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NANDA-I, NOC, and NIC linkages in nursing care plans for hospitalized patients with congestive heart failure

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NANDA-I, NOC, AND NIC LINKAGES IN NURSING CARE PLANS FOR HOSPITALIZED PATIENTS WITH CONGESTIVE HEART FAILURE

by

Hye Jin Park

An Abstract

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

May 2010

Thesis Supervisor: Associate Professor Sue Moorhead

The purpose of the study was to identify NANDA-I, NOC, and NIC linkages based on a clinical reasoning model to capture accurate nursing care plans for patients with Congestive Heart Failure. A retrospective descriptive design was used to address the research questions. Data were obtained from the records of patients discharged for one year with the medical diagnoses of CHF (DRG 127) from an Iowa community hospital. A total of 272 inpatient records were analyzed to describe the frequency and percentage of NANDA-I diagnosis, NIC interventions, and NOC outcomes for patients with CHF. The top ten NANDA-I diagnoses associated with NOC outcomes and NIC interventions were identified. The results were compared with published NNN linkages. Knowledge Deficit (NANDA- I) -Knowledge: Treatment Regimen (NOC)-Teaching Procedure/Treatment (NIC) (N=94) and Cardiac Output Alteration (NANDA-I) – Cardiac Pump Effectiveness (NOC)-Cardiac Care (NIC) (N=83) were the top two NNN linkages for CHF. In addition, using means, SD, and t-tests, the effectiveness of NIC interventions was examined by comparing admission and discharge NOC scores. The top ten NOC outcomes scores showed significant differences between mean score on admission and discharge (p value < .0001). All of top ten NOC-NIC linkages showed significant results in terms of effectiveness (p value <.05). In conclusion, further research related to SNLs using large clinical databases from health information systems is needed to evaluate the effectiveness of nursing care.

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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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ABSTRACT

The purpose of the study was to identify NANDA-I, NOC, and NIC linkages based on a clinical reasoning model to capture accurate nursing care plans for patients with Congestive Heart Failure. A retrospective descriptive design was used to address the research questions. Data were obtained from the records of patients discharged for one year with the medical diagnoses of CHF (DRG 127) from an Iowa community hospital. A total of 272 inpatient records were analyzed to describe the frequency and percentage of NANDA-I diagnosis, NIC interventions, and NOC outcomes for patients with CHF. The top ten NANDA-I diagnoses associated with NOC outcomes and NIC interventions were identified. The results were compared with published NNN linkages. Knowledge Deficit (NANDA- I) -Knowledge: Treatment Regimen (NOC)-Teaching Procedure/Treatment (NIC) (N=94) and Cardiac Output Alteration (NANDA-I) – Cardiac Pump Effectiveness (NOC)-Cardiac Care (NIC) (N=83) were the top two NNN linkages for CHF. In addition, using means, SD, and t-tests, the effectiveness of NIC interventions was examined by comparing admission and discharge NOC scores. The top ten NOC outcomes scores showed significant differences between mean score on admission and discharge (p value < .0001). All of top ten NOC-NIC linkages showed significant results in terms of effectiveness (p value <.05). In conclusion, further research related to SNLs using large clinical databases from health information systems is needed to evaluate the effectiveness of nursing care.

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LIST OF ABBREVIATIONS

ACC/AHA American College of Cardiology with American Heart Association

ADPIE Assessment Diagnosis Planning Implementing Evaluation

AHRQ Agency for Healthcare Research and Quality

ANA American Nurses Association

APIE Assessment Planning Intervention Evaluation

CCC Clinical Care Classification

CHF Congestive Heart Failure

CIS Clinical Information Systems

CNDS computerized nursing documentation systems

CPT codes Common Procedural Terminology

CRW Clinical Reasoning Webs

DM Diabetes Mellitus

DRG Diagnostic Related Groups

EHRs Electronic Health Records

ICNP International Classification of Nursing Practice

NANDA-I NANDA International

NIC Nursing Interventions Classification

NMDS Nursing Minimum Data Set

NMMDS Nursing Management Minimum Data Set

NNN NANDA-I, NOC, and NIC

NOC Nursing Outcomes Classification

OPT Outcome-Present State Test

PCDS Patient Care Data Set

SNOMED CT Systematic Nomenclature of Medicine Clinical Terms

TJR Total Joint Replacement

CHAPTER I

BACKGROUND AND SIGNIFICANCE

The number of elderly over 60 is predicted to gradually increase from 672 million in 2005 to nearly 1.9 billion by 2050, thus the number of elderly around the world will triple (CDC, 2005). Seventy-five to eighty percent of heart failure victims are within the older than 65 age group and with the elderly population tripled, congestive heart failure (CHF) (DRG 127) will become an even greater major public health problem in the United States (U.S.) (U.S. Health News, 2006). Moreover, heart failure leads in the substantial causes of mortality and morbidity in the U.S. (CDC, 2005). Annual health expenditures for hospitalizations for patients with CHF cost over 20 billion dollars (Health Alliance, 2008) and Medicare pays more money for CHF patients than any single cancer or myocardial infarction population (Congress of the U. S. Congressional Budget Office, 2005; Thorpe & Howard, 2006). In order to reduce the economic health care crisis and provide quality care, effective management and treatment of this condition is needed (Sochalski et al., 2009).

Using standardized nursing terminologies is viewed as critical in the healthcare industry for quality of care (Clancy et al., 2008; Fischetti, 2008; Hunt, Sproat, & Kitzmiller, 2004; Lunney et al., 2005; Muller-Staub, 2009; Muller-Stab, Needham, Odenbreit, Lavin, & Van Achterberg, 2007; Rutherford, 2008; Smith & Smith, 2007) because this allows for enhancing the quality of documentation (Muller-Stab et al., 2007; Carrington, 2008) and the efficiency of nursing data management (Lavin, Avant, Craft-Rosenberg, Herdman, & Gebbie, 2004). Identifying the key nursing diagnoses,

interventions and outcomes with standardized terminologies from the data for this population is important as the incidence increases and identifying the key nursing diagnoses, interventions, and outcomes will help build the evidence for caring for patients with CHF.

Standardized Nursing Terminologies

Nursing terminologies play an important role in describing and defining nursing care (Clark & Lang, 1992); they provide the concepts and clear definitions of the phenomena of nursing and enhance nursing care by allowing nurses and other care providers to use the same terminology to describe patient problems, nursing interventions and patient outcomes in many settings, both nationally and internationally (Thoroddsen & Ehnfors, 2007). Moreover, these standardized nursing terminologies can contribute to the development of middle range theories because nursing diagnoses, interventions, and outcomes classifications include lexical elements for the development of these theories built on elements unique to nursing (Moorhead, Johnson, Maas, & Swanson, 2008; Tripp-Reimer, Woodworth, McCloskey, & Bulechek, 1996). A substantive structure for nursing is provided from the pattern of nursing diagnoses, interventions, and outcomes.

Accumulated clinical data using these terminologies can provide information to the nursing discipline as well as support the development of practice parameters. This provides strategies for patient management and assists nurses' clinical decision-making (Hirshfeld, 1994). Furthermore, data are extracted for evaluation of the quality of care provided.

Currently there are 12 standardized nursing terminologies and data set elements

recognized by the American Nurses Association that are applied to describe nursing care. These include the following: NMDS (Nursing Minimum Data Set), NMMDS (Nursing Management Minimum Data Set), CCC (Clinical Care Classification), ICNP (International Classification of Nursing Practice), NANDA-I (NANDA International), NIC (Nursing Interventions Classification), NOC (Nursing Outcomes Classification), the Omaha System, PCDS (Patient Care Data Set), ABC Codes, and SNOMED CT (Systematic Nomenclature of Medicine Clinical Terms) (American Nurses Association, 2009; Rutherford, 2008).

Among the twelve standardized nursing terminologies, NANDA-I nursing diagnoses (NANDA-I, 2009), NOC outcomes (Moorhead et al., 2008), and NIC interventions (Bulechek et al., 2008) were selected for this study because these languages are used in many settings as a means of more effectively communicating among nurses. In addition, the work of NANDA-I, NOC, and NIC is a tremendous contribution to the naming, categorizing, and classifying nursing knowledge (Pesut & Herman, 1999) and one study recognized NANDA, NOC and NIC as having the most extensive penetration in the pattern of diffusion of five nursing terminologies: CCC, ICNP, NANDA/NOC/NIC, OMAHA system, PNDS through a review of literature from 1982 to 2006 in CINAHL (Anderson, Keenan, & Jones, 2009).

Nursing diagnoses have been used in practice and education since the 1970s, and now more than 20 countries are using these diagnoses (NANDA-I, 2009). Work to create NOC began in 1991 and was first published in 1997. NOC has been translated into seven languages and been used in many countries (Moorhead et al., 2008). NIC was first published in 1992 and has been translated into ten languages and also used in many

countries (Bulechek et al., 2008). New editions of NIC and NOC are published every four years. These three nursing terminologies are the most comprehensive, and can be used by any specialty and across a variety of health care settings. Nurses can describe comprehensive patient situations using the nursing process in both paper-based nursing records, as well as electronic health records (EHRs) using these terminologies.

NANDA-I, NOC and NIC (NNN) Integrated into the Nursing Process

Nurses use the nursing process, an essential core of practice, in clinical settings to deliver patient care (Fesler-Birch, 2005). Pesut and Herman (1998) identified how the nursing processes has changed over time: a) the first generation nursing process (1950-1970) was concerned with problems and process; b) the second generation (1970-1990) was focused on the development of nursing diagnoses and diagnostic reasoning; c) the third generation nursing process (1990-2010) is focused on outcome-driven models supported by critical thinking and clinical reasoning; d) the fourth generation is focused on knowledge building (2010-2020) from the analysis of the patterns and relationships among nursing diagnoses, interventions, and outcomes; e) the fifth generation will be models of care (2020-2035) which are the archetypes of care being empirically-based; f) the sixth generation will be predictive care (2035-2050) using tested prototypes of care.

From the1970s to 1990s tremendous progress in nursing knowledge development and classification were made by the North American Nursing Diagnosis Association, Iowa Nursing Intervention Classification Project, and the Iowa Nursing Outcomes Classification Project (Pesut & Herman, 1998). New knowledge based on nursing diagnoses (NANDA-I), nursing interventions classification (NIC) and nursing outcomes

classification (NOC) is requiring redesigned nursing process models of reasoning with electronic support system instead of using old nursing process models. New nursing process models can accommodate recent knowledge development activities and support the use of nursing terminologies (Pesut & Herman, 1998). For example, during the assessment phase, nurses use a dynamic and systematic way to collect and analyze patient data. Nurses select nursing diagnoses using NANDA-I terminology based on patients' actual and potential health conditions and needs. Based on the diagnoses with patients' desirable goals, the nurses and patients set achievable and desirable short or long term goals using NOC outcomes. Nursing care is implemented and documented using NIC interventions during the hospitalization. Outcomes of care are measured by comparing the patient state prior to intervention and after treatment. Nurses continuously monitor the patient's status as part of the evaluation phase of the process and document the care they provide (Kautz, Kuiper, Pesut, & Williams, 2006). In each step of the nursing process, nurses need to use standardized nursing terminologies to describe patient's situations to communicate among nurses and other care givers to limit or control misunderstanding.

These taxonomies with codes are able to capture, store, retrieve, and transport nursing care data into electronic health records (Pesut, 2006). The accumulated data from linkages among three terminologies become information which has meaning. Information becomes knowledge when the relationships between data and information are formalized and this knowledge supports nurses' decision-making (Harris, Graves, Solbrig, Elkin, & Chute, 2000; Englebardt & Nelson, 2002).

Currently there are 202 nursing diagnoses in NANDA-I (NANDA, 2009), 385 outcomes in NOC (Moorhead et al., 2008), and 542 interventions in NIC (Bulechek et al.,

2008) that have been developed and refined with systematic processes to date. During the nursing process critical thinking skills are necessary for nurses to select appropriate and accurate nursing diagnoses, interventions and outcomes using these nursing terminologies based on patient's situation.

Critical Thinking Skills and Clinical Reasoning within the Nursing Process

Nursing is a science and professional discipline that requires critical thinking processes (Lunney, 2008a). Pesut and Herman (1999) assert that critical thinking is the heart of nursing practice. Nurses use a decision-making process during the nursing process to determine nursing diagnoses, to select desired outcomes, and to select interventions to achieve the outcomes using critical thinking skills (Johnson et al., 2006). Clinical reasoning is defined as "a process that pertains to the thought process, organization of ideas and exploration of experiences to reach conclusions" (Banning, 2008, p. 178). It is a non-linear and recursive process that uses diverse cognitive skills to collect patient data as well as evaluate collected data (Simmons, Lanuza, Fonteyn, Hicks, & Holm, 2003).

The importance of critical thinking skills within the nursing process becomes even more critical because increased information from patient care technology and high patient acuity demands more elements as part of the process of making complex decisions, often under conditions of uncertainty and risk (Pesut, 2008). For example, patients' conditions can change hourly, even from minute to minute, requiring close supervision in the current health care environment. Nurses are continuously required to update the matrix of their thinking and reasoning about how patients are responding

(Pesut, 2008). By doing this, nurses can understand the meaning of patient data and have effective nursing care plans. In addition, a better understanding of the reasoning processes in patient care can help nurses with less experience develop additional thinking strategies (Simmons et al., 2003)

Although the American Nurses Association supports the importance of critical thinking skills during the nursing process and critical thinking skills are integrated in BSN curriculum, many decisions in practice are based on habits with little critical thinking involved (Wilkinson, 2007). A useful tool for critical thinking skills within the nursing process is needed. The OPT (Outcome-Present State Test) Model, described below, is a useful structure and tool for critical thinking skills and clinical reasoning (Bartlett et al., 2008).

The OPT (Outcome-Present State Test) Model as a Tool for Enhancing Critical Thinking

The OPT, the third generation nursing process model developed by Pesut and Herman (1999), allows nurses to use critical thinking skills in addressing patients' complex and dynamic needs. The components of the OPT Model include the client-in context story, keystone issue, cue logic, reflection, framing, testing, decision-making, and judgment (Pesut & Herman, 1999; Bartlett et al., 2008). Traditionally, decision-making processes were linear cause and effect methods. However, under the current generation (1990-2010), complexity thinking of recursive and nonlinear pattern is needed for decision-making since diverse and complex patient needs exist. The OPT Model allows nurses to consider many patient problems and needs at the same time using clinical

reasoning webs. Clinical reasoning webs are drawn to depict the situation and relationships among the concepts and help to identify which nursing diagnoses are the most important to address (Kautz et al., 2005). The model contrasts nursing diagnoses of the present state with desirable patient outcomes that measure the impact of nursing interventions on the nursing diagnosis. Nursing interventions are determined by identifying which interventions reduce the gap between the present state of the patient and desirable state or outcome. Contrast, criteria, concurrent considerations, and conclusions are the "4 C's" identified by Pesut (2006) as essential thinking strategies that support clinical judgment in complexity theory. The four C's in clinical judgment in the OPT Model involve "reflection about the contrast between present and desired state; criteria regarding achievement of the desired state; concurrent considerations of the problem, outcome, and intervention; and conclusions or judgments about outcome achievement" (Kautz et al., 2006, p, 132).

Using standardized nursing terminologies, NANDA-I, NOC, and NIC, with the OPT Model can influence the development of middle-range theories in nursing (Pesut & Herman, 1998) because the model provides linkages among the three terminologies and facilitates the development of theoretical schema that provide the foundation for theories in nursing (Blegen & Tripp-Reimer, 1997; Miller & Malcolm, 1990).

Problem Statement

Standardized nursing terminologies are widely used in EHRs, and are increasing in use in a varity of settings. NANDA-I, NOC, and NIC (NNN) represent nursing data, information, and knowledge that can be stored in clinical systems for easy reuse by

nurses. Advantages and effectiveness of using these standardized nursing terminologies in electronic systems are described in several studies (Dochterman et al., 2005; Lunney et al., 2004; Lunney, 2006a; Lunney, 2006b). Dochterman et al (2005) described the NIC interventions that were used for three populations, CHF, hip fracture, and fall prevention by analyzing patient data from EHRs and identified the patterns of interventions for these conditions. Lunney et al. (2004) tested the effect of using NNN in electronic health records on children's health outcomes and found that the ability to help children was significantly increased. Lunney (2006a) described the differences in nursing process between using NNN in EHRs and without using NNN in EHRs. Another study conducted by Lunney (2006b) identified frequently used NANDA-I diagnoses, NIC interventions, and NOC outcomes in 103 children. These identified NNN linkages provide data to support evidenced-based school nursing practice, education of school nurses, development of policies, and communication of the value of school nursing practice to stakeholders.

Although the use of NANDA-I nursing diagnoses, NOC outcomes and NIC interventions with EHRs in care settings has been shown to affect patient outcomes positively, many nurses have difficulty selecting accurate and appropriate nursing diagnoses, outcomes, and interventions because patient situations change continuously in complex adaptive systems such as hospitals (Pesut, 2007). Use of the OPT Model with NNN in clinical settings may enable nurses to more effectively manage patients with chronic and high cost diseases such as CHF. Since NNN linkages provide uniform nomenclature for documenting the diagnosis, intervention, and outcome components of the nursing process, nurses can use the same clinical terms to describe and clearly

communicate patient care situations to promote common understanding of care provided to patients. Studies done testing the use of critical thinking skills through the OPT Model show that it can play a critical role in selecting accurate nursing diagnoses, interventions, and outcomes in nursing practice (Kautz et al., 2005; Kautz et al., 2006; Kuiper & Pesut, 2008). The majority of the studies on the use of NNN languages with the OPT Model were conducted in class activities with nursing students or done for nursing curriculum evaluation. No studies were found in the literature that included nurses using a workflow process model such as the OPT Model to facilitate their use of NNN linkages with CHF patients in the clinical setting. Therefore, it is important to identify NNN linkages using a workflow model, such as the OPT Model, using actual clinical data for hospitalized patients with CHF.

Purpose

The purpose of the study was to describe NANDA-I, NOC and NIC linkages by analyzing patients' nursing care plan records to identify the most frequently used diagnoses, interventions and outcomes for CHF patients. Relationships among the three terminologies were determined based on actual patient data. The hospital health system from which the data were obtained is unique in that it incorporates the OPT Model as an important part of the nursing process with EHRs for this organization.

Research Questions

The study answered the following questions:

1. What are the nursing diagnoses chosen by nurses for patients hospitalized with CHF?

2. What related factors and signs/symptoms for top ten nursing diagnosis are chosen by nurses for patients hospitalized with CHF?
3. What outcomes are chosen by nurses for patients hospitalized with CHF?
4. What interventions are chosen by nurses for patients hospitalized CHF?
5. What are the 10 most prevalent linkages of NANDA-I, NOC, and NIC for patients hospitalized with CHF?
6. What are the NOC scores changes between admission and discharge for patients hospitalized with CHF?
7. What is the effectiveness of the ten frequently used NIC interventions according to NOC outcomes for patients hospitalized with CHF?
8. What are the differences between published NNN linkages and the actual NNN linkages from results of the study for patients hospitalized with CHF?

This research provides a method of testing the proposed expert opinions on the NNN linkages for care of the patient with CHF. In doing so, we will be able to predict the NNN linkages and eventually prescribe the NNN linkages that are designed as pre-coordinated care plan sets for patients hospitalized with CHF. This will be a significant step in establishing evidence-based care plans for electronic health records for patients hospitalized with CHF.

Significance

This study is significant for several reasons. First, the relationships among diagnoses, outcomes, and interventions were examined using actual patient data. Based on the study, we know what standard nursing terms are associated with patients hospitalized with CHF from one organization. Second, the study was the first to explore

NNN linkages with the OPT Model using actual patient data from nursing care plans. NNN linkages identified in the study can help novice nurses select appropriate NANDA nursing diagnoses, NOC outcomes, and NIC interventions for patients hospitalized with CHF. Third, the NNN linkages based on clinical data can be developed into standardized nursing care plans to decrease nursing error in planning and executing care, as well as adjusting for individual patient risk. Finally, the study offers nursing care plan data from NNN linkages for clinical nursing information systems. These linkages can be further tested to determine a more effective way to manage patients with CHF, and the accumulated data will make it possible to compare patient outcomes among facilities using the same nursing languages. Through the use of large nursing data sets from multiple sites using standardized nursing terminologies, nurses will be able to determine nursing outcomes which make the work of nursing visible and use the data for nursing effectiveness research.

Conceptual Model

The conceptual model for this study focuses on the patient population with CHF, which is a high volume, high cost medical condition for most health care organization and affecting primarily older individuals. Figure 1.1 represents a new conceptual model based on the OPT Model, which uses NNN linkages in the context of informatics science. This model presents the linkages in an executable manner within the nurses workflow with the OPT Model of clinical reasoning (Figure 1.1). The model illustrates how nurses make decisions in the course of their workflow and also offers standardized nursing care plans. The standardized nursing care plan box illustrates the improved communication

between nurses and health care providers. With these NNN linkages in care settings, the large arrow between SNL and Difficulties with Decision Making illustrates when student and novice nurses choose terms for nursing diagnoses, outcomes, and interventions and facilitate making accurate decisions using known evidence-based practices when given standardized nursing care plans. When experienced nurses are interrupted and rushed, they are more likely to choose the right nursing diagnoses and interventions for patients when provided a standardized nursing care plan. The use of the OPT Model of critical thinking and clinical reasoning assists in a difficult process when making decisions about CHF care. The large arrow between the standardized nursing care plan could affect the quality of care and patient safety as described by Vizoso, Lyskawa, and Couey (2008) Standardized care plans could minimize the bias imposed by individual mental models by linking evidence-based nursing diagnoses with interventions and outcomes (Clancy et al., 2006) and help nurses make correct decisions. This would lead to enhanced indicators of quality of care such as decreased length of hospital stay and increased patient safety.

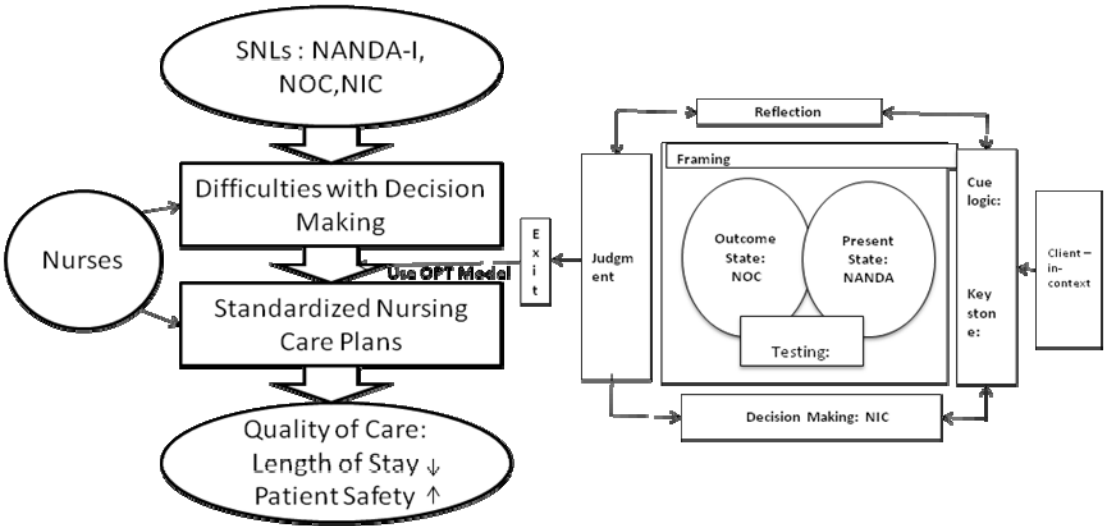


Figure 1.1 Conceptual Framework for NNN Linkages for CHF using the OPT Model

Definition of Terms

NANDA-I (North American Nursing Diagnoses Association International)

The NANDA International Classification is used for the identification of nursing diagnoses. The classification is recognized as a well established diagnosis terminology which is included in UMLS and recognized by ANA. The Nursing Diagnoses: Definition & Classification 2009-2011 includes 21 new diagnoses, 9 revised diagnoses, 6 retired diagnoses, and has a total of 202 nursing diagnoses for use in practice. Each diagnosis has a definition and the actual diagnoses include defining characteristics and related factors. Risk diagnoses include risk factors (NANDA-I, 2009). In this study, NANDA-I diagnoses are based on 155 nursing diagnoses including related factors and signs/symptoms (NANDA-I, 1999) used in the study hospital.

NOC (Nursing Outcomes Classification)

The current 4th edition Nursing Outcomes Classification has 385 outcomes with definitions, indicators, and measurement scales (1 to 5) for use at the individual, family, and community levels. It includes 58 new outcome labels and 67 revised outcomes (Moorhead et al., 2008). NOC allows nurses to follow changes in or maintenance of outcome states over time and across settings. Before providing an intervention, nurses use NOC to understand the patient's current problems and nursing diagnoses and rate the chosen outcome to obtain a baseline rating. After providing an intervention, NOC is used to measure the outcome and determine a change score. In this study, NOC outcomes are defined as the second edition of NOC with 260 outcomes labels (Johnson, Maas, & Moorhead, 2000) as the available terminology in the study hospital.

NIC (Nursing Interventions Classification)

The NIC taxonomy has 7 domains and 30 classes and 542 interventions in the fifth edition. It currently contains 34 new interventions and 77 revised interventions (Bulechek et al., 2008). Each intervention has a list of more specific activities for implementing the intervention that are selected based on the patients needs. In the study, NIC interventions from the third edition with 468 interventions were used in the study hospital as part of the nursing care planning (Dochterman & Bulechek, 2000).

NNN Linkages

NNN linkages provide associations between three standardized languages recognized by the American Nurses Organization: NANDA-I, NIC, and NOC. The first step in the process to link NNN is for nurses to determine a nursing diagnosis using NANDA-I diagnoses. The diagnoses that occur most frequently reflect their importance

in representing an entire group of patients. After determining the nursing diagnosis, nurses consider which NOC outcomes are appropriate for the patient situation, and then choose NIC interventions that are most likely to achieve the desired outcome (Johnson, 2006).

DRG (Diagnostic Related Groups)

"A classification of patients by diagnosis or surgical procedure into major diagnostic categories for the purpose of determining payment of hospitalization charge based on the premise that treatment of similar medical diagnoses generates similar costs" (Online Medical Dictionary, 2008).

CHF (Congestive Heart Failure)

Heart Failure and Shock (DRG 127): This is the primary DRG given to patients based on medical documentation conforming to the criteria for Heart Failure and Shock by coders in the medical information department.

Summary

As the elderly population in the United States increases over the next decades congestive heart failure (CHF) will become an even bigger major public health problem. The use of standardized nursing terminologies, such as NANDA-I, NOC, and NIC with the OPT Model, provides an effective process for nurses to increase the accuracy of nursing care plans in specific care settings or patient situations, and therefore to improve patient outcomes and quality of care.

