81	Self-Mutilation Restraint	1	0.01	1	0.04

Note. n^1 = Count all outcomes applied to each diagnoses in independent patients including duplicate outcomes linked to different diagnoses. n^2 = Count any of 81 outcomes presented individual patient, excluding duplicate outcomes. $\%^1$ = the number of a specific NOC outcome divided by the total number of outcomes for all units (N=8,197). $\%^2$ = the number of patient with a specific outcome divided by the total number of participants (N=2,337).

Oral Intake is a modified nursing sensitive patient outcome used in the study hospital. This is not a recognized NOC outcome.

Table 10 Ranking of NANDA-I (Nursing Diagnoses) by Unit

	Unit G		Unit H		Unit M		Unit A		
NANDA-I	*n*	%	*n*	%	*n*	%	*n*	%	*p*
Acute Pain*	941	92.07	236	50.97	546	77.23	23	51.11	<.0001
Risk for Infection*	317	31.02	148	31.97	204	28.85	41	91.11	<.0001
Nausea*	352	34.44	95	20.52	118	16.69	26	57.78	<.0001
Impaired Skin Integrity*	209	20.45	37	7.99	163	23.06	1	2.22	<.0001
Risk for Falls*	113	11.06	110	23.76	148	20.93	16	35.56	<.0001
Deficient Knowledge Pre/Post Procedure/Surgery*	220	21.53	35	7.56	94	13.30	4	8.89	<.0001
Activity Intolerance*	110	10.76	58	12.53	80	11.32	15	33.33	.0001
Deficient Knowledge, Disease Process*	22	2.15	85	18.36	74	10.47	25	55.56	<.0001
Anxiety*	64	6.26	62	13.39	53	7.50	13	28.89	<.0001
Imbalanced Nutrition: Less than Body Requirements*	51	4.99	50	10.80	78	11.03	13	28.89	<.0001
Risk for Constipation*	90	8.81	10	2.16	38	5.37	0	0.00	<.0001
Ineffective Airway Clearance*	50	4.89	59	12.74	23	3.25	2	4.44	<.0001
Impaired Gas Exchange*	35	3.42	58	12.53	26	3.68	3	6.67	<.0001
Risk for Impaired Skin Integrity	54	5.28	25	5.40	30	4.24	2	4.44	.7500
Impaired Physical Mobility	43	4.21	21	4.54	35	4.95	0	0.00	.4449
Fatigue*	3	0.29	40	8.64	28	3.96	16	35.56	<.0001
Ineffective Tissue Perfusion: Pulmonary*	17	1.66	49	10.58	19	2.69	2	4.44	<.0001
Chronic Pain*	8	0.78	37	7.99	32	4.53	3	6.67	<.0001
Risk for Imbalanced Fluid Volume	31	3.03	18	3.89	25	3.54	3	6.67	.5286
Urinary Retention*	48	4.70	2	0.43	11	1.56	0	0.00	<.0001
Impaired Oral Mucous Membrane*	3	0.29	30	6.48	4	0.57	16	35.56	<.0001
Grieving*	2	0.20	41	8.86	6	0.85	0	0.00	<.0001
Risk for Deficient Fluid Volume*	6	0.59	20	4.32	8	1.13	14	31.11	<.0001
Ineffective Breathing Pattern*	15	1.47	20	4.32	8	1.13	2	4.44	.0004
Risk for Bleeding*	19	1.86	9	1.94	12	1.70	5	11.11	.0002
Deficient Knowledge*	9	0.88	8	1.73	17	2.40	5	11.11	<.0001

Table 10 Continued

Risk for Aspiration	11	1.08	16	3.46	6	0.85	1	2.22	.0016
Risk for Imbalanced Body Temperature	11	1.08	12	2.59	11	1.56	0	0.00	.1329
Acute Confusion*	3	0.29	21	4.54	8	1.13	1	2.22	<.0001
Sleep Deprivation	17	1.66	6	1.30	4	0.57	0	0.00	.1867
Deficient Fluid Volume	4	0.39	9	1.94	12	1.70	1	2.22	.0190
Diarrhea*	3	0.29	9	1.94	8	1.13	6	13.33	<.0001
Excess Fluid Volume*	0	0.00	17	3.67	8	1.13	1	2.22	<.0001
Readiness for Enhanced Family Coping*	1	0.10	22	4.75	1	0.14	0	0.00	<.0001
Ineffective Tissue Perfusion, Cerebral*	4	0.39	17	3.67	1	0.14	1	2.22	<.0001
Self-Care Deficit*	1	0.10	12	2.59	3	0.42	5	11.11	<.0001
Impaired Swallowing	7	0.68	11	2.38	2	0.28	0	0.00	.0015
Decreased Intracranial Adaptive Capacity	2	0.20	13	2.81	3	0.42	1	2.22	
Ineffective Tissue Perfusion: Cardiac	2	0.20	11	2.38	4	0.57	1	2.22	
Spiritual Distress	0	0.00	16	3.46	2	0.28	0	0.00	
Bathing/Hygiene Self-Care Deficit	2	0.20	9	1.94	3	0.42	3	6.67	
Constipation	4	0.39	4	0.86	8	1.13	0	0.00	
Decreased Cardiac Output	0	0.00	12	2.59	3	0.42	0	0.00	
Disturbed Thought Processes	2	0.20	12	2.59	1	0.14	0	0.00	
Impaired Verbal Communication	5	0.49	9	1.94	1	0.14	0	0.00	
Impaired Spontaneous Ventilation	4	0.39	6	1.30	3	0.42	0	0.00	
Risk for Activity Intolerance	8	0.78	4	0.86	1	0.14	0	0.00	
Impaired Bed Mobility	2	0.20	5	1.08	5	0.71	0	0.00	
Feeding: Self-Care Deficit	1	0.10	8	1.73	2	0.28	0	0.00	
Ineffective Tissue Perfusion, Renal	1	0.10	6	1.30	3	0.42	1	2.22	
Risk for Unstable Blood Glucose	3	0.29	3	0.65	5	0.71	0	0.00	
Disturbed Body Image	3	0.29	5	1.08	0	0.00	2	4.44	

Table 10 Continued

Risk for Injury	3	0.29	2	0.43	5	0.71	0	0.00
Risk for Peripheral Neurovascular Dysfunction	2	0.20	8	1.73	0	0.00	0	0.00
Risk for Withdrawal: Alcohol/Drugs	3	0.29	2	0.43	5	0.71	0	0.00
Deficient Knowledge, Insulin Therapy	2	0.20	1	0.22	6	0.85	0	0.00
Disabled Family Coping	0	0.00	8	1.73	1	0.14	0	0.00
Ineffective Tissue Perfusion	0	0.00	7	1.51	2	0.28	0	0.00
Noncompliance	1	0.10	4	0.86	4	0.57	0	0.00
Readiness for Enhanced Spiritual Well-Being	0	0.00	8	1.73	1	0.14	0	0.00
Impaired Memory	1	0.10	5	1.08	2	0.28	0	0.00
Ineffective Coping	4	0.39	1	0.22	1	0.14	2	4.44
Unilateral Neglect	0	0.00	8	1.73	0	0.00	0	0.00
Impaired Urinary Elimination	3	0.29	0	0.00	4	0.57	0	0.00
Ineffective Tissue Perfusion, Peripheral	3	0.29	1	0.22	3	0.42	0	0.00
Social Isolation	1	0.10	5	1.08	1	0.14	0	0.00
Disturbed Sensory Perception, Visual	4	0.39	2	0.43	0	0.00	0	0.00
Risk for Latex Allergy Response	3	0.29	0	0.00	2	0.28	0	0.00
Bowel Incontinence	1	0.10	0	0.00	2	0.28	1	2.22
Chronic Confusion	0	0.00	4	0.86	0	0.00	0	0.00
Ineffective Health Maintenance	0	0.00	1	0.22	3	0.42	0	0.00
Disturbed Sensory Perception, Kinesthetic	0	0.00	3	0.65	0	0.00	0	0.00
Disturbed Sensory Perception, Auditory	2	0.20	0	0.00	0	0.00	0	0.00
Dysfunctional Ventilatory Weaning Response	1	0.10	1	0.22	0	0.00	0	0.00
Impaired Social Interaction	2	0.20	0	0.00	0	0.00	0	0.00
Impaired Tissue Integrity	1	0.10	0	0.00	1	0.14	0	0.00
Mood Alteration: Depression	2	0.20	0	0.00	0	0.00	0	0.00

Table 10 Continued

Risk for Suicide	1	0.10	1	0.22	0	0.00	0	0.00
Autonomic Dysreflexia	0	0.00	1	0.22	0	0.00	0	0.00
Delayed Growth and Development	0	0.00	1	0.22	0	0.00	0	0.00
Inadequate Oral Food Beverage Intake	0	0.00	1	0.22	0	0.00	0	0.00
Interrupted Family Process	0	0.00	0	0.00	1	0.14	0	0.00
Mood Alteration: Mania	0	0.00	1	0.22	0	0.00	0	0.00
Readiness for Enhanced Coping	0	0.00	1	0.22	0	0.00	0	0.00
Risk for Autonomic Dysreflexia	0	0.00	0	0.00	0	0.00	1	2.22
Risk for Self-Directed Violence	0	0.00	1	0.22	0	0.00	0	0.00
Situational Low Self-Esteem	1	0.10	0	0.00	0	0.00	0	0.00
Toileting Self-Care Deficit	1	0.10	0	0.00	0	0.00	0	0.00

Note. Unit G = Gynecology, Oral Surgery, and Otolaryngology Unit; Unit H = Hematology/Oncology and Palliative Care Unit;
Unit M = Medical Surgical Oncology Unit; Unit A = Adult Leukemia and Bone Marrow Transplant Unit

*= significant findings at α =.05, *p* value = .000562 was adjusted from *p* =.05 after Bonferroni's method (Bailar & Hoaglin, 2012) for multiple comparisons (*n*=88).

Table 11 Ranking of Nursing Diagnoses (NANDA-I) Found Significantly Different by Unit

#	Unit G	Unit H	Unit M	Unit A
1	Acute Pain	Acute Pain	Acute Pain	Risk for Infection
2	Nausea	Risk for Infection	Risk for Infection	Nausea
3	Risk for Infection	Risk for Falls	Impaired Skin Integrity	Deficient Knowledge, Disease Process
4	Deficient Knowledge Pre/Post Procedure/Surgery	Nausea	Risk for Falls	Acute Pain
5	Impaired Skin Integrity	Deficient Knowledge, Disease Process	Nausea	Risk for Falls
6	Risk for Falls	Anxiety	Deficient Knowledge Pre/Post Procedure/Surgery	Fatigue
7	Activity Intolerance	Ineffective Airway Clearance	Activity Intolerance	Impaired Oral Mucous Membrane
8	Risk for Constipation	Activity Intolerance	Imbalanced Nutrition: Less than Body Requirements	Activity Intolerance
9	Anxiety	Impaired Gas Exchange	Deficient Knowledge, Disease Process	Risk for Deficient Fluid Volume
10	Imbalanced Nutrition: Less than Body Requirements	Imbalanced Nutrition: Less than Body Requirements	Anxiety	Anxiety
11	Ineffective Airway Clearance	Ineffective Tissue Perfusion: Pulmonary	Risk for Constipation	Imbalanced Nutrition: Less than Body Requirements
12	Urinary Retention	Grieving	Chronic Pain	Diarrhea
13	Impaired Gas Exchange	Fatigue	Fatigue	Risk for Bleeding
14	Risk for Imbalanced Fluid Volume	Impaired Skin Integrity	Impaired Gas Exchange	Deficient Knowledge

Table 11 Continued

15	Deficient Knowledge, Disease Process	Chronic Pain	Risk for Imbalanced Fluid Volume	Self-Care Deficit
16	Risk for Bleeding	Deficient Knowledge Pre/Post Procedure/Surgery	Ineffective Airway Clearance	Deficient Knowledge Pre/Post Procedure/Surgery
17	Ineffective Tissue Perfusion: Pulmonary	Impaired Oral Mucous Membrane	Ineffective Tissue Perfusion: Pulmonary	Impaired Gas Exchange
18	Ineffective Breathing Pattern	Readiness for Enhanced Family Coping	Deficient Knowledge	Chronic Pain
19	Risk for Aspiration	Acute Confusion	Risk for Bleeding	Risk for Imbalanced Fluid Volume
20	Risk for Imbalanced Body Temperature	Risk for Deficient Fluid Volume	Urinary Retention	Ineffective Airway Clearance
21	Deficient Knowledge	Ineffective Breathing Pattern	Risk for Imbalanced Body Temperature	Ineffective Tissue Perfusion: Pulmonary
22	Chronic Pain	Risk for Imbalanced Fluid Volume	Risk for Deficient Fluid Volume	Ineffective Breathing Pattern
23	Risk for Deficient Fluid Volume	Excess Fluid Volume	Ineffective Breathing Pattern	Impaired Skin Integrity
24	Ineffective Tissue Perfusion, Cerebral	Ineffective Tissue Perfusion, Cerebral	Acute Confusion	Risk for Aspiration
25	Fatigue	Risk for Aspiration	Diarrhea	Acute Confusion
26	Impaired Oral Mucous Membrane	Risk for Imbalanced Body Temperature	Excess Fluid Volume	Excess Fluid Volume
27	Acute Confusion	Self-Care Deficit	Grieving	Ineffective Tissue Perfusion, Cerebral
28	Diarrhea	Risk for Constipation	Risk for Aspiration	Risk for Constipation
29	Grieving	Risk for Bleeding	Impaired Oral Mucous Membrane	Urinary Retention

Table 11 Continued

30	Readiness for Enhanced Family Coping	Diarrhea	Self-Care Deficit	Grieving
31	Self-Care Deficit	Deficient Knowledge	Readiness for Enhanced Family Coping	Risk for Imbalanced Body Temperature
32	Excess Fluid Volume	Urinary Retention	Ineffective Tissue Perfusion, Cerebral	Readiness for Enhanced Family Coping

Note. Unit G = Gynecology, Oral Surgery, and Otolaryngology Unit; Unit H = Hematology/Oncology and Palliative Care Unit; Unit M = Medical Surgical Oncology Unit; Unit A = Adult Leukemia and Bone Marrow Transplant Unit

Table 12 Ranking of Nursing Interventions (NIC) by Unit

	Unit G		Unit H		Unit M		Unit A		
NIC	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*p*
Pain Management*	944	92.73	266	57.58	565	80.03	24	53.33	<.0001
Fall Prevention*	113	11.10	110	23.81	148	20.96	16	35.56	<.0001
Infection Protection*	316	31.04	148	32.03	203	28.75	41	91.11	<.0001
Infection Control*	312	30.65	145	31.39	200	28.33	40	88.89	<.0001
Nausea Management*	348	34.18	94	20.35	116	16.43	25	55.56	<.0001
Teaching: Procedure/Treatment*	231	22.69	111	24.03	161	22.80	29	64.44	<.0001
Analgesic Administration*	162	15.91	110	23.81	240	33.99	5	11.11	<.0001
Skin Surveillance*	228	22.40	50	10.82	180	25.50	3	6.67	<.0001
Wound Care*	205	20.14	30	6.49	161	22.80	1	2.22	<.0001
Pressure Management*	195	19.16	35	7.58	155	21.95	1	2.22	<.0001
Energy Management*	113	11.10	79	17.10	99	14.02	20	44.44	<.0001
Teaching: Preoperative*	199	19.55	25	5.41	82	11.61	0	0.00	<.0001
Activity Therapy*	106	10.41	57	12.34	79	11.19	15	33.33	<.0001
Exercise Promotion: Strength Training*	94	9.23	57	12.34	81	11.47	15	33.33	<.0001
Anxiety Reduction*	65	6.39	62	13.42	54	7.65	15	33.33	<.0001
Nutrition Management*	47	4.62	50	10.82	78	11.05	13	28.89	<.0001
Nutrition Therapy*	47	4.62	50	10.82	76	10.76	13	28.89	<.0001
Ventilation Assistance*	34	3.34	63	13.64	29	4.11	4	8.89	<.0001
Teaching: Disease Process*	24	2.36	53	11.47	60	8.50	4	8.89	<.0001
Bowel Management*	88	8.64	9	1.95	37	5.24	0	0.00	<.0001
Diet Staging*	88	8.64	10	2.16	35	4.96	0	0.00	<.0001
Airway Management*	48	4.72	59	12.77	23	3.26	2	4.44	<.0001

Table 12 Continued

Airway Suctioning*	47	4.62	57	12.34	23	3.26	2	4.44	<.0001
Acid-Base Management: Respiratory Acidosis*	29	2.85	56	12.12	25	3.54	2	4.44	<.0001
Acid-Base Management*	18	1.77	50	10.82	18	2.55	2	4.44	<.0001
Fluid Management*	10	0.98	43	9.31	26	3.68	14	31.11	<.0001
Exercise Promotion	39	3.83	21	4.55	33	4.67	0	0.00	.4131
Fluid Monitoring	31	3.05	18	3.90	25	3.54	3	6.67	.5336
Aspiration Precautions*	18	1.77	22	4.76	8	1.13	1	2.22	.0003
Urinary Retention Care*	49	4.81	2	0.43	9	1.27	0	0.00	<.0001
Temperature Regulation	11	1.08	12	2.60	11	1.56	0	0.00	.1338
Coping Enhancement*	11	1.08	26	5.63	9	1.27	2	4.44	<.0001
Oral Health Restoration*	3	0.29	29	6.28	4	0.57	16	35.56	<.0001
Grief Work Facilitation*	2	0.20	41	8.87	6	0.85	0	0.00	<.0001
Self-Care Assistance*	4	0.39	16	3.46	6	0.85	6	13.33	<.0001
Bleeding Precaution*	18	1.77	9	1.95	12	1.70	5	11.11	.0002
Neurologic Monitoring*	5	0.49	24	5.19	8	1.13	1	2.22	<.0001
Nutritional Monitoring	7	0.69	13	2.81	22	3.12	1	2.22	.0014
Teaching: Individual*	9	0.88	9	1.95	17	2.41	5	11.11	<.0001
Diarrhea Management*	7	0.69	12	2.60	13	1.84	6	13.33	<.0001
Delirium Management*	3	0.29	22	4.76	8	1.13	1	2.22	<.0001
Health Education*	8	0.79	7	1.52	16	2.27	5	11.11	<.0001
Cardiac Care: Acute*	2	0.20	15	3.25	6	0.85	1	2.22	<.0001
Emotional Support*	3	0.29	15	3.25	13	1.84	0	0.00	.0001
Circulatory Care: Venous Insufficiency*	3	0.29	19	4.11	8	1.13	1	2.22	<.0001
Circulatory Care: Arterial Insufficiency*	3	0.29	17	3.68	7	0.99	1	2.22	<.0001

Table 12 Continued

Sleep Enhancement	17	1.67	6	1.30	4	0.57	0	0.00	.1849
Cognitive Stimulation	2	0.20	11	2.38	1	0.14	0	0.00	
Cognitive Restructuring	2	0.20	10	2.16	1	0.14	0	0.00	
Family Support	1	0.10	22	4.76	2	0.28	0	0.00	
Pressure Ulcer Care	4	0.39	11	2.38	5	0.71	1	2.22	
Cerebral Perfusion Promotion	3	0.29	15	3.25	1	0.14	1	2.22	
Cerebral Edema Management	1	0.10	13	2.81	3	0.42	1	2.22	
Dying Care	0	0.00	16	3.46	2	0.28	0	0.00	
Positioning	6	0.59	7	1.52	5	0.71	0	0.00	
Constipation/Impaction Management	5	0.49	4	0.87	8	1.13	0	0.00	
Seizure Precaution	3	0.29	12	2.60	1	0.14	1	2.22	
Spiritual Support	0	0.00	12	2.60	2	0.28	0	0.00	
Communication Enhancement: Speech Deficit	4	0.39	8	1.73	1	0.14	0	0.00	
Artificial Airway Management	4	0.39	5	1.08	3	0.42	0	0.00	
Environmental Management	1	0.10	6	1.30	5	0.71	0	0.00	
Active Listening	1	0.10	9	1.95	1	0.14	0	0.00	
Substance Use Treatment: Alcohol Withdrawal	3	0.29	2	0.43	5	0.71	0	0.00	
Hyperglycemia Management	3	0.29	3	0.65	5	1.61	0	0.00	
Hypoglycemia Management	2	0.20	3	0.65	5	0.71	0	0.00	
Peripheral Sensation Management	2	0.20	8	1.73	0	0.00	0	0.00	
Spiritual Growth Facilitation	0	0.00	10	2.16	0	0.00	0	0.00	
Body Image Enhancement	2	0.20	5	1.08	0	0.00	2	4.44	
Mutual Goal Setting	1	0.10	4	0.87	4	0.57	0	0.00	

Table 12 Continued

Socialization Enhancement	3	0.29	5	1.08	1	0.14	0	0.00
Family Therapy	0	0.00	7	1.52	1	0.14	0	0.00
Memory Training	1	0.10	5	1.08	2	0.28	0	0.00
Reality Orientation	0	0.00	8	1.73	0	0.00	0	0.00
Self-Responsibility Facilitation	0	0.00	2	0.43	6	0.85	0	0.00
Unilateral Neglect Management	0	0.00	8	1.73	0	0.00	0	0.00
Substance Use Treatment: Drug Withdrawal	1	0.10	1	0.22	5	0.71	0	0.00
Latex Precautions	3	0.29	1	0.22	2	0.28	0	0.00
Urinary Habit Training	2	0.20	0	0.00	4	0.57	0	0.00
Behavior Management: Self-Harm	2	0.20	2	0.43	0	0.00	0	0.00
Self-Care Assistance: Feeding	0	0.00	4	0.87	1	0.14	0	0.00
Communication Enhancement: Hearing Deficit	3	0.29	1	0.22	0	0.00	0	0.00
Communication Enhancement: Visual Deficit	2	0.20	2	0.43	0	0.00	0	0.00
Foot Care	1	0.10	1	0.22	2	0.28	0	0.00
Hallucination Management	0	0.00	3	0.65	1	0.14	0	0.00
Seizure Management	0	0.00	3	0.65	1	0.14	0	0.00
Exercise Therapy: Balance	0	0.00	3	0.65	0	0.00	0	0.00
Dysreflexia Management	0	0.00	1	0.22	0	0.00	0	0.00
Impulse Control Training	0	0.00	1	0.22	0	0.00	1	2.22
Mechanical Ventilatory Weaning	1	0.10	1	0.22	0	0.00	0	0.00
Self-Care Assistance: Toileting	0	0.00	2	0.43	0	0.00	0	0.00
Self-Esteem Enhancement	1	0.10	0	0.00	0	0.00	0	0.00

Table 12 Continued

Suicide Prevention	1	0.10	1	0.22	0	0.00	0	0.00
Surveillance: Safety	1	0.10	0	0.00	1	0.14	0	0.00
Bowel Incontinence Care	0	0.00	1	0.22	0	0.00	0	0.00
Family Process Maintenance	0	0.00	1	0.22	0	0.00	0	0.00
Health Screening	0	0.00	1	0.22	0	0.00	0	0.00
Mood Management	1	0.10	0	0.00	0	0.00	0	0.00
Nutrition Education	0	0.00	0	0.00	1	0.14	0	0.00
Self-Care Assistance: Bathing/Hygiene	0	0.00	1	0.22	0	0.00	0	0.00
Self-Care Assistance: Dressing/grooming	0	0.00	1	0.22	0	0.00	0	0.00

Note. Unit G = Gynecology, Oral Surgery, and Otolaryngology Unit; Unit H = Hematology/Oncology and Palliative Care Unit Unit M = Medical Surgical Oncology Unit; Unit A = Adult Leukemia and Bone Marrow Transplant Unit

*= significant findings at α =.05, *p* value = .0005 was adjusted from *p* =.05 after Bonferroni's method (Bailar & Hoaglin, 2012) for multiple comparisons (*n*=100).