CHAPTER II

REVIEW OF THE LITERATURE

The rapid increase in the number of older persons is one of the chief reasons for concern about the quality of care provided to patients. A hospital admission for CHF is quite expensive and approximately thirty to forty percent of patients with CHF are readmitted within six months after discharge (Krumholz, Parent, Tu, Vaccarino, Wang, & Radford et al., 1997). The Agency for Healthcare Research and Quality (AHRQ) (Konstam, Dracuo, Baker, & Bottorff, 2001) and the American College of Cardiology with the American Heart Association (ACC/AHA) (Hunt et al., 2005) developed evidence-based practice guidelines for the management of patients with CHF to reduce costs of health care and provide high quality care. Despite these organizations' efforts, CHF still remains a frequent DRG for admission for adult and elderly patients.

Nurses as part of a multidisciplinary team of healthcare providers can promote effective care delivery for patients with CHF (Albert, 2006). It is nurses who focus their care on the patient's responses to the medical diagnosis through the use of nursing diagnoses (NANDA-I), interventions (NIC), and desirable outcomes (NOC). The NANDA-I, NOC and NIC linkages are important knowledge components to improve patient outcomes so that cost effective, quality care can be provided.

Research Involving the Study Population: Congestive Heart Failure (CHF)

According to AHA (2009a), CHF or heart failure is defined as the inability of the heart to pump enough blood to supply the metabolic demands of the body. CHF is a

complex, long-term condition, and heterogeneous disease process that afflicts nearly 5.7 million people and about 670,000 new cases are diagnosed each year in the U. S. (AHA, 2009b). CHF can happen to anyone, but it is more common in people 65 years of age and older (Green, Guu, Levine, & Brower, 2005) because medications and treatments allow prolonged survival for those with serious chronic conditions including CHF (U.S. Health News, 2006).

The condition affects 1% of people aged 50 years and older and about 5% of those age 75 years and older. About 10% of patients diagnosed with heart failure die within one year, and about 50% die within five years of diagnosis. Incidence of CHF is equally distributed in men and women and twice as common in persons with hypertension as compared to normal persons. In addition, CHF is five times greater in persons who have had a heart attack compared to persons who have not (National Heart, Lung and Blood Institute, 2009).

The rising incidence of heart failure is related to several factors, including an aging population and a lowered mortality rate for people who have had heart attacks. In addition, the high rate of obesity in America has escalated the incidence of diabetes and high blood pressure. Both of these conditions make the heart work harder, increasing the risk of heart failure (U.S. Health News, 2006).

Treatment options for heart failure focus on several factors: (a) lifestyle changes to relieve symptoms of congestive heart failure or prevent the disease from worsening; (b) medications prescribed by physicians for treatment of CHF; and (c) surgery and medical devices to improve the survival and quality of care of patients with severe congestive heart failure (American Heart Association, 2009c). Despite the significant

resources and strategies expended on the treatment of this disease, outcomes remain poor (Gold et al., 2008). Approximately 30 to 40 percent of patients with heart failure are readmitted within six months of hospitalization (Vinson, Rich, Sperry, Shah, & McNamara, 1990; Hoyt & Bowling, 2001).

Overview of Standardized Nursing Terminologies

Standardized nursing terminologies are structured vocabularies that provide nurses with a common means of communication (Beyea, 1999). Keenan (1999) also defined standardized terminologies as a common language understood and described by all nurses.

In nursing, the origin of terminologies has been more than a hundred years since Florence Nightingale introduced the modern era of nursing (Clark, 1998). Since then, two nursing classification systems, Abdellah's classification system (1959) of nursing problems that described therapeutic nursing goals and Henderson's classification (1966) of basic functional health problems focused on patient needs, were introduced in the mid twentieth century (Beyea, 1999; Gordon, 1998). These two early classification systems of nursing were influential in the next phase of knowledge development focused on nursing diagnosis, interventions, and outcomes (Gordon, 1998). As the roles of professional nurses in various domains of nursing practice have expanded, there have been a number of initiatives to develop standardized terminologies for nursing practice (Beyea, 1999).

These standardized nursing terminologies provide many benefits to patients, organizations, and the nursing profession and can be used to compare data within and across countries. The benefits include improving communication among nurses and other

health care providers as well as patients, increasing visibility of nursing interventions, and enhancing data collection to evaluate nursing care outcomes (Rutherford, 2008).

Patient benefits from the use of standardized terminologies in nursing are enhanced continuity of care with unambiguous communication among healthcare providers (Lundberg et al., 2008). Healthcare organizations benefit by being able to measure nursing care and its impact on quality patient care through electronic health records using these terminologies instead of costly manual methods. The determination of nursing's impact on patient and organizational outcomes is essential to validate the contribution of nursing to health care and patient safety. Furthermore, the organization benefits from the use of standard terminologies by providing administrators with the actual costs and benefits of nursing care. Use of standardized terminologies thus allows them to make informed decisions regarding staffing ratios (Lundberg et al., 2008). This strategy has been useful for physicians using the Common Procedural Terminology (CPT codes) in electronic health records for billing purposes (Giannangelo & Fenton, 2008).

Nurse educators use standardized terminologies in the curriculum to teach nursing concepts that are essential in the nursing process and are vital to educating new nurses (Warren, Connors, & Weaver, 2002; Powelson, & Leiby, 2003; Finesilver, & Metzler, 2003; Van De Castle, 2003). Nurses in healthcare settings benefit from the use of standardized nursing terminologies to facilitate critical thinking and decision-making during patient care (Dochterman et al., 2005; Pehler & Bodenbender, 2003) and to facilitate nursing assessment, implementation, and evaluation (Clingerman, 1999; Keenan, 1999; Lee et al., 2000; Moorhead et al., 1998). Beyond these entities, the nursing profession benefits from being able to document, store, and retrieve evidence-based

practice in a systematic way to facilitate nursing research and reveal the impact of nursing care through electronic means (Weaver, Warren, & Delaney, 2005) and from an enhanced ability to develop middle range theory (Blegen & Tripp-Reimer, 1997).

The impact also has a global effect on nursing. By using standardized nursing terminologies, each country benefits by having retrievable data that can be aggregated into informative reports or data sets. These reports allow countries to compare nursing's contribution to care, patient outcomes, and frequently used nursing diagnoses, interventions and outcomes for specific populations both nationally and internationally using the International Nursing Minimum Data Set (Goosen et al., 2006).

Since standardized nursing terminologies offer many benefits, nursing organizations in the U.S. as well as international organizations have promoted development of nursing classification systems, understanding that identifying the unique elements of knowledge and practice provides the foundation for the professional aspect of nursing. Many nurses and groups have participated in the development of various nursing classification systems representing diverse nursing care settings (Saba & Taylor, 2007).

ANA and the National League of Nursing have supported efforts related to nursing classification systems at the professional, educational, and organizational levels (Beyea, 1999). The ANA has taken a leadership role in establishing criteria for recognizing nursing classifications, and developing and maintaining relationships with the standard organizations as well as collaborating on multidisciplinary health care terminologies (Beyea, 1999). Currently there are 12 nursing-related classification systems, data sets, or terminologies recognized by the ANA and by the ANA's Nursing Information and Data Set Evaluation Center (NIDSEC) for nursing practice information

infrastructure. Only six classifications, the CCC System, the Omaha System, NANDA-I, NIC, NOC, and PNDS, have been integrated into the Metathesaurus of the Unified Medical Language System (UMLS) of the National Library of Medicine (NLM) and into SNOMED-CT, the reference terminology licensed by the U.S. federal government to promote the national use of a standardized clinical terminology in EHR systems (Saba & Taylor, 2007).

NANDA-I Nursing Diagnoses

The origin of the NANDA-International nursing diagnoses dates back to the 1970s, the first time that the American Nurses Association used the concept nursing diagnosis in a publication (Gordon, 1994). In 1973 this publication was introduced to many nurses who were interested in nursing diagnoses by the American Nurses Association. An interest group in 1982 started the work followed by the founding of North American Nursing Diagnoses Association (NANDA), which is now an independent volunteer membership organization devoted to developing and validating nursing diagnoses. NANDA achieved widespread international acclaim in the 1990s. The NANDA diagnoses are translated into 11 languages (NANDA I, 2009) and the organization changed its name in 2002 to NANDA International (Von-Krogh, 2008). NANDA diagnoses are used to identify human responses to risks, disease, injury or health promotion and nurses use critical thinking skills and critical reasoning to respond to these human responses. This involves interpretation of human behaviors related to the patient, family or a community's health using critical thinking skills (Lunney, 2001; Lunney, 2008b). Nursing diagnoses in electronic health records provide the nurse with the ability to select nursing interventions to achieve desirable outcomes (NANDA, 2007).

The NANDA-I taxonomy consists of a hierarchical structure of three levels: (a) the domain is a broad area of interest or study; functional, physiological, psychosocial, environmental, (b) the class is a division of diagnostic concepts by type of response: activity/exercise, behavior or knowledge, healthcare system, and (c) the nursing diagnosis is defined as "a clinical judgment about an individual, family or community responses to actual or potential health problems/life processes" (NANDA, 2007, p. 332). Each NANDA-I diagnosis consists of a nursing diagnosis concept, definition, defining characteristics or related factors and risk factors with references to support each component (NANDA-I, 2007). NANDA-International nursing diagnoses in an electronic health care record provide a framework for nurses to document care and are used to develop problem lists, assessments, plans of care and clinical pathways as a means to label patient conditions (Lundberg et al., 2008).

NIC Interventions

The NIC classification a) is a comprehensive set of research-based nursing interventions nurses perform across specialties and settings; b) facilitates the analysis of the impact of nursing activities on patient outcomes; c) serves as an integral part of the nursing process focused on treating the nursing diagnosis or patient problem; and d) 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). Nursing interventions include both direct and indirect care aimed at individuals, families and communities.

The first edition of NIC was published in 1992 with 336 interventions; the second edition was published in 1996 with 433 interventions. The current 5th edition of NIC has

542 interventions and more than 12,000 activities. It contains 34 new interventions and 77 revised interventions (Bulechek et al., 2008). Each intervention has a list of more specific activities for implementing the intervention. The NIC taxonomy has 7 domains: Physiological: Basic, Physiological: Complex, Behavior, Safety, Family, Health System, and Community and 30 classes. Each intervention includes a label name with a definition and a unique numeric code that can be used for reimbursement of nursing interventions. The codes are used to facilitate computer use allowing communication with other coded systems. NIC can be used in all clinical settings (acute care, intensive care units, home care, hospice care, long-term care and primary care) and all specialties and has been translated into Chinese, Dutch, French, Italian, Korean, Portuguese, Japanese, and Spanish to support worldwide implementation. The use of the NIC classification system in an electronic health record facilitates the appropriate selection of nursing interventions used to demonstrate the impact of nursing by communicating nursing interventions to other clinicians on the interdisciplinary health care team. A standardized nursing intervention enables researchers to examine the effectiveness and cost that can be used to allocate nursing care resources (Lundburg et al., 2008).

The use of standardized nursing interventions in nursing education curricula facilitates the teaching of clinical decision-making to nurses at the point-of-care by articulating the nursing process as it is used in clinical practice. A large research team has been working since 1987 to construct, validate, and implement NIC as a standardized language for nursing interventions using a variety of qualitative and quantitative methods including content analysis, expert surveys, hierarchical cluster analysis and multidimensional scaling (Bulechek et al., 2008). These research methods are

complementary to NANDA-I and to NOC. A major achievement of the research project has been testing the usefulness of NIC and its implementation in growing numbers of client populations, information systems and educational programs. The Center for Nursing Classification and Clinical Effectiveness, where NIC is housed, outlines research methods for retrieving clinical nursing data from electronic systems including the storing of data according to privacy requirements, applying risk adjustment techniques, and analyzing the impact of nursing treatments (Dochterman et al., 2005). NIC interventions are also used in electronic health records through plans of care, critical pathways, order sets, patient education and data sets for the evaluation of care at the individual or unit level.

NOC Outcomes

Initial work to develop outcomes sensitive to nursing care started in 1991. The first edition of NOC was published in 1997 with 190 outcomes. The second edition was published in 2000 with 260 outcomes and was the first edition to include the taxonomy. The current 4th edition of the Nursing Outcomes Classification has 385 outcomes with definitions, indicators, and measurement scales (1 to 5) for use at the individual, family, and community levels. It includes 58 new outcome labels and 67 revised outcomes in the fourth edition (Moorhead et al., 2008). The development team includes faculty content experts and clinical nurse experts and focuses on reviewing the conceptual links between the outcome label, indicators, the NIC interventions, and NANDA diagnoses and, validating the links through reported research and, reviewing the linkages from the field test sites for practicality.

NOC allows nurses to follow changes in or maintenance of outcome states over time and across settings. Before intervening, nurses use NOC to understand the patient's current problem and nursing diagnoses and nurses rate the chosen outcome to obtain a baseline rating. After implementing the intervention, NOC is used to measure the outcomes and determine a change score.

NOC consists of outcomes for individual patients, families, and communities used across all clinical settings and specialties. NOC is organized using a taxonomy consisting of three levels: domains, classes, and outcomes. The outcomes are organized into 31 classes and 7 domains. Each outcome consists of a definition, a 5-point measurement scale with 5 always the most desirable state. Each outcome also has a list of associated indicators for the outcome concept and measurement scales with codes for use in electronic healthcare records. Across all of the NOCs, there are 12 different measurement scales. In addition, NOC can be implemented in many settings to measure outcomes when patients are admitted, discharged or transferred and also for nursing care plans and patient education records. The use of NOC within electronic health records provides an opportunity for effectiveness research using outcome data. Currently, NOC is used in many countries and has been translated into Chinese, Dutch, French, German, Italian, Portuguese, Japanese, Korean, and Spanish (Moorhead et al., 2008).

The Nursing Minimum Data Set (NMDS)

The Nursing Minimum Data Set (NMDS) is defined as "a minimum set of items of information with uniform definitions and categories concerning the specific dimensions of nursing, which meets the information needs of multiple data users in the health care system" (Werley & Lang, 1988, p. 301). The purposes of the NMDS are to (a)

establish comparability of nursing data across populations, (b) describe nursing care of patients, clients, and families across settings, (c) demonstrate trends of nursing care and resource allocation, and (d) stimulate nursing research through links to the detailed data existing in nursing information systems and other healthcare information systems. In addition to the four nursing care elements; nursing diagnosis, nursing intervention, nursing outcome, and nursing intensity, the NMDS contains five patient demographic elements: personal identification, date of birth, sex, race and ethnicity, and residence, and seven service elements: unique facility or service agency number, unique health record number of patient/client, unique number of principle registered nurse provider, episode administration or termination date, discharge or termination date, disposition of patient/client, expected payer for most of the bill. In 1986, the ANA endorsed a resolution to encourage the collection of the NMDS and the development of nursing information systems. The value of nursing minimum data sets is building the knowledge focused on the nursing needs of patients, the contribution nursing makes to these needs, and the influence of management data for patient safety and outcomes (Butler et al., 2006; Westra, Delaney, Konicek, & Keenan, 2008).

The Contribution of Standardized Nursing Terminologies

Standardized nursing terminologies have made unique contributions to the systemic development of nursing knowledge (Mrayyan, 2005; Pesut & Herman, 1999) from massive amounts of clinical data that describe linkages between and among nursing diagnoses, interventions and outcomes (Iowa Intervention Project, 1992). To link these standardized nursing terminologies nurses select nursing diagnoses, outcomes, and

interventions using critical thinking skills during the nursing process. The selected nursing diagnoses, outcomes, and interventions are stored in the information system. Large databases with standardized terminologies from health information systems can provide information to nursing about the effectiveness of nursing practices, charging and contracting, staff performance, and resource allocation (Delaney & Huber, 1996). This facilitates the collection of nursing data. In addition, the data assist in the development of evidence-based guidelines (Moorhead et al., 2008) such as AHRQ's guidelines to manage patients and assist health providers in decision-making (Hirshfeld, 1994).

Standardized nursing terminologies also contribute to the development of middle-range theories. Tripp-Reimer et al (1996) described nursing diagnoses, interventions, and outcomes classification of middle-range theories. According to these researchers, the conceptual model, classification of nursing diagnoses, interventions, and outcomes contain the lexical elements. In addition, the pattern of nursing diagnoses, interventions, and outcomes provide the vertical shafts for the development of middle-range theories that create a substantive structure of nursing. Thus, using these standard nursing terminologies enable middle-range theories development to build on elements unique to nursing (Retsas, 1995).

Critical Thinking and Clinical Reasoning

There have been a variety of definitions for critical thinking. Watson and Glaser (1964) coined one of the earlier definitions of critical thinking in the 1960s and 1970s. While many of the definitions used in the literature, the most frequently cited definition of critical thinking comes from Facione (1990); Critical thinking is defined as purposeful,

self-regulatory judgment with results in interpretation, analysis, evaluation, inference, explanation of conceptual or contextual consideration upon which that judgment was based. Paul (1993) also defined critical thinking as a "disciplined, self-directed thinking that is appropriate to a particular domain of thinking and displays a particular mastery of intellectual skills and abilities" (p. 462).

Many studies identified that the diversity and complexity of nursing practice makes it essential to prepare nurses who think critically as well as analyze, synthesize and evaluate situations (Banning, 2008; Clancy, Effken & Pesut, 2008; Fowler, 1997; Hammond, Hursh, & Todd, 1964; Scheffer & Rubenfeld, 2000; Tommie, Nelms, & Lane, 1999). Scheffer and Rubenfeld (2000) clearly stated the importance of critical thinking in nursing:

> "Critical thinking in nursing is an essential component of professional accountability and quality nursing care. Critical thinkers in nursing exhibit these habits of the mind: confidence, contextual perspective, creativity, flexibility, inquisitiveness, intellectual integrity, intuition, open mindedness, perseverance, and reflection. Critical thinkers in nursing practice the cognitive skills of analyzing, applying standards, discriminating, information seeking, logical reasoning, predicting and transforming knowledge" (p. 357).

In addition, Tommie et al (1999) determined ways of knowing scheme for women since critical thinking is an essential skill for providing nursing care. Clinical reasoning pertinent to nursing depends on the development of cognition, critical thinking or metacognition (Banning, 2008). Metacognition represents the higher order thinking process involving the active control of cognitive thinking processes and is generally defined as thinking about thinking (Banning, 2008). Nurses use multiple cognitive processes to make a decision such as evidence based on past experience, knowledge, hypotheses, and diagnostic reasoning and reflection.

The clinical decision-making process in nursing is measured in many studies (Bucknall, 2003; Carr, 2004; Thompson, Foster, Cole, & Dowding, 2005). Bucknall (2003) measured environmental influences on nurses' real decision-making in the critical care setting and found three main environments such as the patient situation, resource availability and interpersonal relationship influenced nurses' decision- making process. Carr (2004) focused on the community nurses' decision- making process. This author recognized that all nurses engage with the same concepts for health, need, care, and partnerships to make a decision but organized the information into particular frames by the guiding practice philosophy and service organization. One study by Thompson et al. (2005) focused on how nurses use information for reducing uncertainties they face when making a decision. In this study, nurses rarely used text-based and electronic sources of research-based information to make a decision in real time and practice situations. The nurses used the nursing process as a systemic way to plan patient care.

Nursing Care Plans

The nursing care plan embodies the nursing process, which is the core and essence of professional nursing. Yura and Walsh (1998) define the nursing process as

> "An orderly systematic manner of determining the client's health status, specifying problems defined as alterations in human need fulfillment, making plans to solve them, initiating and implementing the plan, and evaluating the extent to which the plan was effective in promoting optimum wellness and resolving the problems identified" (p.1).

The care plan is the application of the nursing process and is a communication tool for nurses to provide continuity of care for patients. Nurses use the elements of reasoning in critical thinking to develop a nursing care plan.

Nursing process has evolved and has been modified with health industry changes over time (Pesut, & Herman, 1999). In the first generation (1950 to 1970), nursing workflow processes only focused on problem solving and emphasized the importance of assessment. A four step nursing process which included assessment, planning, intervention, evaluation (APIE) was developed in this period (Yura & Walsh, 1998). This generation of nursing process focused on nursing care needs with medical conditions and many nursing problems were related to patho-physiologic conditions. Some nurses recognized that the independent domain of nursing practice was needed and the second generation nursing process era using thinking skills began (Pesut & Herman, 1998). The first generation nursing processes were transformed to focus on diagnosis and reasoning (1970 to 1990) because of a concern and need to understand diagnostic reasoning. This second generation model was influenced by theories and concepts of information processing and decision-making. In the second generation, nursing process consisted of five steps which included assessment, diagnosis, planning, implementing, and evaluation (ADPIE) published by the American Nurses Association in the Standards of Nursing Practice (American Nurses Association, 1973).

In 1980, the healthcare industry in general began focusing attention on the measurement of patient outcomes to reduce hospital length of stay using DRGs. The second generation nursing process model was not a good fit with the outcome focus of healthcare (Pesut & Herman, 1998). The third generation nursing process was needed to support contemporary needs of the nursing profession in multiple settings. In the period from 1990 to the present, outcome specification and testing became a central issue in health care reform. Outcome focused nursing practice with complex analysis of the

diverse patient conditions were required, and critical, creative systems, and complexity thinking were needed. In the future, nursing process will be evolving to (a) knowledge building (2010-2025); as hospitals and health care systems use standardized nursing terminologies within health information systems or electronic health records. Nursing knowledge will be built from discovering and analyzing the patterns of nursing diagnoses, interventions, and outcomes; (b) models of care (2025-2035); which is empirically based archetypes of care from identifying the occurrence and epidemiology of nursing diagnoses, interventions, and outcomes for specific patients' populations. It will allow systems to obtain data by the type of institutions or level of primary, secondary, or tertiary care needs; and (c) predictive care (2035-2050); the predictive model of care will be developed based on the unique personal characteristics of the patients and that data can be compared with empirical data derived from data aggregated from several institutions or from international database (Pesut & Herman, 1998; Pesut, 2006).

The increasing complexity of modern healthcare demands critical thinking in response to the rapidly changing health care environment (Fowler, 1997; Clancy et al., 2008). This has implications for nursing because the role of nursing needs to expand proportionately to cope with the complexities of healthcare, requiring nurses to think critically to be effective (Edwards, 2003; Myrick, 2002; Simpson & Courtney, 2002). Every day, nurses sift through an abundance of data and patient information to assimilate and adapt knowledge for problem generation and solutions to make decisions in their practice (Lindberg, Nash, & Lindberg, 2008). The use of critical thinking is vital in examining simple and complex situations in the nursing process, and it is also an

essential means of establishing the accuracy of the information or assessment obtained in order to specifically and distinctly articulate what the knowledge conveys (Pesut, 2007; Lindberg et al., 2008; Rogal, 2008).

In this third generation, the OPT (Outcome Present State Test) model fits complex patient needs in these current health environment because it is a meta-model of clinical reasoning that has the ability to consider many problems at the same time. The first and second generation nursing process models which were linear and sequential cannot adequately represent the complex and complicated nature of nurses' clinical reasoning. New models of thinking are needed to facilitate rapid, accurate, and strategic care planning processes and care delivery for patients in the fast paced, current healthcare arena. The OPT Model has advantages over the traditional nursing process model as it: (a) reinforces the reflective nature of clinical reasoning, (b) captures the concurrent and iterative nature of reasoning, (c) provides a better fit for an outcome focused health care system, (d) builds on and uses a foundation of critical thinking, (e) enhances nursing knowledge development activities, (f) uses diverse settings for teaching, learning, theory development, and research activities (Pesut & Herman, 1999; Pesut, 2008).

The OPT (Outcome-Present State Test) Model

The OPT Model is a nursing process model designed to help nurses develop clinical reasoning and critical thinking skills. The OPT Model is iterative, recursive, and nonlinear and better represents contemporary nursing practice in dynamic health care systems (Pesut, & Herman, 1999) (Figure 2.1).

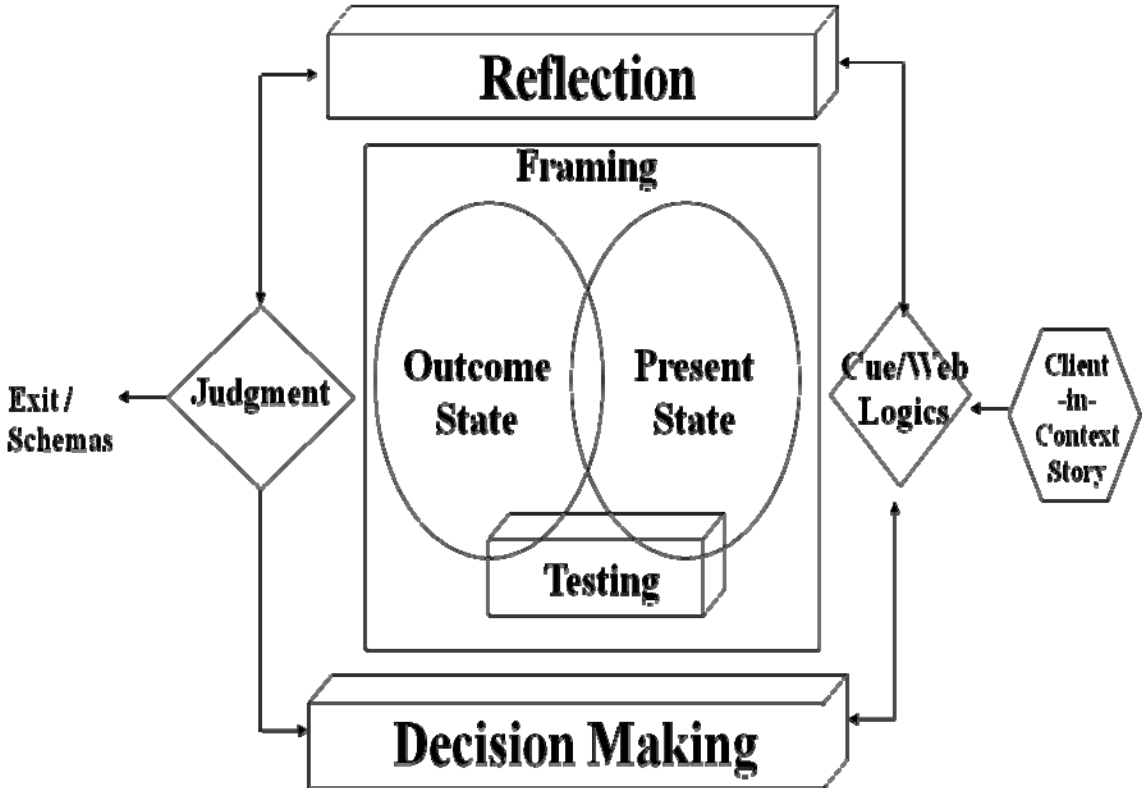


Figure 2.1 Outcome-Present State –Test (OPT) Model

Source: The Outcome-Present State –Test (OPT) Model of Reflective Clinical Reasoning (p 25) in Pesut, D. J., & Herman, J. (1999). *Clinical reasoning: The art and science of critical and creative thinking*. Albany, NY: Delmar Publishers.