Table 13 Ranking of Nursing Interventions (NIC) Found Significantly Different by Unit

#	Unit G	Unit H	Unit M	Unit A
1	Pain Management	Pain Management	Pain Management	Infection Protection
2	Nausea Management	Infection Protection	Analgesic Administration	Infection Control
3	Infection Protection	Infection Control	Infection Protection	Teaching: Procedure/ Treatment
4	Infection Control	Teaching: Procedure/ Treatment	Infection Control	Nausea Management
5	Teaching: Procedure/ Treatment	Fall Prevention	Skin Surveillance	Pain Management
6	Skin Surveillance	Analgesic Administration	Teaching: Procedure/ Treatment	Energy Management
7	Wound Care	Nausea Management	Wound Care	Fall Prevention
8	Teaching: Preoperative	Energy Management	Pressure Management	Oral Health Restoration
9	Pressure Management	Ventilation Assistance	Fall Prevention	Activity Therapy
10	Analgesic Administration	Anxiety Reduction	Nausea Management	Exercise Promotion: Strength Training
11	Fall Prevention	Airway Management	Energy Management	Anxiety Reduction
12	Energy Management	Activity Therapy	Teaching: Preoperative	Fluid Management
13	Activity Therapy	Exercise Promotion: Strength Training	Exercise Promotion: Strength Training	Nutrition Management
14	Exercise Promotion: Strength Training	Airway Suctioning	Activity Therapy	Nutrition Therapy

Table 13 Continued

15	Bowel Management	Acid-Base Management: Respiratory Acidosis	Nutrition Management	Self-Care Assistance
16	Diet Staging	Teaching: Disease Process	Nutrition Therapy	Diarrhea Management
17	Anxiety Reduction	Skin Surveillance	Teaching: Disease Process	Analgesic Administration
18	Urinary Retention Care	Nutrition Management	Anxiety Reduction	Bleeding Precaution
19	Airway Management	Nutrition Therapy	Bowel Management	Teaching: Individual
20	Nutrition Management	Acid-Base Management	Diet Staging	Health Education
21	Nutrition Therapy	Fluid Management	Ventilation Assistance	Ventilation Assistance
22	Airway Suctioning	Grief Work Facilitation	Fluid Management	Teaching: Disease Process
23	Ventilation Assistance	Pressure Management	Acid-Base Management: Respiratory Acidosis	Skin Surveillance
24	Acid-Base Management: Respiratory Acidosis	Wound Care	Airway Management	Airway Management
25	Teaching: Disease Process	Oral Health Restoration	Airway Suctioning	Airway Suctioning
26	Acid-Base Management	Coping Enhancement	Nutritional Monitoring	Acid-Base Management: Respiratory Acidosis
27	Aspiration Precautions	Teaching: Preoperative	Acid-Base Management	Acid-Base Management
28	Bleeding Precaution	Neurologic Monitoring	Teaching: Individual	Coping Enhancement
29	Coping Enhancement	Aspiration Precautions	Health Education	Wound Care

Table 13 Continued

30	Fluid Management	Delirium Management	Diarrhea Management	Pressure Management
31	Teaching: Individual	Circulatory Care: Venous Insufficiency	Emotional Support	Aspiration Precautions
32	Health Education	Circulatory Care: Arterial Insufficiency	Bleeding Precaution	Neurologic Monitoring
33	Nutritional Monitoring	Self-Care Assistance	Urinary Retention Care	Nutritional Monitoring
34	Diarrhea Management	Cardiac Care: Acute	Coping Enhancement	Delirium Management
35	Neurologic Monitoring	Emotional Support	Aspiration Precautions	Cardiac Care: Acute
36	Self-Care Assistance	Nutritional Monitoring	Neurologic Monitoring	Circulatory Care: Venous Insufficiency
37	Oral Health Restoration	Diarrhea Management	Delirium Management	Circulatory Care: Arterial Insufficiency
38	Delirium Management	Diet Staging	Circulatory Care: Venous Insufficiency	Teaching: Preoperative
39	Emotional Support	Bowel Management	Circulatory Care: Arterial Insufficiency	Bowel Management
40	Circulatory Care: Venous Insufficiency	Bleeding Precaution	Grief Work Facilitation	Diet Staging
41	Circulatory Care: Arterial Insufficiency	Teaching: Individual	Self-Care Assistance	Urinary Retention Care
42	Grief Work Facilitation	Health Education	Cardiac Care: Acute	Grief Work Facilitation
43	Cardiac Care: Acute	Urinary Retention Care	Oral Health Restoration	Emotional Support

Note. Unit G = Gynecology, Oral Surgery, and Otolaryngology Unit; Unit H = Hematology/Oncology and Palliative Care Unit; Unit M = Medical Surgical Oncology Unit; Unit A = Adult Leukemia and Bone Marrow Transplant Unit
#=ranking

Table 14 Ranking of Nursing-Sensitive Patient Outcomes (NOC) by Unit

	Unit G		Unit H		Unit M		Unit A		
NOC	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*p*
Pain Level*	938	91.78	265	57.24	566	80.06	24	53.33	<.0001
Infection Severity*	317	31.02	148	31.97	204	28.85	41	91.11	<.0001
Nausea and Vomiting Severity*	352	34.44	95	20.52	118	16.69	26	57.78	<.0001
Knowledge: Treatment Procedure*	236	23.09	114	24.62	161	22.77	29	64.44	<.0001
Tissue Integrity: Skin and Mucous Membranes*	238	23.29	53	11.45	182	25.74	3	6.67	<.0001
Pain Control*	178	17.42	99	21.38	237	33.52	6	13.33	<.0001
Knowledge: Fall Prevention*	111	10.86	110	23.76	145	20.51	16	35.56	<.0001
Fall Prevention: Behavior*	110	10.76	108	23.33	146	20.65	16	35.56	<.0001
Activity Tolerance*	110	10.76	58	12.53	80	11.32	15	33.33	<.0001
Anxiety Level*	64	6.26	62	13.39	53	7.50	13	28.89	<.0001
Nutritional Status*	51	4.99	50	10.80	78	11.03	13	28.89	<.0001
Knowledge: Illness Care*	22	2.15	55	11.88	64	9.05	4	8.89	<.0001
Gastrointestinal Function*	90	8.81	10	2.16	38	5.37	0	0.00	<.0001
Respiratory Status: Airway Patency*	51	4.99	59	12.74	23	3.25	2	4.44	<.0001
Respiratory Status: Gas Exchange*	33	3.23	59	12.74	25	3.54	3	6.67	<.0001
Mobility	43	4.21	23	4.97	35	4.95	0	0.00	.410
Endurance*	11	1.08	42	9.07	28	3.96	16	35.56	<.0001
Tissue Perfusion: Pulmonary*	17	1.66	49	10.58	19	2.69	2	4.44	<.0001
Hydration	31	3.03	18	3.89	25	3.54	3	6.67	.529
Fluid Balance*	10	0.98	28	6.05	20	2.83	15	33.33	<.0001
Urinary Elimination*	50	4.89	2	0.43	11	1.56	0	0.00	<.0001
Aspiration Prevention*	18	1.76	22	4.75	7	0.99	1	2.22	<.0001
Coping*	11	1.08	26	5.62	9	1.27	4	8.89	<.0001
Oral Hygiene*	3	0.29	30	6.48	4	0.57	16	35.56	<.0001

Table 14 Continued

Grief Resolution*	2	0.20	41	8.86	6	0.85	0	0.00	<.0001
Self-Care: Activities of Daily Living(ADL)*	3	0.30	16	3.46	6	0.85	6	13.33	<.0001
Bowel Elimination*	8	0.78	13	2.81	18	2.55	6	13.33	<.0001
Blood Loss Severity*	19	1.86	9	1.94	12	1.70	5	11.11	<.0001
Respiratory Status: Ventilation*	15	1.47	20	4.32	8	1.13	2	4.44	<.0001
Knowledge: Treatment Regimen*	9	0.88	8	1.73	17	2.40	5	11.11	<.0001
Family Coping*	1	0.10	25	5.40	2	0.28	0	0.00	<.0001
Acute Confusion Level*	3	0.29	21	4.54	8	1.13	1	2.22	<.0001
Pain: Disruptive Effects*	4	0.39	15	3.24	13	1.84	0	0.00	<.0001
Risk Control: Hyperthermia	11	1.08	11	2.38	10	1.41	0	0.00	.212
Risk Control: Hypothermia	10	0.98	9	1.94	8	1.13	0	0.00	.371
Sleep	17	1.66	6	1.30	4	0.57	0	0.00	.187
Fluid Overload Severity*	0	0.00	17	3.67	8	1.13	1	2.22	<.0001
Spiritual Health*	0	0.00	18	3.89	2	0.28	0	0.00	<.0001
Tissue Perfusion: Cerebral*	4	0.39	15	3.24	1	0.14	1	2.22	<.0001
Cognitive Orientation*	2	0.20	14	3.02	1	0.14	0	0.00	
Neurological Status*	2	0.20	13	2.81	3	0.42	1	2.22	
Swallowing Status*	6	0.59	11	2.38	2	0.28	0	0.00	
Dignified Life Closure*	0	0.00	16	3.46	2	0.28	0	0.00	
Tissue Perfusion: Cardiac*	2	0.20	11	2.38	4	0.57	1	2.22	
Tissue Perfusion: Peripheral	3	0.29	8	1.73	5	0.71	0	0.00	
Cardiac Pump Effectiveness*	0	0.00	12	2.59	3	0.42	0	0.00	
Communication	5	0.49	9	1.94	1	0.14	0	0.00	
Seizure Control*	1	0.10	11	2.38	1	0.14	1	2.22	
Cognition*	1	0.10	10	2.16	1	0.14	0	0.00	

Table 14 Continued

Blood Glucose Level	3	0.29	3	0.65	5	0.71	0	0.00
Body Positioning: Self-Initiated	2	0.20	4	0.86	5	0.71	0	0.00
Kidney Function	1	0.10	6	1.30	3	0.42	1	2.22
Burn Healing	3	0.29	4	0.86	3	0.42	0	0.00
Neurological Status: Peripheral*	2	0.20	8	1.73	0	0.00	0	0.00
Substance Withdrawal Severity	3	0.29	2	0.43	5	0.71	0	0.00
Body Image*	2	0.20	5	1.08	0	0.00	2	4.44
Compliance Behavior	1	0.10	4	0.86	4	0.57	0	0.00
Diabetes Self-Management	2	0.20	1	0.22	6	0.85	0	0.00
Knowledge: Personal Safety	2	0.20	2	0.43	5	0.71	0	0.00
Heedfulness of Affected Side*	0	0.00	8	1.73	0	0.00	0	0.00
Memory	1	0.10	5	1.08	2	0.28	0	0.00
Allergic Response: Systemic	3	0.29	1	0.22	2	0.28	0	0.00
Sensory Function: Vision	4	0.39	2	0.43	0	0.00	0	0.00
Urinary Continence	2	0.20	0	0.00	4	0.57	0	0.00
Nutritional Status: Food and Fluid Intake	1	0.10	3	0.65	1	0.14	0	0.00
Social Involvement	1	0.10	3	0.65	1	0.14	0	0.00
Health Seeking Behavior	0	0.00	1	0.22	3	0.42	0	0.00
Social Interaction Skills	2	0.20	2	0.43	0	0.00	0	0.00
Balance	0	0.00	3	0.65	0	0.00	0	0.00
Communication: Receptive	2	0.20	0	0.00	0	0.00	0	0.00
Depression Level	2	0.20	0	0.00	0	0.00	0	0.00
Neurological Status: Autonomic	0	0.00	1	0.22	0	0.00	0	0.00
Risk Control	1	0.10	0	0.00	1	0.14	0	0.00
Self-Care Status	0	0.00	2	0.43	0	0.00	0	0.00

Table 14 Continued

Suicide Self-Restraint	1	0.10	1	0.22	0	0.00	0	0.00
Family Integrity	0	0.00	1	0.22	0	0.00	0	0.00
Growth	0	0.00	1	0.22	0	0.00	0	0.00
Mood Equilibrium	0	0.00	1	0.22	0	0.00	0	0.00
Oral Intake	0	0.00	0	0.00	1	0.14	0	0.00
Self-Esteem	1	0.10	0	0.00	0	0.00	0	0.00
Self-Mutilation Restraint	1	0.10	0	0.00	0	0.00	0	0.00

Note. Unit G = Gynecology, Oral Surgery, and Otolaryngology Unit; Unit H = Hematology/Oncology and Palliative Care Unit; Unit M = Medical Surgical Oncology Unit; Unit A = Adult Leukemia and Bone Marrow Transplant Unit
*=significant findings at $\alpha = .05$, p value = .000625 was adjusted from $p = .05$ after Bonferroni's method (Bailar & Hoaglin, 2012) for multiple comparisons (n=81).

Table 15 The Top Ranking of Nursing Outcomes (NOC) Found Significantly Different by Unit

#	Unit G	Unit H	Unit M	Unit A
1	Pain Level	Pain Level	Pain Level	Infection Severity
2	Nausea and Vomiting Severity	Infection Severity	Pain Control	Knowledge: Treatment Procedure
3	Infection Severity	Knowledge: Treatment Procedure	Infection Severity	Nausea and Vomiting Severity
4	Tissue Integrity: Skin and Mucous Membranes	Knowledge: Fall Prevention	Tissue Integrity: Skin and Mucous Membranes	Pain Level
5	Knowledge: Treatment Procedure	Fall Prevention: Behavior	Knowledge: Treatment Procedure	Knowledge: Fall Prevention
6	Pain Control	Pain Control	Fall Prevention: Behavior	Fall Prevention: Behavior
7	Knowledge: Fall Prevention	Nausea and Vomiting Severity	Knowledge: Fall Prevention	Endurance
8	Fall Prevention: Behavior	Anxiety Level	Nausea and Vomiting Severity	Oral Hygiene
9	Activity Tolerance	Respiratory Status: Airway Patency	Activity Tolerance	Activity Tolerance
10	Gastrointestinal Function	Respiratory Status: Gas Exchange	Nutritional Status	Fluid Balance
11	Anxiety Level	Activity Tolerance	Knowledge: Illness Care	Anxiety Level
12	Nutritional Status	Knowledge: Illness Care	Anxiety Level	Nutritional Status
13	Respiratory Status: Airway Patency	Tissue Integrity: Skin and Mucous Membranes	Gastrointestinal Function	Pain Control
14	Urinary Elimination	Nutritional Status	Endurance	Self-Care: Activities of Daily Living(ADL)

Table 15 Continued

15	Respiratory Status: Gas Exchange	Tissue Perfusion: Pulmonary	Respiratory Status: Gas Exchange	Bowel Elimination
16	Knowledge: Illness Care	Endurance	Respiratory Status: Airway Patency	Blood Loss Severity
17	Blood Loss Severity	Grief Resolution	Fluid Balance	Knowledge: Treatment Regimen
18	Aspiration Prevention	Oral Hygiene	Tissue Perfusion: Pulmonary	Knowledge: Illness Care
19	Tissue Perfusion: Pulmonary	Fluid Balance	Bowel Elimination	Coping
20	Respiratory Status: Ventilation	Coping	Knowledge: Treatment Regimen	Tissue Integrity: Skin and Mucous Membranes
21	Endurance	Family Coping	Pain: Disruptive Effects	Respiratory Status: Gas Exchange
22	Coping	Aspiration Prevention	Blood Loss Severity	Respiratory Status: Airway Patency
23	Fluid Balance	Acute Confusion Level	Urinary Elimination	Tissue Perfusion: Pulmonary
24	Knowledge: Treatment Regimen	Respiratory Status: Ventilation	Coping	Respiratory Status: Ventilation
25	Bowel Elimination	Spiritual Health	Respiratory Status: Ventilation	Body Image
26	Swallowing Status	Fluid Overload Severity	Acute Confusion Level	Aspiration Prevention
27	Pain: Disruptive Effects	Self-Care: Activities of Daily Living(ADL)	Fluid Overload Severity	Acute Confusion Level
28	Tissue Perfusion: Cerebral	Dignified Life Closure	Aspiration Prevention	Fluid Overload Severity
29	Oral Hygiene	Pain: Disruptive Effects	Grief Resolution	Tissue Perfusion: Cerebral
30	Acute Confusion Level	Tissue Perfusion: Cerebral	Self-Care: Activities of Daily Living(ADL)	Neurological Status

Table 15 Continued

31	Tissue Perfusion: Peripheral	Cognitive Orientation	Tissue Perfusion: Peripheral	Tissue Perfusion: Cardiac
32	Grief Resolution	Bowel Elimination	Oral Hygiene	Seizure Control
33	Self-Care: Activities of Daily Living(ADL)	Neurological Status	Tissue Perfusion: Cardiac	Gastrointestinal Function
34	Cognitive Orientation	Cardiac Pump Effectiveness	Neurological Status	Urinary Elimination
35	Neurological Status	Swallowing Status	Cardiac Pump Effectiveness	Grief Resolution
36	Tissue Perfusion: Cardiac	Tissue Perfusion: Cardiac	Family Coping	Family Coping
37	Neurological Status: Peripheral	Seizure Control	Spiritual Health	Pain: Disruptive Effects
38	Body Image	Gastrointestinal Function	Swallowing Status	Spiritual Health
39	Family Coping	Cognition	Dignified Life Closure	Cognitive Orientation
40	Seizure Control	Blood Loss Severity	Tissue Perfusion: Cerebral	Swallowing Status
41	Cognition	Knowledge: Treatment Regimen	Cognitive Orientation	Dignified Life Closure
42	Fluid Overload Severity	Tissue Perfusion: Peripheral	Seizure Control	Tissue Perfusion: Peripheral
43	Spiritual Health	Neurological Status: Peripheral	Cognition	Cardiac Pump Effectiveness
44	Dignified Life Closure	Heedfulness of Affected Side	Neurological Status: Peripheral	Cognition
45	Cardiac Pump Effectiveness	Body Image	Body Image	Neurological Status: Peripheral
46	Heedfulness of Affected Side	Urinary Elimination	Heedfulness of Affected Side	Heedfulness of Affected Side

Note. #= Rank

Table 16 Ranking of Nursing Diagnoses (NANDA-I) by Length of Stay (LOS)

	Group 1 LOS<1		Group 2 1≤LOS<3		Group 3 LOS≥3		
NANDA-I	*n*	*%*	*n*	*%*	*n*	*%*	*p*
Acute Pain	40	65.57	932	80.28	774	76.26	.0045
Risk for Infection*	12	19.67	306	26.36	392	38.62	<.0001
Nausea*	6	9.84	282	24.29	303	29.85	.0002
Impaired Skin Integrity	10	16.39	195	16.80	205	20.20	.1141
Risk for Falls*	10	16.39	156	13.44	221	21.77	<.0001
Deficient Knowledge Pre/Post Procedure/Surgery	11	18.03	177	15.25	165	16.26	.7205
Activity Intolerance*	7	11.48	94	8.10	162	15.96	<.0001
Deficient Knowledge, Disease Process*	7	11.48	73	6.29	126	12.41	<.0001
Anxiety*	5	8.20	73	6.29	114	11.23	.0002
Imbalanced Nutrition: Less than Body Requirements*	5	8.20	68	5.86	119	11.72	<.0001
Risk for Constipation*	1	1.64	46	3.96	91	8.97	<.0001
Ineffective Airway Clearance*	15	24.59	45	3.88	74	7.29	<.0001
Impaired Gas Exchange*	14	22.95	40	3.45	68	6.70	<.0001
Risk for Impaired Skin Integrity*	3	4.92	38	3.27	70	6.90	.0005
Impaired Physical Mobility	2	3.28	35	3.01	62	6.11	.0020
Fatigue	2	3.28	34	2.93	51	5.02	.0402
Ineffective Tissue Perfusion: Pulmonary*	12	19.67	31	2.67	44	4.33	<.0001
Chronic Pain*	2	3.28	24	2.07	54	5.32	.0002
Risk for Imbalanced Fluid Volume*	5	8.20	20	1.72	52	5.12	<.0001

Table 16 Continued

Urinary Retention	0	0.00	24	2.07	37	3.65	.0327
Impaired Oral Mucous Membrane	1	1.64	16	1.38	36	3.55	.0038
Grieving	3	4.92	13	1.12	33	3.25	.0011
Risk for Deficient Fluid Volume	1	1.64	17	1.46	30	2.96	.0547
Ineffective Breathing Pattern	2	3.28	20	1.72	23	2.27	.5164
Risk for Bleeding	4	6.56	17	1.46	24	2.36	.0123
Deficient Knowledge	3	4.92	18	1.55	18	1.77	.1461
Risk for Aspiration	2	3.28	16	1.38	16	1.58	.4872
Risk for Imbalanced Body Temperature	0	0.00	10	0.86	24	2.36	.0103
Acute Confusion	1	1.64	13	1.12	19	1.87	.3465
Sleep Deprivation	1	1.64	9	0.78	17	1.67	.1515
Deficient Fluid Volume	1	1.64	8	0.69	17	1.67	.0951
Diarrhea*	3	4.92	3	0.26	20	1.97	<.0001
Excess Fluid Volume	3	4.92	10	0.86	13	1.28	.0141
Readiness for Enhanced Family Coping	2	3.28	7	0.60	15	1.48	.0337
Ineffective Tissue Perfusion, Cerebral	2	3.28	14	1.21	7	0.69	.1033
Self-Care Deficit	0	0.00	8	0.69	13	1.28	.2680
Impaired Swallowing	1	1.64	11	0.95	8	0.79	.7603
Decreased Intracranial Adaptive Capacity	2	3.28	13	1.12	4	0.39	
Ineffective Tissue Perfusion: Cardiac	2	3.28	10	0.86	6	0.59	
Spiritual Distress	1	1.64	7	0.60	10	0.99	
Bathing/Hygiene Self-Care Deficit	1	1.64	5	0.43	11	1.08	
Constipation	2	3.28	7	0.60	7	0.69	

Table 16 Continued

Decreased Cardiac Output	2	3.28	9	0.78	4	0.39
Disturbed Thought Processes	1	1.64	7	0.60	7	0.69
Impaired Verbal Communication	0	0.00	8	0.69	7	0.69
Impaired Spontaneous Ventilation	1	1.64	3	0.26	9	0.89
Risk for Activity Intolerance	0	0.00	7	0.60	6	0.59
Impaired Bed Mobility	0	0.00	4	0.34	8	0.79
Feeding: Self-Care Deficit	0	0.00	5	0.43	6	0.59
Ineffective Tissue Perfusion, Renal	0	0.00	2	0.17	9	0.89
Risk for Unstable Blood Glucose	0	0.00	5	0.43	6	0.59
Disturbed Body Image	0	0.00	3	0.26	7	0.69
Risk for Injury	2	3.28	3	0.26	5	0.49
Risk for Peripheral Neurovascular Dysfunction	0	0.00	5	0.43	5	0.49
Risk for Withdrawal: Alcohol/Drugs	0	0.00	6	0.52	4	0.39
Deficient Knowledge, Insulin Therapy	0	0.00	2	0.17	7	0.69
Disabled Family Coping	1	1.64	3	0.26	5	0.49
Ineffective Tissue Perfusion	0	0.00	1	0.09	8	0.79
Noncompliance	0	0.00	5	0.43	4	0.39
Readiness for Enhanced Spiritual Well-Being	1	1.64	2	0.17	6	0.59
Impaired Memory	0	0.00	4	0.34	4	0.39
Ineffective Coping	2	3.28	2	0.17	4	0.39
Unilateral Neglect	2	3.28	3	0.26	3	0.30
Impaired Urinary Elimination	0	0.00	4	0.34	3	0.30
Ineffective Tissue Perfusion, Peripheral	0	0.00	0	0.00	7	0.69

Table 16 Continued

Social Isolation	1	1.64	1	0.09	5	0.49
Disturbed Sensory Perception, Visual	0	0.00	2	0.17	4	0.39
Risk for Latex Allergy Response	0	0.00	3	0.26	2	0.20
Bowel Incontinence	0	0.00	2	0.17	2	0.20
Chronic Confusion	1	1.64	2	0.17	1	0.10
Ineffective Health Maintenance	0	0.00	3	0.26	1	0.10
Disturbed Sensory Perception, Kinesthetic	0	0.00	2	0.17	1	0.10
Disturbed Sensory Perception, Auditory	0	0.00	2	0.17	0	0.00
Dysfunctional Ventilatory Weaning Response	0	0.00	0	0.00	2	0.20
Impaired Social Interaction	1	1.64	0	0.00	1	0.10
Impaired Tissue Integrity	0	0.00	0	0.00	2	0.20
Mood Alteration: Depression	1	1.64	0	0.00	1	0.10
Risk for Suicide	1	1.64	1	0.09	0	0.00
Systemic Risk for Latex Allergy Response	0	0.00	1	0.09	0	0.00
Autonomic Dysreflexia	0	0.00	0	0.00	1	0.10
Delayed Growth and Development	0	0.00	1	0.09	0	0.00
Inadequate Oral Food Beverage Intake	0	0.00	1	0.09	0	0.00
Interrupted Family Process	0	0.00	1	0.09	0	0.00
Mood Alteration: Mania	0	0.00	1	0.09	0	0.00
Readiness for Enhanced Coping	0	0.00	0	0.00	1	0.10
Risk for Autonomic Dysreflexia	0	0.00	0	0.00	1	0.10
Risk for Self-Directed Violence	0	0.00	0	0.00	1	0.10
Situational Low Self-Esteem	0	0.00	0	0.00	1	0.10
Toileting Self-Care Deficit	0	0.00	0	0.00	1	0.10

Note. LOS=Length of stay (day)

A total of 2,237 samples, Group 1 = LOS < 1 (*n*=61, 3%), Group 2 = 1≤ LOS <3 (*n*=1,161, 52%), Group 3 = LOS ≥ 3 (*n*=1,015, 45%)

n in parenthesis = number of patients in each group of LOS
% in parenthesis = percentage of patients in each group of LOS

*=significant finding
Bonferroni's method (Bailar & Hoaglin, 2012) for multiple comparisons (n=88) were applied, and *p* value = 000568 was adjusted from α = .05.

Table 17 Ranking of Nursing Diagnoses (NANDA-I) Found Significantly Different by LOS

#	**Group 1:** LOS<1	**Group 2:** 1 ≤ LOS < 3	**Group 3:** LOS ≥ 3
1	Ineffective Airway Clearance	Risk for Infection	Risk for Infection
2	Impaired Gas Exchange	Nausea	Nausea
3	Risk for Infection	Risk for Falls	Risk for Falls
4	Ineffective Tissue Perfusion: Pulmonary	Activity Intolerance	Activity Intolerance
5	Risk for Falls	Deficient Knowledge, Disease Process	Deficient Knowledge, Disease Process
6	Activity Intolerance	Anxiety	Imbalanced Nutrition: Less than Body Requirements
7	Deficient Knowledge, Disease Process	Imbalanced Nutrition: Less than Body Requirements	Anxiety
8	Nausea	Risk for Constipation	Risk for Constipation
9	Anxiety	Ineffective Airway Clearance	Ineffective Airway Clearance
10	Imbalanced Nutrition: Less than Body Requirements	Impaired Gas Exchange	Risk for Impaired Skin Integrity
11	Risk for Imbalanced Fluid Volume	Risk for Impaired Skin Integrity	Impaired Gas Exchange
12	Risk for Impaired Skin Integrity	Ineffective Tissue Perfusion: Pulmonary	Chronic Pain
13	Diarrhea	Chronic Pain	Risk for Imbalanced Fluid Volume
14	Chronic Pain	Risk for Imbalanced Fluid Volume	Ineffective Tissue Perfusion: Pulmonary
15	Risk for Constipation	Diarrhea	Diarrhea
16	Ineffective Airway Clearance	Risk for Infection	Risk for Infection
17	Impaired Gas Exchange	Nausea	Nausea
18	Risk for Infection	Risk for Falls	Risk for Falls

Table 18 Ranking of Nursing Interventions (NIC) by Length of Stay (LOS)

	Group 1 LOS<1		**Group 2** 1≤LOS<3		**Group 3** LOS≥3		
NIC	*n*	*%*	*n*	*%*	*n*	*%*	*p*
Pain Management	41	67.21	953	82.51	805	79.31	.0046
Fall Prevention*	10	16.39	156	13.51	221	21.77	<.0001
Infection Protection*	12	19.67	305	26.41	391	38.52	<.0001
Infection Control*	12	19.67	303	26.23	382	37.64	<.0001
Nausea Management	6	9.84	279	24.16	298	29.36	.0003
Teaching: Procedure/Treatment	16	26.23	239	20.69	277	27.29	.0014
Analgesic Administration	11	18.03	269	23.29	237	23.35	.6275
Skin Surveillance	10	16.39	216	18.70	235	23.15	.0270
Wound Care	9	14.75	193	16.71	195	19.21	.2582
Pressure Management	10	16.39	185	16.02	191	18.82	.2234
Energy Management*	9	14.75	112	9.70	190	18.72	<.0001
Teaching: Preoperative	9	14.75	151	13.07	145	14.29	.6925
Activity Therapy*	7	11.48	92	7.97	158	15.57	<.0001
Exercise Promotion: Strength Training*	7	11.48	87	7.53	153	15.07	<.0001
Anxiety Reduction*	5	8.20	73	6.32	118	11.63	.0001
Nutrition Management*	5	8.20	67	5.80	116	11.43	<.0001
Nutrition Therapy*	5	8.20	64	5.54	117	11.53	<.0001
Ventilation Assistance*	14	22.95	46	3.98	70	6.90	<.0001
Teaching: Disease Process*	6	9.84	47	4.07	88	8.67	<.0001
Bowel Management*	1	1.64	46	3.98	87	8.57	<.0001

Table 18 Continued

Diet Staging*	1	1.64	45	3.90	87	8.57	<.0001
Airway Management*	15	24.59	44	3.81	73	7.19	<.0001
Airway Suctioning*	14	22.95	42	3.64	73	7.19	<.0001
Acid-Base Management: Respiratory Acidosis*	14	22.95	37	3.20	61	6.01	<.0001
Acid-Base Management*	13	21.31	34	2.94	41	4.04	<.0001
Fluid Management	5	8.20	33	2.86	55	5.42	.0033
Exercise Promotion	2	3.28	34	2.94	57	5.62	.0075
Fluid Monitoring*	5	8.20	20	1.73	52	5.12	<.0001
Aspiration Precautions	3	4.92	23	1.99	23	2.27	.3084
Urinary Retention Care	0	0.00	24	2.08	36	3.55	.0453
Temperature Regulation	0	0.00	10	0.87	24	2.36	.0108
Coping Enhancement	3	4.92	14	1.21	31	3.05	.0041
Oral Health Restoration	1	1.64	16	1.39	35	3.45	.0060
Grief Work Facilitation	3	4.92	13	1.13	33	3.25	.0012
Self-Care Assistance	1	1.64	10	0.87	21	2.07	.0623
Bleeding Precaution	4	6.56	16	1.39	24	2.36	.0087
Neurologic Monitoring	1	1.64	14	1.21	23	2.27	.1665
Nutritional Monitoring	2	3.28	13	1.13	28	2.76	.0163
Teaching: Individual	3	4.92	18	1.56	19	1.87	.1511
Diarrhea Management*	5	8.20	8	0.69	25	2.46	<.0001
Delirium Management	1	1.64	12	1.04	21	2.07	.1477
Health Education	2	3.28	17	1.47	17	1.67	.5392
Cardiac Care: Acute	3	4.92	14	1.21	7	0.69	.0065

Table 18 Continued

Emotional Support	1	1.64	14	1.21	16	1.58	.7589
Circulatory Care: Venous Insufficiency	0	0.00	6	0.52	25	2.46	.0004
Circulatory Care: Arterial Insufficiency	0	0.00	6	0.52	22	2.17	.0018
Sleep Enhancement	1	1.64	9	0.78	17	1.67	.1556
Cognitive Stimulation	1	1.64	6	0.52	7	0.69	.5272
Cognitive Restructuring	1	1.64	5	0.43	7	0.69	.4018
Family Support	2	3.28	7	0.61	16	1.58	.0270
Pressure Ulcer Care	1	1.64	9	0.78	11	1.08	.6489
Cerebral Perfusion Promotion	1	1.64	13	1.13	6	0.59	.3454
Cerebral Edema Management	1	1.64	13	1.13	4	0.39	
Dying Care	1	1.64	7	0.61	10	0.99	
Positioning	1	1.64	7	0.61	10	0.99	
Constipation/Impaction Management	2	3.28	7	0.61	8	0.79	
Seizure Precaution	2	3.28	9	0.78	6	0.59	
Spiritual Support	1	1.64	5	0.43	8	0.79	
Communication Enhancement: Speech Deficit	0	0.00	6	0.52	7	0.69	
Artificial Airway Management	1	1.64	3	0.26	8	0.79	
Environmental Management	2	3.28	4	0.35	6	0.59	
Active Listening	0	0.00	7	0.61	4	0.39	
Substance Use Treatment: Alcohol Withdrawal	0	0.00	6	0.52	4	0.39	
Hyperglycemia Management	0	0.00	5	0.43	5	0.49	
Hypoglycemia Management	0	0.00	4	0.35	6	0.59	
Peripheral Sensation Management	0	0.00	5	0.43	5	0.49	

Table 18 Continued

Spiritual Growth Facilitation	1	1.64	3	0.26	6	0.59
Body Image Enhancement	0	0.00	2	0.17	7	0.69
Mutual Goal Setting	0	0.00	5	0.43	4	0.39
Socialization Enhancement	2	3.28	1	0.09	6	0.59
Family Therapy	1	1.64	2	0.17	5	0.49
Memory Training	0	0.00	4	0.35	4	0.39
Reality Orientation	1	1.64	3	0.26	4	0.39
Self-Responsibility Facilitation	0	0.00	5	0.43	3	0.30
Unilateral Neglect Management	2	3.28	3	0.26	3	0.30
Substance Use Treatment: Drug Withdrawal	0	0.00	3	0.26	4	0.39
Latex Precautions	0	0.00	4	0.35	2	0.20
Urinary Habit Training	0	0.00	4	0.35	2	0.20
Behavior Management: Self-Harm	1	1.64	2	0.17	1	0.10
Self-Care Assistance: Feeding	0	0.00	0	0.00	5	0.49
Communication Enhancement: Hearing Deficit	0	0.00	4	0.35	0	0.00
Communication Enhancement: Visual Deficit	0	0.00	1	0.09	3	0.30
Foot Care	0	0.00	1	0.09	3	0.30
Hallucination Management	0	0.00	0	0.00	4	0.39
Seizure Management	0	0.00	2	0.17	2	0.20
Exercise Therapy: Balance	0	0.00	2	0.17	1	0.10
Dysreflexia Management	0	0.00	0	0.00	1	0.10
Impulse Control Training	0	0.00	1	0.09	1	0.10
Mechanical Ventilatory Weaning	0	0.00	0	0.00	2	0.20

Table 18 Continued

Self-Care Assistance: Toileting	0	0.00	0	0.00	2	0.20
Self-Esteem Enhancement	0	0.00	0	0.00	1	0.10
Suicide Prevention	1	1.64	1	0.09	0	0.00
Surveillance: Safety	1	1.64	0	0.00	1	0.10
Bowel Incontinence Care	0	0.00	0	0.00	1	0.10
Family Process Maintenance	0	0.00	1	0.09	0	0.00
Health Screening	0	0.00	1	0.09	0	0.00
Hyperglycemia Management	0	0.00	0	0.00	1	0.10
Mood Management	1	1.64	0	0.00	0	0.00
Nutrition Education	0	0.00	1	0.09	0	0.00
Parenting Promotion	0	0.00	1	0.09	0	0.00
Self-Care Assistance: Bathing/Hygiene	0	0.00	0	0.00	1	0.10
Self-Care Assistance: Dressing/grooming	0	0.00	0	0.00	1	0.10
Teaching: preoperative	0	0.00	1	0.09	0	0.00

Note. LOS=Length of stay (day), *=significant finding,

A total of 2,237 samples, Group One = LOS < 1 (*n*=61, 3%), Group Two = 1≤ LOS <3 (*n*=1,161, 52%), Group Three = LOS ≥ 3 (*n*=1,015, 45%)

Bonferroni's method (Bailar & Hoaglin, 2012) for multiple comparisons (n=100) were applied, and *p* value = .0005 was adjusted from α = .05.

Table 19 Ranking of NIC Outcomes Found Significantly Different by LOS

#	**Group 1:** LOS<1	**Group 2:** 1 ≤ LOS < 3	**Group 3:** LOS ≥ 3
1	Airway Management	Airway Management	Infection Protection
2	Ventilation Assistance	Ventilation Assistance	Infection Control
3	Airway Suctioning	Airway Suctioning	Analgesic Administration
4	Acid-Base Management: Respiratory Acidosis	Acid-Base Management: Respiratory Acidosis	Fall Prevention
5	Acid-Base Management	Acid-Base Management	Energy Management
6	Infection Protection	Infection Protection	Activity Therapy
7	Infection Control	Infection Control	Exercise Promotion: Strength Training
8	Analgesic Administration	Analgesic Administration	Anxiety Reduction
9	Fall Prevention	Fall Prevention	Nutrition Therapy
10	Energy Management	Energy Management	Nutrition Management
11	Activity Therapy	Activity Therapy	Teaching: Disease Process
12	Exercise Promotion: Strength Training	Exercise Promotion: Strength Training	Bowel Management
13	Teaching: Disease Process	Teaching: Disease Process	Diet Staging
14	Anxiety Reduction	Anxiety Reduction	Airway Management
15	Nutrition Management	Nutrition Management	Airway Suctioning
16	Nutrition Therapy	Nutrition Therapy	Ventilation Assistance
17	Fluid Monitoring	Fluid Monitoring	Acid-Base Management: Respiratory Acidosis
18	Diarrhea Management	Diarrhea Management	Fluid Monitoring
19	Bowel Management	Bowel Management	Acid-Base Management
20	Diet Staging	Diet Staging	Diarrhea Management

Note. LOS=Length of stay (day), *=significant finding; A total of 2,237 samples, Group One = LOS < 1 (*n*=61, 3%), Group Two = 1≤ LOS <3 (*n*=1,161, 52%), Group Three = LOS ≥ 3 (*n*=1,015, 45%), Bonferroni's method (Bailar & Hoaglin, 2012) for multiple comparisons (n=100) were applied, and *p* value = .0005 was adjusted from α = .05.

Table 20 Ranking of Nursing Outcomes (NOC) by Length of Stay (LOS)

	Group 1: LOS<1		**Group 2: 1**≤LOS<3		**Group 3:** LOS≥3		
NOC	*n*	*%*	*n*	*%*	*n*	*%*	*p*
Pain Level	40	65.57	950	81.83	803	79.11	.0043
Infection Severity*	12	19.67	306	26.36	392	38.62	<.0001
Nausea and Vomiting Severity*	6	9.84	282	24.29	303	29.85	.0002
Knowledge: Treatment Procedure*	17	27.87	240	2.67	283	27.88	.0004
Tissue Integrity: Skin and Mucous Membranes	12	19.67	224	19.29	240	23.65	.0446
Pain Control	12	19.67	278	23.94	229	22.56	.6006
Knowledge: Fall Prevention*	10	16.39	155	13.35	217	21.38	<.0001
Fall Prevention: Behavior*	10	16.39	153	13.18	217	21.38	<.0001
Activity Tolerance*	7	11.48	94	8.10	162	15.96	<.0001
Anxiety Level*	5	8.20	73	6.29	114	11.23	.0002
Nutritional Status*	5	8.20	68	5.86	119	11.72	<.0001
Knowledge: Illness Care*	7	11.48	49	4.22	89	8.77	<.0001
Gastrointestinal Function*	1	1.64	46	3.96	91	8.97	<.0001
Respiratory Status: Airway Patency*	15	24.59	45	3.88	75	7.39	<.0001
Respiratory Status: Gas Exchange*	14	22.95	39	3.36	67	6.60	<.0001
Mobility	2	3.28	36	3.10	63	6.21	.0021
Endurance	2	3.28	39	3.36	56	5.52	.0440
Tissue Perfusion: Pulmonary*	12	19.67	31	2.67	44	4.33	<.0001
Hydration*	5	8.20	20	1.72	52	5.12	<.0001
Fluid Balance	2	3.28	24	2.07	47	4.63	.0036

Table 20 Continued

Urinary Elimination	0	0.00	25	2.15	38	3.74	.0330
Aspiration Prevention	3	4.92	22	1.89	23	2.27	.2657
Coping	3	4.92	14	1.21	33	3.25	.0020
Oral Hygiene	1	1.64	16	1.38	36	3.55	.0038
Grief Resolution	3	4.92	13	1.12	33	3.25	.0011
Self-Care: Activities of Daily Living(ADL)	1	1.64	9	0.78	21	2.97	.0526
Bowel Elimination*	5	8.20	12	1.03	28	2.76	<.0001
Blood Loss Severity	4	6.56	17	1.46	24	2.36	.0123
Respiratory Status: Ventilation	2	3.28	20	1.72	23	2.27	.5164
Knowledge: Treatment Regimen	3	4.92	18	1.55	18	1.77	.1461
Family Coping	2	3.28	10	0.86	16	1.58	.1151
Acute Confusion Level	1	1.64	13	1.12	19	1.87	.3465
Pain: Disruptive Effects	1	1.64	15	1.29	16	1.58	.8479
Risk Control: Hyperthermia	0	0.00	8	0.69	24	2.36	.0029
Risk Control: Hypothermia	0	0.00	8	0.69	19	1.87	.0284
Sleep	1	1.64	9	0.78	17	1.67	.1515
Fluid Overload Severity	3	4.92	10	0.86	13	1.28	.0141
Spiritual Health	1	1.64	7	0.60	12	1.18	.2946
Tissue Perfusion: Cerebral	1	1.64	13	1.12	7	0.69	.4946
Cognitive Orientation	2	3.28	8	0.69	7	0.69	
Neurological Status	2	3.28	13	1.12	4	0.39	
Swallowing Status	1	1.64	10	0.86	8	0.79	
Dignified Life Closure	1	1.64	7	0.60	10	0.99	

Table 20 Continued

Tissue Perfusion: Cardiac	2	3.28	10	0.86	6	0.59
Tissue Perfusion: Peripheral	0	0.00	1	0.09	15	1.48
Cardiac Pump Effectiveness	2	3.28	9	0.78	4	0.39
Communication	0	0.00	8	0.69	7	0.69
Seizure Control	1	1.64	9	0.78	4	0.39
Cognition	0	0.00	5	0.43	7	0.69
Blood Glucose Level	0	0.00	5	0.43	6	0.59
Body Positioning: Self-Initiated	0	0.00	3	0.26	8	0.79
Kidney Function	0	0.00	2	0.17	9	0.89
Burn Healing	0	0.00	6	0.52	4	0.39
Neurological Status: Peripheral	0	0.00	5	0.43	5	0.49
Substance Withdrawal Severity	0	0.00	6	0.52	4	0.39
Body Image	0	0.00	2	0.17	7	0.69
Compliance Behavior	0	0.00	5	0.43	4	0.39
Diabetes Self-Management	0	0.00	2	0.17	7	0.69
Knowledge: Personal Safety	1	1.64	3	0.26	5	0.49
Heedfulness of Affected Side	2	3.28	3	0.26	3	0.30
Memory	0	0.00	4	0.34	4	0.39
Allergic Response: Systemic	0	0.00	4	0.34	2	0.20
Sensory Function: Vision	0	0.00	2	0.17	4	0.39
Urinary Continence	0	0.00	4	0.34	2	0.20
Nutritional Status: Food and Fluid Intake	0	0.00	1	0.09	4	0.39
Social Involvement	1	1.64	1	0.09	3	0.30

Table 20 Continued

Health Seeking Behavior	0	0.00	3	0.26	1	0.10
Social Interaction Skills	1	1.64	0	0.00	3	0.30
Balance	0	0.00	2	0.17	1	0.10
Communication: Receptive	0	0.00	2	0.17	0	0.00
Depression Level	1	1.64	0	0.00	1	0.10
Neurological Status: Autonomic	0	0.00	0	0.00	1	0.10
Risk Control	1	1.64	0	0.00	1	0.10
Self-Care Status	0	0.00	0	0.00	2	0.20
Suicide Self-Restraint	1	1.64	1	0.09	0	0.00
Family Integrity	0	0.00	1	0.09	0	0.00
Growth	0	0.00	1	0.09	0	0.00
Mood Equilibrium	0	0.00	1	0.09	0	0.00
Oral Intake	0	0.00	1	0.09	0	0.00
Self-Esteem	0	0.00	0	0.00	1	0.10
Self-Mutilation Restraint	0	0.00	0	0.00	1	0.10

Note. LOS=Length of stay (day), *=significant finding, a total of 2,237 samples, Group One = LOS < 1 (*n*=61, 3%), Group Two = 1≤ LOS <3 (*n*=1,161, 52%), Group Three = LOS ≥ 3 (*n*=1,015, 45%)

Bonferroni's method (Bailar & Hoaglin, 2012) for multiple comparisons (n=81) were applied, and *p* value = .000617 was adjusted from $\alpha = .05$.