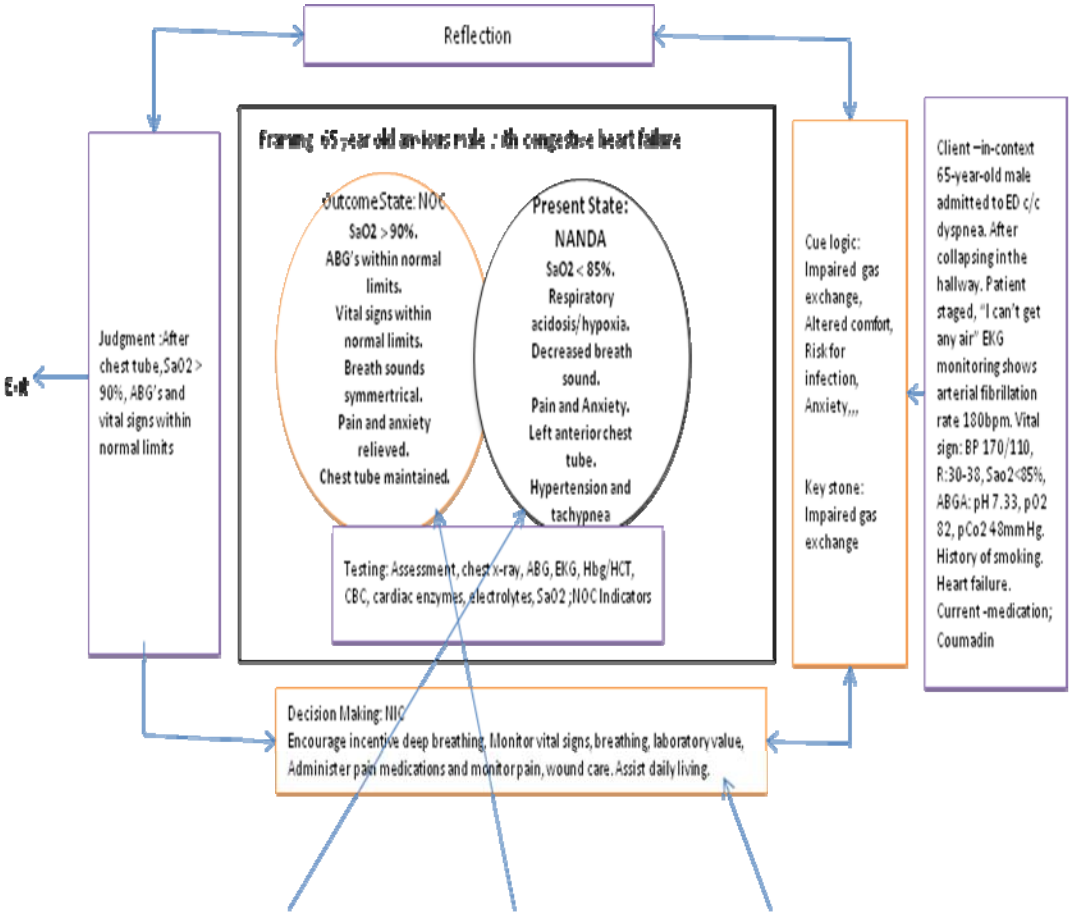
The OPT Model was by Pesut and Herman in 1999. The client in context story, keystone issue, cue logic, reflection, framing, testing, decision-making, and judgments are essential processes contained within the OPT Model. The clients' stories provide important information regarding major issues for clinical reasoning. Nurses listen to their stories and organize and connect concepts in a meaningful way. The keystone issue is recognized from all the potential or actual problems in the stories. Cue logic is the deliberate structuring of clients in context data to discern the meaning for nursing care. The frame process uses mental models that influence and guide nurses' perception and behavior and offers the big picture when providing care. Reflection is a component of the executive thinking process and consists of critical creative and concurrent thinking. Decision-making in this model is when nurses consider and select interventions and actions that facilitate the patients' achievement of a desired outcome state. Judgment is the process of drawing conclusions based on the finding from the test of the comparison of present state to a specified outcome state (Pesut & Herman, 1999).

Relationships Among the OPT Model, NNN (NANDA-I, NOC, and NIC) Terminologies, and Nursing Care Plans

NNN linkages are structured NANDA-I nursing diagnoses with a list of recommended or possible NOC outcomes, and a list of recommended NIC interventions to meet the selected outcome of the diagnosis. They are used for the development of care plans and critical paths for a population of patients or for individual patients (Johnson, 2006). The OPT Model is an effective way to use NNN linkages in practice as part of the

nurse's care planning because the model provides a conceptual structure for the use of standardized terminologies.

The first step in using the OPT Model is focused on the nurse listening to the patient's story. The nurse then identifies the patient's central issues or problems using "cue logic". The nurse describes the initial patient conditions which are reflective of the "present state" and selects the desired outcomes which are identified as "outcome state". The "present state" can be defined using NANDA-I nursing diagnoses and the "outcomes state" can be defined in terms of NOC outcomes in the OPT Model. The present state can be compared to the outcome state and the identified gaps between them are addressed through implementing NIC interventions in the care planning process (Kautz et al, 2006). Accumulated data using the OPT Model with the three standardized nursing terminologies, NANDA-I, NOC, NIC, can lead to the best NNN linkages through evaluation of outcomes over time. This process supports nursing knowledge work in the future by recognizing the best combinations of nursing diagnoses related to interventions with associated desirable outcomes for specific patient populations. Moreover, the OPT Model with NNN language facilitates nursing work processes, accurate data for clinical information systems (CIS), and the accumulated data from the CIS can be evidence for the value of nursing care.



NANDA	NOC	NIC
Impaired Gas Exchange	Respiratory Statues: Gas Exchange	Acid-Base Management: Reparatory Acidosis
		Ventilation Assistance

Figure 2.2 An Example of NNN Linkages with the OPT Model

From "Debriefing with the OPT Model of clinical reasoning during high fidelity patient simulation" by Kuiper, R., Heinrich, C., Matthias, A., Graham, M.J., & Bell-Kotwall, L. (2008). *International Journal of Nursing Education*, *5*(1), 1-13.

Figure 2.2 shows an example of the OPT Model using NANDA-I, NOC, and NIC languages. In the example, the patient scenario is that a 65-year-old male patient admitted to the emergency department of an acute care hospital with dyspnea. The EKG monitor shows arterial fibrillation with a rate of 180 beats per minute; vital signs- BP 170/110, respiration rate 30-38; Sa02 < 85%; ABG's (arterial blood gas) pH 7.33, pO2 82 mm Hg, pCO2 48 mm Hg; history of smoking for 34 years, emphysema, chronic arterial fibrillation, heart failure; and current medications- Coumadin, Atrovent (Kuiper et al., 2008).

Based on this patient scenario, a clinical reasoning web is drawn (Figure 2.3). During the creation of the clinical reasoning web, the nurse thinks about the patient's chief complaint, which is dyspnea and about the patient's story. Then, the nurse identifies that some of the actual and potential nursing diagnoses are *Impaired Gas Exchange*, *Activity Intolerance*, and *Risk for Decrease Cardiac Output*, as depicted in Figure 2.3. In addition, multiple nursing diagnoses relationships can be determined. For example, what is the relationship between *Impaired Gas Exchange* and *Activity Intolerance*? How does *Activity Intolerance* affect the other nursing diagnoses? The nurse identifies the keystone problem by noting the nursing diagnosis with the most arrows in the web supporting that this diagnosis has an impact on the other related diagnoses in the patient's situations. This web can be shared and validated with the patient.

Once the keystone issue is identified, the nurse compares and contrasts two frames such as present state SaO2 < 85%, respiratory acidosis, hypertension and tachypnea, decreased breath sounds, pain, anxiety and desirable outcome states such as SaO2> 90%, ABG's within normal limits, breath sounds symmetrical, pain , anxiety

relieved for the patient (Figure 2.2). The possible NOC outcome is *Respiratory Status: Gas Exchange* from the NOC classification. The nurse identifies the gap between the present and desired states and determines what nursing interventions are needed. In this scenario, the possible NIC Interventions are *Acid-base Management: Respiratory Acidosis, Ventilation Assistance, Oxygen Therapy, and Pain Management* for the *Impaired Gas Exchange* nursing diagnosis. Based on thinking strategies, the best nursing interventions are selected (Kuiper et al., 2008) (Figure 2.2). For example, *Acid-base management: Respiratory Acidosis and Ventilation Assistance* can be selected from NIC. Testing is used to determine whether the interventions are selected correctly or not, whether the keystone issue was correctly identified, and whether the patient is moving toward the outcome identified (Bartlett et al., 2008). Finally, nurses can develop nursing care plans using NNN (NANDA-I nursing diagnoses, Nursing Interventions Classification, and Nursing Outcomes Classification) languages for patients with CHF based on OPT Model. The accumulated NNN linkages through the clinical information systems for CHF will give information to make a decision as well as nursing knowledge will be developed by identifying patterns of NNN linkages for patients with CHF. In addition, this will enhance nurses' abilities to develop middle range theory for nursing.

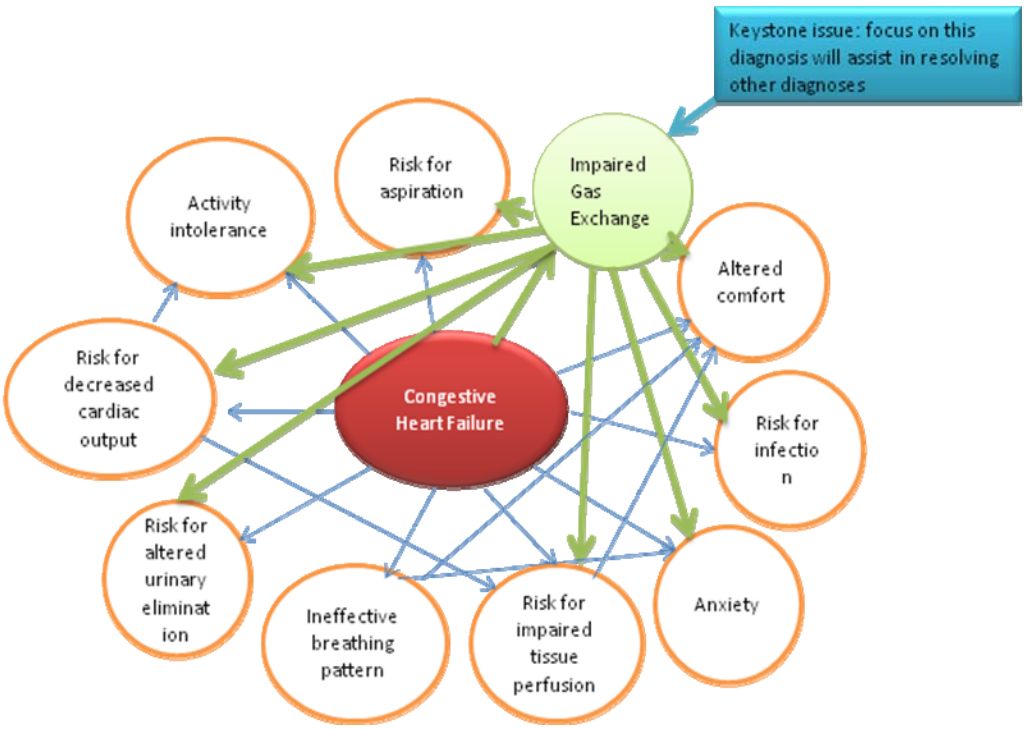


Figure 2.3 Clinical Reasoning Webs (CRW)

Source: The Clinical Reasoning Web (CRW) (p.79) in Pesut, D. J., & Herman, J. (1999). *Clinical reasoning: The art and science of critical and creative thinking*. Albany, NY: Delmar Publishers.

Studies of NANDA-I, NOC and NIC

Many studies have been conducted based on NANDA-I, NOC, and NIC nationally and internationally with diverse patient populations (Yom et al., 2002; Scherb, 2003; Dochterman et al., 2005; Kim, 2005; Abreu, 2006; Erdemir & Algier, 2006; Hughes, 2006; Shever, 2006; De Limia Lopes, De Barros, & Michel, 2009). One study analyzed frequently used NANDAs, NICs, and NOCs in three populations: pneumonia, TJR (Total Joint Replacement), and CHF (Congestive Heart Failure) within EHR in the hospital (Scherb, 2003). In this study, the major nursing diagnosis for all three groups was *Knowledge Deficit*, nursing outcome was *Knowledge: Illness Care* and the intervention was *Teaching: Individual.* Dochterman et al. (2005) identified frequently used nursing interventions for three elderly patients groups, CHF, Hip fracture procedures, and fall prevention in the hospital by analyzing data from an EHR. *Surveillance* for both heart failure and hip fracture procedures, and *Bowel Management* for fall prevention were identified as key interventions. Shever (2006) also identified NIC interventions used with patients having CHF and the frequency of NIC interventions with patients over age of 60 with heart failure and when having a hip procedure. The results identified that *Surveillance* was used as a nursing intervention for these two populations as a major intervention.

Recently studies about NNN linkages based on case studies for specific populations were conducted (Fischetti, 2008; Cirminiello, Terjesen, & Lunney, 2009). One study identified NNN linkages by a case study for home nursing care focused on a 62-year-old woman who has many health problems including excess weight with hypertension, diabetes, and polyneuropathy. The considered nursing diagnoses for her

were imbalanced nutrition: more than body requirement, impaired mobility, activity intolerance, and readiness for enhanced self-health management. The most frequently addressed nursing diagnosis for her was Readiness for Enhanced Self-Health Management. Two nursing outcomes classification outcomes were selected with Readiness for Enhanced Self-Health Management: *Self Care Status and Self Care: Activities of Daily Living* including a majority of the indicators for both outcomes: bathing, dressing, preparing food, feeding, personal cleansing, toileting, ambulating, managing medications, finances, and transportation. Three Nursing Interventions Classification interventions were selected: *Self Care Assistance: IADL, Self Efficacy Enhancement,* and *Teaching: Prescribed Activity/Exercise* (Cirminiello, Terjesen, & Lunney, 2009). Another study using case studies was conducted by Fischetti (2008) for Diabetes Mellitus (Type 2 DM). A 47-year-old man has type 2 DM and needs education about self-injection and a diet to promote weight loss. Based on this situation, the nursing diagnosis was *Readiness for Enhanced Self Health Management* and NOC outcomes were *Knowledge: Treatment Regimen* and *Personal Health Status* and the NIC interventions were *Health Education, Exercise Promotion, Nutrition Counseling, and Health Screening*.

International studies of the application of NANDA-I, NOC, and NIC have been conducted that demonstrated the use of nursing diagnoses, interventions, and outcomes with patients undergoing abdominal surgery in Korea (Yom et al., 2002) and the development and application of a computerized nursing process program for orthopedic surgery inpatients using NANDA-I, NOC, and NIC terminologies (Kim, 2005). The findings show that the frequency of NANDA-I, NOC, and NIC related to medical

diagnoses in Korea. The study of NANDA and NIC linkages by Abreu (2006) in Brazil validated NANDA and NIC linkages in the care of orthopedic patients in a Brazilian University Hospital. The linkages were for three nursing diagnoses (153 patients presented with a Bathing/Hygiene Self Care Deficit; 134 patients had Impaired Physical Mobility; 128 patients had Risk For Infection) with patients undergoing Total Hip Replacement or Total Knee Replacement procedures. For the three most prevalent nursing diagnoses, fifty- two different nursing interventions were prescribed and the majority of them were mapped to interventions and activities contained in twenty- eight NIC interventions located in Physiological: Basic, Physiological: Complex, Behavioral, and Safety domains. Another study was conducted to validate the content of the priority NIC activities and NOC indicators associated with *Excess Fluid Volume* nursing diagnosis for cardiac patients in Brazil (Lopes, de Barros, & Michel, 2009).. Three NOC such as *Fluid Balance, Hydration, Electrolyte and Acid/base balance* selected for cardiac patient. Of the total of 53 indicators, 26 indicators were considered as useful NOC indicators for cardiac patients in Brazil. Three NIC such as *Fluid Management, Fluid Monitoring, Hypervolemic Management* has 83 activities. Of the 83 activities, 50 activities were considered as major activities (Lopes, de Barros, & Michel, 2009).

In Ireland, Hughes (2006) identified and defined the problems, interventions, and outcomes of patients with spinal cord injury within the Irish Spinal Cord Injury Service with standardized nursing terminologies using consensus-based approach. Comparisons were made between the acute and rehabilitation centers as well as with results of a similar study conducted previously in the United Kingdom. These studies are being used for

further study on identification of common nursing terminologies among the spinal cord injury in Ireland and United Kingdom.

In another study the understandability, validity, and appropriateness of the determined diagnoses and interventions and activities of each intervention were evaluated through a series of focus group meetings in a Burn Unit in Turkey. In this pilot study, the actual and potential nursing diagnoses leading to nursing interventions in the care of patients in the Burn Unit were identified (Erdemir & Algier, 2006). All of these studies are examples of work beginning to identify the frequently used NANDA-I, NOC, NIC and valid NNN linkages for specific populations.

Researchers and clinicians have recognized the importance of having accurate of NNN linkages beyond the NNN linkages based only on the frequency of use. Thus, some studies emphasized accuracy of nursing diagnosis for quality of care (Lunney, 1998; Lunney, 2003; Levin, Lunney, & Krainovich-Miller, 2004; Lunney, 2006; Kurashimia, 2008). According to Lunney (2006c) low accuracy of nursing diagnosis results in negative outcomes for patients and families, wasting the nurse's time and energy, and creating dissatisfaction of customers, so the author suggested that researchers and clinicians consider the accuracy issue. Lunney (2003) also identified critical thinking strategies can facilitate improved accuracy of nursing diagnoses.

Several studies were completed that focused on clinical reasoning and critical thinking skills using the OPT Model with NNN terms (Kautz et al., 2005; Kautz et al., 2006; Bartlett et al., 2008; Kuiper, 2008; Kuiper et al., 2008; Bland et al., 2009). Kautz et al., (2005) indicated the intentional use of guided reflection coupled with structure and learning tools of the OPT Model significantly enhanced clinical reasoning skill

acquisition, and provided evidence for the effectiveness of structured teaching learning strategies. Another study of Kautz (2006) found that NANDA nursing diagnoses were correctly stated in 92% of the OPT Model. Nursing Outcomes Classification (NOC) outcomes were explicitly stated in 22%, and implied in 72% of the OPT Model. Interventions matched appropriate Nursing Interventions Classification (NIC) activities in 61% of the OPT Model. This study suggested that if NNN terminologies are to advance nursing knowledge, its promotion, representation in curriculum development and active use is necessary.

Bartlett et al. (2008) used the OPT Model as a teaching tool in an undergraduate psychiatric and mental health clinical nursing course and evaluated how quickly students became adept at using it. The results of the study were that most students mastered the use of the model. In addition, not only did the students gain clinical reasoning skills, but they also used and learned more about the North American Nursing Diagnosis Association, Nursing Interventions Classification, and Nursing Outcomes Classification languages. Kuiper and colleagues (2008) studied used a structured debriefing activity which is the OPT Model of clinical reasoning following high fidelity patient simulation. The results of this project challenged faculty to create and manage patient simulation scenarios that coordinate with didactic content and clinical experiences to direct student learning for the best reinforcement of clinical reasoning outcomes. In the results of these studies, the OPT Model with NNN languages enhanced the accuracy of nursing care by using critical thinking skills, increasing use and learning opportunities for standardized nursing terminologies as well as positively affecting patient outcomes. Bland et al. (2009) also conducted a study to evaluate the OPT Model as a teaching strategy for

undergraduate psychiatric nursing students. In this study, the researchers identified how the model can be used in clinical teaching and also evaluated the model and some strategies, benefits and limitations of this teaching method in a psychiatric clinical setting.

Even though the authors identified that critical thinking skills through the OPT Model played a critical role in selecting accurate nursing diagnosis, interventions, and outcomes in nursing practice, the majority of these studies about NNN terminologies with OPT Model (Kautz et al., 2005; Kautz et al., 2006; Kuiper et al., 2008; Bland et al., 2009) were conducted as part of class activities or done for nursing curriculum evaluation. A study based on real patient data using critical thinking skills is necessary.

Summary

Standardized nursing terminologies play an important role in describing, communicating, organizing and defining nursing (Clark & Lang, 1992) and facilitating the nursing process. During the nursing process critical thinking skills and clinical reasoning are key elements in the selection of accurate and appropriate nursing diagnoses, interventions, and outcomes. However, many nurses have difficulties selecting nursing diagnoses, interventions, and outcomes using standardized nursing terminologies since the healthcare industry has became more complex and patient needs are changing over time. The OPT Model helps nurses think critically in a more organized way (Pesut & Herman, 1998).

In the literature, research related to standardized nursing terminologies such as NNN with the OPT Model were rarely found. Therefore, NNN linkages using actual data

generated by nurses using the OPT Model within the workflow need to be identified. Using actual patient data from an organization that uses the OPT Model as part of the practice standards within the workflow will allow registered nurses to recognize the best NNN linkages through critical thinking process; which interventions achieve the best outcomes for a particular diagnosis that is related to a specific medical diagnosis, and which diagnoses are the most frequently used for a specific medical diagnosis (Johnson, 2006). The goal of this research is to develop more accurate standard NNN linkages for patients with CHF, so nurses are able to offer quality care to the patients with this medical condition and enhance communication among nurses and other caregivers. The next chapter will describe the methods used in this research.

CHAPTER III

METHODOLOGY

As the elderly population in the United States increases over the next decades congestive heart failure (CHF) will become a major public health problem. The use of standardized nursing terminologies such as the classification of nursing diagnoses (NANDA-I), the Nursing Outcomes Classification (NOC), and the Nursing Interventions Classification (NIC) with the Outcome-Present State Test (OPT) Model, provides an effective process for nurses to increase the accuracy of nursing care plans in specific care settings or patient situations and improve patient outcomes. Since NANDA-I, NOC, and NIC provide uniform terminologies for documenting diagnosis, intervention, and outcome components of the nursing process, nurses can use the same clinical terms to describe and communicate clearly patient care situations to others providing care. The OPT Model by Pesut and Herman (1999) allows nurses to use critical thinking skills based on a patients' complex and dynamic needs and assists the nurse to make accurate nursing care plans using the nursing process.

The purpose of this study was to identify frequently used NANDA-I, NOC, and NIC (NNN) concepts using the OPT Model for patients with CHF. The defining characteristics and related factors for each diagnosis were collected from paper-based care plans at a Midwest community hospital. The 10 most prevalent linkages of NANDA-I, NOC, and NIC were identified and compared to the published NNN linkages (Johnson et al., 2006). NNN linkages based on clinical data can be used as an infrastructure for

clinical nursing information systems and accumulated data through these systems will assist in developing nursing knowledge.

Design

A retrospective descriptive research design was used to answer the research questions. Secondary data from a Midwestern community hospital located in Iowa, using nursing care plans based on NANDA-I diagnoses, NOC outcomes, and NIC interventions were obtained after obtaining human subjects approval from both the hospital and the University of Iowa IRB. The collected data were analyzed using descriptive statistical analysis procedures.

Setting

The Midwestern community hospital has two campuses, and achieved Magnet status in 2005. The west campus has medical-surgical, cancer, pulmonary, neurological, orthopedic, rehabilitation, behavioral and substance abuse sources. The east campus has birth services, neonatal intensive care, pediatrics, general surgical, trauma/emergency and cardiology service. The hospital is a member of a larger health system that has another hospital in Illinois and a small rural hospital within the system. This 502-bed Medical Center has more than 450 physicians, and 3,100 staff members. Approximately 800 registered nurses and the 450 physicians provide acute and skilled care across the inpatient, outpatient, and clinical areas. This facility uses NANDA-I, NOC, and NIC with clinical reasoning and critical thinking, which are critical components for the OPT Model. There is a long tradition in this hospital of being a leader in the use of

standardized terminologies in nursing practice dating back to the 1970s. Lists of NANDA labels were made available to nurses in all patient care areas after publication of nursing diagnoses generated from the first and second NANDA conferences. For the documentation of patients' needs, problems, or response to illness, nurses in this facility were requested to use NANDA diagnoses. During the early 1980s the organization implemented a clinical information system which included NANDA diagnosis labels with codes, defining characteristics, related factors, patient outcomes, and nursing interventions selected by nurses in the nursing planning process. In the early 1990s, NIC was implemented at the label level without NIC activities. The NIC labels replaced the lengthy descriptions of nursing orders. Instead of returning to lengthy hand written care plans, a template needed to be developed that utilized preprinted information with use of a check mark to individualize any element of the diagnostic label. The linkages of NIC interventions to the NANDA diagnostic label were identified by clinical nurse specialists in 1993. In addition, this facility has implemented a competency-based learning program using NIC as a framework. For nurses and unit specialties, various NIC interventions were identified as competencies and selected NIC activities described the performance criteria. Finally, NOC was added to the patient plan of care. The NOC outcome is applied at the label level with ratings and does not identify specific indicators in this facility.

In 2003, Cerner Millennium was implemented in pharmacy, radiology, laboratory, and emergency care at the facility. For nursing clinical information solution, "PowerChart" was implemented in most of the inpatient nursing care areas. Majority of nursing documentation was electronic but the patient plan of care using standardized

nursing terminologies was not included. Therefore, the nursing staff maintained paper-based patient plans of care using NANDA-I, NOC, and NIC.

The paper based nursing care plan format with three standardized nursing terminologies includes (a) NANDA-I nursing diagnoses including defining characteristic and related factors, (b) NIC interventions at the label level without specific nursing activities, and (c) NOC outcomes at the label level and do not include indicators. The content of the nursing care plans and NNN linkages was developed by the clinical nurse specialists group.

Sample

The study sample was all patient nursing care plan records using NANDA-I, NOC, and NIC languages discharged with the medical diagnoses of Congestive Heart Failure (CHF) (DRG 127) from January 1 to December 31 of 2007 from inpatient acute care units at this Midwestern community hospital. The sample was 272 patients for the one year time period. The nursing units are currently using manual patient care plans with NANDA-I, NOC, and NIC and critical thinking skills. The most frequently selected NANDA-I, NOC and NIC are combined on a two page document to facilitate completion of the care planning process. Patients with CHF were chosen as the sampling group in the acute setting because of the high volume of CHF admissions in the U.S. and the critical need to improve their care outcomes. The sample population included both genders, all adults over 18 years old, and all ethnic groups.

Inclusion criteria for subjects were: 1) primary diagnosis of Heart Failure and Shock (DRG 127) admitted to the acute care setting 2) age 18 years or older, and 3) a

primary DRG code assigned to patient based on medical documentation conforming to the criteria for Heart Failure and Shock by coders in the Health Information Management. Exclusion criteria were 1) secondary diagnosis of CHF patients in long term care setting, 2) below 17 years of age.

Data Forms

In this retrospective descriptive study, the most frequently used three standardized nursing terminologies (NANDA-I, NOC, NIC) variables were measured for Congestive Heart Failure (CHF) from patient care plan records using descriptive statistical analysis.

NANDA-I: Nursing Diagnosis is defined as "a clinical judgment about individual, family, or community responses to actual or potential health problems/life processes" (NANDA-I, 2007, p 332). The validity was established by expert opinion, literature review, and through a few studies completed through nursing clinical information systems (Delaney & Mehmert, 1991; McKeighen, Mehmert & Dickel, 1989). Some reliability testing has occurred in the past using the nursing clinical information system such as the work of Delaney, Herr, Maas & Specht (2000). In this study, 155 NANDA I diagnoses including defining characteristics and related factors (1999-2000) were used for the identification of nursing diagnoses.

NOC: The Nursing Outcomes Classification is defined as "an individual, family, or community state behavior or perception that is measured along a continuum in response to nursing interventions" (Moorhead et al., 2008, p. 30). The NOC development team includes faculty content experts and clinical nurse experts and focuses on reviewing the conceptual links between the outcome label, and indicators. In the study, the second edition of NOC with 260 outcomes was used in the care plans.

NIC: The Nursing Interventions Classification is defined as "any treatment based upon clinical judgment and knowledge that a nurse performs to enhance patient/client outcome" (Bulechek, Butcher, & Dochterman, 2008, p. 3). Content validity of NIC was done by the Iowa intervention project in 2000. After development of the classification and construction of the taxonomy, validation was completed through conducting surveys of specialty organizations, surveys to individual nurses' experts, and use of indirect care interventions. Studies have been completed that demonstrate that interventions performed by nurses are captured in the NIC (Coenen, Ryan, & Sutton, 1997; Henry, Holzemer, Randell, Hsieh, & Miller, 1997; Moorhead & Delaney, 1997). The use of NIC in this research was the 486 interventions from the third edition.

Patient Plan of Care Sheet

The plan of care is a standardized template created at the request of the nursing staff organized around the nursing diagnosis selected by the nurse. The most frequently selected NANDA-I, NOCs and NICs were the elements of the two-page paper care plan. The current plan of care consists of NANDA-I with defining characteristics and related factors, NOC labels and scoring, and NIC interventions at the label level. The nursing care plans are all paper based documents organized by single diagnoses (Appendix B).

Nursing Diagnostic Reasoning

Nurses use "Nursing Diagnostic Reasoning" for identifying the patient needs for nursing care based on nursing assessments of signs or symptoms, projected outcomes and selection of interventions appropriate to meet the patient's needs (Appendix A).

Procedures for Data Collection

Nurses use nursing diagnostic reasoning (Appendix A) such as OPT Model for selecting accurate nursing diagnoses, outcomes and interventions with standardized nursing terminologies (NANDA-I, NOC, and NIC) during nursing care. For example, nurses select each NANDA-I diagnosis as a separate plan of care with several options for NOC outcomes and NIC interventions which are important outcomes and treatments for the nursing diagnosis selected. Paper based nursing care plans for each diagnosis are printed and the nurses check the NOC outcomes and NIC interventions that best represent the patient's situation using their critical thinking skills. These care plans are conveniently located at the nursing station.

Data from paper based care plans (Appendix B) with NANDA-I, NOC, and NIC using the critical reasoning skills were collected including patient ID number, demographic variables (age and gender), NANDA nursing diagnoses with defining characteristics and related factors, NOC outcomes labels with scales from 1 to 5, and NIC interventions labels were used for the study. Variables for the study are age, gender, CHF (DRG 127), NANDA-I nursing diagnoses, NOC outcomes, and NIC interventions. Descriptions of variables are explained in Table 3-1.

First, a staff member in the hospital extracted nursing records of discharged patients with medical diagnosis of CHF (DRG 127) from all patient records for one year. Extracted patient records were scanned and de-identified and each was given a unique code number by the staff member instead of the actual patient ID or social security number. Every NANDA-I nursing diagnosis, defining characteristic (signs/symptoms), related factor, NOC outcome, and NIC intervention in the patient record had unique

identified codes, so the research assistant entered the created unique code number, demographic information (age and gender), NOC outcome scores, each code of selected NANDA-I, signs/symptoms, related factors, NOC, NIC by nurses into Microsoft Access using scanned patient nursing records. The researcher explained to the RA how to code NANDA-I, NOC, and NIC in detail.

Data Analyses

Data compiled within SPSS was analyzed to describe the frequencies and percentages of NANDA-I nursing diagnoses, NOC outcomes, and NIC interventions selected for patients with CHF. The percent of use of NANDA-I, NOC, and NIC based on clinical data were correlated and compared to the level of agreement with the published NNN linkages book. As a result, accumulated data using the clinical reasoning such as OPT Model can describe and identify more accurate nursing care plans and clinical pathways for patients with CHF based on plans of care using SNLs combined with the clinical reasoning supported by the OPT Model. The collected data were analyzed according to the following research questions.

1) What are the nursing diagnoses chosen by nurses for patients hospitalized with CHF?

   This was measured by calculating frequency of each NANDA-I nursing diagnosis documented for CHF with DRG 127 medical diagnosis.

2) What related factors and signs/symptoms for top ten nursing diagnosis are chosen by nurses for patients hospitalized with CHF?

This was measured by calculating frequency of each characteristic or related factor and signs/symptoms for each nursing diagnosis documented on each CHF patient records.

3) What outcomes are chosen by nurses for patients hospitalized with CHF?

   This was measured by calculating the frequency of each NOC outcome documented on each CHF patient record.

4) What interventions are chosen by nurses for patients hospitalized CHF?

   This was measured by calculating the frequency of each NIC intervention documented on each CHF patient record.

5) What are the 10 most prevalent linkages of NANDA-I, NOC, and NIC for patients hospitalized with CHF?

   This was measured by identifying the 10 most prevalent NANDA-I nursing diagnoses and associated NOC outcomes and NIC interventions linked to them.

6) What are the NOC scores changes between admission and discharge for patients hospitalized with CHF?

   This was measured by the ten most frequently used NOC outcomes using t-test: comparing mean, SD of before interventions which are admission NOC scores and mean, SD of after interventions which are discharge of NOC scores.

7) What is the effectiveness of the ten frequently used NIC interventions according to NOC outcomes for patients hospitalized with CHF?

   This was measured by admission and discharge of NOC-NIC linkages outcome scores using t-test.

8) What are the differences between published NNN linkages and the actual NNN linkages from results of the study for patients hospitalized with CHF?

   This was measured by comparing with NNN linkages from the published book, *Nursing Diagnoses, Outcomes, & Interventions: NANDA, NOC, and NIC Linkages* (Johnson et al., 2006), and NNN linkages from actual data. Qualitative methods were used to describe the results.

Limitations

There are limitations in this study. First, the currently used care plans were linked by experts in the facility because selecting nursing diagnoses, outcomes, and interventions is time consuming. The use of preformed care plans reduced the total universal list of NIC and NOCs. In addition the current editions of the languages were not in use at the time data were collected. However, nurses could add nursing diagnoses, outcomes and interventions to the care plan. Second, nurses may have preferred nursing diagnoses, interventions, and outcomes in special units but the care plans were developed for all units to use across the health system. Third, it was not easy to retrieve the data from the paper care plan records. In addition, if there are more than one NOC outcomes selected by the nurse then the detailed link to NIC was not explicit because multiple NOC outcomes linked to multiple NIC interventions for one NANDA nursing diagnosis. Fourth, the amount of data can be overwhelming to enter into Microsoft Access. In addition, how the data were collected and coded for entry into the database in must be consistent, accurate, and replicable over time (Pollack, 1999). Thus, reliability of data

could be a limitation in this study because errors could occur during data coding. Inter-coder reliability is an issue that threatens reliability for the study.

Human Subjects

Potential Risks

The only potential risks for subjects to be included in the study were related to confidentiality of information that may be sensitive and could be used to disadvantage the subject in some way. No alternative treatments were given to research subjects, as the data collected were part of the patient hospital record.

Recruitment and Informed Consent

The use of electronic and paper health record data requires strict procedures to ensure the confidentiality of information and to protect the privacy of the subjects. The researcher carefully adhered to all confidentiality procedures in conducting the study. Each patient was given a unique identifier upon data download and no personal identifiers were used. The procedures used in this research strictly conformed to all HIPAA regulations.

Protection against Risk

The researcher strictly adhered to study site and federal procedures for the protection of the confidentiality of health information and subject privacy. Each patient was given a unique identifier upon data download and no personal identifiers were used. Personal identifiers removed from the health information using the "safe-harbor" method, i.e., removal of all 18 identifiers enumerated at section 164.514(b) (2) of the regulations governing the HIPAA Rule (National Institutes of Health, 2004). Data that are not

available in electronic form were collected by a Data Retrieval Assistant, a hospital employee with authorized access to the data, from paper records and linked to electronic records for individual patients. The de-identified data were transferred for examination and storage to a secure data warehouse at the Midwestern community hospital. Master data files and data analyses were stored on a secured PC with access password protection. Finally for further data security, all paper data records and data disks were stored in locked cabinets accessible only to the researcher and on-line data files were password protected with passwords.

Potential Benefits of the Proposed Research to the Subjects and Others

Although there was no direct benefit to the subjects in this study, the benefits of examining the feasibility of conducting nursing effectiveness research for older persons hospitalized with CHF in hospital settings that have standardized nursing terminologies in their electronic documentation systems will enable subsequent innovative research using standardized clinical data in integrated information systems across multiple sites.

Plans for Dissemination of Results

Results will be shared with Nursing Leadership and other interested parties at this Midwestern community hospital upon completion of data analysis and the summarization of results. Results will be published in a nursing journal and abstracts will be submitted for presentation at regional, national, and international conferences as appropriate.

Table 3.1 Description of Variables

Variable	Definition	Measure
Age	Number of years living since birth	Early Adult (18-40) =1 Middle Adult (41-64) =2 Older Adult (65- 74) =3 (75-84) =4 Over 85=5
Gender	Male and Female	Male=1 Female=2
NANDA-I Diagnosis	The NANDA-I nursing diagnoses with definition, related factors, and Signs/Symptoms, selected by nurses on patient plans of care	Frequency of NANDA-I Code
Defining characteristics and related factors	Defining characteristics and related factors selected by nurses on patient plans of care	Frequency of Defining characteristics and related factors Code
NOC Outcomes	The NOC outcomes selected by nurses on patient plans of care	Frequency of NOC Code
NIC Interventions	The NIC interventions selected by nurses on patient plans of care	Frequency of NIC Code
CHF: Heart Failure and Shock (DRG 127)	The primary DRG given to patients based on medical documentation conforming to the criteria for Heart Failure and Shock by coders in the medical information department.	DRG Code

CHAPTER IV

STUDY FINDINGS

The study findings by analyzing patients care plan records are described in this chapter. The first section represents the demographics of the sample. The second section addresses findings relevant to the research questions.

Sample

The study sample consisted of nursing records of patients admitted with the primary medical diagnosis DRG 127 of Congestive Heart Failure (CHF) from January 1, 2007 to December 31, 2007 from inpatient acute care units at a Midwestern community hospital. A total of 272 patient records were collected for analysis. The sample for this year of data consisted of 148 females and 124 males with an average age of 77.98 and 72.88, respectively. The age range was from 20 to 98 years (Table 4.1). Almost half of the patients were over 65 and female (N=124), and of the 272 patients, 93 male patients were over 65. Only 3 patients were in the age range of 20-40 years (Table 4.2).

Table 4.1 Overall Demographic Characteristics of Patients with CHF

Gender	N	Age Mean	SD	Age Range
F	148	77.98	11.88	40-96
M	124	72.88	13.29	20-98
Total	272	75.43	12.58	20-98

Note. SD = Standard Deviation.

Table 4.2 Age by Gender

Age	Gender (N/%)		Total (N/%)
	F	M	
20-40	1 (0.5)	2 (1.0)	3 (1.5)
41-64	23(8.0)	29 (11.0)	52 (19.0)
65-74	26 (10.0)	33 (12.0)	59 (22.0)
75-84	48(17.5)	38 (14.0)	86 (31.5)
>85	50(18.0)	22 (8.0)	72 (26.0)
Total	148 (54)	124 (46)	272(100)

Each CHF patient had an average of 5.41 nursing diagnoses, 8.15 nursing outcomes, and 10.99 nursing interventions with a minimum of 1 to maximum of 13 nursing diagnoses, to 35 nursing outcomes, and to 74 nursing interventions (Table 4.3).

Table 4.3 Number of NANDA-Is, NOCs, & NICs per Patient Hospitalized with CHF

Variables	Mean	SD	Median	Minimum	Maximum
NANDA-I	5.41	2.30	5	1	13
NOC	8.15	4.88	7	1	35
NIC	10.99	8.66	9	1	74

Note; *SD = Standard Deviation*.

Analysis of the Research Questions

Question 1

The first research question was to identify the NANDA- I nursing diagnoses of patients hospitalized with CHF. Forty -one different NANDA-I diagnoses were selected by nurses for patients with CHF. The patients had an average of 5.41 nursing diagnoses. The most prevalent nursing diagnoses were *Knowledge Deficit, Cardiac Output Alteration, Injury High Risk for, Airway Clearance Ineffective, Infection risk for, Activity Intolerance, Pain Acute, Tissue Integrity Impaired, Fluid Volume Deficit, and Nutrition Less than Body Requirements Altered* (Table 4.4). These ten nursing diagnoses accounted for almost 90% of the nursing diagnoses for patients with CHF. Of the ten nursing diagnoses, the top four nursing diagnoses (*Knowledge Deficit, Cardiac Output Alteration, Injury High Risk for, Airway Clearance Ineffective*) accounted for almost 50% of the nursing diagnoses for patients with CHF (Table 4.4).

Table 4.4 Overall Frequencies of NANDA-I Diagnoses for Patients Hospitalized with CHF (N=272)

NANDA-I Nursing Diagnosis	Freq	%	Cum Freq	Cum %
Knowledge Deficit	**232**	**14.96**	**232**	**14.96**
Cardiac Output Alteration	**191**	**12.31**	**423**	**27.27**
Injury, High Risk For	**170**	**10.96**	**593**	**38.23**
Airway Clearness Ineffectiveness	**167**	**10.77**	**760**	**49.00**
Infection, Risk For	**166**	**10.7**	**926**	**59.70**
Activity Intolerance	**146**	**9.41**	**1072**	**69.12**
Pain, Acute	**120**	**7.74**	**1192**	**76.85**
Tissue Integrity, Impaired	**80**	**5.16**	**1272**	**82.01**
Fluid Volume Deficit	**72**	**4.64**	**1344**	**86.65**
Nutrition Less Than Body Requirements Altered	**42**	**2.71**	**1386**	**89.36**
Fear	39	2.51	1425	91.88
Fluid Volume Excess	24	1.55	1449	93.42
Breathing Pattern Ineffectiveness	14	0.9	1463	94.33
Health Maintenance, Altered	13	0.84	1476	95.16
Skin Integrity, Impaired	10	0.64	1486	95.81
Gas Exchange Impairment	8	0.52	1494	96.32
Physical Mobility Alteration	5	0.32	1499	96.65
Anxiety	4	0.26	1503	96.91
Aspiration, Risk For	4	0.26	1507	97.16
Confusion, Acute	4	0.26	1511	97.42
Activity Intolerance, Risk For	3	0.19	1514	97.61
Communication, Impaired Verbal	3	0.19	1517	97.81
Confusion, Chronic	3	0.19	1520	98.00
Coping Ineffectiveness	3	0.19	1523	98.19
Fatigue	3	0.19	1526	98.39
Pain, Chronic	3	0.19	1529	98.58
Bowel Incontinence	2	0.13	1531	98.71
Constipation	2	0.13	1533	98.84
Self Care Deficit, Bathing/Hygiene	2	0.13	1535	98.97
Self Care Deficit, Dressing/Grooming	2	0.13	1537	99.10
Self Care Deficit, Toileting	2	0.13	1539	99.23
Skin Integrity, Risk For Impaired	2	0.13	1541	99.36
Urinary Retention	2	0.13	1543	99.48
Caregiver Roles Strain	2	0.13	1545	99.55
Coping, Ineffective Family: Compromised	1	0.06	1546	99.61
Decisional Conflict	1	0.06	1547	99.68
Fluid Volume Deficit, Risk For	1	0.06	1548	99.74
Family Process Alteration	1	0.06	1549	99.81
Incontinence, Functional	1	0.06	1550	99.87
Memory, Impaired	1	0.06	1551	99.94
Nutrition: Risk For More Than Body Requirements	1	0.06	1552	100.0

Note. The bold are the top ten NANDA-I for patients with CHF.

Freq = Frequency. % =Percent. Cum Freq = Cumulative Frequency. Cum % = Cumulative Percent

One way to examine the results of this study is to compare the frequency of the NANDA I diagnoses using the domains of the NANDA I Taxonomy II (NANDA I, 2009). Activity/Rest and Safety/Protection are the most frequently used domains for patients with CHF. In contrast, Life Principles and Health Promotion are the least used NANDA domains for CHF (Figure 4.1). The data depict diagnoses from 10 of the 13 domains. No diagnoses from Domain 6 (Self Perception), Domain 8 (Sexuality) or Domain 13 (Growth) were chosen for this sample of patients with CHF during their hospitalization.

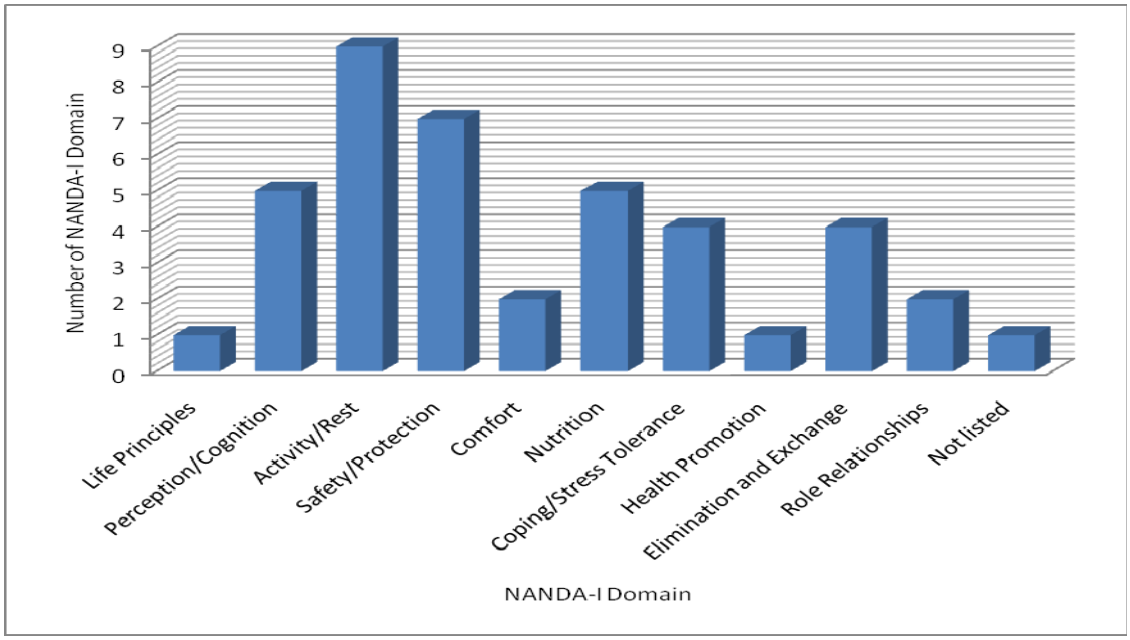


Figure 4.1 Domains of NANDA-I Diagnoses for Patients Hospitalized with CHF

Note: Domains and definitions depicted in the below

Health Promotion *(Domain 1- The awareness of wellbeing or normality of function and the strategies used to maintain control of and enhance that wellbeing or normality of function).*

Nutrition *(Domain 2-The activities of taking in, assimilating, and using nutrients for the purpose of tissue maintenance, tissue repair, and the production of energy).*

Elimination and Exchange *(Domain 3- Secretion and excretion of waste products from the body).*

Activity/Rest *(Domain 4- The production, conservation, expenditure, or balance of energy resources).*

Perception/Cognition *(Domain 5- The human information processing system including attention, orientation, sensation, perception, cognition, and communication).*

Role Relationships *(Domain 7- The positive and negative connections or associations between people or groups of people and the means by which those connections are demonstrated).*

Coping/Stress Tolerance *(Domain 9- Contending with life events/life processes).*

Life Principles *(Domain 10-Principles underlying conduct, thought, and behavior about acts, customs, or institutions viewed as being true or having intrinsic worth).*

Safety/Protection *(Domain 11- Freedom from danger, physical injury, or immune system damage; preservation from loss; and protection on safety and security).*

Comfort *(Domain 12- Sense of mental, physical, or social wellbeing or ease).*

Examining the top ten NANDA- I diagnoses for patients hospitalized with CHF, Safety/Protection (40%) is the most prevalent NANDA-I domain followed by the domains Activity/Rest (20%), Nutrition (20%), Comfort (10%) and Perception/Cognition (10%). While Activity/Rest is the most frequently used domain in overall selected NANDA-I diagnoses for patients with CHF, the domain Safety/Protection is the most frequently used domain for the top ten NANDA-I diagnoses (Figure 4.2).

At the class level of Taxonomy II, Cardiovascular/Pulmonary Responses (10%), Cognition (10%), Coping Responses (10%), and Physical Injury (10%) are the frequently used NANDA-I classes for patients with CHF. Family Relationships, Caregiver Roles are the examples of the least used NANDA-I classes for patients with CHF (Figure 4.3). These classes are not found to be directly related to NANDA-I diagnoses for patients with CHF.

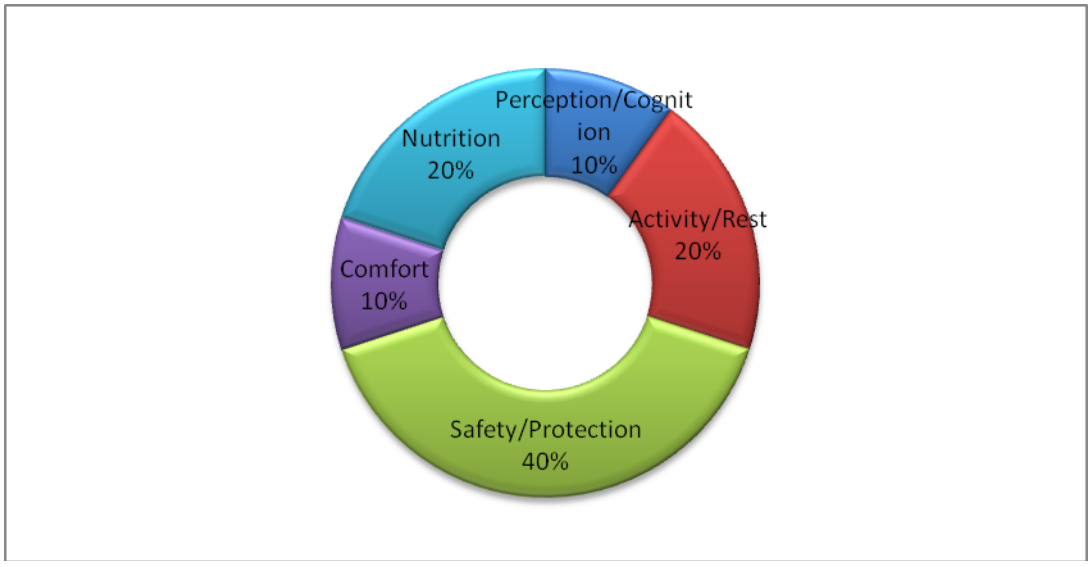


Figure 4.2 Top Domains of the Top Ten NANDA –I Diagnoses for Patients Hospitalized with CHF

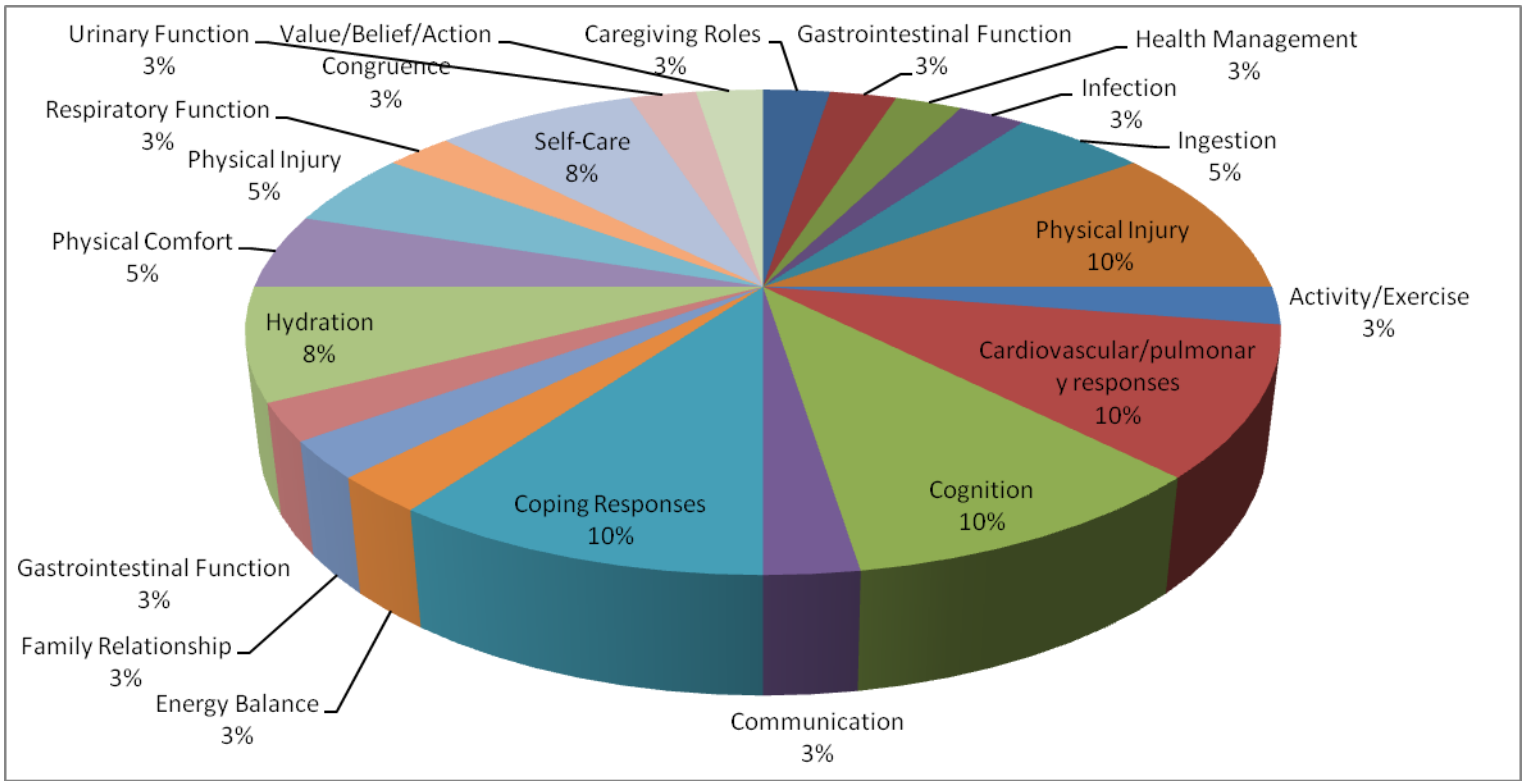


Figure 4.3 The Total Selected NANDA-I Classes for Patients Hospitalized with CHF

Question 2

The second research question is "What related factors and signs/symptoms for each nursing diagnosis are chosen by nurses for patients with CHF?"