Table 21 Ranking of NOC Outcomes Found Significantly Different by LOS

#	**Group 1:** LOS<1	**Group 2:** 1 ≤ LOS < 3	**Group 3:** LOS ≥ 3
1	Knowledge: Treatment Procedure	Infection Severity	Infection Severity
2	Respiratory Status: Airway Patency	Nausea and Vomiting Severity	Nausea and Vomiting Severity
3	Respiratory Status: Gas Exchange	Knowledge: Fall Prevention	Knowledge: Treatment Procedure
4	Infection Severity	Fall Prevention: Behavior	Knowledge: Fall Prevention
5	Tissue Perfusion: Pulmonary	Activity Tolerance	Fall Prevention: Behavior
6	Knowledge: Fall Prevention	Anxiety Level	Activity Tolerance
7	Fall Prevention: Behavior	Nutritional Status	Nutritional Status
8	Activity Tolerance	Knowledge: Illness Care	Anxiety Level
9	Knowledge: Illness Care	Gastrointestinal Function	Gastrointestinal Function
10	Nausea and Vomiting Severity	Respiratory Status: Airway Patency	Knowledge: Illness Care
11	Anxiety Level	Respiratory Status: Gas Exchange	Respiratory Status: Airway Patency
12	Nutritional Status	Knowledge: Treatment Procedure	Respiratory Status: Gas Exchange
13	Hydration	Tissue Perfusion: Pulmonary	Hydration
14	Bowel Elimination	Hydration	Tissue Perfusion: Pulmonary
15	Gastrointestinal Function	Bowel Elimination	Bowel Elimination

Note. LOS=Length of stay (day)
A total of 2,237 samples, Group 1 = LOS < 1 (*n*=61, 3%), Group 2 = 1≤ LOS <3 (*n*=1,161, 52%), Group 3 = LOS ≥ 3 (*n*=1,015, 45%), #=rank

Table 22 The Top Ten linkages of Nursing Diagnoses (NANDA-I), Nursing Interventions (NIC), and Nursing-Sensitive Patient Outcomes (NOC)

#	NANDA-I	NIC	NOC	*n*
1	Acute Pain	Pain Management	Pain Level	1,735
2	Risk for Infection	Infection Protection	Infection Severity	708
3	Risk for Infection	Infection Control	Infection Severity	697
4	Nausea	Nausea Management	Nausea and Vomiting Severity	591
5	Acute Pain	Pain Management	Pain Control	514
6	Impaired Skin Integrity	Skin Surveillance	Tissue Integrity: Skin and Mucous Membranes	397
7	Impaired Skin Integrity	Wound Care	Tissue Integrity: Skin and Mucous Membranes	390
8	Risk for Falls	Fall Prevention	Knowledge: Fall Prevention	372
9	Risk for Falls	Fall Prevention	Fall Prevention: Behavior	370
10	Deficient Knowledge Pre/Post Procedure/Surgery	Teaching: Procedure/ Treatment	Knowledge: Treatment Procedure	347

Table 23 Patterns of Nursing Diagnoses (NANDA-I) Combinations

Nursing Diagnoses	*n*	*%*	*Row %*	*Col %*	*p*
Acute Pain & Risk for Infection	528	23.60	30.24	74.37	.0051
Acute Pain & Nausea*	495	22.13	28.35	83.76	.0001
Acute Pain & Impaired Skin Integrity*	379	16.94	21.71	92.44	<.0001
Acute Pain & Risk for Falls	293	13.10	16.78	75.71	.2245
Acute Pain & Deficient Knowledge Pre/Post Procedure/Surgery*	331	14.80	18.96	93.77	<.0001
Acute Pain & Activity Intolerance	201	8.99	11.51	76.43	.5258
Acute Pain & Anxiety	141	6.30	8.08	73.44	.1206
Acute Pain & Imbalanced Nutrition: Less than Body Requirements*	123	5.50	7.04	64.06	<.0001
Acute Pain & Risk for Constipation*	39	6.12	7.85	99.28	<.0001
Acute Pain & Ineffective Airway Clearance	137	4.11	5.27	68.66	.0095
Acute Pain & Fatigue*	92	1.74	2.23	44.83	<.0001
Acute Pain & Risk for Imbalanced Fluid Volume	54	2.41	3.09	70.13	.0931
Acute Pain & Urinary Retention*	61	2.73	3.49	100.00	<.0001
Acute Pain & Grieving	30	1.34	1.72	61.22	.0078
Risk for Infection & Nausea	211	9.43	29.72	35.70	.0178
Risk for Infection & Impaired Skin Integrity*	202	9.03	28.45	49.27	<.0001
Risk for Infection & Risk for Falls*	163	7.29	22.96	42.12	<.0001
Risk for Infection & Deficient Knowledge Pre/Post Procedure/Surgery*	176	7.87	24.79	49.86	<.0001
Risk for Infection & Activity Intolerance*	151	6.75	21.27	57.41	<.0001
Risk for Infection & Anxiety*	103	4.60	14.51	53.65	<.0001
Risk for Infection & Imbalanced Nutrition: Less than Body Requirements*	83	3.71	11.69	43.23	.0005

Table 23 Continued

Risk for Infection & Risk for Constipation*	61	3.40	10.70	55.07	<.0001
Risk for Infection & Ineffective Airway Clearance	76	2.24	7.04	37.31	.1524
Risk for Infection & Fatigue*	50	2.73	8.59	70.11	<.0001
Risk for Infection & Risk for Imbalanced Fluid Volume*	51	2.28	7.18	66.23	<.0001
Risk for Infection & Urinary Retention	32	1.43	4.51	52.46	.0007
Risk for Infection & Grieving	7	0.31	0.99	14.29	.0077
Nausea & Impaired Skin Integrity	120	5.36	20.30	29.27	.1541
Nausea & Risk for Falls	97	4.34	16.41	25.06	.5266
Nausea & Deficient Knowledge Pre/Post Procedure/Surgery	77	3.44	13.03	21.81	.0352
Nausea & Activity Intolerance*	113	5.05	19.12	42.97	<.0001
Nausea & Anxiety*	80	3.58	13.54	41.67	<.0001
Nausea & Imbalanced Nutrition: Less than Body Requirements*	73	3.26	12.35	38.02	.0002
Nausea & Risk for Constipation*	56	3.67	13.87	59.42	<.0001
Nausea & Ineffective Airway Clearance*	82	0.76	2.88	12.69	.0001
Nausea & Fatigue*	17	2.50	9.48	64.37	<.0001
Nausea & Risk for Imbalanced Fluid Volume	24	1.07	4.06	31.17	.3573
Nausea & Urinary Retention*	31	1.39	5.25	50.82	<.0001
Impaired Skin Integrity & Grieving	6	0.27	1.02	12.24	.0214
Impaired Skin Integrity & Risk for Falls*	122	5.45	29.76	31.52	<.0001
Impaired Skin Integrity & Deficient Knowledge Pre/Post Procedure/Surgery*	150	6.71	36.59	42.49	<.0001
Impaired Skin Integrity & Activity Intolerance*	78	3.49	19.02	29.66	<.0001
Impaired Skin Integrity & Anxiety*	55	2.46	13.41	28.65	.0003

Table 23 Continued

Impaired Skin Integrity & Imbalanced Nutrition: Less than Body Requirements	39	1.74	9.51	20.31	.4368
Impaired Skin Integrity & Risk for Constipation*	3	2.32	12.68	37.68	<.0001
Impaired Skin Integrity & Ineffective Airway Clearance	52	1.25	6.83	20.90	.4211
Impaired Skin Integrity & Fatigue*	28	0.13	0.73	3.45	<.0001
Impaired Skin Integrity & Risk for Imbalanced Fluid Volume*	28	1.25	6.83	36.36	.0001
Impaired Skin Integrity & Urinary Retention	22	0.98	5.37	36.07	.0011
Impaired Skin Integrity & Grieving	6	0.27	1.46	12.24	.3503
Risk for Falls & Deficient Knowledge Pre/Post Procedure/Surgery*	93	4.16	24.03	26.35	<.0001
Risk for Falls & Activity Intolerance*	96	4.29	24.81	36.50	<.0001
Risk for Falls & Anxiety*	76	3.40	19.64	39.58	<.0001
Risk for Falls & Imbalanced Nutrition: Less than Body Requirements*	59	2.64	15.25	30.73	<.0001
Risk for Falls & Risk for Constipation*	26	1.79	10.34	28.99	.0004
Risk for Falls & Ineffective Airway Clearance	40	1.61	9.30	26.87	.0044
Risk for Falls & Fatigue	36	1.16	6.72	29.89	.0034
Risk for Falls & Risk for Imbalanced Fluid Volume*	28	1.25	7.24	36.36	<.0001
Risk for Falls & Urinary Retention	17	0.76	4.39	27.87	.0376
Risk for Falls & Grieving*	24	1.07	6.20	48.98	<.0001
Deficient Knowledge Pre/Post Procedure/Surgery & Activity Intolerance*	83	3.71	23.51	31.56	<.0001
Deficient Knowledge Pre/Post Procedure/Surgery & Anxiety*	61	2.73	17.28	31.77	<.0001
Deficient Knowledge Pre/Post Procedure/Surgery & Imbalanced Nutrition: Less than Body Requirements	35	1.56	9.92	18.23	.3510
Deficient Knowledge Pre/Post Procedure/Surgery & Risk for Constipation*	6	1.97	12.46	31.88	<.0001

Table 23 Continued

Deficient Knowledge Pre/Post Procedure/Surgery & Ineffective Airway Clearance	44	0.85	5.38	14.18	.7138
Deficient Knowledge Pre/Post Procedure/Surgery & Fatigue	19	0.27	1.70	6.90	.0163
Deficient Knowledge Pre/Post Procedure/Surgery & Risk for Imbalanced Fluid Volume*	30	1.34	8.50	38.96	<.0001
Deficient Knowledge Pre/Post Procedure/Surgery & Urinary Retention*	25	1.12	7.08	40.98	<.0001
Deficient Knowledge Pre/Post Procedure/Surgery & Grieving	5	0.22	1.42	10.20	.3281
Activity Intolerance & Anxiety*	59	2.64	22.43	30.73	<.0001
Activity Intolerance & Imbalanced Nutrition: Less than Body Requirements*	57	2.55	21.67	29.69	<.0001
Activity Intolerance & Risk for Constipation*	38	1.61	13.69	26.09	<.0001
Activity Intolerance & Ineffective Airway Clearance	36	1.25	10.65	20.90	.0020
Activity Intolerance & Fatigue*	28	1.70	14.45	43.68	<.0001
Activity Intolerance & Risk for Imbalanced Fluid Volume*	30	1.34	11.41	38.96	<.0001
Activity Intolerance & Urinary Retention*	29	1.30	11.03	47.54	<.0001
Activity Intolerance & Grieving	4	0.18	1.52	8.16	.6516
Anxiety & Imbalanced Nutrition: Less than Body Requirements*	47	2.10	24.48	24.48	<.0001
Anxiety & Risk for Constipation	32	0.80	9.38	13.04	.0596
Anxiety & Ineffective Airway Clearance*	18	1.07	12.50	17.91	.0003
Anxiety & Fatigue*	24	1.43	16.67	36.78	<.0001
Anxiety & Risk for Imbalanced Fluid Volume*	23	1.03	11.98	29.87	<.0001
Anxiety & Urinary Retention*	14	0.63	7.29	22.95	.0004
Anxiety & Grieving	11	0.49	5.73	22.45	.0022
Imbalanced Nutrition: Less than Body Requirements & Risk for Constipation*	27	1.12	13.02	18.12	.0002

Table 23 Continued

Imbalanced Nutrition: Less than Body Requirements & Ineffective Airway Clearance	25	0.98	11.46	16.42	.0021
Imbalanced Nutrition: Less than Body Requirements & Fatigue*	22	1.21	14.06	31.03	<.0001
Imbalanced Nutrition: Less than Body Requirements & Risk for Imbalanced Fluid Volume*	29	1.30	15.10	37.66	<.0001
Imbalanced Nutrition: Less than Body Requirements & Urinary Retention*	15	0.67	7.81	24.59	.0001
Imbalanced Nutrition: Less than Body Requirements & Grieving	6	0.27	3.13	12.24	.3069
Risk for Constipation & Ineffective Airway Clearance	2	0.27	4.35	4.48	.5763
Risk for Constipation & Fatigue	2	0.09	1.45	2.30	.1695
Risk for Constipation & Risk for Imbalanced Fluid Volume*	3	1.25	20.29	36.36	<.0001
Risk for Constipation & Urinary Retention*	1	0.98	15.94	36.07	<.0001
Risk for Constipation & Grieving	1	0.13	2.17	6.12	
Ineffective Airway Clearance & Fatigue	6	0.09	1.49	2.30	.1686
Ineffective Airway Clearance & Risk for Imbalanced Fluid Volume	28	0.54	8.96	15.58	.0017
Ineffective Airway Clearance & Urinary Retention	22	0.09	1.49	3.28	.5810
Ineffective Airway Clearance & Grieving*	3	0.67	11.19	30.61	<.0001
Fatigue & Risk for Imbalanced Fluid Volume	12	0.13	3.45	3.90	
Fatigue & Urinary Retention	2	0.04	1.15	1.64	.7306
Fatigue & Grieving	15	0.04	1.15	2.04	
Risk for Imbalanced Fluid Volume & Urinary Retention*	17	0.76	22.08	27.87	<.0001
Risk for Imbalanced Fluid Volume & Grieving	3	0.13	3.90	6.12	.2367
Urinary Retention & Grieving	2	0.09	3.28	4.08	.3888

Note. *= significant findings; Bonferroni's method (Bailar & Hoaglin, 2012) for multiple comparisons (n=100) was applied, and *p* value = .0005 was adjusted from α =.05.; Row %=Row percentage; Col %=Column percentage

Table 24 Pattern of Nursing Interventions (NIC) Combinations

NIC (nursing interventions)	*n*	*%*	*Row%*	*Col%*	*p*
Pain Management & Fall Prevention	306	13.72	17.01	79.07	.3962
Pain Management & Infection Protection*	534	24.11	29.91	75.99	.0002
Pain Management & Nausea Management*	502	22.46	27.85	85.93	.0002
Pain Management & Teaching: Procedure/Treatment	442	19.81	24.57	83.08	.1159
Pain Management & Skin Surveillance*	421	18.92	23.46	91.54	<.0001
Pain Management & Energy Management*	224	10.09	12.51	72.35	.0001
Pain Management & Anxiety Reduction	138	6.86	8.50	78.06	.3442
Pain Management & Nutrition Management*	129	5.83	7.23	69.15	.0001
Pain Management & Ventilation Assistance	89	4.03	5.00	69.23	.0013
Pain Management & Bowel Management*	128	5.96	7.39	99.25	<.0001
Pain Management & Fluid Management*	58	2.33	2.89	55.91	<.0001
Pain Management & Urinary Retention Care*	58	2.64	3.28	98.33	<.0001
Pain Management & Temperature Regulation	29	1.34	1.67	88.24	.3800
Pain Management & Oral Health Restoration*	35	0.94	1.17	43.75	<.0001
Fall Prevention & Infection Protection*	162	7.31	42.12	23.02	<.0001
Fall Prevention & Nausea Management	96	4.26	24.55	16.30	.4460
Fall Prevention & Teaching: Procedure/Treatment*	163	7.26	41.86	30.45	<.0001
Fall Prevention & Skin Surveillance*	139	6.28	36.18	30.37	<.0001
Fall Prevention & Energy Management*	103	4.57	26.36	32.80	<.0001
Fall Prevention & Anxiety Reduction*	69	3.45	19.90	39.29	<.0001
Fall Prevention & Nutrition Management*	58	2.60	14.99	30.85	<.0001
Fall Prevention & Ventilation Assistance	37	1.66	9.56	28.46	.0012
Fall Prevention & Bowel Management	36	1.70	9.82	28.36	.0013

Table 24 Continued

Fall Prevention & Fluid Management	29	1.08	6.20	25.81	.0351
Fall Prevention & Urinary Retention Care	17	0.76	4.39	28.33	.0359
Fall Prevention & Temperature Regulation*	15	0.67	3.88	44.12	.0002
Fall Prevention & Oral Health Restoration*	21	0.54	3.10	25.00	.1753
Infection Protection & Nausea Management	207	9.32	29.38	35.68	.0198
Infection Protection & Teaching: Procedure/Treatment*	236	10.71	33.76	44.92	<.0001
Infection Protection & Skin Surveillance*	222	9.95	31.36	48.16	<.0001
Infection Protection & Energy Management*	177	8.02	25.28	57.56	<.0001
Infection Protection & Anxiety Reduction*	94	4.71	14.83	53.57	<.0001
Infection Protection & Nutrition Management*	82	3.68	11.58	43.62	.0004
Infection Protection & Ventilation Assistance	49	2.20	6.92	37.69	.1452
Infection Protection & Bowel Management*	71	3.41	10.73	56.72	<.0001
Infection Protection & Fluid Management	44	1.70	5.37	40.86	.0679
Infection Protection & Urinary Retention Care*	32	1.43	4.52	53.33	.0006
Infection Protection & Temperature Regulation	19	0.85	2.68	55.88	.0045
Infection Protection & Oral Health Restoration	44	0.54	1.69	25.00	.3502
Nausea Management & Teaching: Procedure/Treatment	129	5.74	21.96	24.06	.2350
Nausea Management & Skin Surveillance	125	5.65	21.61	27.33	.5131
Nausea Management & Energy Management*	136	6.14	23.50	44.05	<.0001
Nausea Management & Anxiety Reduction*	73	3.54	13.55	40.31	<.0001
Nausea Management & Nutrition Management	69	3.09	11.84	36.70	.0009
Nausea Management & Ventilation Assistance*	15	0.67	2.57	11.54	<.0001
Nausea Management & Bowel Management*	73	3.41	13.04	56.72	<.0001
Nausea Management & Fluid Management	34	1.39	5.32	33.33	.1169
Nausea Management & Urinary Retention Care*	29	1.30	4.97	48.33	.0003
Nausea Management & Temperature Regulation	11	0.49	1.89	32.35	.4319

Table 24 Continued

Nausea Management & Oral Health Restoration	43	0.40	1.54	18.75	.3184
Teaching: Procedure/Treatment & Skin Surveillance*	168	7.49	31.39	36.23	<.0001
Teaching: Procedure/Treatment & Energy Management*	133	5.92	24.81	42.44	<.0001
Teaching: Procedure/Treatment & Anxiety Reduction*	82	4.12	17.29	46.94	<.0001
Teaching: Procedure/Treatment & Nutrition Management*	73	3.32	13.91	39.36	<.0001
Teaching: Procedure/Treatment & Ventilation Assistance	38	1.66	6.95	28.46	.2041
Teaching: Procedure/Treatment & Bowel Management	43	2.02	8.46	33.58	.0087
Teaching: Procedure/Treatment & Fluid Management	36	1.43	6.02	34.41	.0180
Teaching: Procedure/Treatment & Urinary Retention Care	25	1.12	4.70	41.67	.0019
Teaching: Procedure/Treatment & Temperature Regulation*	21	0.94	3.95	61.76	<.0001
Teaching: Procedure/Treatment & Oral Health Restoration	33	0.22	0.94	10.42	.0256
Skin Surveillance & Energy Management	83	3.77	18.22	27.01	.0040
Skin Surveillance & Anxiety Reduction*	53	2.78	13.45	31.63	.0001
Skin Surveillance & Nutrition Management	43	1.93	9.33	22.87	.4514
Skin Surveillance & Ventilation Assistance	42	1.88	9.11	32.31	.0016
Skin Surveillance & Bowel Management*	50	2.47	11.93	41.04	<.0001
Skin Surveillance & Fluid Management*	10	0.27	1.30	6.45	.0002
Skin Surveillance & Urinary Retention Care	21	0.94	4.56	35.00	.0089
Skin Surveillance & Temperature Regulation*	20	0.90	4.34	58.82	<.0001
Skin Surveillance & Oral Health Restoration	4	0.18	0.87	8.33	.0304
Energy Management & Anxiety Reduction*	64	3.23	23.15	36.73	<.0001
Energy Management & Nutrition Management*	63	2.78	19.94	32.98	<.0001
Energy Management & Ventilation Assistance*	33	1.48	10.61	25.38	.0003
Energy Management & Bowel Management*	36	1.61	11.58	26.87	<.0001
Energy Management & Fluid Management*	40	1.66	11.90	39.78	<.0001
Energy Management & Urinary Retention Care*	28	1.26	9.00	46.67	<.0001

Table 24 Continued

Energy Management & Temperature Regulation*	13	0.58	4.18	38.24	.0003
Energy Management & Oral Health Restoration	38	0.18	1.29	8.33	.3963
Anxiety Reduction & Nutrition Management*	44	2.20	25.00	26.06	<.0001
Anxiety Reduction & Ventilation Assistance*	21	1.12	12.76	19.23	.0002
Anxiety Reduction & Bowel Management	17	0.81	9.18	13.43	.0581
Anxiety Reduction & Fluid Management	15	0.67	7.65	16.13	.0222
Anxiety Reduction & Urinary Retention Care	13	0.58	6.63	21.67	.0016
Anxiety Reduction & Temperature Regulation*	9	0.45	5.10	29.41	.0004
Anxiety Reduction & Oral Health Restoration*	20	2.11	23.98	97.92	<.0001
Nutrition Management & Ventilation Assistance	21	0.94	11.17	16.15	.0029
Nutrition Management & Bowel Management*	24	1.08	12.77	17.91	.0003
Nutrition Management & Fluid Management*	33	1.21	14.36	29.03	<.0001
Nutrition Management & Urinary Retention Care	13	0.58	6.91	21.67	.0011
Nutrition Management & Temperature Regulation*	18	0.81	9.57	52.94	<.0001
Nutrition Management & Oral Health Restoration	27	0.31	3.72	14.58	.1177
Ventilation Assistance & Bowel Management	4	0.18	3.08	2.99	.1826
Ventilation Assistance & Fluid Management	9	0.40	6.92	9.68	.1114
Ventilation Assistance & Urinary Retention Care	1	0.04	0.77	1.67	.2580
Ventilation Assistance & Temperature Regulation	7	0.31	5.38	20.59	.0028
Ventilation Assistance & Oral Health Restoration	6	0.22	3.85	10.42	.1983
Bowel Management & Fluid Management	5	0.04	0.75	1.08	.0412
Bowel Management & Urinary Retention Care*	20	0.90	14.93	33.33	<.0001
Bowel Management & Temperature Regulation*	17	0.76	12.69	50.00	<.0001
Bowel Management & Oral Health Restoration	1	0.04	0.75	2.08	.3624
Fluid Management & Urinary Retention Care	3	0.04	1.08	1.67	.5151
Fluid Management & Temperature Regulation	8	0.18	4.30	11.76	.0504

Table 24 Continued

Fluid Management & Oral Health Restoration	19	0.04	1.08	2.08	.7205
Urinary Retention Care & Temperature Regulation*	10	0.45	16.67	29.41	<.0001
Urinary Retention Care & Oral Health Restoration	1	0.04	1.67	2.08	-
Temperature Regulation & Oral Health Restoration	1	0.04	2.94	2.08	.5253

Note. *=significant findings at α =.05, *p* value = .0005 was adjusted from *p*=.05 after Bonferroni's method (Bailar & Hoaglin, 2012) for multiple comparisons (n=100)

Row %=Row percentage, Col %=Column percentage

Table 25 Pattern of Nursing-Sensitive Patient Outcomes (NOC) Combinations

Nursing-sensitive patient outcomes	*n*	*%*	*Row%*	*Col%*	*p*
Pain Level & Infection Severity	540	24.14	30.12	76.06	.0012
Pain Level & Nausea and Vomiting Severity*	508	22.71	28.33	85.96	<.0001
Pain Level & Knowledge: Treatment Procedure	451	20.16	25.15	83.52	.0257
Pain Level & Tissue Integrity: Skin and Mucous Membranes*	436	19.49	24.32	91.60	<.0001
Pain Level & Knowledge: Fall Prevention	304	13.59	16.95	79.58	.7782
Pain Level & Activity Tolerance	207	9.25	11.54	78.71	.5645
Pain Level & Anxiety Level	152	6.79	8.48	79.17	.7057
Pain Level & Nutritional Status*	133	5.95	7.42	69.27	.0002
Pain Level & Respiratory Status: Airway Patency	94	4.20	5.24	69.63	.0025
Pain Level & Hydration	53	2.37	2.96	68.83	.0189
Pain Level & Urinary Elimination*	61	2.73	3.40	96.83	.0002
Pain Level & Coping*	21	0.94	1.17	42.00	<.0001
Pain Level & Oral Hygiene	35	1.56	1.95	66.04	.0138
Pain Level & Grief Resolution	33	1.48	1.84	67.35	.0293
Infection Severity & Nausea and Vomiting Severity	211	9.43	29.72	35.70	.0178
Infection Severity & Knowledge: Treatment Procedure*	241	10.77	33.94	44.63	<.0001
Infection Severity & Tissue Integrity: Skin and Mucous Membranes*	228	10.19	32.11	47.90	<.0001
Infection Severity & Knowledge: Fall Prevention*	161	7.20	22.68	42.15	<.0001
Infection Severity & Activity Tolerance*	151	6.75	21.27	57.41	<.0001
Infection Severity & Anxiety Level*	103	4.60	14.51	53.65	<.0001
Infection Severity & Nutritional Status*	83	3.71	11.69	43.23	.0005

Table 25 Continued

Infection Severity & Respiratory Status: Airway Patency	51	2.28	7.18	37.78	.1272
Infection Severity & Hydration*	51	2.28	7.18	66.23	<.0001
Infection Severity & Urinary Elimination	32	1.43	4.51	50.79	.0015
Infection Severity & Coping	14	0.63	1.97	28.00	.6463
Infection Severity & Oral Hygiene*	44	1.97	6.20	83.02	<.0001
Infection Severity & Grief Resolution	7	0.31	0.99	14.29	.0077
Nausea and Vomiting Severity & Knowledge: Treatment Procedure	132	5.90	22.34	24.44	.2398
Nausea and Vomiting Severity & Tissue Integrity: Skin and Mucous Membranes	130	5.81	22.00	27.31	.6394
Nausea and Vomiting Severity & Knowledge: Fall Prevention	96	4.29	16.24	25.13	.5665
Nausea and Vomiting Severity & Activity Tolerance*	113	5.05	19.12	42.97	<.0001
Nausea and Vomiting Severity & Anxiety Level*	80	3.58	13.54	41.67	<.0001
Nausea and Vomiting Severity & Nutritional Status*	73	3.26	12.35	38.02	.0002
Nausea and Vomiting Severity & Respiratory Status: Airway Patency*	17	0.76	2.88	12.59	.0001
Nausea and Vomiting Severity & Hydration	24	1.07	4.06	31.17	.3573
Nausea and Vomiting Severity & Urinary Elimination*	32	1.43	5.41	50.79	<.0001
Nausea and Vomiting Severity & Coping	11	0.49	1.86	22.00	.5213
Nausea and Vomiting Severity & Oral Hygiene*	42	1.88	7.11	79.25	<.0001
Nausea and Vomiting Severity & Grief Resolution	6	0.27	1.02	12.24	.0214
Knowledge: Treatment Procedure & Tissue Integrity: Skin and Mucous Membranes*	175	7.82	32.41	36.76	<.0001
Knowledge: Treatment Procedure & Knowledge: Fall Prevention*	163	7.29	30.19	42.67	<.0001
Knowledge: Treatment Procedure & Activity Tolerance*	115	5.14	21.30	43.73	<.0001
Knowledge: Treatment Procedure & Anxiety Level*	90	4.02	16.67	46.88	<.0001
Knowledge: Treatment Procedure & Nutritional Status*	76	3.40	14.07	39.58	<.0001
Knowledge: Treatment Procedure & Respiratory Status: Airway Patency	34	1.52	6.30	25.19	.7563

Table 25 Continued

Knowledge: Treatment Procedure & Hydration*	37	1.65	6.85	48.05	<.0001
Knowledge: Treatment Procedure & Urinary Elimination	27	1.21	5.00	42.86	.0009
Knowledge: Treatment Procedure & Coping	7	0.31	1.30	14.00	.0964
Knowledge: Treatment Procedure & Oral Hygiene*	31	1.39	5.74	58.49	<.0001
Knowledge: Treatment Procedure & Grief Resolution	11	0.49	2.04	22.45	.8672
Tissue Integrity: Skin and Mucous Membranes & Knowledge: Fall Prevention*	139	6.21	29.20	36.39	<.0001
Tissue Integrity: Skin and Mucous Membranes & Activity Tolerance*	85	3.80	17.86	32.32	<.0001
Tissue Integrity: Skin and Mucous Membranes & Anxiety Level*	64	2.86	13.45	33.33	<.0001
Tissue Integrity: Skin and Mucous Membranes & Nutritional Status	46	2.06	9.66	23.96	.3564
Tissue Integrity: Skin and Mucous Membranes & Respiratory Status: Airway Patency	44	1.97	9.24	32.59	.0016
Tissue Integrity: Skin and Mucous Membranes & Hydration*	34	1.52	7.14	44.16	<.0001
Tissue Integrity: Skin and Mucous Membranes & Urinary Elimination	24	1.07	5.04	38.10	.0025
Tissue Integrity: Skin and Mucous Membranes & Coping	4	0.18	0.84	8.00	.0215
Tissue Integrity: Skin and Mucous Membranes & Oral Hygiene	3	0.13	0.63	5.66	.0033
Tissue Integrity: Skin and Mucous Membranes & Grief Resolution	11	0.49	2.31	22.45	.8599
Knowledge: Fall Prevention & Activity Tolerance*	95	4.25	24.87	36.12	<.0001
Knowledge: Fall Prevention & Anxiety Level*	76	3.40	19.90	39.58	<.0001
Knowledge: Fall Prevention & Nutritional Status*	59	2.64	15.45	30.73	<.0001
Knowledge: Fall Prevention & Respiratory Status: Airway Patency	37	1.65	9.69	27.41	.0020
Knowledge: Fall Prevention & Hydration*	28	1.25	7.33	36.36	<.0001
Knowledge: Fall Prevention & Urinary Elimination	17	0.76	4.45	26.98	.0411
Knowledge: Fall Prevention & Coping	13	0.58	3.40	26.00	.1250
Knowledge: Fall Prevention & Oral Hygiene	19	0.85	4.97	35.85	.0007
Knowledge: Fall Prevention & Grief Resolution*	24	1.07	6.28	48.98	<.0001

Table 25 Continued

Activity Tolerance & Anxiety Level*	59	2.64	22.43	30.73	<.0001
Activity Tolerance & Nutritional Status*	57	2.55	21.67	29.69	<.0001
Activity Tolerance & Respiratory Status: Airway Patency	28	1.25	10.65	20.74	.0021
Activity Tolerance & Hydration*	30	1.34	11.41	38.96	<.0001
Activity Tolerance & Urinary Elimination*	29	1.30	11.03	46.03	<.0001
Activity Tolerance & Coping	4	0.18	1.52	8.00	.5100
Activity Tolerance & Oral Hygiene*	28	1.25	10.65	52.83	<.0001
Activity Tolerance & Grief Resolution	4	0.18	1.52	8.16	.6516
Anxiety Level & Nutritional Status*	47	2.10	24.48	24.48	<.0001
Anxiety Level & Respiratory Status: Airway Patency*	25	1.12	13.02	18.52	.0002
Anxiety Level & Hydration*	23	1.03	11.98	29.87	<.0001
Anxiety Level & Urinary Elimination	14	0.63	7.29	22.22	.0006
Anxiety Level & Coping*	44	1.97	22.92	88.00	<.0001
Anxiety Level & Oral Hygiene*	22	0.98	11.46	41.51	<.0001
Anxiety Level & Grief Resolution	11	0.49	5.73	22.45	.0022
Nutritional Status & Respiratory Status: Airway Patency	22	0.98	11.46	16.30	.0023
Nutritional Status & Hydration*	29	1.30	15.10	37.66	<.0001
Nutritional Status & Urinary Elimination*	15	0.67	7.81	23.81	.0002
Nutritional Status & Coping	8	0.36	4.17	16.00	.0701
Nutritional Status & Oral Hygiene*	26	1.16	13.54	49.06	<.0001
Nutritional Status & Grief Resolution	6	0.27	3.13	12.24	.3069
Respiratory Status: Airway Patency & Hydration	12	0.54	8.89	15.58	.0018
Respiratory Status: Airway Patency & Urinary Elimination	2	0.09	1.48	3.17	.5860
Respiratory Status: Airway Patency & Coping	6	0.27	4.44	12.00	.1200

Table 25 Continued

Respiratory Status: Airway Patency & Oral Hygiene	3	0.13	2.22	5.66	-
Respiratory Status: Airway Patency & Grief Resolution*	15	0.67	11.11	30.61	<.0001
Hydration & Urinary Elimination*	17	0.76	22.08	26.98	<.0001
Hydration & Coping	1	0.04	1.30	2.00	-
Hydration & Oral Hygiene	0	0.00	0.00	0.00	.2597
Hydration & Grief Resolution	3	0.13	3.90	6.12	.2367
Urinary Elimination & Coping	2	0.09	3.17	4.00	.6504
Urinary Elimination & Oral Hygiene	0	0.00	0.00	0.00	-
Urinary Elimination & Grief Resolution	2	0.09	3.17	4.08	.6474
Coping & Oral Hygiene	2	0.09	4.00	3.77	.3333
Coping & Grief Resolution	1	0.04	2.00	2.04	-
Oral Hygiene & Grief Resolution	1	0.04	1.89	2.04	-

Note. *=significant findings at α =.05, *p* value = 000617was adjusted from *p*=.05 after Bonferroni's method (Bailar & Hoaglin, 2012) for multiple comparisons (*n*=81).

Table 26 Distribution of Outcome Change Scores for Pain Level

	≤-2	-1	0	1	2	≥3
Overall	2.08(22)	9.93(105)	35.26(415)	34.63(366)	11.36(118)	2.93(31)
Unit*						
Unit G	1.35(8)	11.45(68)	43.94(261)	33.00(196)	9.43(56)	0.84(5)
Unit H	2.04(3)	8.16(12)	42.86(63)	29.25(43)	12.93(19)	4.76(7)
Unit M	3.37(10)	7.41(22)	28.96(86)	41.41(123)	13.13(39)	5.72(17)
Unit A	5.26(1)	15.79(3)	26.32(5)	21.05(4)	21.05(4)	10.53(2)
Gender						
Female	1.51(16)	6.15(65)	24.88(263)	22.89(242)	6.72(71)	1.51(16)
Male	0.57(6)	3.78(40)	14.38(152)	11.73(124)	4.45(47)	1.42(15)
Race						
White	1.99(21)	9.02(95)	34.76(366)	30.01(316)	9.59(101)	2.75(29)
AA	0.09(1)	1.33(14)	2.18(23)	0.85(9)		
Asian		0.09(1)	0.28(3)	0.28(3)		
AI	0.09(1)	0.19(2)	0.09(1)		0.09(1)	
Other		0.66(7)	2.66(28)	2.18(23)	0.66(7)	0.09(1)
Age						
18<Age<65	7.20(76)	26.80(283)	26.52(280)	8.24(87)	2.37(25)	
Age≥65	0.85(9)	2.75(29)	12.50(132)	8.14(86)	2.84(30)	0.57(6)
Treatment						
SP		2.90(9)	11.61(36)	12.26(38)	1.61(5)	0.97(3)
CT		0.65(2)	3.23(10)	2.26(7)	0.65(2)	0.32(1)

Table 26 Continued

RT		0.32(1)	0.32(1)	1.29(4)	0.32(1)	
SP/RT		2.42(3)	0.81(1)			
CT/RT		0.97(3)	3.23(10)	2.58(8)	0.97(3)	0.32(1)
SP/CT/RT	0.32(1)	4.52(14)	8.71(27)	11.61(36)	3.23(10)	0.97(3)
Others	0.32(1)	0.65(2)	7.10(22)	5.81(18)	2.26(7)	1.29(4)
Insurance						
Medicaid	1.04 (11)	3.41(36)	14.00(148)	11.07(117)	4.07(43)	0.95(10)
Medicare	0.09(1)	1.42(15)	3.41 (36)	3.50(37)	1.32(14)	0.66(7)
Self-pay	0.09(1)		0.47(5)	0.09(1)	0.19(2)	
Private	0.85(9)	5.11(54)	21.38(226)	19.96(211)	5.58(59)	1.32(14)

Note. % (n)=percentage(frequency)

*=significant <.001

AA= African American; AI= American Indian;

SP=Surgery Procedure; CT=Chemotherapy; RT=Radiotherapy;
Self-pay=uninsured
Private= Private Insurance

Table 27 Distribution of Outcome Change Scores for Infection Severity

	≤-2	-1	0	1	2	≥3
Overall	5.38(19)	15.01(53)	37.68(133)	30.03(106)	7.93(28)	3.97(14)
Unit						
Unit G	3.23(4)	19.35(24)	46.77(58)	23.39(29)	4.84(6)	2.42(5)
Unit H	3.75(3)	15(12)	41.25(33)	30(24)	7.5(6)	2.5(2)
Unit M	4.2(5)	11.76(14)	27.73(33)	37.82(45)	12.61(15)	5.88(7)
Unit A	23.33(7)	10(3)	30(9)	26.67(8)	3.33(1)	6.67(2)

Note. *n*=353

CHAPTER V

DISCUSSION AND CONCLUSION

The purpose of this descriptive study was to identify planned nursing care as defined by selected nursing diagnoses, nursing interventions, nursing-sensitive patient outcomes using standardized nursing terminologies from an EHR for patients in four oncology specialty units in a 762-bed Midwestern tertiary hospital.

Overview of Study Findings

The study sample was on average 55 years of age, female, Caucasian, married, retired, and had private insurance coverage.

Type of Unit, Age, Treatment Associated with LOS

The characteristics of the specialty units played a more important role in LOS, rather than characteristics of patients. In this study hospital, surgery was the major reason for admission and thereby a shorter LOS was expected. Although age reports the only patient characteristic related to LOS ($p = .011$), the difference of LOS between two age groups, which was less than one day (3.6 and 3.8) did not provide meaningful information in practice. The type of unit and treatments were associated with LOS. Patients who received a combination of three treatments, including surgery related to cancer, chemotherapy, and radiotherapy had longer LOSs than patients receiving other therapies, such as hormone therapy or immunotherapy. This difference in LOS found across the four units may potentially be based on the type of cancer treated by the specialty the unit. For example, the Adult Leukemia and Bone Marrow Transplant Unit

had longer LOSs for patients than the specialties in the Hematology, Gynecology, and Medical-Surgical Units.

Top Ranking of Nursing Diagnoses (NANDA-I)

Acute Pain

Acute Pain (Appendix C) was the top nursing diagnosis on three of the units, while *Risk for Infection* ranked as the top NANDA-I diagnosis in the Adult Leukemia and Bone Marrow Transplant Unit. The rankings may slightly differ in order among units; however, the top ten nursing diagnoses were similar across the four units. Two modified nursing diagnoses relevant to *Deficient Knowledge* appeared in the higher ranking diagnoses. These modified nursing diagnoses were used frequently by nurses, which may explain their importance to meet the needs of the cancer population admitted to these units. The reasons for nurses selecting a global term instead of a specific NANDA-I diagnosis were not collected in the study. Future research might investigate how nurses make decisions about selecting a global term or a specific one as part of their decision-making process. In addition, the top nursing diagnosis, *Acute Pain*, was recognized more much more frequently than the diagnosis ranked in second place. For the top ten nursing diagnoses, except *Nausea*, which is obviously related to cancer treatment, there are three nursing diagnoses, which emphasized quality indicators- *Risk for Infection, Impaired Skin Integrity* and R*isk for Falls.* This emphasis on patient safety has been a focus in practice since a report published by IOM focused on quality and safety.

Top Ranking of Nursing Interventions (NIC)

Pain Management

Pain Management (Appendix D) was the top nursing intervention provided on these units. The ranking of NIC interventions was similar with those for NANDA-I diagnoses since the NIC were chosen based on NANDA-I diagnoses. *Nausea Management* may be the only specific nursing intervention directly relevant to cancer. In the top ten nursing interventions, there are six nursing interventions relevant to patient safety. These six nursing interventions are *Fall Prevention, Infection Protection, Infection Control, Skin Surveillance, Wound Care,* and *Pressure Management.* These six interventions are closely associated with well-known negative outcomes and have been emphasized as indicators of quality care. They are usually called sensitive data in the hospital and also relevant to reimbursement in the current healthcare arena. The finding of a high percentage of interventions focused on patient safety may be due to the promotion of health policy in this decade. However, for this specialty, an intervention such as *Nausea Management* is also important to an oncology patient to receive a care focused on symptom management. Besides, interventions for patient safety, or interventions to prevent these negative outcomes, nurses should also focus on interventions that improve ‘ positive outcomes,’ especially in a specialty unit.

Top Ranking of Nursing-Sensitive Patient Outcomes (NOC)

Pain Level

Pain Level (Appendix E) was the top nursing-sensitive patient outcome in this study since this NOC is also linked to the NANDA-I diagnosis, *Acute Pain. Chronic Pain*

was another NOC outcome, *Pain Level*. However, outcome change scores for *Pain Level* in Question Five only referenced to *Acute Pain*. These outcomes have a different focus because *Pain Level* measures the severity of pain while *Pain Control* measures the patient's ability to personally control the pain. In the top ten outcomes, 26% of patients had been evaluated for their *Nausea and Vomiting Severity*. Only 9% of cancer patients were evaluated for their *Nutrition Status* during hospitalization. For these patients there is a high prevalence of risk of malnutrition and neglect of nutritional problems by health care providers is a serious problem. In the top ten outcomes, *Anxiety Level* is the only outcome chosen to address the social-psychological perspective of the patient. This finding suggests that the social-psychical problems faced by patients may need to be more carefully evaluated in spite of short hospital lengths of stay.

Top Linkages of NANDA-I, NOC, and NIC (NNN)

Acute Pain—Pain Level—Pain Management

The most frequent linkages were between the top rankings of NANDA-I diagnoses, NOC outcomes, and NIC interventions. Other frequent linkages, such as *Risk for Infection*, *Infection Severity,* and *Infection Protection* were also important to denote clinical decision-making of nurses providing oncology nursing care in this hospital. In the researcher's experience, during manual data retrieval of data, no illogical linkages of NNN were identified in the study sample during the seven-month data collection period. Less frequently used linkages are also important to disclose practice patterns in specialty populations. Uncommon nursing diagnoses, interventions or outcomes should not be ignored by both clinical nurses and researchers. First, these uncommon plans of care can provide individualized patient care, which mayelevate the quality of patient care. Second,

it can be a potential and important plan of care but not yet identified in clinical settings. Third, it can be an inappropriate plan of care due to inaccurate clinical reasoning and priority setting by the nurse. Finally, the linkages provide an excellent educational resource for clinically naïve nurses and nursing students. Nurses are using standardized nursing terminologies to tailor the care plan to fit the needs of individual patients. It is important that the nursing diagnosis is accurately identified since the outcomes and interventions are built on the problem that is identified using NANDA I diagnoses.

Patterns of NANDA-I Diagnoses, NIC Interventions, NOC Outcomes

Paired relationships between two NANDA-I diagnoses were examined by using the Chi-square tests with Fisher's exact tests (Der & Everitt, 2006). The top fifteen NANDA-I diagnoses, excluding any second closely related nursing diagnosis or concept from a similar domain, were selected and then 105 multiple comparisons using Bonferroni's method (Bailar & Hoaglin, 2012) were applied. The strategies were replicated using NIC interventions and NOC outcomes for a pattern examination. This method brought insight to the emerging field of symptom clusters experienced by oncology patients admitted to the hospital. NANDA-I diagnoses include signs and symptoms in the defining characteristics, which provide a good tool for studies of symptom management. Rather than a symptom, a study of nursing diagnoses would also appropriately disclose patient problems associated with nursing care. Additionally, NANDA-I, a SNT linked to NOC and NIC, would empower researchers to delineate and explore in a more comprehensive and efficient method the defining characteristics and etiologies of specific symptoms experienced by oncology patients for this type of study.

Outcome Change Scores: Pain Level

Outcome Change Scores Mostly Maintained or Improved

The descriptive statistics of outcome change scores of the NOC outcome, *Pain Level,* among the patients with *Acute Pain* for all units and by unit were addressed. The percentages of outcome change scores for *Pain Level* in six categories (≤-2, -1, 0, 1, 2, ≥3) by the characteristics of the patients (age, gender, and race) and other variables (treatment, and type of insurance) showed similar distributions. In general, the majority of patients maintained the same outcome rating score or improved their outcome change scores for *Pain Level*. However, five histograms (all units and each unit) show different shapes of distribution by unit when presented by using percentages of outcomes change scores in the six categories. Most patients discharged from these oncology units remained the same change score ratings or had +1 improvement in change scores from admission to discharge from the hospital.

Outcome Change Scores: Infection Severity

Infection Severity reported the most frequently used NOC outcomes in Unit A (Adult Leukemia and Bone Marrow Transplant Unit). The distributions of outcome change scores for all units and by unit are reported. Unit A had a greater range of distribution of outcome change scores than the other units. This result conveys that Unit A has higher percentage of patients that either improved or declined in outcome change scores based on *Infection Severity* than the other three units. This finding demonstrates that these patients are admitted to this specific specialty are subject to the problem of infection.

Outcome Ratings

Use of Outcome Change Scores

Use of outcome ratings itself not only demonstrates the nursing profession's contributions to patient outcomes in a scientific way but also benefits the nursing profession in clinical practice, education, and research. Outcome rating scores provide a standard way to evaluate nursing care. Outcomes ratings from each patient record provide evidence of the nursing care provided for patients during the hospitalization. It also provides a mechanism for nursing staff to evaluate their nursing planned care. The outcome scores recorded before and after a nursing intervention that can be used to create a change score provide nursing insight in clinical decision-making and helps nurses decide if they should modify their plan of care. Outcome change scores help determine if patients' problems (diagnoses) have been resolved or diminished in a straight forward way. The relationship between outcomes and interventions helps identify the most appropriate interventions for quality patient care. Therefore, outcome change scores can be a measure for researchers, who plan to conduct cost-effectiveness research,

Use of outcome change scores can be considered in different ways due to study purposes. In this study, outcome change score was defined by the change in rating scores from admission to discharge. The finding in the study did not show characteristics of patients (age, gender, race), and others (treatments and types of insurance) to be associated with outcome change scores for *Pain Level* for the patients with a nursing diagnose of *Acute Pain*. The outcome change scores for each person were calculated from two ratings at admission and at discharge. The variation between these two outcome ratings were not considered in the study due to the patients' short LOSs in this acute

setting (M=3.7 days). But the study did provide initial research to identify any association between patient characteristics and outcome change scores based on the primary nursing diagnoses. For patients with long LOSs, a series of potential fluctuating outcome scores during the hospitalization should be studied. In future studies, the pattern of NOC ratings along with certain procedures, such as nursing interventions or other treatments, in the hospitalization period should also be studied. A mixed design approach should be encouraged to study patterns of outcome change scores in different LOSs. Qualitative methods may provide an alternative to discover some factors potentially associated with the pattern of outcome scores. The outcome change scores can also be used to study the impact of a certain event, intervention, or behavior, For example, the relationship between music therapy and *Anxiety Level* before and after an operation. The defined change scores then would be the rating before and after the event, such as the *Pain Level* could be evaluated before and after a surgical procedure.