For related factors associated with each nursing diagnosis*, Unfamiliarity with information* (lack of exposure, lack of recall, information misinterpretation with unfamiliarity information resources) was the most frequently used for Knowledge Deficit and *Inadequate primary defenses* (invasive procedure, broken skin, traumatized tissue, decrease in ciliary action, stasis of body fluids, change in pH secretions, altered peristalsis, rupture of amniotic membranes) for Cardiac Output, Infection Risk for, Activity Intolerance, Tissue Integrity Impaired, and Fluid Volume Deficit. *Situational (restraints, physical, people, provider, environment, personal)* for Injury High Risk For, *COPD* for Airway Clearance Ineffectiveness, *Physical injuring agent* for Pain Acute, and *Pathophysiological* for Nutritional Less Than Body Requirements Altered were used (Table 4.5).

Of the total related factors, four related factors were more than 50% of the total related factors chosen for patients with CHF. There are four related factors; 1) Inadequate primary defenses (invasive procedure, broken skin, traumatized tissue, decrease in ciliary action, stasis of body fluids, change in pH secretions, altered peristalsis, rupture of amniotic membranes), 2) Situational (restraints, physical, people, provider, environment, personal), 3) Unfamiliarity with information (lack of exposure, lack of recall, information misinterpretation with unfamiliarity information resources), and 4) Pathophysiological (biochemical, immune/ autoimmune, biochemical regulation, biological, chemical) (Table 4.6).

Table 4.5 Top Two Related Factors for the Top Ten NANDA-I Diagnoses

NANDA-I	Related Factors	Freq	%	Cum %
Knowledge Deficit	Unfamiliarity with information (lack of exposure, lack of recall, information misinterpretation with unfamiliarity information resources)	93	63.70	63.70
	Inadequate primary defenses (invasive procedure, broken skin, traumatized tissue, decrease in ciliary action, stasis of body fluids, change in pH secretions, altered peristalsis, rupture of amniotic membranes)	8	5.48	69.18
Cardiac Output Alteration	Inadequate primary defenses (invasive procedure, broken skin, traumatized tissue, decrease in ciliary action, stasis of body fluids, change in pH secretions, altered peristalsis, rupture of amniotic membranes)	11	16.67	16.67
	Situational (restraints, physical, people, provider, environment, personal)	9	13.64	30.30
Injury, High Risk For	Situational (restraints, physical, people, provider, environment, personal)	97	60.25	60.25
	Pathophysiological (biochemical, immune/ autoimmune, biochemical regulation, biological, chemical)	38	23.60	83.85
Airway Clearance Ineffective	COPD	11	14.67	14.67
	Situational (restraints, physical, people, provider, environment, personal)	9	12.00	26.67
Infection Risk For	Inadequate primary defenses (invasive procedure, broken skin, traumatized tissue, decrease in ciliary action, stasis of body fluids, change in pH secretions, altered peristalsis, rupture of amniotic membranes)	124	80.00	80.00
	Chronic illness	7	4.52	84.52
Activity Intolerance	Inadequate primary defenses (invasive procedure, broken skin, traumatized tissue, decrease in ciliary action, stasis of body fluids, change in pH secretions, altered peristalsis, rupture of amniotic membranes)	8	17.02	17.02
	Unfamiliarity with information (lack of exposure, lack of recall, information misinterpretation with unfamiliarity information resources)	7	14.89	31.91
Pain Acute	Physical injuring agent	12	30.77	30.77
	Psychological injuring agent	6	15.38	46.15

Table 4.5 Continued

NANDA-I	Related Factors	Freq	%	Cum %
Tissue Integrity, Impaired	Inadequate primary defenses (invasive procedure, broken skin, traumatized tissue, decrease in ciliary action, stasis of body fluids, change in pH secretions, altered peristalsis, rupture of amniotic membranes)	6	20.69	20.69
	Knowledge deficit	3	10.34	31.03
Fluid Volume Deficit	Inadequate primary defenses (invasive procedure, broken skin, traumatized tissue, decrease in ciliary action, stasis of body fluids, change in pH secretions, altered peristalsis, rupture of amniotic membranes)	6	21.43	21.43
	Unfamiliarity with information (lack of exposure, lack of recall, information misinterpretation with unfamiliarity information resources)	4	14.29	35.71
Nutritional Less Thank Body Requirements Altered	Pathophysiological (acute or chronic illness, dysphasia, hypermetabolic/catabolic state, nausea/vomiting, NPO status for extended period, endocrine disorder, cirrhosis, diarrhea, radiation therapy, edentulous condition	7	36.84	36.84
	Deconditioned status (bedrest/immobility, generalized weakness, sedentary lifestyle)	2	10.53	47.37

Note: Freq = Frequency. % =Percent. Cum % =Cumulative Percent

Table 4.6 Most Frequently Selected Related Factors for Patients Hospitalized with CHF

Related Factors	Freq	%	Cum %
Inadequate primary defenses (invasive procedure, broken skin, traumatized tissue, decrease in ciliary action, stasis of body fluids, change in pH secretions, altered peristalsis, rupture of amniotic membranes)	122	18.32	18.32
Situational (restraints, physical, people, provider, environment, personal)	98	14.71	33.03
Unfamiliarity with information (lack of exposure, lack of recall, information misinterpretation with unfamiliarity information resources)	90	13.51	46.55
Pathophysiological (biochemical, immune/ autoimmune, biochemical regulation, biological, chemical)	43	6.46	53.00

Note: Freq = Frequency. % =Percent. Cum % = Cumulative Percent

The Signs/Symptoms for the top ten nursing diagnosis are described in Table 4.7. The most prevalent signs/symptoms for each NANDA-I were 1) *Verbalization of the problem* for Knowledge Deficit, Injury High risk for, 2) *Crackles (rales)* for Cardiac Output Alteration, 3) *Adventitious breath sounds* for Airway Clearance Ineffectiveness, 4) *Verbal report of fatigue or weakness* for Activity Intolerance, 5) *Patients self report of pain* for Pain Acute, 6) *Damaged or destroyed tissue* for Tissue Integrity Impaired, 7) *Weakness* for Fluid Volume Deficit, and 8) *Aversion to eating* for Nutritional less than body Requirement Altered.

These ten signs/symptoms accounted for over 50% of the total. Of the ten, the top five frequently selected signs and symptoms across all diagnoses were *Adventitious breath sounds* followed by *Verbalization of the problem, Verbal report of fatigue or weakness, Exertional discomfort or dyspnea, and Patients self report of* (Table 4.8).

Table 4.7 Top Two Signs and Symptoms Associated with the Top Ten NANDA-I Diagnoses

NANDA-I	Signs/Symptoms	Freq	%	Cum %
Knowledge Deficit	Verbalization of the problem	112	44.8	44.80
	Inaccurate follow-through of instructions	28	11.2	56.00
Cardiac Output Alteration	Crackles (rales)	49	22.27	22.27
	Arrhythmias(tachycardia/bradycardia)	46	20.91	43.18
Injury, High risk for	Verbalization of the problem	12	13.19	13.19
	Adventitious breath sounds	8	8.79	21.98
Airway Clearance Ineffective	Adventitious breath sounds	120	56.34	56.34
	Chest Congestion	16	7.51	63.85
Infection Risk for	Verbalization of the problem	7	10	10
	Verbal report of fatigue or weakness	6	8.75	18.75
Activity Intolerance	Verbal report of fatigue or weakness	62	31.16	31.16
	Exertional discomfort or dyspnea	61	30.65	61.18
Pain Acute	Patients self report of pain	67	48.91	48.91
	Restlessness	9	6.57	55.47
Tissue Integrity, Impaired	Damaged or destroyed tissue	38	55.88	55.88
	Crackles(rales)	3	4.41	60.29
Fluid Volume Deficit	Weakness	32	37.65	37.65
	Tachycardia	10	11.76	49.41
Nutritional less than body Requirement Altered	Aversion to eating	14	31.82	31.82
	Reported inadequate food intake less than RDA	11	25	56.82

Note: Freq = Frequency. % =Percent. Cum % = Cumulative Percent for each diagnosis

Table 4.8 Overall Signs and Symptoms for Patients Hospitalized with CHF (Over 50% of a total)

Signs/Symptoms	Freq	%	Cum%
Adventitious breath sounds	123	9.33	9.33
Verbalization of the problem	106	8.04	17.37
Verbal report of fatigue or weakness	80	6.07	23.44
Exertional discomfort or dyspnea	74	5.61	29.06
Patients self report of pain	71	5.39	34.45
Crackles (rales)	55	4.17	38.62
Arrhythmias(tachycardia/bradycardia)	52	3.95	42.56
Damaged or destroyed tissue (cornea, integumentary, mucous membrane or subcutaneous)	37	2.81	45.37
Inaccurate follow-through of instructions	35	2.66	48.03
Weakness	35	2.66	50.68

Note: Freq = Frequency. % =Percent. Cum % = Cumulative Percent

Question 3

The third research question is "What NOC outcomes were chosen by nurses for patient hospitalized with CHF?" Sixty-three different NOC outcomes were selected by nurses. Each patient with CHF averaged 8.15 nursing outcomes.

Six NOC outcomes accounted for over 50 % of the total: *Knowledge: Treatment Regimen (11.15%), Safety Behavior: Fall Prevention (9.02%), Risk Control (8.52%), Tissue Integrity: Skin & Mucous Membranes (8.25%), Cardiac Pump Effectiveness (8.11%),* and *Fluid Balance (7.84%)*(Table 4.9).

Table 4.9 Frequency of Selected NOC Outcomes for Patients Hospitalized with CHF

NOC Outcomes	Freq	%	Cum Freq	Cum %
Knowledge: Treatment Regimen	**246**	**11.15**	**246**	**11.15**
Safety Behavior: Fall Prevention	**199**	**9.02**	**445**	**20.17**
Risk Control	**188**	**8.52**	**633**	**28.69**
Tissue Integrity: Skin & Mucous Membranes	**182**	**8.25**	**815**	**36.94**
Cardiac Pump Effectiveness	**179**	**8.11**	**994**	**45.06**
Fluid Balance	**173**	**7.84**	**1167**	**52.90**
Respiratory Status: Ventilation	**166**	**7.52**	**1333**	**60.43**
Immune Status	**119**	**5.39**	**1452**	**65.82**
Energy Conservation	**115**	**5.21**	**1567**	**71.03**
Pain Level	**108**	**4.90**	**1675**	**75.93**
Knowledge: Treatment Procedure	46	2.09	1721	78.01
Nutritional Status: Food & Fluid Intake	43	1.95	1764	79.96
Knowledge: Disease Process	42	1.90	1806	81.87
Knowledge: Infection Control	28	1.27	1834	83.14
Respiratory Status: Gas Exchange	27	1.22	1861	84.36
Knowledge: Medication	24	1.09	1885	85.45
Knowledge: Diet	20	0.91	1905	86.36
Pain Control Behavior	19	0.86	1924	87.22
Symptom Control Behavior	18	0.82	1942	88.03
Anxiety Control	16	0.73	1958	88.76
Knowledge: Health Behaviors	15	0.68	1973	89.44
Comfort Level	13	0.59	1986	90.03
Health Beliefs: Perceived Threat	13	0.59	1999	90.62
Knowledge: Prescribed Activity	13	0.59	2012	91.21
Electrolyte & Acid/Base Balance	11	0.50	2023	91.7
Health Orientation	10	0.45	2033	92.16
Self-Care: Activities of Daily Living (ADL)	10	0.45	2043	92.61
Treatment Behavior: Illness or Injury	10	0.45	2053	93.06

Note: The bold represents the top ten NOCs.

Freq = Frequency. % =Percent. Cum % = Cumulative Percent

One way to examine the results of this study is to compare the frequency of the NOC outcomes using the domains of the NOC Taxonomy (Moorhead et al., 2008). Physiologic Health (35%) is the most frequently selected NOC domain followed by Health Knowledge & Behavior (30%), Functional Health (21%), Psychological Health (8%), Family Health (3%) and Perceived Health (3%) as shown in Figure 4.4. The domain Community Health is the only domain that did not have outcomes selected for patients with CHF.

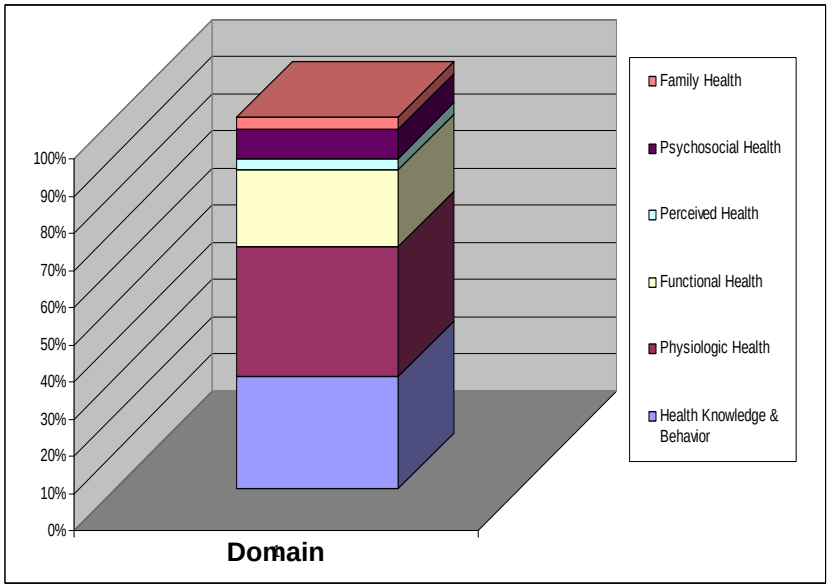


Figure 4.4 Selected NOC Outcomes Domains for Patients Hospitalized with CHF

Note: Domains and definitions of the NOC Taxonomy

Health Knowledge & Behavior *(Domain IV-Outcomes that describe attitudes, comprehension, and actions with respect to health and illness).* **Physiologic Health** *(Domain II – Outcomes that describe organic functioning).* **Functional Health** *(Domain I- Outcomes that describe capacity of and performance of basic tasks of life).* **Psychosocial Health** *(Domain III- Outcomes that describe psychological and social functioning).* **Perceived Health** *(Domain V- Outcomes that describe impression of an individual's health and health care).* **Family Health** *(Domain VI- Outcomes that describe health status, behavior, or functioning of the family as a whole or of an individual as a family member).*

For the top ten NOC outcomes selected, the most frequent domains used for patients with CHF are Physiological Health (50%) followed by Health Knowledge & Behavior (30%). There were no outcomes from the domains Psychological Health or Family Health in the top 10 outcomes identified compared to complete list of selected NOC outcomes (Figure 4.5).

The NOC Taxonomy has 31 classes. Of the 31 classes, 19 classes were selected for patients hospitalized with CHF. Health Knowledge (14%) is the most prevalent NOC class selected by nurses for patients with CHF followed by the classes Cardiopulmonary (10%) and Self-Care (10%). Health & Life Quality (2%), Immune Response (2%), and Symptom Status (2%) are the least selected NOC classes for patients with CHF (Figure 4.6).

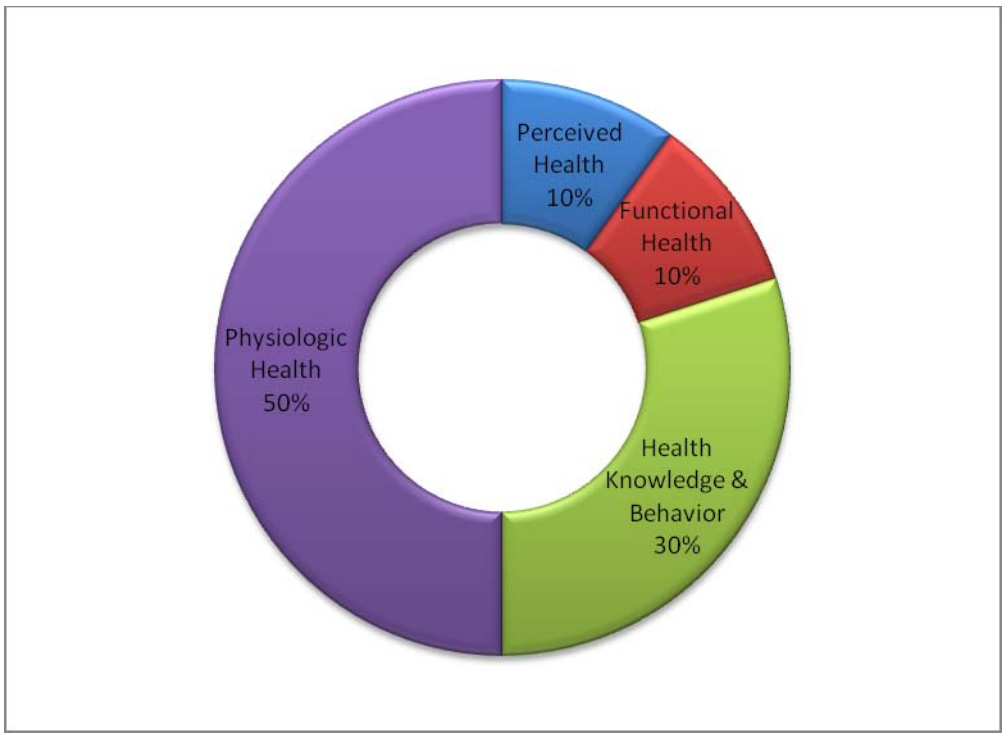


Figure 4.5 Domains of the Top Ten NOC Outcomes for Patients Hospitalized with CHF

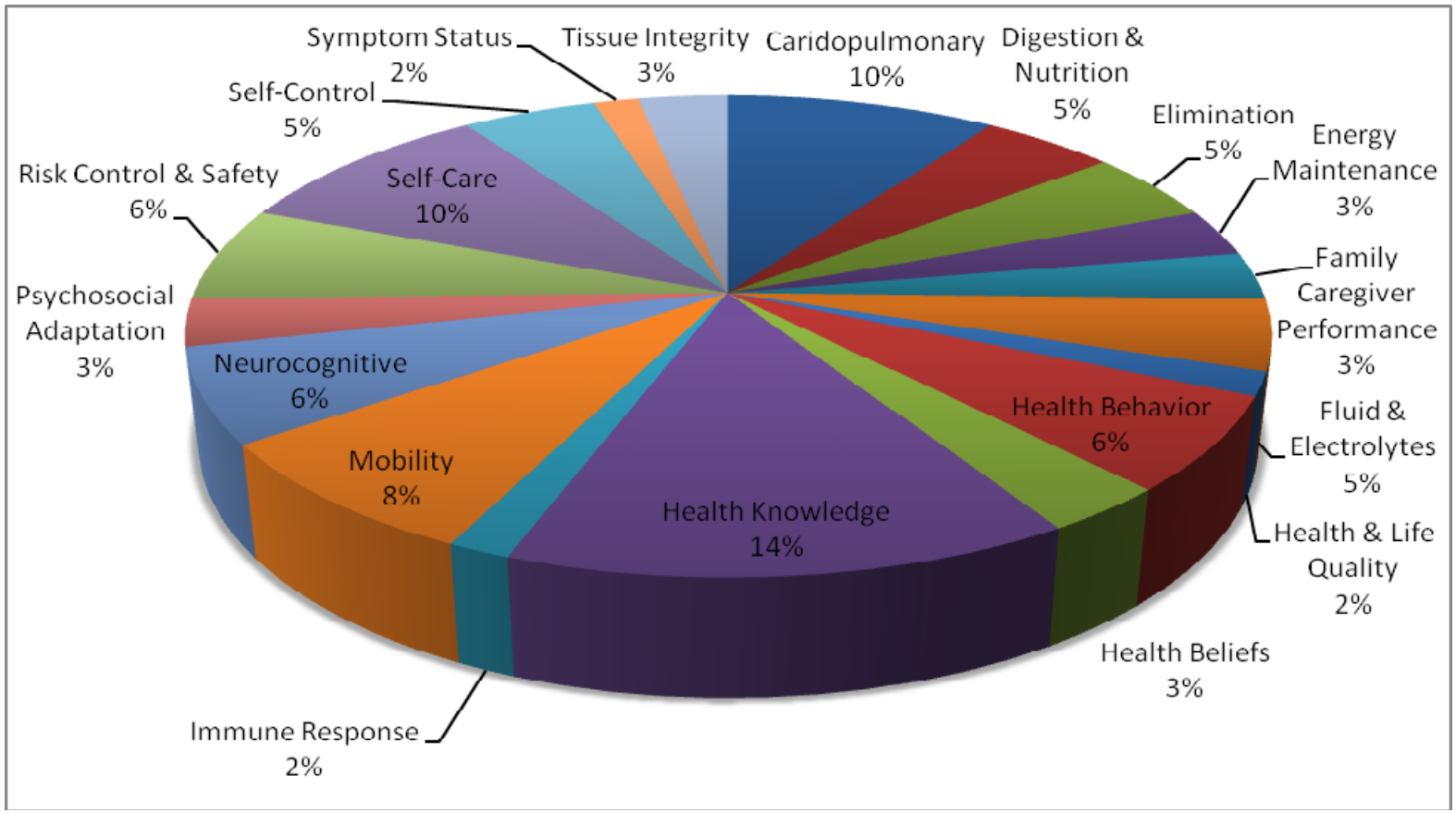


Figure 4.6 The Total Selected NOC Classes for Patients Hospitalized with CHF

Question 4

The fourth research question is "What interventions are chosen by nurses for patients hospitalized with CHF?" One hundred forty- three different NIC interventions were selected by nurses for patients with CHF. Each patient with CHF averaged 10.99 nursing interventions. Of the total NIC interventions (N=143), 51.03% were represented by only ten NIC interventions which were *Fluid Monitoring* (N=232)*, Cardiac Care* (N=192)*, Teaching: Procedure/Treatment* (N=144), *Fall Prevention* (N=130), *Emotional Support* (N=130), *Fluid/Electrolyte Management* (N=113), *Infection Protection* (N=105), *Nutrition Management* (N=100), *Infection Control* (N=99), *and Respiratory Monitoring* (N=98) (Table 4.10).

The NIC Taxonomy has 7 domains. Of the 7 domains, Physiological: Basic (30%) is the most frequently selected domain for patients with CHF followed by Physiological: Complex (28%), Behavioral (27%), Safety (8%), Family (5%), and Health System (2%) (Figure 4.7). The Community domain was not selected for patients with CHF.

For the top ten NIC interventions the domain, Physiological: Complex accounted for 40 % of the NIC interventions selected and the Family Health System domains were not existed in the top 10 interventions identified compared to complete list of selected NIC interventions (Figure 4.8).

NIC has 30 classes. Of the 30 classes, 22 classes were used for patients hospitalized with CHF. Self-Care Facilitation (11%) is the most prevalent NIC class selected by nurses. Coping Assistance (8%), Risk Management (8%) and Patient Education (8%) are followed by next. Health system Mediation (1%), Information

Management (1%) and Neurologic Management (1%) are the least selected NIC classes for CHF (Figure 4.9).

Table 4.10 Frequency of Selected NIC Interventions for Patients Hospitalized with CHF

NIC Interventions	Freq	%	Cum Freq	Cum %c
Fluid Monitoring	**232**	**8.81**	**232**	**8.81**
Cardiac Care	**192**	**7.29**	**424**	**16.11**
Teaching: Procedure/Treatment	**144**	**5.47**	**568**	**21.58**
Fall Prevention	**130**	**4.94**	**698**	**26.52**
Emotional Support	**130**	**4.94**	**828**	**31.46**
Fluid/Electrolyte Management	**113**	**4.29**	**941**	**35.75**
Infection Protection	**105**	**3.99**	**1046**	**39.74**
Nutrition Management	**100**	**3.80**	**1146**	**43.54**
Infection Control	**99**	**3.76**	**1245**	**47.3**
Respiratory Monitoring	**98**	**3.72**	**1343**	**51.03**
Surveillance: Safety	96	3.65	1439	54.67
Pain Management	69	2.62	1508	57.29
Dysrhythmia Management	57	2.17	1565	59.46
Teaching: Disease Process	49	1.86	1614	61.32
Environmental Management: Safety	47	1.79	1661	63.11
Risk Identification	41	1.56	1702	64.67
Oxygen Therapy	36	1.37	1738	66.03
Weight Management	34	1.29	1772	67.33
Wound Care	34	1.29	1806	68.62
Electrolyte Monitoring	32	1.22	1838	69.83
Discharge Planning	31	1.18	1869	71.01
Fluid Management	31	1.18	1900	72.19
Teaching: Prescribed Medication	30	1.14	1930	73.33
Airway Management	29	1.1	1959	74.43
Analgesic Administration	29	1.1	1988	75.53
Nutritional Monitoring	28	1.06	2016	76.6
Cardiac Care: Rehabilitative	27	1.03	2043	77.62
Skin Surveillance	25	0.95	2068	78.57
Teaching: Individual	24	0.91	2092	79.48
Anxiety Reduction	23	0.87	2115	80.36
Environmental Management: Comfort	22	0.84	2137	81.19
Learning Facilitation	21	0.8	2158	81.99
Teaching: Prescribed Activity/Exercise	21	0.8	2179	82.79
Coping Enhancement	20	0.76	2199	83.55
Energy Management	19	0.72	2218	84.27
Positioning	18	0.68	2236	84.95
Presence	18	0.68	2254	85.64
Learning Readiness Enhancement	17	0.65	2271	86.28
Teaching: Prescribed Diet	17	0.65	2288	86.93
Perineal Care	15	0.57	2303	87.5
Environmental Management	13	0.49	2316	87.99
Venous Access Device (VAD) Maintenance	13	0.49	2329	88.49
Circulatory Care	11	0.42	2340	88.91
Electrolyte Management	11	0.42	2351	89.32
Health System Guidance	10	0.38	2361	89.7

Note: The bold represents the top ten NIC interventions. Freq = Frequency. % =Percent. Cum % = Cumulative Percent

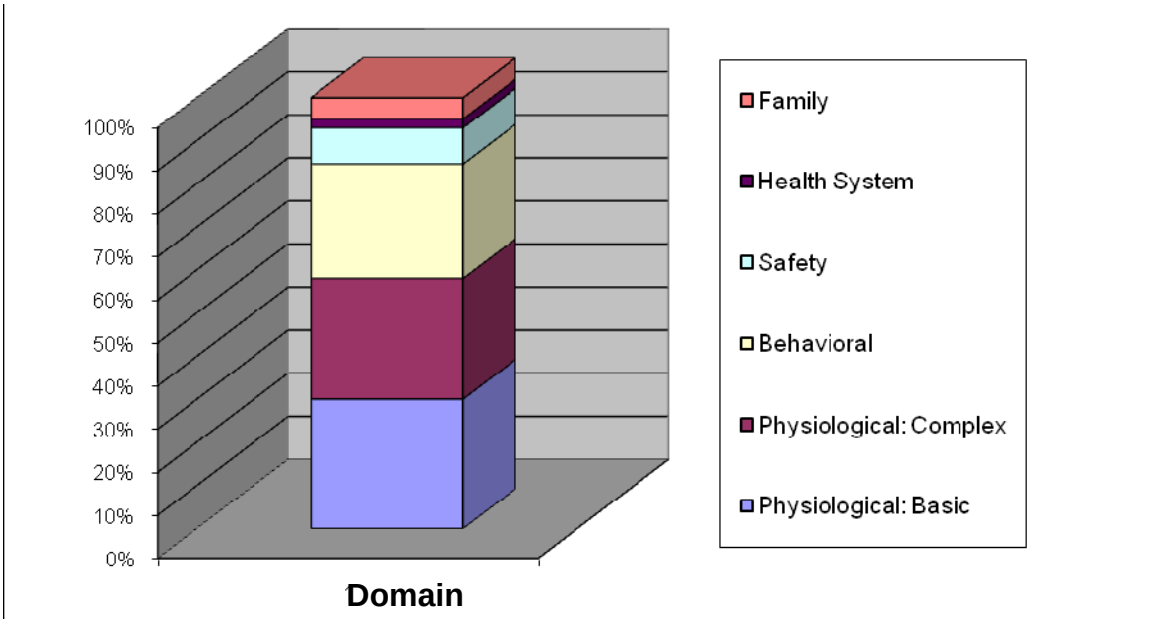


Figure 4.7 Domains of Selected NIC Interventions for Patients Hospitalized with CHF

Note: Domains of NIC Selected

Physiological; Basic *(Domain 1- Care that supports physical functioning).*

Physiological: Complex *(Domain 2- Care that supports homeostatic regulation).*

Behavioral *(Domain 3- Care that supports psychosocial functioning and facilitates life style changes).*

Safety *(Domain 4- Care that supports protection against harm).*

Family *(Domain 5- Care that supports the family).*

Health System *(Domain 6- Care that supports effective use of the health care delivery system).*

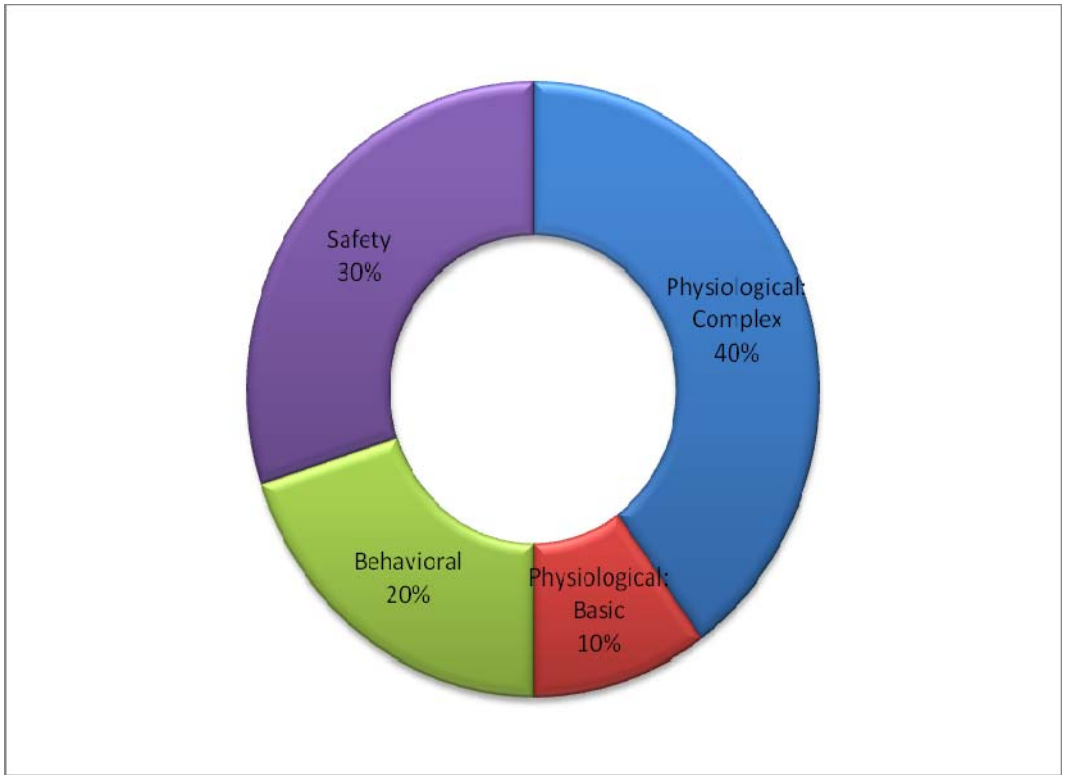


Figure 4.8 Top Ten NIC Domains for Patients Hospitalized with CHF

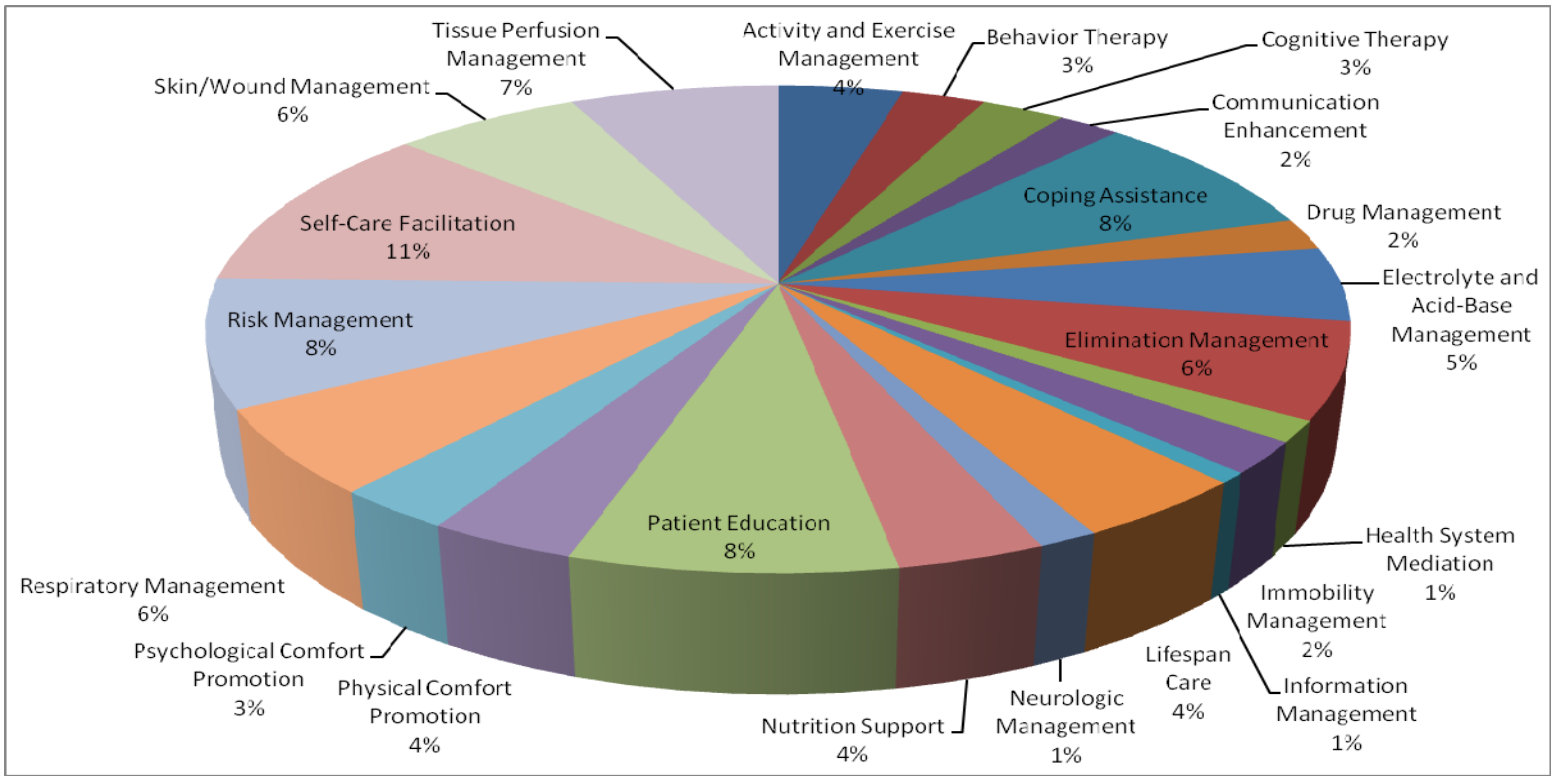


Figure 4.9 The Total Selected NIC Classes for Patients Hospitalized with CHF

Question 5

The fifth research question was "What are the 10 most prevalent linkages of NANDA-I, NOC, and NIC for patients with CHF? Table 4.11 showed at least ten times used NNN (NANDA-NOC-NIC) linkages for patients hospitalized with CHF. Nine hundred and twenty-seven different NNN linkages were used for patients with CHF. The top five prevalent NNN linkages were *1) Knowledge deficit - Knowledge: Treatment Regimen- Teaching: Procedure/Treatment (N=94), 2) Cardiac Output Alteration-Cardiac Pump Effectiveness-Cardiac Care (N=83), 3) Injury High risk for-Safety behavior: fall prevention-Fall prevention (N=76), 4) Cardiac Output Alteration-Cardiac Pump Effectiveness-Fluid Monitoring (N=71), and 5) Injury High risk for-Risk Control-Fall Prevention (N=58).* Of the top ten NNN linkages, nursing diagnosis of *Injury High Risk for* were selected three times with linking to the different NOCs and NICs. In addition, the nursing diagnosis of *Cardiac Output Alteration* was also selected three times with linking to different NOC and NIC. NNN linkages according to the top ten NANDA are indicated in Table 4.1

Table 4.11 Frequency of Selected NNN Linkages for Patients Hospitalized with CHF (Over ten times used)

NANDA-I	NOC	NIC	N
Knowledge Deficit	**Knowledge: Treatment Regimen**	**Teaching: Procedure/Treatment**	**94**
Cardiac Output Alteration	**Cardiac Pump Effectiveness**	**Cardiac Care**	**83**
Injury, High Risk For	**Safety Behavior: Fall Prevention**	**Fall Prevention**	**76**
Cardiac Output Alteration	**Cardiac Pump Effectiveness**	**Fluid Monitoring**	**71**
Injury, High Risk For	**Risk Control**	**Fall Prevention**	**58**
Airway Clearance Ineffective	**Respiratory Status: Ventilation**	**Respiratory Monitoring**	**57**
Infection, Risk For	**Immune Status**	**Infection Protection**	**57**
Cardiac Output Alteration	**Cardiac Pump Effectiveness**	**Fluid/Electrolyte Management**	**56**
Injury, High Risk For	**Safety Behavior: Fall Prevention**	**Surveillance: Safety**	**54**
Infection, Risk For	**Immune Status**	**Fluid Monitoring**	**53**
Infection, Risk For	Tissue Integrity: Skin & Mucous Membranes	Infection Protection	53
Infection, Risk For	Risk Control	Infection Protection	51
Pain, Acute	Pain Level	Pain Management	49
Injury, High Risk For	Risk Control	Surveillance: Safety	46
Infection, Risk For	Immune Status	Infection Control	44
Knowledge Deficit	Knowledge: Treatment Regimen	Emotional Support	41
Infection, Risk For	Tissue Integrity: Skin & Mucous Membranes	Fluid Monitoring	40
Infection, Risk For	Risk Control	Infection Control	38
Activity Intolerance	Energy Conservation	Cardiac Care	37
Infection, Risk For	Risk Control	Fluid Monitoring	36
Cardiac Output Alteration	Fluid Balance	Fluid Monitoring	34
Activity Intolerance	Safety Behavior: Fall Prevention	Cardiac Care	33
Infection, Risk For	Tissue Integrity: Skin & Mucous Membranes	Infection Control	33
Injury, High Risk For	Safety Behavior: Fall Prevention	Environmental Management: Safety	31
Cardiac Output Alteration	Fluid Balance	Cardiac Care	29
Cardiac Output Alteration	Fluid Balance	Fluid/Electrolyte Management	28
Fluid Volume Deficit	Fluid Balance	Fluid Monitoring	28

Table 4.11 Continued

NANDA-I	NOC	NIC	N
Activity Intolerance	Energy Conservation	Emotional Support	25
Fluid Volume Deficit	Fluid Balance	Fluid Management	24
Injury, High Risk For	Risk Control	Environmental Management: Safety	24
Knowledge Deficit	Knowledge: Disease Process	Teaching: Disease Process	24
Cardiac Output Alteration	Cardiac Pump Effectiveness	Dysrhythmia Management	23
Infection, Risk For	Immune Status	Nutrition Management	23
Fluid Volume Deficit	Fluid Balance	Fluid/Electrolyte Management	22
Knowledge Deficit	Knowledge: Treatment Procedure	Teaching: Procedure/Treatment	22
Knowledge Deficit	Knowledge: Disease Process	Teaching: Prescribed Medication	21
Activity Intolerance	Safety Behavior: Fall Prevention	Emotional Support	20
Knowledge Deficit	Knowledge: Treatment Procedure	Teaching: Disease Process	20
Knowledge Deficit	Knowledge: Disease Process	Teaching: Individual	18
Tissue Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Infection Control	18
Activity Intolerance	Energy Conservation	Nutrition Management	17
Knowledge Deficit	Knowledge: Treatment Procedure	Teaching: Prescribed Medication	17
Pain, Acute	Pain Level	Analgesic Administration	17
Airway Clearance Ineffective	Respiratory Status: Ventilation	Airway Management	16
Infection, Risk For	Knowledge: Infection Control	Risk Identification	16
Knowledge Deficit	Knowledge: Disease Process	Teaching: Procedure/Treatment	16
Knowledge Deficit	Knowledge: Treatment Procedure	Teaching: Individual	16
Knowledge Deficit	Knowledge: Treatment Regimen	Teaching: Disease Process	16
Pain, Acute	Pain Level	Environmental Management: Comfort	16
Infection, Risk For	Knowledge: Infection Control	Infection Protection	15
Infection, Risk For	Tissue Integrity: Skin & Mucous Membranes	Nutrition Management	15
Knowledge Deficit	Knowledge: Disease Process	Learning Facilitation	15
Knowledge Deficit	Knowledge: Disease Process	Teaching: Prescribed Activity/Exercise	15
Knowledge Deficit	Knowledge: Treatment Regimen	Teaching: Prescribed Medication	15
Nutrition Less Than Body Requirements Altered	Nutritional Status: Food & Fluid Intake	Nutrition Management	15
Tissue Integrity, Impaired	Knowledge: Treatment Regimen	Infection Control	15
Activity Intolerance	Energy Conservation	Dysrhythmia Management	14
Cardiac Output Alteration	Cardiac Pump Effectiveness	Cardiac Care: Rehabilitative	14
Fluid Volume Excess	Fluid Balance	Fluid Monitoring	14

Table 4.11 Continued

NANDA-I	NOC	NIC	N
Infection, Risk For	Risk Control	Nutrition Management	14
Infection, Risk For	Risk Control	Risk Identification	14
Infection, Risk For	Risk Control	Skin Surveillance	14
Injury, High Risk For	Safety Behavior: Fall Prevention	Risk Identification	14
Knowledge Deficit	Knowledge: Medication	Teaching: Disease Process	14
Knowledge Deficit	Knowledge: Medication	Teaching: Prescribed Medication	14
Tissue Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Nutrition Management	14
Infection, Risk For	Knowledge: Infection Control	Infection Control	13
Knowledge Deficit	Knowledge: Disease Process	Discharge Planning	13
Knowledge Deficit	Knowledge: Treatment Procedure	Learning Facilitation	13
Knowledge Deficit	Knowledge: Treatment Procedure	Teaching: Prescribed Activity/Exercise	13
Tissue Integrity, Impaired	Knowledge: Treatment Regimen	Nutrition Management	13
Fluid Volume Excess	Fluid Balance	Electrolyte Monitoring	12
Knowledge Deficit	Knowledge: Disease Process	Learning Readiness Enhancement	12
Knowledge Deficit	Knowledge: Disease Process	Teaching: Prescribed Diet	12
Activity Intolerance	Safety Behavior: Fall Prevention	Nutrition Management	11
Infection, Risk For	Tissue Integrity: Skin & Mucous Membranes	Risk Identification	11
Infection, Risk For	Tissue Integrity: Skin & Mucous Membranes	Skin Surveillance	11
Knowledge Deficit	Knowledge: Treatment Procedure	Learning Readiness Enhancement	11
Knowledge Deficit	Knowledge: Treatment Procedure	Teaching: Prescribed Diet	11
Knowledge Deficit	Knowledge: Treatment Regimen	Teaching: Individual	11
Knowledge Deficit	Knowledge: Treatment Regimen	Teaching: Prescribed Activity/Exercise	11
Tissue Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Wound Care	11
Cardiac Output Alteration	Fluid Balance	Dysrhythmia Management	10
Infection, Risk For	Immune Status	Skin Surveillance	10
Infection, Risk For	Knowledge: Infection Control	Skin Surveillance	10
Injury, High Risk For	Risk Control	Risk Identification	10
Knowledge Deficit	Knowledge: Diet	Teaching: Disease Process	10
Knowledge Deficit	Knowledge: Diet	Teaching: Prescribed Medication	10
Knowledge Deficit	Knowledge: Health Behaviors	Teaching: Disease Process	10
Knowledge Deficit	Knowledge: Medication	Teaching: Procedure/Treatment	10
Knowledge Deficit	Knowledge: Treatment Regimen	Learning Facilitation	10
Knowledge Deficit	Knowledge: Treatment Regimen	Learning Readiness Enhancement	10

Note: The bold items represent the top ten NNN linkages

Table 4.12 NNN linkages for the Top Ten NANDA-I Diagnoses for Patients Hospitalized with CHF

NANDA-I	NOC	NIC	N
Knowledge Deficit	Knowledge: Treatment Regimen	Teaching: Procedure/Treatment	94
	Knowledge: Treatment Regimen	Emotional Support	41
	Knowledge: Disease Process	Teaching: Disease Process	24
	Knowledge: Treatment Procedure	Teaching: Disease Process	20
	Knowledge: Disease Process	Teaching: Prescribed Medication	21
	Knowledge: Treatment Procedure	Teaching: Disease Process	20
	Knowledge: Disease Process	Teaching: Individual	18
	Knowledge: Treatment Procedure	Teaching: Prescribed Medication	17
	Knowledge: Disease Process	Teaching: Procedure/Treatment	16
	Knowledge: Treatment Procedure	Teaching: Individual	16
	Knowledge: Treatment Regimen	Teaching: Disease Process	16
	Knowledge: Disease Process	Learning Facilitation	15
	Knowledge: Disease Process	Teaching: Prescribed Activity/Exercise	15
	Knowledge: Treatment Regimen	Teaching: Prescribed Medication	15
	Knowledge: Medication	Teaching: Disease Process	14
	Knowledge: Medication	Teaching: Prescribed Medication	14
	Knowledge: Disease Process	Discharge Planning	13
	Knowledge: Treatment Procedure	Learning Facilitation	13
	Knowledge: Treatment Procedure	Teaching: Prescribed Activity/Exercise	13
	Knowledge: Disease Process	Learning Readiness Enhancement	12
	Knowledge: Disease Process	Teaching: Prescribed Diet	12
	Knowledge: Treatment Procedure	Learning Readiness Enhancement	11
	Knowledge: Treatment Procedure	Teaching: Prescribed Diet	11
	Knowledge: Treatment Regimen	Teaching: Individual	11
	Knowledge: Treatment Regimen	Teaching: Prescribed Activity/Exercise	11
	Knowledge: Diet	Teaching: Disease Process	10
	Knowledge: Diet	Teaching: Prescribed Medication	10
	Knowledge: Health Behaviors	Teaching: Disease Process	10
	Knowledge: Medication	Teaching: Procedure/Treatment	10
	Knowledge: Treatment Regimen	Learning Facilitation	10
	Knowledge: Treatment Regimen	Learning Readiness Enhancement	10
Cardiac Output Alteration	Cardiac Pump Effectiveness	Cardiac Care	83
	Cardiac Pump Effectiveness	Fluid Monitoring	71
	Cardiac Pump Effectiveness	Fluid/Electrolyte Management	56
	Fluid Balance	Fluid Monitoring	34
	Fluid Balance	Cardiac Care	29
	Fluid Balance	Fluid/Electrolyte Management	28
	Cardiac Pump Effectiveness	Dysrhythmia Management	23
	Cardiac Pump Effectiveness	Cardiac Care: Rehabilitative	14
	Fluid Balance	Dysrhythmia Management	10

Table 4.12 Continued

NANDA-I	NOC	NIC	N
Injury, High Risk For	Safety Behavior: Fall Prevention	Fall Prevention	76
	Risk Control	Fall Prevention	58
	Safety Behavior: Fall Prevention	Surveillance: Safety	54
	Risk Control	Surveillance: Safety	46
	Safety Behavior: Fall Prevention	Environmental Management: Safety	31
	Risk Control	Environmental Management: Safety	24
	Safety Behavior: Fall Prevention	Risk Identification	14
Airway Clearness Ineffective	Respiratory Status: Ventilation	Respiratory Monitoring	57
	Respiratory Status: Ventilation		44
	Respiratory Status: Ventilation	Airway Management	16
Infection, Risk For	Immune Status	Infection Protection	57
	Immune Status	Fluid Monitoring	53
	Tissue Integrity: Skin & Mucous Membranes	Infection Protection	53
	Risk Control	Infection Protection	51
	Immune Status	Infection Control	44
	Tissue Integrity: Skin & Mucous Membranes	Fluid Monitoring	40
	Risk Control	Infection Control	38
	Risk Control	Fluid Monitoring	36
	Tissue Integrity: Skin & Mucous Membranes	Infection Control	33
	Immune Status	Nutrition Management	23
	Knowledge: Infection Control	Risk Identification	16
	Knowledge: Infection Control	Infection Protection	15
	Tissue Integrity: Skin & Mucous Membranes	Nutrition Management	15
	Immune Status		14
	Risk Control	Nutrition Management	14
	Risk Control	Risk Identification	14
	Risk Control	Skin Surveillance	14
	Knowledge: Infection Control	Infection Control	13
	Tissue Integrity: Skin & Mucous Membranes	Risk Identification	11
	Tissue Integrity: Skin & Mucous Membranes	Skin Surveillance	11
	Immune Status	Skin Surveillance	10
	Knowledge: Infection Control	Skin Surveillance	10

Table 4.12 Continued

NANDA-I	NOC	NIC	N
Activity Intolerance	Energy Conservation	Cardiac Care	37
	Safety Behavior: Fall Prevention	Cardiac Care	33
	Energy Conservation	Emotional Support	25
	Safety Behavior: Fall Prevention	Emotional Support	20
	Energy Conservation	Nutrition Management	17
	Energy Conservation	Dysrhythmia Management	14
	Safety Behavior: Fall Prevention	Nutrition Management	11
Pain, Acute	Pain Level	Pain Management	49
	Pain Level		23
	Pain Level	Analgesic Administration	17
	Pain Level	Environmental Management: Comfort	16
Tissue Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes		18
	Tissue Integrity: Skin & Mucous Membranes	Infection Control	18
	Knowledge: Treatment Regimen	Infection Control	15
	Tissue Integrity: Skin & Mucous Membranes	Nutrition Management	14
	Knowledge: Treatment Regimen		13
	Knowledge: Treatment Regimen	Nutrition Management	13
	Tissue Integrity: Skin & Mucous Membranes	Wound Care	11
Fluid Volume Deficit	Fluid Balance	Fluid Monitoring	28
	Fluid Balance	Fluid Management	24
	Fluid Balance	Fluid/Electrolyte Management	22
	Fluid Balance		13
Nutrition Less Than Body Requirements Altered	Nutritional Status: Food & Fluid Intake	Nutrition Management	15

Question 6

The sixth research question was "What are the NOC change scores between admission and discharge for patients with CHF?" For mean and standard deviations descriptive statistics were used and for comparison of admission and discharge scores, a t- test was used for differences in NOC outcome scores from admissions to discharges. The mean of the top ten NOC outcomes score ranged from 2.648 to 3.257 at the admission. The mean of the discharge top ten NOC scores ranged from 3.126 to 3.909. The entire top ten NOCs showed significant differences between mean score at admission and discharge at p value < .0001 (Table 4.13). Pain Level is the biggest difference in NOC outcome scores from admission to discharge.

Table 4.13 Mean Scores of the Top Ten NOC Outcomes for Admission and Discharge Scores (Based on 1 to 5 rating)

NOC Outcomes	First Mean (SD)	Last Mean (SD)	Ave Change	P value	N
Knowledge: Treatment Regimen	2.648(0.5823)	3.175(0.818)	0.527	<.0001*	230
Safety Behavior: Fall Prevention	2.938(0.596)	3.325(0.811)	0.387	<.0001*	168
Risk Control	2.825(0.636)	3.219(0.893)	0.393	<.0001*	166
Tissue Integrity: Skin & Mucous Membranes	2.909(0.752)	3.322(0.858)	0.413	<.0001*	168
Cardiac Pump Effectiveness	2.698(0.5311)	3.172(0.701)	0.474	<.0001*	170
Fluid Balance	2.840(0.658)	3.329(0.783)	0.488	<.0001*	143
Respiratory Status: Ventilation	2.836(0.559)	3.346(0.747)	0.509	<.0001*	154
Immune Status	3.000(0.634)	3.413(0.696)	0.413	<.0001*	109
Energy Conservation	2.732(0.509)	3.126(0.630)	0.394	<.0001*	104
Pain Level	3.257(0.686)	3.909(0.625)	0.651	<.0001*	98

Note; *SD = Standard Deviation*. ** p <.0001*

Question 7

The seventh research question was "What is the effectiveness of the frequently used NIC interventions according to NOC outcomes scores for patients with CHF? The mean of NOC admission scores for the top ten NOC - NIC linkages ranged from 2.65 to 3.24. Mean of NOC discharge scores for the top ten NOC-NIC linkages ranged from 3.13 to 3.92.