In addition, another factor that should be considered for outcome change scores are characteristics of the disease itself. Patients diagnosed with cancer experience a deteriorating process in many cases when the cancer is progressing. The outcome rating can be influenced by the stage of cancer or by an individual's other chronic conditions. A range of outcome scores is expected in different populations. Therefore, future research may lead to the development of an index of the range of baseline outcome ratings, expected outcome ratings, and outcome change scores for different populations of patients to provide clinical decision support for nurses.

Moreover, in order to build such an index of optimum range of outcome ratings, research on factors influencing the range of outcome ratings is required. The

metaparadigms (person, environment, health, and nursing) need to be considered to address the potential factors. Some examples could be described as:

1) Functional status (ADL)
2) Characteristics of patients related to outcome measures, such as personality and coping/or Anxiety Level;
3) Disease information, such as stage of tumor.
4) Health care resource provided within limited nursing care hours, including environment (treatment purpose in settings, nursing staffing level)

Use of Outcome Ratings at Admission

An outcome rating should be completed within 24 hours of admission as a similar policy standard for establishing a nursing diagnosis. A first outcome rating serves as the baseline assessment. It is important to obtain the first outcome rating for nurses to plan appropriate care for their patients. This has to be completed once a patient is admitted to a hospital. The NOC rating feature with the five-Likert scale provides nurses with a quick, easy way to monitor changes of patients' conditions and evaluate the care planned for patients. Outcome ratings at admission and their association with other variables were not addressed in the study. However, it is important to use the first outcome rating scores and related factors to develop an optimum range of baseline outcome rating for this oncology population.

Use of Outcome Ratings at Discharge

An outcome rating at discharge should be studied along with the baseline ratings. The pattern of all ratings during the hospitalization period based on various conditions should be explored.

Use of SNTs is an important component of the role of the nurse. It provides a communication tool for nurses. It demonstrates nurses' unique and independent function in quality patient care to other healthcare providers. It is essential to invite all nurses in each specialty, such as oncology, gerontology, pediatrics etc., to assure and update completeness and comprehensiveness of SNLs. This completeness of SNTs is also critical to advance nursing information systems. A current underdeveloped nursing information system is an obstacle for successful implementation of SNTs in EHRs. As patients' conditions and advanced treatments become more complicated, nurses are challenged to provide evidenced-based care without the support of well-developed nursing information systems that meet the needs of nurses at the bedside. Nurses need a professional language to communicate and document their planned care in practice. Researchers require a well-structured data warehouse to assure the quality of data for exploring and defining the knowledge of nursing practice that is beneficial for quality patient care. This study provided an initial look of how SNTs within a complete set of nursing planned care (nursing diagnoses, nursing interventions, and nursing sensitive patient outcomes) can be used in oncology inpatients. This knowledge can be beneficial to nurses in current oncology inpatient care and expand future research in this area.

An outcome score at discharge could serve as a desired outcome in an ideal situation. The better outcome rating at discharge for a patient is expected and lead to a

lower rate of readmission for oncology patients. A potential study can be designed to examine the outcome ratings at discharge and their association with readmission rate.

Study Limitations

Population Representation

One Site Sample

The study findings may not be generalizable to other hospitals because the sample is from one hospital. The geographic population may contribute to some specific characteristics of the patients, such as one specific race and thereby reducing the representation for the general population. For example, the majority of the sample was Caucasian (90%). Nearly 42% of the patients admitted to study units were under investigation for cancer and the majority of patients were newly diagnosed with cancer (M=3 months). The findings may not be generalized to patients with long durations of cancer or to states with different frequencies of types of cancers.

The average LOS was 3.7 days, shorter than published for similar populations. The short LOS may potentially lead to more difficulty in generalizing results in other facilities with documented longer LOSs. Patients received three combinations of treatments had longer LOSs. Patients who were treated for Leukemia or undergoing Bone Marrow Transplant stayed longer in the hospital. The cost and other complications such as *Risk for Infection* would be a concern in this group with prolonged LOSs. Nursing planned care may be modified in this group. For example, *Anxiety Level* varied in different stages for this population under chemotherapy (Young et al., 2002).

Data

Data Quality

The researcher used a variety of strategies, such as regular, random checks during data collection, SAS software (data filtering) and EXCEL (data validation) in the stage of data proceeding and data completion to reduce the potential for errors in the manual data retrieval of nursing planned care in the EHR. The quality of data in manual retrieval is still a concern. In addition, the design of the nursing documentation system also creates a challenge. For example, the system allowed nurses to place the same nursing diagnosis on the same patient when the previous identical nursing diagnosis was not terminated. Duplicate nursing diagnoses confuse nurses when monitoring the change of ratings with the latest outcome rating. It also more time consuming for the researcher to clean the data and assure data quality. The clinical information system should have processes that prevent these duplications.

Another factor that influences the data quality is the accuracy of the NNN linkages. No data information relevant to confirm the NNN linkages matched the clinical conditions of patients. The accuracy of the NNN linkages relies on nurses' knowledge of SNTs and their familiarity with the nursing documentation system. Although the study hospital had a long history of use of NNN, the computerized system in the study hospital has been implemented for a year prior to the data collection period for this research. An adoption rate of a technology innovation for nurses has to been considered as a possible influence on the data retrieved for research in the initial phases of implementation. The first year data collection may be too short for nurses' familiarity both in nursing diagnosis and the use of the computer system based on the adult's learning curve. Although the

start date was one year after the switch to the new nursing information system for documentation, a naïve nurse without previous training of SNTs in school might experience a longer learning curve to the 'new' knowledge and technology. Therefore, the completeness of computerized nursing documentation has to be considered for data quality, but it was beyond the scope of the study. Nevertheless, overall the data collection process, percentage of complete sets of linkages of NNN can be evaluated as data quality and provides a general idea of nurses' competency in clinical decision-making based on the logical and rational links between NNN. An irrelevant linkage of NNN is always easily detected. Finally, the computerized NNN system itself might be a factor due to its design or the selected content for inclusion for NNN linkages in the systems could influence the results of the study.

Sample Size for Outcome Change Scores

In this study, 84% of patients had documented planned care. Only 61% of patients diagnosed with *Acute Pain* had at least two outcome ratings to calculate outcome change scores. Although the sample size for the overall analysis was sufficient, some study variables, such as date of first cancer diagnosis, stage of cancer and treatment, and education, had obviously reduced the sample size for analysis. Nurses should receive alerts at discharge to make a discharge outcome rating to ensure quality data.

Study Design and Tools

SNTs in EHRs for Oncology Population

Although using guided planned care embodies evidence-based practice, it is possible that nurses may encounter a patient problem that could not be addressed by

current developed care plans. For example, an oncology patient may have a unique need that had not been covered by the current SNTs in EHRs or the system has not been updated for this need. This leads to research bias. Another potential limitation is associated with accuracy of nursing diagnoses or their linkages of NNN in the sample, which was not considered in this study. This is because no other further information for patients' conditions was documented in the plan of care for patients. The researcher checked that each linkage of NNN was logically placed. The nursing staff in the study hospital were highly educated (bachelor degree in nursing) and were well-trained in using SNTs for years. The current nursing information system using NNN in the study hospital had also been implemented since May, 2009 and nurses were provided with intensive continuing education and updates as modification in the system have occurred.

This study did not focus on accuracy of nursing diagnosis based on clinical conditions. However, the potential errors may be lower as nurses from different work shifts planned the same care on the same patients. Another problem reported in the study was the lack of a clear 'dose' of a nursing intervention in the care plan data in the current system. The 'dose' of a nursing intervention is defined as amount and frequency of interventions. The 'dose' of a nursing intervention was concerned because the improvement of outcomes can be accurately measured by the 'dose' of interventions delivered. The transparence of nursing care then can be described in a scientific way with how much efforts need to be performed to reach the expected outcome. 'Moreover, nursing documentation was not linked to nursing planned care in the system, causing the confirmation of actual interventions to be even more difficult. This is a common weakness of current EHRs in terms of nursing applications and needs to be corrected by

vendors developing nursing information systems for nursing. Care planned must be linked to care delivered.

Study Variables

Data collection was retrospective. Factors associated with nursing planned care that were not documented would be impossible to be collected, such as the exact duration of each nursing intervention, rather than a start date and an end date.

Some covariates relevant to outcome change scores were not collected in the study. For example, the study did not include medication information, which was potentially an important inference for *Pain Management*. The inference of medication control was not included as covariate for patients with *Pain Level* for *Acute Pain*, which may influence the outcome change scores. Future studies should include these variables.

Implications for Nursing Practice

The results of the study contributed to defining nursing knowledge of oncology care. The frequently used linkages of NNN in the study should be acknowledged by oncology nurses. The discrepancy between less frequently used linkages than expected for some nursing diagnoses, interventions and outcomes found in the study need further study to identify the issues. Some retired NNN terms were still available in this hospital's information system and unexpected nursing diagnoses, interventions, or outcomes are still in use. This reveals a problem. The organization may not be aware of the changes, updates may not have occurred in the EHR system at the time of the study, planned continuing education for nurses focused on the changes may not have happened at the time of the study, or an appropriate SNT has not been developed to replace the retired one.

It also can serve as a good example for training students' critical thinking skills, helping them recognize unusual nursing diagnoses, nursing interventions, and outcomes. To identify frequently or infrequently used diagnoses, interventions, and outcomes, assistant nurse managers or administrators can assign patients to nurses and expect quality care considering the characteristics of patients, type of unit, age, and treatment that may influence their length of stay (LOS). Nurses can also use common outcome change scores for this population as a reference in decision-making. The discrepant findings in nursing diagnoses, interventions, and outcomes guide nurses in practice settings in new directions as needed. For example, psychosocial aspects of care may be perceived by nurses as less of a concerned in acute settings; however, in the concept of care continuum, the hospitalization period is the best time to holistically evaluate the patient's planned care. In conclusion, the recognition of nursing diagnoses, nursing interventions, and patient- sensitive patient outcomes including psychosocial needs is important to describe oncology nursing care using SNTs.

This study provided a picture of current oncology nursing care, the demographics of patients on oncology specialty units and the core nursing process components (diagnoses, interventions, and outcomes) for patients receiving cancer care. This study also offered a valuable evaluation of oncology nursing care by examining the relationship between outcome score changes and patient characteristics and the association between outcomes score changes and cost-related variables, such as LOS using a large sample of patients. Additionally, the study addressed the linkages of currently used SNTs (NNN as examples) and provides an evaluation of SNTs in clinical practice and helps identify future development needs for SNTs in this specialty.

Implications for Nursing Education

Use of the information in educational programs or training new oncology nurses in clinical practice bridge the gap of from school training into practice in a real world, especially in an organization using SNTs in the EHRs. The frequently used SNTs are a good resource for students and nurses obtaining knowledge in this specialty. The frequently used SNTs, such as NANDA-I diagnoses, NIC interventions, and NOC outcomes and their linkages (NNN) found in the study should be included in academic education and continuing education in oncology nursing. Nursing students must receive content on SNTs in their educational programs in order to recognize the importance of SNTs in EHRs as positioning nursing in new era of evidence-based practice. Nursing students need to learn about nursing through concepts that are fundamental to SNTs and thus decreasing the gap between the gap preventing a gap between education and practice as EHRs becomes mandatory in healthcare settings.. The use of SNTs also strengthens nursing students' clinical reasoning skills. The OPT model was an example of applying NNN to clinical reasoning. A proper training program and continuing education of the NNN may most likely contribute to highly achievement of selecting correct NNN links in EHRs. The successful use of SNTs in EHRs in the study site can be an exemplar for other organizations in seeking the same innovation to achieve the Meaningful Use (MU) in the implementation of EHRs.

Implications for the Health Care System and Health Policy

Nursing leaders and administrators should address the need for electronic SNTs in their organizations. Governmental and non-governmental organizations should collaborate to promote resource integration in education, research, and the health care

industries. Stakeholders in the healthcare system should recognize the importance of SNTs in EHRs in providing cost-effective research potentially preventing nursing hours wasted in documentation and communication by investing in creating advanced nursing work environments with advanced nursing information and documentation systems. The findings on the outcome change scores of the study hopefully provided an initial insight for decision-makers for further policy changes, such as investing in advancing nursing information systems and providing a better nursing work environment to assure quality patient care.

Recommendations for Future Research

Use of Different Resources

Use of different resources, such as patient data, nursing surveys, and observation from researchers, benefits in developing a more comprehensive sets of SNTs. It also fills the gap of the perspectives of nursing care using SNTs in EHRs between use in clinical practice and in research. In addition, each SNT may be developed for different purposes or different target populations. The NNN is designed to be able to describe nursing care in all settings and all populations (Johnson et al., 2011). To enable SNTs to appropriately describe nursing care in each specialty, SNTs have to be validated through patient data and nursing surveys in each specialty and in different care settings. The findings in the study using patient data provide evidence of the use of SNTs in EHRs describing nursing care in specific oncology units. This is an initial step for future studies examining a specific benefit of SNTs in EHRs in order to provide evidence for previous inconsistent findings. Conducting a survey of nursing staff in these oncology units is critical to evaluate current perspectives of nursing staff and their knowledge basis of their practice

expertise. A survey of these nurses or a future study should collect relevant information to see if a need for a new nursing diagnosis, a new nursing intervention, and a new nursing sensitive patient outcome as SNTs is needed.

The findings will help nursing classification experts develop appropriate SNTs to describe nursing care for their specialties, such as common nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes for oncology nursing care. It suggests that the mechanism of retiring a nursing diagnosis, a nursing intervention, and a nursing-sensitive patient outcome may be required to be established by experts and clinical practical perspective as well.

An ethnography methodology in the organization is an alternative to explore nursing planned care, especially audit for data quality or accuracy of the NNN linkages. It suggests organizational studies should consider this design (Brink & Wood, 1998). In summary, the completeness of SNTs for every population requires validation from patient data, surveys of nurses, and observation from researchers focused on effectiveness research.

SNTs in EHRs and Data Warehouses

A user-friendly design of planned care using SNTs as a nursing documentation system to provide efficient communication through EHRs is necessary. Nursing decision support systems with reminders for identifying patients who have been admitted longer than 24 hours without planned care is recommended. The use of structured nursing documentation using SNTs benefits organizations to assist in developing data warehouses.

Modify Study Design

Inclusion of Different Populations in Multiple Sites and Other Covariates

In future studies, data collection in different organizations using SNTs should be studied so that generalization of findings can be possible. Moreover, both micro-and-macro systems have to be considered in the research designs for the subject matters. On an individual level, some covariates relevant to alter outcome ratings have to be taken into consideration as critical to decision-making for the desired outcomes. For example, medication information and difference of individual threshold of pain may alter their outcome ratings for *Pain Level*. Individuals with different level of functional status may also alter their optimum range of outcome ratings for relevant NOC outcomes as baseline and through the care continuum. On a unit level, the type of specialty as found in the study was associated with LOS and outcome change scores for *Pain Level* for patients with *Acute Pain*. At the system level, nursing information systems or relevant policy, such as a template for a specific nursing care can influence plans of care and how they are addressed in EHRs. Donabedian's Structural-Process- Outcome Model provides a framework for this type of study.

Inclusion of Dose of Nursing Intervention

In order to accurately evaluate nursing care, the dose of nursing interventions should be measured and documented as a part of hospital standards. This will enable researchers to measure nursing-sensitive patient outcomes based on the amount of nursing care. A better-designed nursing information and documentation system is still required. However, the effort of linking the amount of nursing interventions and their association with improvement based on the nursing activities is an initial step that

evidence of Meaningful Use (MU) has emphasized in health care industry in recent years. These data are essential for comparison across organizations to determine why some organizations are producing better outcomes for patients than others. Differences in practice patterns (interventions) need to be a part of future research to build the knowledge base of nursing.

Development of Optimum Ranges for Outcome Ratings

To establish an optimum range of outcome ratings at admission, at discharge, and outcome change scores based on relevant information for a specific population would assist nurses in decision making for appropriate outcome expectation for patient care. Outcome change scores would be more accurately interpreted when relevant information is concerned, such as functional status. Additionally, based on disease process, maintaining the outcome ratings would become the maximum of nursing care that is expected, especially for a population, such as cancer patients, whose optimum outcome score may not range from one to five and whose outcome change scores may fluctuate as the disease process or because of individual health conditions (functional status). Therefore, disease process should be considered and an index for such special situations should be established for nurses for clinical-decision making.

Pattern of NOC Outcome Change Scores

Future studies should explore the pattern of change scores during hospitalization, especially for those patients have LOS.

Compatibility of NOC Outcome Ratings and Other Scales

The fact is that a variety of scales are used to measure very similar things. The scales in each specialty may provide unique functions to measure their interest in certain variables. However, not all of them use a five-Likert scale as NOC ratings. It is challenging to have all these commonly used scales in EHRs due to their variations and unstructured format. Therefore, a new strategy to validate the indicators of NOC and its five-Likert scale can represent the same function as current scales used in each specialty. Future studies should focus on compatibility of a variety of scales and a potential communication between SNTs and these common used scales in each specialties or how SNTs can benefit from these current scales.

Another consideration is how nursing information systems can benefit nurses' daily workload. The advanced nursing information system is expected to save nursing time, for example, by automatically retrieving relevant patient information that is required for nursing assessment and reduce the repetitive documentations in EHRs. It is also expected to have reminder functions in order to provide nurses with decision support. The advanced nursing information system is expected to allow nurses to visualize each outcome rating and easily notice if there is a dramatic change in patient condition. The linkages of NANDA-I, NIC and NOC in EHRs provides a potential tool in nursing information systems and serves as an evidence-based decision support system for nurses and can enhance the quality of patient care.

This is one of the first studies to identify NNN linkages focused on oncology patients. It is critical to study NOC outcomes and its compatibility with other commonly used quality indicators. The demand of a good measure should account for ease of use

and prevent nurses documenting the same things in two different formats. It may not be realistic to change current scales into 1 to 5 scales. However, NOC outcomes provide potential development of needed indicators in 1to 5-point Linker scale for each specialty.

Conclusion

NANDA-International, the Nursing Interventions Classification, and the Nursing Outcomes Classification describe nursing planned care for oncology units. The benefits of using NNN include identifying the common patient problems, symptoms, interventions, outcomes and their evaluation based on measurable indicators with a one-to-five Likert measurement scale. The study helps validate the common linkages of NNN in the oncology population. The study of linkages of NNN benefit research effectiveness by exploring the most effective interventions for outcome improvement based on a specific diagnosis. It also benefits exploring patterns of nursing diagnoses, nursing interventions and outcomes, especially for this population and other populations as well. For example, the exploration of patterns of nursing diagnoses, which identified patient healthcare problems, including symptoms are helpful for the newly emerging knowledge of symptom clusters. The discovery of new patterns of interventions is also helpful for clinical decision-making for nurses. The pattern of outcomes and their outcome changes scores would be an index for building a baseline standard care for a specific population. For example, the optimum outcome ratings may not be five as their disease processes and health status deteriorates, the desired rating may change to a lower rating. Therefore, the range of outcome ratings is expected in different stages of cancer. They may not always be expected to reach a rating of “5” and the target rating may be modified in different

stages as the disease advanced. In conclusion with these changes nursing diagnoses and interventions may change as well.

Pain was the dominant concept in the nursing care provided to all oncology patients but only 78% of the cancer patients were diagnosed to have *Acute Pain* which was higher than 70% reported by 2004 ONS survey (Mallory & Thomas, 2004). For the 2,237 patients with a diagnosis of *Acute Pain* and the outcome *Pain Level*, 39% of the patients had no change in their outcome score at discharge, 12% had negative changes, and 49% had positive changes. *Acute Pain* is an area of great emphasis in the treatment of patients with cancer and these data suggest that improvements in the assessment of pain need to be reinforced in the care planning process. *Risk for Infection* was the most frequent nursing diagnosis for patients in the Adult Leukemia and Bone Marrow Transplant Unit. Hospitals should provide continuing education on infection control for these nurses.

The results of this study demonstrate that cancer patients admitted to specialty units tend to have similar nursing diagnoses, interventions, and outcomes regardless of the type of cancer diagnosis. This study was the first step in establishing core diagnoses, interventions, and outcomes for oncology nurses using actual patient data. However, it is crucial to further investigate how pain is managed by oncology nurses by also examining outcome change scores. In future research, in order to use the data to maximum, combing other resources available, such as the National Database of Nursing Quality Indicators (NDNQI) data, can be useful in identifying other issues in nursing care. For example, a comparison of time spent on the planned NIC interventions using suggested time indicated from NIC (Nursing Interventions Classification) (Bulechek & Dochterman,

2008), and the HPPD (Hour Per Patient Day) from administrative data, can be a focus for future studies. Knowledge about current practice in oncology using SNTs that links with different datasets, such as tumor registries and the National Database of Nursing Quality Indicators (NDNQI) database will help establish the core diagnoses, interventions, and outcomes for oncology nurses necessary to guide the evaluation of nurse competencies.

The study plays an important role to evaluating current nursing planned care in oncology units using SNTs. The findings of the study provide knowledge of oncology care in the perspective of classification and EHRs. The lesson the author obtained for data retrieval also provides an insight to evaluate the nursing information system for documentation for this study hospital. This experience and findings of the study are further evidence of the need to advance the current underdeveloped nursing information system. First, the data retrieval experience revealed a demand to redesign the nursing information system to enable automatic data retrieval and storage for clinical practical and research purposes. The findings of the study would be a base standard to develop an index of standard nursing planned care and advanced nursing decision support systems for the oncology population by using the common linkages of NNN and their expected admission outcome ratings, discharge outcome rating, and outcome change scores. A replication of the study in different organizations is needed to refine nursing core standards and practices across patient population.

Summary

This study identifies oncology nursing knowledge using NANDA-I, NIC and NOC. The study also guide nursing administrator design continuing education programs for their nurses and build up a commonly used planned care for novice nurses. The

findings of the study can also provide useful educational resources for nursing students learning oncology nursing care and training their clinical thinking skills by using the common used NNN linkages. This study also identifies common range of NOC outcome ratings and NOC change scores for oncology patients. This helps nurses to plan an appropriate care as knowing the optimum range of this population. The results need to be replicated in multiple sites to enable the generalizability of the findings of the study. Future research using SNTs in EHRs should be conducted to describe the care provided by other specialties.