Except Safety Behavior: Fall Prevention (NOC) - Surveillance: Safety (NIC), others were significant (p value < .01). All of top ten NOC-NIC linkages showed significant (p value <.05) (Table 4.14). All linkages of NOC and NIC are illustrated in Appendix. In addition, mean, SD, and p value of each NOC-NIC linkages are illustrated.

Table 4.14 Mean of NOC Admission and Discharge Scores for the Top Ten NOC-NIC Linkages (Based on 1 to 5 rating)

NOC	NIC	First Mean(SD)	Last Mean(SD)	Ave Change	P value	N
Knowledge: Treatment Regimen	Teaching: Procedure/Treatment	2.72(0.54)	3.27(0.84)	0.542	<.0001*	94
Cardiac Pump Effectiveness	Cardiac Care	2.65(0.56)	3.13(0.69)	0.480	<.0001*	77
Respiratory Status: Ventilation	Respiratory Monitoring	2.77(0.52)	3.45(0.75)	0.676	<.0001*	65
Safety Behavior: Fall Prevention	Fall Prevention	2.88(0.54)	3.24(0.82)	0.351	0.0098***	54
Pain Level	Pain Management	3.24(0.75)	3.92(0.70)	0.673	<.0001*	49
Cardiac Pump Effectiveness	Fluid/Electrolyte Management	2.76(0.48)	3.13(0.58)	0.369	0.0013***	46
Safety Behavior: Fall Prevention	Surveillance: Safety	2.89(0.58)	3.23(0.71)	0.340	0.0156****	44
Risk Control	Fall Prevention	2.83(0.59)	3.46(0.84)	0.634	0.0002**	41
Energy Conservation	Cardiac Care	2.74(0.55)	3.32(0.70)	0.578	0.0002**	38
Risk Control	Infection Protection	2.78(0.64)	3.42(0.84)	0.638	0.0005**	36

Note. *SD = Standard Deviation*. * p<.0001 **p <.001 *** p< .01 **** p<.05

Question 8

The eighth research question was "What are the differences between published NNN linkages and the actual NNN linkages from the results of the study for patients with CHF? Johnson et al (2006) linked the NIC interventions with each NANDA-I and NOC outcomes as a major, suggested or optional interventions. To compare the actual NNN linkages and published NNN linkages listed in Johnson et al (2006), three or more NOCs and NICs for each NANDA-I were identified. The bold print in the following table indicates the top three NOC and NIC linkages associated with the top ten NANDA-I diagnoses (Table 4.15).

Table 4.15 Comparison of NNN linkages according to the top ten NANDA-I Nursing diagnoses with published NNN linkages

NANDA-I	NOC	NIC	N	Published NNN
Knowledge Deficit	**Knowledge: Treatment Regimen**	**Teaching: Procedure/Treatment**	**94**	Major
	Knowledge: Disease Process	**Teaching: Disease Process**	**24**	Major
	Knowledge: Treatment Procedure	Teaching: Procedure/Treatment	22	Major
	Knowledge: Treatment Regimen	Teaching: Disease Process	16	Major
	Knowledge: Medication	Teaching: Prescribed Medication	14	Major
	Knowledge: Diet	Teaching: Prescribed Medication	10	Major
	Knowledge: Treatment Regimen	**Emotional Support**	**41**	Not listed
	Knowledge: Disease Process	Teaching: Prescribed Medication	21	Not listed
	Knowledge: Treatment Procedure	Teaching: Prescribed Medication	17	Not listed
	Knowledge: Treatment Procedure	Teaching: Prescribed Medication	17	Not listed
	Knowledge: Disease Process	Teaching: Procedure/Treatment	16	Not listed
	Knowledge: Disease Process	Teaching: Prescribed Activity/Exercise	15	Not listed
	Knowledge: Treatment Procedure	Teaching: Prescribed Activity/Exercise	13	Not listed
	Knowledge: Disease Process	Teaching: Prescribed Diet	12	Not listed
	Knowledge: Treatment Procedure	Teaching: Prescribed Diet	11	Not listed
	Knowledge: Diet	Teaching: Disease Process	10	Not listed
	Knowledge: Health Behaviors	Teaching: Disease Process	10	Not listed
	Knowledge: Medication	Teaching: Procedure/Treatment	10	Not listed
	Knowledge: Disease Process	Discharge Planning	13	Optional
	Knowledge: Treatment Procedure	Teaching: Disease Process	20	Suggested
	Knowledge: Disease Process	Teaching: Individual	18	Suggested
	Knowledge: Treatment Procedure	Teaching: Individual	16	Suggested
	Knowledge: Disease Process	Learning Facilitation	15	Suggested

Table 4.15 Continued

NANDA-I	NOC	NIC	N	Published NNN
Cardiac Output Alteration	**Cardiac Pump Effectiveness**	**Cardiac Care**	**83**	Major
	Fluid Balance	Fluid Monitoring	34	Not listed
	Fluid Balance	Cardiac Care	29	Not listed
	Fluid Balance	Fluid/Electrolyte Management	28	Not listed
	Fluid Balance	Dysrhythmia Management	10	Not listed
	Cardiac Pump Effectiveness	Dysrhythmia Management	23	Optional
	Cardiac Pump Effectiveness	**Fluid Monitoring**	**71**	Suggested
	Cardiac Pump Effectiveness	**Fluid/Electrolyte Management**	**56**	Suggested
	Cardiac Pump Effectiveness	Cardiac Care: Rehabilitative	14	Suggested
Injury, High Risk For	**Safety Behavior: Fall Prevention**	**Fall Prevention**	**76**	Not listed
	Risk Control	**Fall Prevention**	**58**	Not listed
	Safety Behavior: Fall Prevention	**Surveillance: Safety**	**54**	Not listed
	Risk Control	Surveillance: Safety	46	Not listed
	Safety Behavior: Fall Prevention	Environmental Management: Safety	31	Not listed
	Safety Behavior: Fall Prevention	Risk Identification	14	Not listed
	Risk Control	Environmental Management: Safety	24	Suggested
Airway Clearness Ineffective	**Respiratory Status: Ventilation**	**Respiratory Monitoring**	**57**	Major
	Respiratory Status: Ventilation	**Airway Management**	**16**	Major
Infection, Risk For	**Immune Status**	**Fluid Monitoring**	**53**	Not listed
	Tissue Integrity: Skin & Mucous Membranes	**Infection Protection**	**53**	Not listed
	Risk Control	**Infection Protection**	**51**	Not listed
	Immune Status	Infection Control	44	Not listed
	Tissue Integrity: Skin & Mucous Membranes	Fluid Monitoring	40	Not listed
	Risk Control	Infection Control	38	Not listed
	Risk Control	Fluid Monitoring	36	Not listed
	Tissue Integrity: Skin & Mucous Membranes	Infection Control	33	Not listed
	Immune Status	Nutrition Management	23	Not listed
	Knowledge: Infection Control	Risk Identification	16	Not listed
	Knowledge: Infection Control	Infection Protection	15	Not listed
	Tissue Integrity: Skin & Mucous Membranes	Nutrition Management	15	Not listed
	Risk Control	Nutrition Management	14	Not listed
	Risk Control	Risk Identification	14	Not listed

Table 4.15 Continued

NANDA-I	NOC	NIC	N	Published NNN
	Knowledge: Infection Control	Infection Control	13	Not listed
	Tissue Integrity: Skin & Mucous Membranes	Risk Identification	11	Not listed
	Tissue Integrity: Skin & Mucous Membranes	Skin Surveillance	11	Not listed
	Knowledge: Infection Control	Skin Surveillance	10	Not listed
	Immune Status	**Infection Protection**	**57**	Suggested
	Immune Status	Skin Surveillance	10	Suggested
Activity Intolerance	**Energy Conservation**	**Cardiac Care**	**37**	Not listed
	Safety Behavior: Fall Prevention	**Cardiac Care**	**33**	Not listed
	Energy Conservation	**Emotional Support**	**25**	Not listed
	Safety Behavior: Fall Prevention	Emotional Support	20	Not listed
	Energy Conservation	Dysrhythmia Management	14	Not listed
	Safety Behavior: Fall Prevention	Nutrition Management	11	Not listed
	Energy Conservation	Nutrition Management	17	Suggested
Pain, Acute	**Pain Level**	**Pain Management**	**49**	Major
	Pain Level	**Analgesic Administration**	**17**	Major
	Pain Level	**Environmental Management: Comfort**	**16**	Suggested
Tissue Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Wound Care	11	Major
	Tissue Integrity: Skin & Mucous Membranes	**Infection Control**	**18**	Not listed
	Knowledge: Treatment Regimen	**Infection Control**	**15**	Not listed
	Knowledge: Treatment Regimen	Nutrition Management	13	Not listed
	Tissue Integrity: Skin & Mucous Membranes	**Nutrition Management**	**14**	Suggested
Fluid Volume Deficit	**Fluid Balance**	**Fluid Monitoring**	**28**	Major
	Fluid Balance	**Fluid Management**	**24**	Major
	Fluid Balance	**Fluid/Electrolyte Management**	**22**	Suggested
Nutrition Less Than Body Requirements Altered	**Nutritional Status: Food & Fluid Intake**	**Nutrition Management**	**15**	Suggested

The distribution of the interventions identified in this study by the categories in the previous linkage work is Major Interventions (16%), Suggested Interventions (14%), and Optional interventions (4%). Of the total, sixty-six percent were not-listed (Figure 4.10). This result was not surprising because NNN linkages in the published book represent linkages for patients in general with these diagnoses and not specifically for patients hospitalized with CHF.

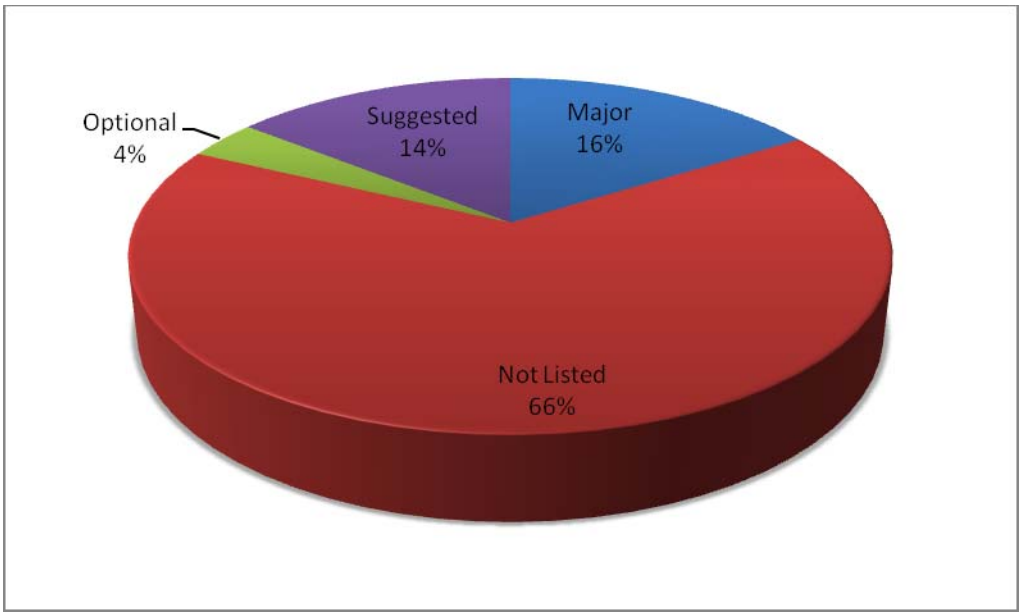


Figure 4.10 Comparison of NOC and NIC linkages associated with the top ten NANDA-I with published NNN linkages.

Summary

This study was to identify the frequently used NANDA-I diagnoses, NOC outcomes, NIC interventions, and NNN linkages for patients with CHF. The study

sample consisted of all records of patients admitted with primary DRG CHF from January 1, 2007 to December 31, 2007 at a Midwestern community hospital in Iowa. A total of 272 patient records were collected for analysis. The study was able to identify the top ten nursing diagnoses, nursing interventions, outcomes, and NNN linkages. These results will provide valuable data for clinical information systems. The most frequently used NIC intervention' effects were identified. The results showed that the majority of NIC interventions for patient hospitalized with CHF had a statistically significant effect on patient outcomes. A few nursing interventions were not significant. In the following chapter 5, discussion of the results will be described.

CHAPTER V

DISCUSSION

The purpose of the study was to identify NANDA-I, NOC, and NIC linkages based on a critical reasoning model to capture accurate nursing care plans for patients hospitalized with CHF. A retrospective descriptive design was used for answering the research questions. Data were obtained after IRB approval from all records of patients discharged with the Medical Diagnoses of CHF (DRG 127) for one year in a hospital using NANDA-I, NOC and NIC located in Iowa. ata from a total of 272 patients were analyzed to describe the frequency and percentage of NANDA-I diagnosis, NIC Interventions, and NOC outcomes for patients hospitalized with CHF. The top ten most frequently used NANDA-I diagnoses associated with NOCs and NICs were identified and then the linkage of NANDA-I, NOC, and NIC based on clinical data were compared with published NNN linkages book (Johnson et al., 2006). Effectiveness of NIC interventions was examined by comparison of admission and discharge of NOC scores using means, SDs, and t -tests.

The Pattern of Use of NANDA-I Nursing Diagnoses for Patients Hospitalized with CHF

In this study, forty -one different NANDA-I nursing diagnoses were selected by nurses for patients hospitalized with CHF. The average number of nursing diagnoses identified for patients with CHF was 5.41 with a range of 1 to 13. The most prevalent

nursing diagnoses were *Knowledge Deficit, Cardiac Output Alteration, Injury High Risk for, Airway Clearance Ineffective, Infection risk for, Activity Intolerance, Pain Acute, Tissue Integrity Impaired, Fluid Volume Deficit, and Nutrition Less than body Requirements Altered*. The top four nursing diagnoses (*Knowledge Deficit, Cardiac Output Alteration, Injury High Risk for, Airway Clearance Ineffective*) represented almost 50% of the total nursing diagnoses for CHF.

Scherb (2003) had identified the frequently used NANDA I diagnoses for CHF in an inpatient population where an average of 10.1 nursing diagnoses were chosen by nurses with a range of 6-18 diagnoses. The average number of NANDA-I diagnoses for each patient in Scherb's study was larger than the results from this study. The reason that a lower number of NANDA diagnoses in this study were identified may be caused by the use of OPT Model. When nurses use the OPT Model the focus is on identifying the key stone issue which is the urgent problem or need of a patient rather than identifying multiple patient problems. The top five frequently used NANDA diagnoses were Knowledge Deficit, Decreased Cardiac Output, Impaired Gas Exchanges, Activity Intolerance and Anxiety. In this previous study forty different nursing diagnoses were chosen for patients with CHF. These results are similar to this study. In this study, forty-one different NANDA I selected and Knowledge Deficit, and Cardiac Output Alteration were top two identified NANDA-I that are common to both studies. However, Activity Intolerance was identified as the sixth ranked in this study. Anxiety and Impaired Gas Exchanges were not found in the top ten NANDA in this study.

In addition, according to De Assis and De Barros (2003), nursing diagnoses for patients hospitalized with CHF were identified based on CHF types I-IV (N=26). Activity

Intolerance was chosen for these patients 100% of the time regardless of severity of CHF. Activity Intolerance is also included in the top ten NANDA-I diagnoses in this study. Fluid Volume Excess was chosen for 79% of patients with type I and II and 92% with type II and IV. Sleep Pattern Disturbance was identified for 80% of patents classified as type I and II, and 90% with types III and IV. Fluid Volume Excess is the twelfth NANDA- I identified in this study. In comparing these studies' results with this study, we can identify that Knowledge Deficit, Cardiac Output Alteration, Activity Intolerance and Fluid Volume Excess might be the common health problems.

The identified nursing diagnoses in this study focused on physiological rather than the psychosocial problems represented in the results of the other studies (De Assis & De Barros, 2003; Scherb, 2003). These results findings were not surprising because hospitalized CHF patients have more physical problems than psychological problems compared with other patients. However, nurses should be encouraged to identify psychological nursing diagnoses for holistic care plan of care for patients.

In addition, according to Lunney (2006), nurses should use clinical judgment and assessment when they select for accurate nursing diagnoses. This study is unique because nurses as diagnosticians used diagnostic reasoning to identify the best diagnoses to guide nursing interventions to achieve positive patient outcomes. Through the literature, there is little evidence that nurses attend to the accuracy of their diagnoses in clinical practice. The reasons for a lack of attention to diagnostic accuracy include inadequate knowledge about the complexity of interpreting human responses and the existence of other priorities in health care settings (Lunney, 2001; Cruz, Pimenta, & Lunney, 2009) and inadequate knowledge and use of standardized nursing terminologies.

Therefore, this study provides an example of an organization that emphasizes the use of clinical reasoning to select nursing diagnoses. Based on this example, nurses need to develop diagnostic competencies in order to become good diagnosticians. In short, identifying nursing diagnoses for the patients hospitalized with CHF is a fundamental skill for providing high quality of care.

The Pattern of Use of NIC Interventions for Patients Hospitalized with CHF

The data in clinical information systems using standardized nursing terminologies such as NIC, commonly used by nurses to document the provision of nursing interventions, provides others with the ability to analysis large data sets and to improve the quality of care provided by nurses to patients. For this, a first step is to show that the documentation of clinical data using the type and pattern of nursing interventions for the specific population. Determining the interventions used most frequently by nurses for a specific population helps to determine interventions that should be included in the facility's nursing information system and content for continuing education needed by care providers. This information is also useful in constructing nursing care plans, determining costs of services, and planning for resource allocation (Dochterman et al., 2005). Thus, it is important to identify the specific interventions commonly delivered for specified groups of patients.

In this study, one hundred forty three different NIC interventions were selected by nurses for patients hospitalized with CHF. Of the total NIC interventions (N=143), 51.03% were often provided which are competences that nurses should have to care for the patients with CHF (*Fluid Monitoring, Cardiac Care, Teaching:Procedure/Treatment,*

Fall Prevention, Emotional Support, Fluid/Electrolyte Management, Infection Protection, Nutrition Management, Infection Control, and Respiratory Monitoring).

Some studies have shown the patterns of NICs for patients. According to Dochterman and colleagues (2005), a broad overview of the nursing interventions for three populations (heart failure, hip fracture procedures, and risk for falling) were identified in their research. For the study, data were obtained from 33 general inpatient units, 1,435 patients with heart failure, 567 patients undergoing hip fracture procedures, and 11,756 in the fall prevention group. A total of 120 different nursing interventions were provided at least once in the heart failure group. The top 18 interventions were used for 49% of those treated for heart failure. The top three frequently used interventions for heart failure patients were Surveillance, Routine care: Adult, and Cardiac Care.

In another similar study by Shever et al. (2007), the most frequently used NICs were identified for patients hospitalized with heart failure, hip procedures and patients who received the nursing intervention of Fall Prevention. Surveillance was the most frequently used intervention for all three patient groups. For heart failure, Routine Care: Adult, Cardiac Care, IV Therapy, Fluid Management, Diet Staging, Teaching, Bed Rest Care, Pain Management, Fall Prevention: Adult were identified as the top ten most frequently used NIC interventions. Four interventions (Surveillance, IV therapy, Fluid Management, and Diet staging) were among the ten most commonly used interventions for all three groups. Based on these two studies results Surveillance was the most prevalent intervention while it was the eleventh most commonly used in this study. The different results might be caused by different facilities policies or difference of patients needs.

Cardiac Care, Teaching, and Fall Prevention are also selected in this study for patients with CHF.

Prevalent NIC domains from the above populations were falling into the domains of Physiological: Basic and Physiological: Complex. This result is similar in this study: Physiological: Basic (29%) is the most frequently selected domain followed by Physiological: Complex (28%).

Other studies have also identified NICs for specific populations in diverse settings (Dahlen & Roberts, 1995; Laurent-Bopp, 2000; Schneider & Slowik, 2009; Weismuller, Grasska, Alexander, White, & Kramer, 2007). In school settings, Pavelka, McCarthy and Denehy (1999) identified NICs that were used by school nurses via a mailed survey. Of the 433 NIC interventions, 114 were used by school nurses at least monthly, while only 32 of them were used at least once a week. Similarly, Weismuller and colleagues (2007) also identified NICs for school nurses. Infection Control, Emergency Care, Eye Care, First Aid, Health Education, and Health Screening were prevalent Safety Domain interventions used in school settings.

The frequently used NICs for 106 patients admitted to home healthcare (Schneider, 2006) were Vital Signs Monitoring. Similarly, the most frequently used NICs for cardiac home care patients were Vital Signs Monitoring, Teaching: Individual, Medication Management, Teaching: Disease Process, and Cardiac Care (Schneider, & Slowik, 2009). By surveying 50 critical care nurses, forty-one nursing interventions were determined to be important for critical patients care. Respiratory Monitoring and temporary pacemaker were the most frequently selected by critical care nurses (Wong, Scott, Bariseno, Crawford, & Hsu, 2009).

The studies about identified NICs for specific populations provide valuable information to evaluate care provided to patients. In addition, the information from multiple studies can reaffirm the types of intervention found useful by practicing nurses. The quality of health care services is an ongoing concern. Concern about the quality has been advanced by continuous quality improvement, outcomes management, effectiveness research, and evidence based practice (Jennings, 2004). Evidence based practice can be strengthened when clinical information systems include NIC and NOC data that can guide care and when documented are used to study the effect of providers' interventions on patients' outcomes. Further research would discern differences in more diverse settings.

The Pattern of Use of NOC Outcomes for Patients Hospitalized with CHF

The need for standardized information about the patient outcomes documented by nurses has increased as organizations have restructured to achieve greater cost effectiveness and qualitative care with patient safety (Moorhead et al., 2009). The Nursing Outcomes Classification (NOC) facilitates the identification and analysis of outcome status for specific patients' populations and also facilitates the identification of realistic standards of care for specific populations.

To realize these benefits, identifying the patterns of NOC outcomes for a particular patient or a group is the first step. In this study, the outcomes for patients hospitalized with CHF were identified. The average number of NOCs selected were 8.15 nursing outcomes per patient with a range from 1 to 35 and sixty-three different NOCs was selected by nurses. The top six NOCs were *Knowledge: Treatment Regimen, Safety*

Behavior: Fall Prevention, Risk Control, Tissue Integrity: Skin & Mucous Membranes, Cardiac Pump Effectiveness, and Fluid Balance. These NOC accounted for almost 50% of the total NOCs selected for patients hospitalized with CHF.

Physiologic Health (35%) is the most frequently selected NOC domain followed by Health Knowledge & Behavior (30%), Functional Health (21%), Psychological Health (8%), Family Health (3%) and Perceived Health (3%). These findings were not surprising because the selected NOCs were related to NICs to assess and measure them. NOC domains are reflective of NIC domains. However, it is necessary to study what factors could affect selections of NOCs. Moorhead et al (2008) identified that a number of factors are considered when selecting an outcome, including the type of health concern, the nursing or medical diagnoses and health problems, patient characteristics, patient resources, patient preferences, patient capacities, and treatment potential. There are a number of aids available that can assist in selecting outcomes for the individual patient, patient groups, or standardized care plans or when teaching staff about the use of the classification and outcomes.

As a tool for assessment and measurement, NOC was used for assessment before interventions and for measurement of outcomes after interventions in this study while other studies only identified the frequency of NOCs in diverse settings such as acute care setting or school settings (Behrenbeck, Timm, Griebenow, & Demmer, 2005; Cavendish, Lunney, Luise, & Richardson, 2001). One study identified the nursing outcomes that were most relevant for acute care nursing practice and assessed the adequacy of measures in 434 patients including cardiac surgery intensive care (n=76) in cardiac transplant unit (n= 153), and medical unit (n= 205) during 14 months at tertiary care center. Thirty- six

NOC outcomes were used 10 or more times and 16 NOCs had an inter-rater reliability of 75% or higher (Behrenbeck, Timm, Griebenow, & Demmer, 2005). Cavendish and colleagues (2001) identified the useful NOCs in school settings for documentation of the effectiveness of nursing interventions.

Finally, these results suggest that more studies are needed about the effectiveness of nursing interventions using NOC outcomes. In addition, the additional research to identify NOCs for specific populations can provide further guidelines for appropriate selections of NOCs.

NNN Linkages Using Clinical Reasoning

Nurses use a decision- making process to determine a nursing diagnosis, to project a desired outcome, and to select interventions to achieve the outcome. The linkages can assist the nurses in making decisions about the outcome and interventions to be selected. However, nurses continually evaluate the patients' situation using critical thinking skills and adjust the diagnoses, outcomes and interventions to fit the unique needs of each patient or patient population. NNN linkages are an important step in the organization of nursing information and provide meaningful categories of data for analysis. The NNN linkages assist with the organization and structuring of nursing clinical information system that are the most efficient for nurses' documentation of the practice.

In this study, the top ten NNN linkages for patients with CHF were *1) Knowledge deficit - Knowledge: Treatment Regimen- Teaching: Procedure/Treatment (N=94), 2) Cardiac Output Alteration-Cardiac Pump Effectiveness-Cardiac Care (N=83), 3) Injury High risk for-Safety behavior: fall prevention-Fall prevention (N=76), 4)Cardiac Output*

Alteration-Cardiac Pump Effectiveness-Fluid Monitoring (N=71), 5) Injury High risk for-Risk Control-Fall Prevention (N=58), 6) Airway Clearance Ineffectiveness-Respiratory Status: Ventilation-Respiratory Monitoring (N=57), 7) *Infection Risk For-Immune Status- Infection Protection (N=57), 8)Cardiac Output Alteration- Cardiac Pump Effectiveness-Fluid/electrolyte Management (N=34), 9) Injury High Risk For-Safety Behavior: Fall Prevention-Surveillance: Safety (N=54), and 10) Infection, and Risk for-Immune Status-Fluid Monitoring (N=53).* Of the ten, four (Knowledge deficit - Knowledge: Treatment Regimen- Teaching: Procedure/Treatment, Cardiac Output Alteration-Cardiac Pump Effectiveness-Cardiac Care, Injury High risk for-Safety behavior: fall prevention-Fall prevention, and Cardiac Output Alteration-Cardiac Pump Effectiveness-Fluid Monitoring) were the major linkages. These linkages were used over 70 times for patients with CHF. Of the four main linkages, two were major (*Knowledge deficit - Knowledge: Treatment Regimen- Teaching: Procedure/Treatment and Cardiac Output Alteration-Cardiac Pump Effectiveness-Cardiac Care*), and one was suggested (*Cardiac Output Alteration-Cardiac Pump Effectiveness-Fluid Monitoring)* and another one was not listed (*Injury High risk for-Safety Behavior: fall prevention-Fall prevention*) in the NNN linkages book by Johnson et al (2006). Some combinations of NNN in the category of "Not listed" were slightly different from the NNN linkages book. For example, in the book, Fall Occurrence was selected as a NOC outcome instead of Safety Behavior: Fall Prevention for Injury High Risk nursing diagnosis. Also, Health education or risk identification was selected as NICs for Injury High Risk nursing diagnosis instead of Fall Prevention in the book.