APPENDIX A DEFINITIONS

Definitions

Variable	Variable Definition	Operational Definition	Variable Type	Data Resource
Characteristics of Patient				
		Demographics		
Date of Birth	Date of Birth	mm/date/year	Date	
Gender	The behavioral cultural or psychological traits typically associated with one sex.	0 = Female 1 = Male	Categorical (Binary)	EMR (Electronic Medical Records)
Race	A group of people united by certain characteristics.	0 = Caucasian 1 = African-American 2 = Asian 3 = American Indian 4 = Other	Categorical (Nominal)	EMR
Marital Status	Marital status indicates whether the person is married divorced or widowed.	0 = Married 1 = Single 2 = Divorced 3 = Widowed 4 = Separated 5 = Life partner	Categorical (Nominal)	EMR
Years of Education	Education level is defined as the highest degree or diploma that has been completed.	Years	Continuous	EMR
Patient's Employment Status	Activity pursued as a livelihood; An activity to which one devotes time.	0 = Retired 1 = Unemployed/Not retired 2 = Disabled 3 = Employed/Service 4 = Homemaker 5 = Other	Categorical (Nominal)	EMR

Table Continued

Disease Information				
Medical Diagnosis	The Primary Medical diagnosis came from International Classification Disease-9th Version Clinical Modification codes (ICD-9-CM) (Public Health Service and Health Care Financing Administration 1994)	ICD Code	Categorical (Nominal)	EMR
Primary Site of Tumor	The Primary site of tumor	ICD Code	Categorical (Nominal)	Tumor Registry
Date Of First Cancer Diagnosis	Date of first diagnosed as cancer	mm/date/year	Date	Tumor Registry
Stage of Cancer	The stage of a cancer is a descriptor (usually numbers I to IV) of how much the cancer has spread and influences treatment decisions and prognosis. Staging is determined based on three measures contained in the pathology report: T (Tumor Size) N (Lymph Node Status) and M (Metastasis).	(Depend on the hospital coding) 0 = Stage I-III 1 = Stage IV	Categorical (Ordinal)	Tumor Registry
Severity of Illness	A rating assigned to measure organ system loss of function or physiological decompensation. The All Patient Refined Diagnosis Related Group (APR-DRG) was used.	Integral; 1 = Mild 2 = Moderate 3 = Major 4 = Severe	Categorical (Ordinal)	EMR

Table Continued

Comorbidity	Clinical Conditions that exist before admission which are not related to the hospitalization; however they are likely to contribute mortality and resource utility.	Binary; 0 = No comorbidity 1= Yes at least one comorbid condition	Categorical (Binary)	EMR
	Hospitalization Information			
Admission Date to an Oncology Unit	Dates at admission to one of the four oncology units in the study year	Each specific date at admission to any oncology unit in the study year	Date(s)	EMR
Initial Site at Admission	The site from which the patient was admitted to the hospital.	0 = Other units in the hospital 1 = Other hospital 2 = Care facility and 3 = Home or other routine admission	Categorical (Nominal)	EMR
Type of Unit	Type of the four oncology units that patients admitted to	1 = Gynecology, Oral Surgery, and Otolaryngology Unit 2 = Hematology/Oncology and Palliative Care Unit 3 = Medical-Surgical Oncology 4 = Adult and Bone Marrow Transplant Unit	Categorical (Nominal)	EMR

Table Continued

Admission Date to Hospital	Date of admission to hospital in the study period	Each specific date of admission to hospital in the study period		
Admission Date to Oncology Unit	Date of Admission to any oncology unit in the study period	Each specific date of admission date to any oncology unit in the study period		
Discharge Date from an Oncology Unit	Date at discharge from any oncology unit in the study period	Each specific date at discharge from any oncology unit in the study period	Date(s)	EMR
Length of Stay (LOS)	The number of days that a patient stayed in an inpatient facility during a single episode of hospitalization.	Length of stay is the count of days between patient admission day and patient discharge day as a continuous variable. (Discharge Date – Admission Date)	Numerical (Continuous)	EMR
Discharge Status	The site to which the patient was referral at discharge.	0 = Home or self-care 1 = Home with home health care 2 = Other facilities 3 = Deceased	Categorical (Nominal)	EMR
		Cost-related Variables		
MS-DRG	Medical-Service Disease-Related Group is defined as a system to classify hospital cases into one of approximately 500 groups for resource utility.	The categorical variable was listed in appendix.	Categorical (Nominal)	EMR

Table Continued

Mortality	The number of deaths within a particular group or area	Death divided 30 day hospitalization	Numerical (Continuous)	EMR
Types of Insurance	Health insurance is insurance that pays for all or part of a person's health care bills. The types of health insurance are group health plans individual plans workers' compensation and government health plans such as Medicare and Medicaid.	0 = No insurance/Self Pay 1 = Medicaid 2 = Medicare 3 = Other Insurance	Categorical (Nominal)	EMR
		Treatment		
Cancer Surgery	Operation for the treatment of cancer	0 = No surgery 1 = surgery	Categorical	Tumor Registry
Radiotherapy	Radiotherapy for treatment of cancer	Categorical; 0 = No radiotherapy 1 = radiotherapy	Categorical	Tumor Registry
Chemotherapy	Chemotherapy for treatment of cancer	0 = No chemotherapy 1 =chemotherapy	Categorical	Tumor Registry
Other Type of Medical Treatments	Any other medical treatments related to cancer, such as hormone therapy or immunotherapy, or other combinations.	List of treatment type	Categorical (Nominal)	Tumor Registry

Table Continued

Standard Nursing Terminologies (SNTs)				
Nursing Diagnosis (NANDA-I)	NANDA-I: Nursing diagnosis is defined as "*a clinical judgment about individual family or community responses to actual or potential health problems / life processes. A nursing diagnosis provides the basis for selection of nursing interventions to achieve outcomes for which the nurse is accountable*" (NANDA-I 2009-2011 p.419).	Multi-level	Categorical (Nominal)	Nursing Information System/Manual Retrieval
Nursing Intervention (NIC)	Nursing interventions delivered to enhance patient outcomes. These labels were captured in NIC format. NIC: An intervention is defined as "*any treatment based upon clinical judgment and knowledge that a nurse performs to enhance patient/client outcomes*" (Dochterman & Bulechek 2008, p. 3).	Categorical; (Multi-level).	Categorical (Nominal)	Nursing Information System/Manual Retrieval

Table Continued

Nursing-Sensitive Patient Outcomes (NOC)	NOC: Nursing-sensitive patient outcome is defined as "*An intervention family or community state behavior or perception that is measured along a continuum in response to a nursing intervention(s). Each outcome has an associated group of indicators that are used to determine patient status in relation to the outcome In order to the measurement the outcome requires identification of a series of more specific indicators* " (Moorhead Johnson & Maas 2004, p. 38)	Multi-levels;	Categorical (Nominal)	Nursing Information System/ Manual retrieval
Linkages of NANDA-I NIC and NOC	Linkages of NANDA-I NIC and NOC are taken to the whole combination of the nursing diagnoses nursing interventions and nursing-sensitive patient outcomes in individuals. This describes how SNLs are combined together as a set of complete nursing documentation for nursing activities.	Multi-levels;	Categorical (Nominal)	Nursing Information System/ Manual retrieval

Table Continued

Measurable Nursing-Sensitive Patient Outcome Variables				
Nursing Sensitive Patient Outcome Rating (NOC Score Rating)	Score changes on the 5 point rating of NOC for per unique type of NOC. The intensity and duration were documented as well.	Nursing Sensitive Patient Outcome Rating (NOC Score Rating) on a 0 to 5 scale. Nursing-sensitive patient outcome rating for each NOC labels both **at first and last measurement.**	Categorical (Ordinal)	Nursing Information System/ Manual retrieval
Changes in Nursing Sensitive Patient Outcome Rating (NOC Score Rating)	Changes in Nursing Sensitive Patient Outcome Rating (NOC Score Rating) on the 5 point rating for per unique type of NOC.	Final score minus initial score of NOC.	Numerical (Discrete)	Nursing Information System/ Manual retrieval
Duration of first and last measurement of Nursing Sensitive Patient Outcome Rating	The duration between the first and last measurement of nursing-sensitive patient outcome rating.	Time of last measurement minus first measurement of nursing-sensitive patient outcome rating.	Numerical (Continuous)	Nursing Information System/ Manual retrieval

APPENDIX B NANDA-I DIAGNOSIS: ACUTE PAIN

Acute Pain (00132)

(1996)
Domain 12: Comfort
Class 1: Physical Comfort

Definition: Unpleasant sensory and emotional experience arising from actual or potential tissue damage or described in terms of such damage (International Association for the Study of Pain); sudden or slow onset of any intensity from mild to severe with an anticipated or predictable end and a duration of less than 6 months

Defining Characteristics

- Change in Appetite
- Change in blood pressure
- Change in heart rate
- Change in respiratory rate
- Coded reports (e.g., use of pain scale)

Related Factors:

- Injury agents (e.g., biological, chemical, physical, psychosocial)
- Diaphoresis
- Distraction behavior (e.g., pacing, seeking out other people or activities, repetitive activities)
- Expressive behavior (e.g., restlessness, moaning, crying, vigilance, irritability, sighing)
- Facial mask (e.g., eyes lack luster, beaten look, fixed or scattered movement, grimace)
- Guarding behavior
- Narrowed focus (e.g., altered time perception, impaired thought process, reduced interaction with people and environment)
- Observed evidence of pain
- Position to avoid pain
- Protective gestures
- Pupillary dilation
- Reports pain
- Self-focused
- Sleep pattern disturbance

APPENDIX C NIC INTERVENTIONS: PAIN MANAGEMENT

Pain Management 1400

DEFINITION: Alleviation of pain or a reduction in pain to a level of comfort that is acceptable to the patient

ACTIVITIES:

Perform a comprehensive assessment of pain to include location, characteristics, onset/duration, frequency, quality, intensity or severity of pain, and precipitating factors

Observe for nonverbal cues of discomfort, especially in those unable to communicate effectively

Assure patient attentive analgesic care

Use therapeutic communication strategies to acknowledge the pain experience and convey acceptance of the patient's response to pain

Explore patient's knowledge and beliefs about pain

Consider cultural influences on pain response

Determine the impact of the pain experience on quality of life (e.g., sleep, appetite, activity, cognition, mood, relationships, performance of job, and role responsibilities)

Explore with patient factors that improve/worsen pain

Evaluate past experiences with pain to include individual or family history of chronic pain or resulting disability, as appropriate

Evaluate, with the patient and the health care team, the effectiveness of past pain control measures that have been used

Assist patient and family to seek and provide support

Utilize a developmentally appropriate assessment method that allows for monitoring of change in pain and that will assist in identifying actual and potential precipitating factors (e.g., flow sheet, daily diary)

Determine the needed frequency of making an assessment of patient comfort and implement monitoring plan

Provide information about the pain, such as causes of the pain, how long it will last, and anticipated discomforts from procedures

Control environmental factors that may influence the patient's response to discomfort (e.g., room temperature, lighting, noise)

Reduce or eliminate factors that precipitate or increase the pain experience (e.g., fear, fatigue, monotony, and lack of knowledge)

Consider the patient's willingness to participate, ability to participate, preference, support of significant others for method, and contraindications when selecting a pain relief strategy

Select and implement a variety of measures (e.g., pharmacological, nonpharmacological, interpersonal) to facilitate pain relief as appropriate

Teach principles of pain management

Consider type and source of pain when selecting pain relief strategy

Encourage patient to monitor own pain and to intervene appropriately

Teach the use of nonpharmacological techniques (e.g., biofeedback, TENS, hypnosis, relaxation, guided imagery, music therapy, distraction, play therapy, activity therapy, acupressure, hot/cold application, and massage) before, after, and, if possible, during painful activities; before pain occurs or increases; and along with other pain relief measures

Explore patient's current use of pharmacological methods of pain relief

Teach about pharmacological methods of pain relief

Encourage patient to use adequate pain medication

Collaborate with the patient, significant other, and other health professionals to select and implement nonpharmacological pain relief measures as appropriate

Provide the person optimal pain relief with prescribed analgesics

Implement the use of patient-controlled analgesia (PCA) if appropriate

Use pain control measures before pain becomes severe

Medicate prior to an activity to increase participation, but evaluate the hazard of sedation

Assure pretreatment analgesia and/or nonpharmacologic strategies prior to painful procedures

Verify level of discomfort with patient, note changes in the medical record, inform other health professionals working with the patient

Evaluate the effectiveness of the pain control measures used through ongoing assessment of the pain experience

Institute and modify pain control measures on the basis of the patient's response

Promote adequate rest/sleep to facilitate pain relief

Encourage patient to discuss his/her pain experience, as appropriate

Notify physician if measures are unsuccessful or if current complaint is a significant change from patient's past experience of pain

Inform other health care professionals/family members of nonpharmacologic strategies being used by the patient to encourage preventive approaches to pain management

Utilize a multidisciplinary approach to pain management, when appropriate

Consider referrals for patient, family, and significant others to support groups, and other resources, as appropriate

Provide accurate information to promote family's knowledge of and response to the pain experience

Incorporate the family in the pain relief modality, if possible

Monitor patient satisfaction with pain management at specified intervals

1st edition 1992; Revised 2nd edition 1996; Revised 4th edition 2004

BACKGROUND READINGS:

Acute Pain Management Guideline Panel. (1992). *Acute pain management: Operative or medical procedures and trauma. Clinical practice guideline* (AHCPR Pub. No. 92-0032). Rockville, MD: Agency for Health Care Policy and Research, Public Health Service, U.S. Department of Health and Human Services.

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APPENDIX D NOC OUTCOME: PAIN LEVEL

Pain Level--2102

Domain-Perceived Health (V) *Care Recipient:*

Class-Symptom Status (V) *Data Source:*

Scale(s)-Severe to None (n) and Severe deviation from normal range to No deviation from normal range (b)

DEFINITION: Severity of observed or reported pain

OUTCOME TARGET RATING: Maintain at_____ Increase to_____

		Severe	Substantial	Moderate	Mild	None	
PAIN LEVEL OVERALL RATING		**1**	**2**	**3**	**4**	**5**	
INDICATORS:							
210201	Reported pain	1	2	3	4	5	NA
210204	Length of pain episodes	1	2	3	4	5	NA
210221	Rubbing affected area	1	2	3	4	5	NA
210217	Moaning and crying	1	2	3	4	5	NA
210206	Facial expressions of pain	1	2	3	4	5	NA
210208	Restlessness	1	2	3	4	5	NA
210222	Agitation	1	2	3	4	5	NA
210223	Irritability	1	2	3	4	5	NA
210224	Wincing	1	2	3	4	5	NA
210225	Tearing	1	2	3	4	5	NA
210226	Diaphoresis	1	2	3	4	5	NA
210218	Pacing	1	2	3	4	5	NA
210219	Narrowed focus	1	2	3	4	5	NA
210209	Muscle tension	1	2	3	4	5	NA
210215	Loss of appetite	1	2	3	4	5	NA
210227	Nausea	1	2	3	4	5	NA
210228	Food intolerance	1	2	3	4	5	NA

		Severe deviation from normal range	Substantial deviation from normal range	Moderate deviation from normal range	Mild deviation from normal range	No deviation from normal range	
210210	Respiratory rate	1	2	3	4	5	NA
210211	Apical heart rate	1	2	3	4	5	NA
210220	Radial pulse rate	1	2	3	4	5	NA
210212	Blood pressure	1	2	3	4	5	NA
210214	Perspiration	1	2	3	4	5	NA

Site of pain _____

1st edition 1997; Revised 3rd edition 2004; Revised 4th edition

OUTCOME CONTENT REFERENCES:

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APPENDIX E NURSING DIAGNOSES: LEUKEMIA PATIENTS

Nursing Diagnoses: Leukemia Patients

Functional Dimensions	NANDA-I Label
Health Perception-Health Management (*n*=4)	Risk for bleeding (n=13)
	Risk for infection (n=10)
	Noncompliance (n=5)
	Risk for falling (*n*=2)
Nutritional-Metabolic (*n*=10)	Impaired skin integrity (*n*=13)
	Fluid volume excess (*n*=12)
	Altered nutrition, less than body requirements (n=12)
	Altered oral mucous membrane (*n*=12)
	Nausea (*n*=11)
	Fever (*n*=9)
	Vomiting (*n*=8)
	Impaired swallowing (*n*=5)
	Risk for fluid volume deficit (*n*=3)
	Incontinence of feces (*n*=2)
Activity-Exercise (*n*=5)	Fatigue (*n*=13)
	Self-care physical mobility (*n*=7)
	Diversional activity deficit (*n*=3)
	Ineffective breathing pattern (*n*=5)
	Dizziness (*n*=4)
Self-Perception (*n*=3).	Anxiety (*n*=8)
	Hopelessness (*n*=3)
	Body image disturbance (*n*=3)
Coping-Stress Tolerance (*n*=2)	Ineffective individual coping (*n*=5)
	Ineffective family coping (*n*=3)
Cognitive-Perceptual (*n*=5)	Pain (*n*=12)
	Knowledge deficit (*n*=6)
	Pruritus (*n*=4)
	Altered thought process (*n*=2)
	Sensory changes, tingling (*n*=1)
Elimination (*n*=3)	Diarrhea (*n*=10)
	Incontinence of urine (*n*=4)
	Constipation (*n*=2)
Sleep-Rest (*n*=1)	Sleep pattern disturbance (*n*=14)
Role-Relationship (*n*=2).	Impaired social interaction (*n*=5)
	Anticipatory grieving (*n*=2)

Resource: Courtens, A. M., & Abu-Saad, H. H. (1998). Nursing diagnoses in patients with leukemia. *International Journal of Nursing Terminologies and Classifications, 9*(2), 49-61.

APPENDIX F HUMAN SUBJECT APPROVAL

THE UNIVERSITY OF IOWA

Human Subjects Office/
Institutional Review Board (IRB)
105 Hardin Library for the Health Sciences
600 Newton Road
Iowa City, Iowa 52242-1098
319-335-6564 *Fax* 319-335-7310
irb@uiowa.edu
http://research.uiowa.edu/hso

IRB ID #: 201102761

To: Hui-Chen Tseng

From: IRB-01 DHHS Registration # IRB00000099,
Univ of Iowa, DHHS Federalwide Assurance # FWA00003007

Re: Validation of Standardized Nursing Languages in the Sample of the Oncology Population Using NANDA-I, Nursing Interventions Classification, Nursing Outcomes Classification in Electronic Health Records

Protocol Number:
Protocol Version:
Protocol Date:
Amendment Number/Date(s):

Approval Date: 03/31/11

Next IRB Approval Due Before: 03/10/12

Type of Application:	**Type of Application Review:**	**Approved for Populations:**
☐ New Project	☐ Full Board:	☐ Children
☐ Continuing Review	Meeting Date:	☐ Prisoners
☒ Modification	☒ Expedited	☐ Pregnant Women, Fetuses, Neonates
	☐ Exempt	

Source of Support:

Investigational New Drug/Biologic Name:
Investigational New Drug/Biologic Number:
Name of Sponsor who holds IND:

Investigational Device Name:
Investigational Device Number:
Sponsor who holds IDE:

This approval has been electronically signed by IRB Chair:
Brian Bishop, CIP, MA
03/31/11 1005

OFFICE OF THE VICE PRESIDENT FOR RESEARCH

IRB Approval: IRB approval indicates that this project meets the regulatory requirements for the protection of human subjects. IRB approval does not absolve the principal investigator from complying with other institutional, collegiate, or departmental policies or procedures.

Agency Notification: If this is a New Project or Continuing Review application and the project is funded by an external government or non-profit agency, the original HHS 310 form, "Protection of Human Subjects Assurance Identification/IRB Certification/Declaration of Exemption," has been forwarded to the UI Division of Sponsored Programs, 100 Gilmore Hall, for appropriate action. You will receive a signed copy from Sponsored Programs.

Recruitment/Consent: Your IRB application has been approved for recruitment of subjects not to exceed the number indicated on your application form. If you are using written informed consent, the IRB-approved and stamped Informed Consent Document(s) are attached. Please make copies from the attached "masters" for subjects to sign when agreeing to participate. The original signed Informed Consent Document should be placed in your research files. A copy of the Informed Consent Document should be given to the subject. (A copy of the *signed* Informed Consent Document should be given to the subject if your Consent contains a HIPAA authorization section.) If hospital/clinic patients are being enrolled, a copy of the IRB approved Record of Consent form should be placed in the subject's electronic medical record.

Continuing Review: Federal regulations require that the IRB re-approve research projects at intervals appropriate to the degree of risk, but no less than once per year. This process is called "continuing review." Continuing review for non-exempt research is required to occur as long as the research remains active for long-term follow-up of research subjects, even when the research is permanently closed to enrollment of new subjects and all subjects have completed all research-related interventions and to occur when the remaining research activities are limited to collection of private identifiable information. Your project "expires" at 12:01 AM on the date indicated on the preceding page ("Next IRB Approval Due on or Before"). You must obtain your next IRB approval of this project on or before that expiration date. You are responsible for submitting a Continuing Review application in sufficient time for approval before the expiration date, however the HSO will send a reminder notice approximately 60 and 30 days prior to the expiration date.

Modifications: Any change in this research project or materials must be submitted on a Modification application to the IRB for prior review and approval, except when a change is necessary to eliminate apparent immediate hazards to subjects. The investigator is required to promptly notify the IRB of any changes made without IRB approval to eliminate apparent immediate hazards to subjects using the Modification/Update Form. Modifications requiring the prior review and approval of the IRB include but are not limited to: changing the protocol or study procedures, changing investigators or funding sources, changing the Informed Consent Document, increasing the anticipated total number of subjects from what was originally approved, or adding any new materials (e.g., letters to subjects, ads, questionnaires).

Unanticipated Problems Involving Risks: You must promptly report to the IRB any serious and/or unexpected adverse experience, as defined in the UI Investigator's Guide, and any other unanticipated problems involving risks to subjects or others. The Reportable Events Form (REF) should be used for reporting to the IRB.

Audits/Record-Keeping: Your research records may be audited at any time during or after the implementation of your project. Federal and University policies require that all research records be maintained for a period of three (3) years following the close of the research project. For research that involves drugs or devices seeking FDA approval, the research records must be kept for a period of three years after the FDA has taken final action on the marketing application.

Additional Information: Complete information regarding research involving human subjects at The University of Iowa is available in the "Investigator's Guide to Human Subjects Research." Research investigators are expected to comply with these policies and procedures, and to be familiar with the University's Federalwide Assurance, the Belmont Report, 45CFR46, and other applicable regulations prior to conducting the research. These documents and IRB application and related forms are available on the Human Subjects Office website or are available by calling 335-6564.

APPENDIX F LINKS OF NANDA-I AND NIC

Table *Links between Nursing diagnoses (NANDA-I) and Nursing Interventions (NIC)*

NANDA-I	NIC	n	%
Activity Intolerance	Activity Therapy	129	34
Activity Intolerance	Energy Management	132	35
Activity Intolerance	Exercise Promotion: Strength Training	115	31
Acute Confusion	Delirium Management	22	49
Acute Confusion	Neurologic Monitoring	23	51
Acute Pain	Analgesic Administration	235	15
Acute Pain	Emotional Support	1	0
Acute Pain	Pain Management	1,303	85
Anxiety	Anxiety Reduction	105	78
Anxiety	Coping Enhancement	29	22
Bathing/Hygiene Self-Care Deficit	Self-Care Assistance	3	100
Chronic Confusion	Environmental Management	1	50
Chronic Confusion	Reality Orientation	1	50
Chronic Pain	Analgesic Administration	15	16
Chronic Pain	Emotional Support	14	15
Chronic Pain	Pain Management	63	68
Constipation	Constipation/Impaction Management	8	57
Constipation	Diarrhea Management	6	43
Decreased Cardiac Output	Cardiac Care: Acute	8	100
Decreased Intracranial Adaptive Capacity	Cerebral Edema Management	12	100
Deficient Fluid Volume	Fluid Management	12	100
Deficient Knowledge	Health Education	26	47
Deficient Knowledge	Teaching: Individual	29	53
Deficient Knowledge Pre/Post Procedure/Surgery	Teaching: Disease Process	4	2
Deficient Knowledge Pre/Post Procedure/Surgery	Teaching: Preoperative	110	45
Deficient Knowledge Pre/Post Procedure/Surgery	Teaching: Procedure/Treatment	131	53
Deficient Knowledge, Disease Process	Teaching: Disease Process	67	42
Deficient Knowledge, Disease Process	Teaching: Individual	1	1
Deficient Knowledge, Disease Process	Teaching: Preoperative	1	1
Deficient Knowledge, Disease Process	Teaching: Procedure/Treatment	89	56

Table Continued

Deficient Knowledge, Insulin Therapy	Teaching: Procedure/Treatment	6	100
Diarrhea	Diarrhea Management	21	100
Disabled Family Coping	Family Therapy	3	100
Disturbed Body Image	Body Image Enhancement	2	100
Disturbed Sensory Perception, Auditory	Communication Enhancement: Hearing Deficit	2	100
Disturbed Thought Processes	Cognitive Restructuring	8	35
Disturbed Thought Processes	Cognitive Stimulation	9	39
Disturbed Thought Processes	Delirium Management	2	9
Disturbed Thought Processes	Hallucination Management	2	9
Disturbed Thought Processes	Reality Orientation	2	9
Dysfunctional Ventilatory Weaning Response	Mechanical Ventilatory Weaning	1	100
Excess Fluid Volume	Fluid Management	19	100
Fatigue	Energy Management	46	100
Feeding: Self-Care Deficit	Self-Care Assistance	2	50
Feeding: Self-Care Deficit	Self-Care Assistance: Feeding	2	50
Grieving	Grief Work Facilitation	16	100
Imbalanced Nutrition: Less than Body Requirements	Nausea Management	1	0
Imbalanced Nutrition: Less than Body Requirements	Nutrition Management	97	45
Imbalanced Nutrition: Less than Body Requirements	Nutrition Therapy	97	45
Imbalanced Nutrition: Less than Body Requirements	Nutritional Monitoring	22	10
Impaired Bed Mobility	Exercise Promotion: Strength Training	4	100
Impaired Gas Exchange	Acid-Base Management: Respiratory Acidosis	87	48
Impaired Gas Exchange	Pressure Management	2	1
Impaired Gas Exchange	Skin Surveillance	2	1
Impaired Gas Exchange	Ventilation Assistance	88	49
Impaired Gas Exchange	Wound Care	2	1
Impaired Memory	Memory Training	3	100
Impaired Oral Mucous Membrane	Oral Health Restoration	25	100
Impaired Physical Mobility	Exercise Promotion	45	80
Impaired Physical Mobility	Positioning	11	20
Impaired Skin Integrity	Foot Care	2	0
Impaired Skin Integrity	Pressure Management	178	32

Table Continued

Impaired Skin Integrity	Pressure Ulcer Care	10	2
Impaired Skin Integrity	Seizure Precaution	3	1
Impaired Skin Integrity	Skin Surveillance	183	33
Impaired Skin Integrity	Wound Care	184	33
Impaired Social Interaction	Socialization Enhancement	1	100
Impaired Spontaneous Ventilation	Acid-Base Management	1	9
Impaired Spontaneous Ventilation	Airway Management	1	9
Impaired Spontaneous Ventilation	Airway Suctioning	1	9
Impaired Spontaneous Ventilation	Artificial Airway Management	8	73
Impaired Swallowing	Aspiration Precautions	18	100
Impaired Tissue Integrity	Pressure Management	2	33
Impaired Tissue Integrity	Skin Surveillance	2	33
Impaired Tissue Integrity	Wound Care	2	33
Impaired Urinary Elimination	Urinary Habit Training	3	75
Impaired Urinary Elimination	Urinary Retention Care	1	25
Impaired Verbal Communication	Active Listening	6	46
Impaired Verbal Communication	Communication Enhancement: Speech Deficit	7	54
Ineffective Airway Clearance	Airway Management	103	50
Ineffective Airway Clearance	Airway Suctioning	101	50
Ineffective Breathing Pattern	Ventilation Assistance	31	100
Ineffective Coping	Anxiety Reduction	4	44
Ineffective Coping	Coping Enhancement	5	56
Ineffective Health Maintenance	Self-Responsibility Facilitation	1	100
Ineffective Tissue Perfusion	Circulatory Care: Arterial Insufficiency	5	45
Ineffective Tissue Perfusion	Circulatory Care: Venous Insufficiency	6	55
Ineffective Tissue Perfusion, Cerebral	Cerebral Perfusion Promotion	8	89
Ineffective Tissue Perfusion, Cerebral	Seizure Precaution	1	11
Ineffective Tissue Perfusion, Peripheral	Circulatory Care: Arterial Insufficiency	1	33
Ineffective Tissue Perfusion, Peripheral	Circulatory Care: Venous Insufficiency	2	67
Ineffective Tissue Perfusion, Renal	Circulatory Care: Arterial Insufficiency	6	50
Ineffective Tissue Perfusion, Renal	Circulatory Care: Venous Insufficiency	6	50
Ineffective Tissue Perfusion: Cardiac	Acid-Base Management	11	48

Table Continued

Ineffective Tissue Perfusion: Cardiac	Cardiac Care: Acute	12	52
Ineffective Tissue Perfusion: Pulmonary	Acid-Base Management	52	100
Mood Alteration: Mania	Behavior Management: Self-Harm	1	33
Mood Alteration: Mania	Impulse Control Training	1	33
Mood Alteration: Mania	Reality Orientation	1	33
Nausea	Nausea Management	338	100
Noncompliance	Mutual Goal Setting	3	75
Noncompliance	Self-Responsibility Facilitation	1	25
Readiness for Enhanced Family Coping	Family Support	8	100
Risk for Activity Intolerance	Energy Management	2	100
Risk for Aspiration	Aspiration Precautions	17	100
Risk for Bleeding	Bleeding Precaution	25	100
Risk for Constipation	Bowel Management	64	50
Risk for Constipation	Diet Staging	64	50
Risk for Deficient Fluid Volume	Fluid Management	14	100
Risk for Falls	Fall Prevention	321	100
Risk for Imbalanced Body Temperature	Temperature Regulation	11	100
Risk for Imbalanced Fluid Volume	Fluid Monitoring	33	100
Risk for Impaired Skin Integrity	Skin Surveillance	50	100
Risk for Infection	Infection Control	348	50
Risk for Infection	Infection Protection	352	50
Risk for Injury	Delirium Management	1	13
Risk for Injury	Environmental Management	5	63
Risk for Injury	Hallucination Management	1	13
Risk for Injury	Surveillance: Safety	1	13
Risk for Peripheral Neurovascular Dysfunction	Circulatory Care: Arterial Insufficiency	2	33
Risk for Peripheral Neurovascular Dysfunction	Neurologic Monitoring	2	33
Risk for Peripheral Neurovascular Dysfunction	Peripheral Sensation Management	2	33
Risk for Suicide	Behavior Management: Self-Harm	1	50
Risk for Suicide	Suicide Prevention	1	50
Risk for Unstable Blood Glucose	Hyperglycemia Management	8	53
Risk for Unstable Blood Glucose	Hypoglycemia Management	7	47
Risk for Withdrawal: Alcohol/Drugs	Substance Use Treatment: Alcohol Withdrawal	6	60

Table Continued

Risk for Withdrawal: Alcohol/Drugs	Substance Use Treatment: Drug Withdrawal	4	40
Self-Care Deficit	Self-Care Assistance	4	100
Sleep Deprivation	Sleep Enhancement	12	100
Social Isolation	Socialization Enhancement	3	100
Spiritual Distress	Dying Care	2	40
Spiritual Distress	Spiritual Support	3	60
Toileting Self-Care Deficit	Self-Care Assistance: Toileting	1	100
Urinary Retention	Urinary Retention Care	18	100

APPENDIX G LINKS OF NANDA-I AND NOC

Table *Links between Nursing diagnoses (NANDA-I) and Nursing-Sensitive Patient Outcomes (NOC)*

NANDA-I	NOC	*n*	*%*
Activity Intolerance	Activity Tolerance	135	100
Acute Confusion	Acute Confusion Level	23	100
Acute Pain	Pain Control	251	19
Acute Pain	Pain Level	1,057	81
Acute Pain	Pain: Disruptive Effects	1	0
Anxiety	Anxiety Level	105	78
Anxiety	Coping	29	22
Bathing/Hygiene Self-Care Deficit	Self-Care: Activities of Daily Living(ADL)	2	67
Bathing/Hygiene Self-Care Deficit	Self-care: Activities of Daily Living(ADL)	1	33
Bowel Incontinence	Bowel Elimination	2	100
Chronic Confusion	Cognitive Orientation	1	100
Chronic Pain	Pain Level	51	80
Chronic Pain	Pain: Disruptive Effects	13	20
Constipation	Bowel Elimination	9	100
Decreased Cardiac Output	Cardiac Pump Effectiveness	8	100
Decreased Intracranial Adaptive Capacity	Neurological Status	14	100
Deficient Fluid Volume	Fluid Balance	12	100
Deficient Knowledge	Knowledge: Treatment Regimen	29	100
Deficient Knowledge Pre/Post Procedure/Surgery	Knowledge: Illness Care	2	1
Deficient Knowledge Pre/Post Procedure/Surgery	Knowledge: Treatment Procedure	134	99
Deficient Knowledge, Disease Process	Knowledge: Illness Care	69	43
Deficient Knowledge, Disease Process	Knowledge: Treatment Procedure	91	57
Deficient Knowledge, Insulin Therapy	Diabetes Self-Management	3	50
Deficient Knowledge, Insulin Therapy	Knowledge: Treatment Procedure	3	50
Diarrhea	Bowel Elimination	21	100
Disabled Family Coping	Family Coping	4	100
Disturbed Body Image	Body Image	2	100
Disturbed Sensory Perception, Auditory	Communication: Receptive	2	100
Disturbed Thought Processes	Cognition	4	44
Disturbed Thought Processes	Cognitive Orientation	5	56

Table Continued

Dysfunctional Ventilatory Weaning Response	Respiratory Status: Gas Exchange	1	100
Excess Fluid Volume	Fluid Overload Severity	20	100
Fatigue	Endurance	46	100
Feeding: Self-Care Deficit	Nutritional Status: Food and Fluid Intake	2	50
Feeding: Self-Care Deficit	Self-Care: Activities of Daily Living(ADL)	2	50
Grieving	Grief Resolution	16	100
Imbalanced Nutrition: Less than Body Requirements	Nutritional Status	99	100
Impaired Bed Mobility	Body Positioning: Self-Initiated	4	100
Impaired Gas Exchange	Respiratory Status: Gas Exchange	92	98
Impaired Gas Exchange	Tissue Integrity: Skin and Mucous Membranes	2	2
Impaired Memory	Memory	3	100
Impaired Oral Mucous Membrane	Oral Hygiene	26	100
Impaired Physical Mobility	Mobility	48	100
Impaired Skin Integrity	Burn Healing	1	1
Impaired Skin Integrity	Tissue Integrity: Skin and Mucous Membranes	191	99
Impaired Social Interaction	Social Interaction Skills	1	100
Impaired Spontaneous Ventilation	Respiratory Status: Airway Patency	1	10
Impaired Spontaneous Ventilation	Respiratory Status: Gas Exchange	9	90
Impaired Swallowing	Aspiration Prevention	7	39
Impaired Swallowing	Swallowing Status	11	61
Impaired Tissue Integrity	Tissue Integrity: Skin and Mucous Membranes	2	100
Impaired Urinary Elimination	Urinary Continence	3	75
Impaired Urinary Elimination	Urinary Elimination	1	25
Impaired Verbal Communication	Communication	8	100
Ineffective Airway Clearance	Respiratory Status: Airway Patency	104	100
Ineffective Breathing Pattern	Respiratory Status: Ventilation	32	100
Ineffective Coping	Coping	5	100
Ineffective Health Maintenance	Health Seeking Behavior	1	100
Ineffective Tissue Perfusion	Tissue Perfusion: Peripheral	6	100
Ineffective Tissue Perfusion, Cerebral	Seizure Control	1	11
Ineffective Tissue Perfusion, Cerebral	Tissue Perfusion: Cerebral	8	89

Table Continued

Ineffective Tissue Perfusion, Peripheral	Tissue Perfusion: Peripheral	3	100
Ineffective Tissue Perfusion, Renal	Kidney Function	6	100
Ineffective Tissue Perfusion: Cardiac	Tissue Perfusion: Cardiac	12	100
Ineffective Tissue Perfusion: Pulmonary	Tissue Perfusion: Pulmonary	58	100
Mood Alteration: Mania	Mood Equilibrium	1	100
Nausea	Nausea and Vomiting Severity	344	100
Noncompliance	Compliance Behavior	3	100
Readiness for Enhanced Family Coping	Family Coping	8	100
Risk for Activity Intolerance	Endurance	4	100
Risk for Aspiration	Aspiration Prevention	17	100
Risk for Bleeding	Blood Loss Severity	25	100
Risk for Constipation	Gastrointestinal Function	66	100
Risk for Deficient Fluid Volume	Fluid Balance	14	100
Risk for Falls	Fall Prevention: Behavior	148	44
Risk for Falls	Knowledge: Fall Prevention	185	56
Risk for Imbalanced Body Temperature	Risk Control: Hyperthermia	7	64
Risk for Imbalanced Body Temperature	Risk Control: Hypothermia	4	36
Risk for Imbalanced Fluid Volume	Hydration	33	100
Risk for Impaired Skin Integrity	Tissue Integrity: Skin and Mucous Membranes	50	100
Risk for Infection	Infection Severity	353	100
Risk for Injury	Knowledge: Personal Safety	6	86
Risk for Injury	Risk Control	1	14
Risk for Peripheral Neurovascular Dysfunction	Neurological Status: Peripheral	2	100
Risk for Suicide	Suicide Self-Restraint	1	100
Risk for Unstable Blood Glucose	Blood Glucose Level	8	100
Risk for Withdrawal: Alcohol/Drugs	Substance Withdrawal Severity	5	100
Self-Care Deficit	Self-Care: Activities of Daily Living(ADL)	4	100
Sleep Deprivation	Sleep	12	100
Social Isolation	Social Interaction Skills	2	67
Social Isolation	Social Involvement	1	33
Spiritual Distress	Dignified Life Closure	2	40
Spiritual Distress	Spiritual Health	3	60
Toileting Self-Care Deficit	Self-Care Status	1	100
Urinary Retention	Urinary Elimination	19	100

APPENDIX H LINKS OF NOC AND NIC

Table *Links between Nursing-Sensitive Patient Outcomes (NOC) and Nursing Interventions (NIC)*

NOC	NIC	*n*	*%*
Activity Tolerance	Activity Therapy	129	34
Activity Tolerance	Energy Management	132	35
Activity Tolerance	Exercise Promotion: Strength Training	115	31
Acute Confusion Level	Delirium Management	22	49
Acute Confusion Level	Neurologic Monitoring	23	51
Anxiety Level	Anxiety Reduction	105	100
Aspiration Prevention	Aspiration Precautions	24	100
Blood Glucose Level	Hyperglycemia Management	8	53
Blood Loss Severity	Bleeding Precaution	25	100
Body Image	Body Image Enhancement	2	100
Body Positioning: Self-Initiated	Exercise Promotion: Strength Training	4	100
Bowel Elimination	Constipation/Impaction Management	8	23
Bowel Elimination	Diarrhea Management	27	77
Burn Healing	Pressure Management	1	33
Burn Healing	Skin Surveillance	1	33
Burn Healing	Wound Care	1	33
Cardiac Pump Effectiveness	Cardiac Care: Acute	8	100
Cognition	Cognitive Restructuring	4	50
Cognition	Cognitive Stimulation	4	50
Cognitive Orientation	Cognitive Restructuring	4	24
Cognitive Orientation	Cognitive Stimulation	5	29
Cognitive Orientation	Delirium Management	2	12
Cognitive Orientation	Environmental Management	1	6
Cognitive Orientation	Hallucination Management	2	12
Cognitive Orientation	Reality Orientation	3	18
Communication	Active Listening	6	46
Communication	Communication Enhancement: Speech Deficit	7	54
Communication: Receptive	Communication Enhancement: Hearing Deficit	2	100
Compliance Behavior	Mutual Goal Setting	3	75
Compliance Behavior	Self-Responsibility Facilitation	1	25
Coping	Anxiety Reduction	4	11
Coping	Coping Enhancement	34	89
Diabetes Self-Management	Teaching: Procedure/Treatment	3	100

Table Continued

Dignified Life Closure	Dying Care	2	100
Endurance	Energy Management	48	100
Fall Prevention: Behavior	Fall Prevention	143	100
Family Coping	Family Support	8	73
Family Coping	Family Therapy	3	27
Fluid Balance	Fluid Management	26	100
Fluid Overload Severity	Fluid Management	19	100
Gastrointestinal Function	Bowel Management	64	50
Gastrointestinal Function	Diet Staging	64	50
Grief Resolution	Grief Work Facilitation	16	100
Health Seeking Behavior	Self-Responsibility Facilitation	1	100
Hydration	Fluid Monitoring	33	100
Infection Severity	Infection Control	348	50
Infection Severity	Infection Protection	352	50
Kidney Function	Circulatory Care: Arterial Insufficiency	6	50
Kidney Function	Circulatory Care: Venous Insufficiency	6	50
Knowledge: Fall Prevention	Fall Prevention	178	100
Knowledge: Illness Care	Teaching: Disease Process	69	97
Knowledge: Illness Care	Teaching: Procedure/Treatment	2	3
Knowledge: Personal Safety	Environmental Management	5	100
Knowledge: Treatment Procedure	Teaching: Disease Process	2	1
Knowledge: Treatment Procedure	Teaching: Individual	1	0
Knowledge: Treatment Procedure	Teaching: Preoperative	111	33
Knowledge: Treatment Procedure	Teaching: Procedure/Treatment	221	66
Knowledge: Treatment Regimen	Health Education	26	47
Knowledge: Treatment Regimen	Teaching: Individual	29	53
Memory	Memory Training	3	100
Mobility	Exercise Promotion	45	80
Mobility	Positioning	11	20
Mood Equilibrium	Behavior Management: Self-Harm	1	33
Mood Equilibrium	Impulse Control Training	1	33
Mood Equilibrium	Reality Orientation	1	33
Nausea and Vomiting Severity	Nausea Management	338	100
Neurological Status	Cerebral Edema Management	12	100
Neurological Status: Peripheral	Circulatory Care: Arterial Insufficiency	2	33
Neurological Status: Peripheral	Neurologic Monitoring	2	33
Neurological Status: Peripheral	Peripheral Sensation Management	2	33

Table Continued

Nutritional Status	Nausea Management	1	0
Nutritional Status	Nutrition Management	97	45
Nutritional Status	Nutrition Therapy	97	45
Nutritional Status	Nutritional Monitoring	22	10
Nutritional Status: Food and Fluid Intake	Self-Care Assistance: Feeding	2	100
Oral Hygiene	Oral Health Restoration	25	100
Pain Control	Analgesic Administration	232	48
Pain Control	Pain Management	249	52
Pain Control	Parenting Promotion	1	0
Pain Level	Analgesic Administration	4	0
Pain Level	Emotional Support	1	0
Pain Level	Pain Management	1,102	100
Pain: Disruptive Effects	Analgesic Administration	14	33
Pain: Disruptive Effects	Emotional Support	14	33
Pain: Disruptive Effects	Pain Management	14	33
Respiratory Status: Airway Patency	Airway Management	104	50
Respiratory Status: Airway Patency	Airway Suctioning	102	50
Respiratory Status: Gas Exchange	Acid-Base Management	1	1
Respiratory Status: Gas Exchange	Acid-Base Management: Respiratory Acidosis	87	47
Respiratory Status: Gas Exchange	Artificial Airway Management	8	4
Respiratory Status: Gas Exchange	Mechanical Ventilatory Weaning	1	1
Respiratory Status: Gas Exchange	Ventilation Assistance	88	48
Respiratory Status: Ventilation	Ventilation Assistance	31	100
Risk Control	Delirium Management	1	33
Risk Control	Hallucination Management	1	33
Risk Control	Surveillance: Safety	1	33
Risk Control: Hyperthermia	Temperature Regulation	7	100
Risk Control: Hypothermia	Temperature Regulation	4	100
Seizure Control	Seizure Precaution	1	100
Self-Care Status	Self-Care Assistance: Toileting	1	100
Self-Care: Activities of Daily Living(ADL)	Self-Care Assistance	8	100
Self-care: Activities of Daily Living(ADL)	Self-Care Assistance	1	100
Sleep	Sleep Enhancement	12	100
Social Interaction Skills	Socialization Enhancement	3	100
Social Involvement	Socialization Enhancement	1	100

Table Continued

Spiritual Health	Spiritual Support	3	100
Substance Withdrawal Severity	Substance Use Treatment: Alcohol Withdrawal	6	60
Substance Withdrawal Severity	Substance Use Treatment: Drug Withdrawal	4	40
Suicide Self-Restraint	Behavior Management: Self-Harm	1	50
Suicide Self-Restraint	Suicide Prevention	1	50
Swallowing Status	Aspiration Precautions	11	100
Tissue Integrity: Skin and Mucous Membranes	Foot Care	2	0
Tissue Integrity: Skin and Mucous Membranes	Pressure Management	181	29
Tissue Integrity: Skin and Mucous Membranes	Pressure Ulcer Care	10	2
Tissue Integrity: Skin and Mucous Membranes	Seizure Precaution	4	1
Tissue Integrity: Skin and Mucous Membranes	Skin Surveillance	235	38
Tissue Integrity: Skin and Mucous Membranes	Wound Care	187	30
Tissue Perfusion: Cardiac	Acid-Base Management	11	48
Tissue Perfusion: Cardiac	Cardiac Care: Acute	12	52
Tissue Perfusion: Cerebral	Cerebral Perfusion Promotion	8	100
Tissue Perfusion: Peripheral	Circulatory Care: Arterial Insufficiency	6	43
Tissue Perfusion: Peripheral	Circulatory Care: Venous Insufficiency	8	57
Tissue Perfusion: Pulmonary	Acid-Base Management	52	100
Urinary Continence	Urinary Habit Training	3	100
Urinary Elimination	Urinary Retention Care	19	100

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