These linkages from this study were valuable in that they were linked using critical thinking skills while many of studies created NNN linkages without critical thinking skills or validation of NNN linkages. For example, one study using NANDA-I, NOC, and NIC was to provide appropriate nursing diagnoses, interventions, and outcomes relevant to person who have many health problems in the community setting (Criminiello, Terjesen, & Lunney, 2009). The study provides an example for enhancing management of care for specific population. Another case study using SNL was related medical diagnoses which was Diabetes Mellitus. The study encouraged nurses to use critical thinking skill based on patients' complex data to select nursing diagnoses, interventions and outcomes (Fischetti, 2008). In addition, the recent study identified validation of the priority NICs and NOCs for the diagnosis Excess Fluid Volume in cardiac patients. In this study, the content of the interventions and outcomes was scored by seven expert nurses using a Likert scale. The majority of NICs and NOCs were considered useful by Brazilian Cardiology nurses (De Lima Lopes, De Barros, & Michel, 2009). One study also identified that NANDA-I, NIC, and NOC need to add labels to describe life threatening situations when activating rapid response systems (Wong, 2009). In addition nursing care plans using NANDA-I, NOC, and NIC were identified in school settings (Lunney, 2006). In the study, one hundred three children in the 4th and 5th grades in six schools in New York selected as samples for identifying nursing care plans. The most frequently used nursing diagnosis was Knowledge Deficit and the frequently used NIC was Active Listening. Knowledge: Health Behaviors was the most frequently used NOCs.

Identifying new standardized nursing terminologies for describing patients' situation continuously is needed. Research focused on NNN linkages using critical thinking skills is needed. Moreover, evidence based nursing care plans using NNN terminologies should be studied for proving quality of care as well as evidence into the practice.

Identifying the Effectiveness of NIC using NOC Outcome Scores

For analyzing the effect of nursing interventions on the top ten NOC-NIC linkages with for CHF, t-test was used for patients. The dependent variables were the outcomes ratings from admission and discharge. Independent variables were interventions chosen by nurses to achieve each outcome. The top ten NOCs associated NIC interventions were *Knowledge: Treatment Regimen-Teaching: Procedure/Treatment, Cardiac Pump Effectiveness-Cardiac Care, Respiratory Status: Ventilation-Respiratory Monitoring, Safety Behavior: Fall Prevention-Fall Prevention, Pain Management-Pain Level, Cardiac Pump Effectiveness-Fluid/Electrolyte Management, Safety Behavior: Fall Prevention-Surveillance: Safety, Risk Control-Fall Prevention, Energy Conservation-Cardiac Care, and Risk Control-Infection Protection*. Only one NOC and NIC linkage (Safety Behavior: Fall Prevention-Surveillance: Safety) was not statistically significant for the admission and discharge outcomes scores at p value < 0. 01. However, Safety Behavior: Fall Prevention-Surveillance: Safety is significant p value at <.05.

Three NOC- NIC linkages (*Safety Behavior: Fall Prevention-Fall Prevention, Safety Behavior: Fall Prevention-Surveillance: Safety, and Risk Control- Infection Protection*) were not statistically significant at p value <. 001. Seven NOC-NIC linkages

(*Knowledge: Treatment Regimen-Teaching: Procedure/Treatment, Cardiac Pump Effectiveness-Fluid/Electrolyte Management, Pain Management-Pain Level, Cardiac Pump Effectiveness-Cardiac Care, Respiratory Status: Ventilation-Respiratory Monitoring, Risk Control-Fall Prevention, and Energy Conservation-Cardiac Care*) were statistically significant at p value < .001.

One study also identified NOC outcomes changes in admission and discharge in pediatric patients. Twenty -nine patients' records were analyzed and eight NOC outcomes were identified for standard nursing care plan of dehydration. Seven of eight outcomes had statistically significant results indicating that there was improvement in the patient's status from admission to discharge. These outcomes were Nutritional Status, Fluid Balance, Knowledge Status: Illness Care, Child Adaptation to Hospitalization, Electrolyte and Acid/Base Balance, Tissue Integrity: Skin and Mucous Membranes, and Pain Control Behavior (Scherb, Stevens, & Busman, 2007). However, it was not possible to determine a consistent pattern in any of the populations as to what affected the change in outcome ratings from admission to discharge.

Discussion of Limitations

Documentation

Most selected NNN linkages by nurses were not diverse because the currently used patient plan of care was a template providing links developed by experts in the Midwestern community hospital. The reason for pre-coordinated NNN linkages is that selecting nursing diagnoses, outcomes, and interventions is time consuming so that use of preformed care plans has reduced the total universal list of NIC and NOCs. For example,

there are 153 nursing diagnoses and each diagnosis could be linked to over 300 nursing outcomes and over 500 nursing interventions. This combination would be a near infinite number and makes nurses' decision at the point of care very time consuming (Clancy, Delaney, Morrison, Guun, 2006). Thus, for specific population sensitive and essential core NNN linkages are the most efficient way for nurses to document the care they provide by supplying linkages of nursing diagnoses, outcomes, and interventions with a high probability of providing quality care to special populations.

In this study, inappropriate placement of outcomes within the documentation system was found studying the linkages between the nursing diagnoses, outcomes, and interventions. For example, Infection, Risk (NANDA-I) was linked to Tissue Integrity: Skin & Mucous (NOC) and Fluid Monitoring (NIC). These inappropriately placed outcomes related nursing diagnosis have usually small number of frequency. But because outcome was placed inappropriately, the correct nursing diagnosis and intervention may not have been added to the care plans. This would affect the accuracy of the data. The reasons why nurses do not accurately document could be lack of time to complete documentation or might be related to a lack of knowledge regarding standardized nursing terminologies especially for novice nurses. Therefore, continuous education for nurses will be needed in this facility through the continuing education program. In addition, it is necessary to build electronic nursing care plans to document and to retrieve data for nursing interventions effectiveness research.

Data

Large secondary databases have been used for nursing effectiveness studies. However, nursing care plans in this study were paper-based and extracted from not

electronic record so it was not easy to retrieve the data from patients' records. Even though this study used a large clinical database, the sample size was small for the number of the variables in the study. Thus, the sample size may be too small to detect intervention effects. Future studies using a large data set are needed to increase the ability to detect significant effects of nursing interventions for NOC-NIC linkages used for patients. Many outcomes and their related interventions were not studied because they were not particularly prevalent for the CHF population. It might be possible that other interventions and outcomes not studied due to sample size could show statistically significant effects with a larger database.

In addition, the researcher was unable to determine the extent of use of the OPT Model by staff nurses. For example, staff nurses were encouraged to use the OPT Model in this organization and it was included in orientation materials and educational offering but this study did not measure the extent to which the nurses actually used this critical thinking model during care planning processes.

Another data limitation is that some of the interventions were linked to more than one outcome. For example, a patient may not have Fluid Management linked to the outcome of Fluid Balance but Fluid Management could be linked to a different outcome such as Hydration. So the patient is receiving Fluid Management and it could be affecting more than the one outcome with which it is associated. Therefore, intervention effects may be found between interventions and outcomes that are linked to each other within the documentation system. However, when we considered about linked NOC-NIC data, the small data were identified. It could affect statistically the results. Moreover, nurses are not the only discipline that impact the outcomes achieved. For example, the interventions

of physicians and other health providers may have impacted the outcomes of patients in this study. Future studies need to include the interventions of these disciplines to obtain a more accurate description of what interventions have the greatest effect on patient outcomes.

System

It is important to measure the nursing outcomes by eliminating bias. It is possible with three shifts of nurses providing care to the patients in this study. At least four nurses could deliver nursing care to a patient. Some variance of outcome ratings might exist among nurses and could be factors that impact the research findings. In addition, outcomes were rated on admission to a nursing unit within the hospital. Often this is not the first contact the patient has had with nurses or other disciplines. If the patient was seen in the emergency room before admission, many interventions are already provided. Thus, when the outcome rating is not completed until patient is admitted to a unit, interventions are likely to have already affected the outcome. This would impact the amount of change that would be seen in outcome ratings from admission to discharge. The initial outcome rating may have been lower if interventions had not been provided prior to the nurse documenting the rating. It would be beneficial if outcomes were rated in the emergency room prior to the initiation of treatment. This would be true with clinic settings as well so it is important that outcomes are measured across the care continuum and not just at admission to acute care nursing units.

Only the ten most prevalent outcomes for the population were analyzed. Future studies may need to examine a more complete list of outcomes across all populations.

Implications

Research

For quality of care, this research on studying the NNN linkages using critical reasoning was important. With the increasing use of technologies in clinical settings, Identifying standardized nursing care plans using standardized nursing terminologies are required for clinical information system development. By doing this, nurses can document more accurate nursing care for specific populations.

Based on the results from this study, future studies should 1) explore the processes in clinical reasoning when nurses select nursing diagnoses, outcomes and interventions, 2) identify evidence based NNN linkages to facilitate integrating evidence into practice, 3) further evaluate the effectiveness of using evidence based nursing care plans for patients with CHF and other populations, and 4) identify the staffing ratios or skill mix required for the number of nursing diagnosis and nursing interventions required for quality patient care.

Practice

Documenting nursing care using standardized nursing terminologies is a responsibility for any nurse. The terminologies are often updated and modified. Thus, ongoing staff education related with standardized nursing terminologies and the nursing process using critical thinking skills is necessary. There will be time constraints related to documentation but it is important that nurses realize that they must document accurately for the data to be reused to treat patients care and to measure effectiveness of care provided by nurses.

Education about the SNLs and critical thinking skills was the primary focus leading during the implementation of the nursing processes. Recommendations for future implementations would be to focus education efforts on each of the terminology separately to select proper NOC and NIC for NANDA-I diagnoses. Understanding how to measure outcomes is another responsibility for nurses. Inter-rater reliability testing during implementation may have assisted the nurses in understanding the outcomes and the rating process. During the implementation, changes of pre-coordinated nursing care plans with NNN terminologies are constantly made in the documentation system. For example, a nurse should add, delete and revise nursing diagnoses, interventions, outcomes and the linkages between them. However, it was difficult to make changes using paper-based records. To meet this need, computerized nursing documentation systems (CNDS) are recommended. Also by using computerized nursing documentation, it is easy to store data and retrieve data for nursing interventions effectiveness research. A computerized nursing documentation system will be developed in this facility in the near future.

Education

This facility has used standardized nursing terminologies (NANDA-I NOC, and NIC) for a long time. The majority of nurses in this facility are familiar with these NNN terminologies. They understood these nursing terminologies in this facility through the education. They might not come into practice with a solid understanding of the languages, the purpose of the languages, nor the understanding of the importance of the languages to the nursing profession. Although some nurses have experienced learning about the theses terminologies, they could be updated and modified. Thus, it is necessary

for all facilities to educate standardized nursing terminologies continuously for nurses. In addition, all educational institutions should adopt standardized nursing terminologies so that nursing students have knowledge about the standardized nursing terminologies, use the terminologies when learning the nursing process with critical thinking skills and understand the importance of the terminologies to the nursing profession. By doing this, graduating nurses will have an ability to build quality patient care practices. Based on this process, documentation practices will be enhanced. Additionally, the data retrieved from the clinical documentation systems using standardized nursing terminologies will better identify the pertinent patient problems, the desired outcomes, and the necessary interventions needed to assist patients in achieving these outcomes. More accurate documentation practices of nurses will be built in the practice. Nurse practitioners students should be encouraged to document medical and nursing practice actives of the care they provide to patients to help build the knowledge base of nursing.

Policy

Identifying the NNN linkages using critical thinking skills is essential for nursing to improve accurate nursing care plans. Because of the pressure on healthcare to demonstrate results and quality of care, nurses need to demonstrate their contributions to the public and to policy makers. Thus, nursing must continue to explore its contribution to the achievement of patient outcomes. Implementation of standardized nursing terminologies within computerized clinical documentation systems for the development of large clinical data sets are required because through these data sets nursing effectiveness research can be completed. It can influence health policy because the policy makers will not be responsive to a discipline that cannot provide data supporting its

effectiveness. Thus, nursing needs to continue to be present at the discussions related to reference terminologies and standards for the electronic patient record and the importance of this data to evaluating care must be emphasized. Through these ongoing efforts, nursing will positioned to make a substantial contribution to current and future health policy decisions.

Conclusions

The purpose of the study was to identify NNN linkages using critical thinking skills for patients with CHF. With increasing complex health environment, patients have diverse health problems at the same time. Nurses have to select accurate nursing diagnoses, nursing outcomes, and nursing interventions using critical thinking skills. Among the near infinite number of NNN terminologies combination, however, it is difficult to select appropriate nursing diagnosis, outcomes and interventions. Identifying NNN linkages from actual clinical data in this study provides guidance for selecting appropriate nursing diagnoses, outcomes, and interventions for a population.

In addition, with the advancing of technology, it is possible for assessing the effects of nursing interventions on patient outcomes with standardized nursing terminologies such as NOC and NIC. Analysis of nursing effectiveness through the use of large data sets will be able to make nursing visible to other health providers as well as policy makers.

APPENDIX A: NURSING DIAGNOSTIC REASONING

NURSING DIAGNOSTIC REASONING

COMPETENCY ASSESSMENT AND VALIDATION
Genesis Medical Center

01/2008 Updated Definition

NURSING DIAGNOSTIC REASONING-Identifies the patient's need for nursing care based on nursing assessed signs or symptoms, projects outcomes and assigns interventions appropriate to meet patient needs.

Employee: Please read performance criteria and √ any item needing review.	Needs Review	Validation Date/Preceptor Initials
1. Identifies two or more signs or symptoms		
2. Recognize the cluster of signs and symptoms as defining characteristics of the need (Problem)		
3. Name (select) the need as a nursing diagnosis		
4. Identify the related factor (signs or symptoms)		
5. Project outcomes		
6. Assign nursing intervention(s) that alter the sign and symptoms		
7. Use nursing standardized languages (NANDA, NIC and NOC or Perioperative Nursing Data Set)		

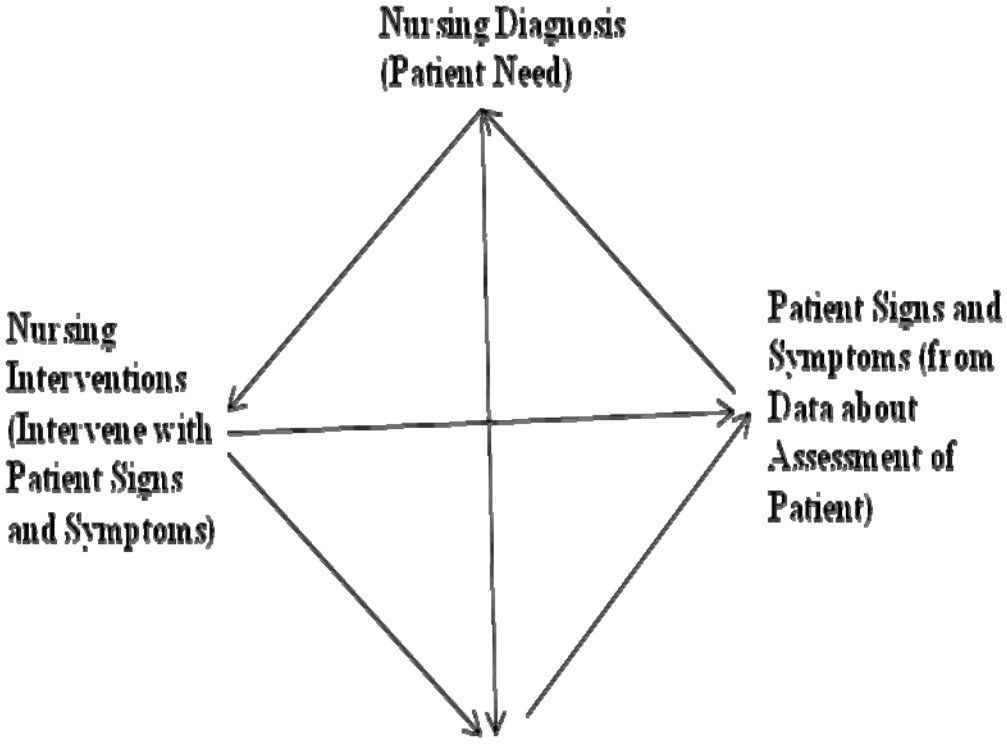
EVALUATION MECHANISMS:

( ) Completion of case study at completion of nursing orientation – 3 completed diagnostic reasoning cycles approved and an annual renewal.

( ) Observation of Performance

Employee_____ Preceptor(s) _____

NURSING DIAGNOSTIC REASONING



Ken Cianfrani
University of Illinois

APPENDIX B: PATIENT PLAN OF CARE SHEET

PATIENT PLAN OF CARE

GENESIS MEDICAL CENTER - Davenport, Iowa

PAIN, ACUTE: Experience of an unpleasant sensory and emotional sensation for a duration of less than 6 months.

SIGNS & SYMPTOMS Observed or reported (select at least 2)

- ☐ Change in BP 1B00120001
- ☐ Patients self report of pain 1B00120002
- ☐ Change in respiratory pattern 1B00120003
- ☐ Restlessness 1B00120004
- ☐ Diaphoresis 1B00120005
- ☐ Whimpering 1B00120011
- ☐ Grimacing 1B00120006
- ☐ Increased muscle tension 1B00120007
- ☐ Whining 1B00120010
- ☐ Crying 1B00120008
- ☐ Change in pulse rate 1B00120009

OUTCOME SCORING

RELATED FACTORS	OUTCOMES	ADM				**DC**	INTERVENTIONS
☐Physical injuring agent 1A00120001 ☐Psychological injuring agent 1A00120002	☐Pain Control -Recognizes Causal Factors -Uses Non-Analgesic Relief Measures -Uses Analgesics Appropriately -Reports Pain Controlled 1d00121605 ☐Pain Level -Oral/Facial Expressions of Pain -Change in Respiratory Rate, Heart Rate BP -Restlessness -reported pain 1d00122102						☐Pain Management 1E00121400 ☐Analgesic Administration 1E00122210 ☐Patient-Controlled Analgesic (PCA) Assistance 1E00122400 ☐Analgesic Administration: Intraspinal 1E00122214 ☐Environmental Management: Comfort 1E00126482 ☐Anxiety Reduction 1E00125820 ☐Transcutaneous Electrical Nerve Stimulation (TENS) 1E00121540 ☐Heat/Cold Application 1E00121380 ☐Distraction 1E00125900 ☐Simple Relaxation Therapy 1E00126040 ☐Simple Massage 1E00121480

Diagnosis_____

Date Initiated_____RN Initials_____

Date Resolved_____

469-006G 7/00

PATIENT PLAN OF CARE

ACUTE PAIN

OUTCOME SCORING

RELATED FACTORS	OUTCOMES	ADM				**DC**	INTERVENTIONS
	☐Comfort Level -Reported satisfaction with symptom control -Expressed satisfaction with pain control -Reported physical well-being 0d00122100						☐Developmental Care 1E00128250 ☐Preparatory Sensory Information 1E00125580 ☐Positioning 1E00120840

Definition of Scoring Scales	**1**	**2**	**3**	**4**	**5**
Pain Control- personal actions to control pain	Never Demonstrated	Rarely Demonstrated	Sometimes Demonstrated	Often Demonstrated	Consistently Demonstrated
Pain Level- severity of reported pain	Severe	Substantial	Moderate	Slight	None
Comfort Level-extent of physical and psychological lease	None	Limited	Moderate	Substantial	Extensive

*IER-In Expected Range
*WNL-Within Normal Limits

APPENDIX C: RESULTS OF THE STUDY

Table C.1 Related factors less than 50% of the total

Related Factors	Freq	%	Cum%
Congestive heart failure	18	2.70	55.71
Physical injuring agent	11	1.65	57.36
COPD	10	1.50	58.86
Chronic illness	10	1.50	60.36
External (environmental) hyper or hypothermia. Chemical substance, mechanical factors (shearing forces, pressure, restraint), radiation, physical immobilization, humidity	9	1.35	61.
Inadequate secondary defenses and immunosuppression (decreased hemoglobin, leukopenia, suppressed inflammatory response, malnutrition)	9	1.35	63.06
Inadequate physical/social resources	8	1.20	64.26
Pathophysiological (acute or chronic illness, dysphasia, hypermetabolic/catabolic state, nausea/vomiting, NPO status for extended period, endocrine disorder, cirrhosis, diarrhea, radiation therapy, edentulous condition,	8	1.20	65.47
Retained secretions	8	1.20	66.67
Altered heart rate/rhythm	7	1.05	67.72
Altered afterload	6	0.90	68.62
Altered preload	6	0.90	69.52
Cognitive and/or physiological limitation	6	0.90	70.42
Internal (somatic) medication, altered nutritional state (obesity, emaciation), altered metabolic state, altered circulation, altered sensation, altered pigmentation, skeletal prominence, development factors, immunologic	6	0.90	71.32
Lack of interest in learning	6	0.90	72.22
Ventilation/perfusion alterations	6	0.90	73.12
Weakness/tiredness	6	0.90	74.02
Deconditioned status (bedrest/immobility, generalized weakness, sedentary lifestyle)	5	0.75	74.77
Failure to practice preventative measures	5	0.75	75.53
Oxygen supply and demand imbalance	5	0.75	76.28
Psychological injuring agent	5	0.75	77.03
Respiratory muscle fatigue	5	0.75	77.78
Body position	4	0.60	78.38
Health status	4	0.60	78.98
Infection	4	0.60	79.58
Obesity	4	0.60	80.18
Over 60 years of age	4	0.60	80.78
Psychological	4	0.60	81.38
Deconditioned status	3	0.45	81.83
Disturbance in pattern of tension release	3	0.45	82.28
Environment	3	0.45	82.73
Environmental exposure (pharmaceutical agents, radiation therapy, increased environmental exposure)	3	0.45	83.18
Excess ingestion of sodium containing foods or medications	3	0.45	83.63
Knowledge deficit	3	0.45	84.08
Musculoskeletal impairment	3	0.45	84.53
Neurological impairment (reduced level of consciousness, depressed cough and gag reflexes, impaired swallowing, pocketing of food)	3	0.45	84.98
Situational or maturational crises	3	0.45	85.44
Altered contractility	2	0.30	85.74
Alveolar-capillary membrane changes	2	0.30	86.04
Anxiety	2	0.30	86.3

Table C.1 Continued

Related Factor	Freq	%	Cum%
Delirium	2	0.30	86.64
Developmental	2	0.30	86.94
External (pressure, shearing, chemical substance, physical immobilization, radiation, excretions/secretions, hyper/hypothermia, restraint, humidity)	2	0.30	87.24
Functional Factors (Insufficient physical activity, inadequate toileting, irregular defecation habits, abdominal muscle weakness, recent environmental changes)	2	0.30	87.54
Hyperventilation	2	0.30	87.84
Hypoventilation syndrome	2	0.30	88.14
Immobility	2	0.30	88.44
Inadequate resources available	2	0.30	88.74
Inadequate social support	2	0.30	89.04
Ineffective coping	2	0.30	89.34
Mechanical (pressure, friction, shear)	2	0.30	89.64
Neuromuscular impairment	2	0.30	89.94
Physiological factors(dehydration, insufficient fiber intake, poor eating habits, change in usual foods and eating patterns, decreased motility of GI tract, Inadequate dentition or oral hygiene, insufficient fluid intake	2	0.30	90.24
Physiological insult	2	0.30	90.54
Poor physical condition	2	0.30	90.84
Presence of circulatory/ respiratory problems	2	0.30	91.14
Self concept	2	0.30	91.44
Social role function	2	0.30	91.74
Unfamiliarity	2	0.30	92.04
Airway spasm	1	0.15	92.19
Alteration/lack of communication skills	1	0.15	92.34
Altered circulation	1	0.15	92.49
Alzheimer s disease	1	0.15	92.64
Asthma	1	0.15	92.79
Blockage (stone, edema, tumor, BPH, fecal impaction, stricture)	1	0.15	92.94
Caregiver-care-receiver relationship	1	0.15	93.09
Caregiving activities	1	0.15	93.24
Cultural barrier	1	0.15	93.39
Dementia	1	0.15	93.54
Depression	1	0.15	93.69
Excessive loss (diarrhea, diuretics, indwelling tubes)	1	0.15	93.84
Excessive mucus	1	0.15	93.99
Family processes	1	0.15	94.14
Fluid deficit/excess	1	0.15	94.29
Gastrointestinal impairment (increased intragastric pressure, gastric residual, decreased gastrointestinal motility, delayed gastric emptying, incomplete esophageal sphincter)	1	0.15	94.44
History of previous intolerance	1	0.15	94.59
Humidity	1	0.15	94.74
Impaired Cognition	1	0.15	94.89
Impaired mobility status	1	0.15	95.05
Impaired transfer ability	1	0.15	95.20
Inability to ingest food or absorb nutrients	1	0.15	95.35
Increased physical exertion	1	0.15	95.50
Insufficient knowledge to avoid exposure to pathogens	1	0.15	95.65
Internal (alterations in nutritional state [obesity, emaciation], metabolic state, circulation, sensation, pigmentation, skin turgor, skeletal prominence, medications, immunologic reaction, psychogenic)	1	0.15	95.80

Table C.1 Continued

Related Factors	Freq	%	Cum%
Lights	1	0.15	95.95
Mechanical Factors (Postsurgical obstruction, prostate enlargement, neurological impairment, electrolyte imbalance, hemorrhoids)	1	0.15	96.10
Multi-infarct dementia	1	0.15	96.25
Neurological disturbances	1	0.15	96.40
Noise	1	0.15	96.55
Nutritional deficit/excess	1	0.15	96.70
Pain/discomfort	1	0.15	96.85
Pathophysiological (inhibition or injury of nerve stimulus; anesthesia medications, alcohol, pain, lack of sufficient muscle control)	1	0.15	97.00
Perceived threat to value system	1	0.15	97.15
Perceptual and/or cognitive impairment	1	0.15	97.30
Pharmacological Factors (antidepressants, aluminum-containing antacids, calcium channel blockers, laxative overuse, opiates, sedatives)	1	0.15	97.45
Prescribed movement restriction(s), e.g.; restraints, bedrest prescription, use of mechanical equipment that restricts movement, therapeutic immobilizations	1	0.15	97.60
Psychological (anxiety, depression)	1	0.15	97.75
Psychological barrier (psychosis, lack of stimuli, stress)	1	0.15	97.90
Psychological factors (depression, emotional stress, mental confusion)	1	0.15	98.05
Renal failure	1	0.15	98.20
Resources	1	0.15	98.35
Role change in family/family dis-organization	1	0.15	98.50
Secretions in the bronchi	1	0.15	98.65
Self Care Deficit Toileting	1	0.15	98.80
Situational/developmental crisis of significant other	1	0.15	98.95
Smoking	1	0.15	99.10
Temperature	1	0.15	99.25
Third spacing of fluid	1	0.15	99.40
Threat of death	1	0.15	99.55
Uncertainty	1	0.15	99.70
Unclear personal values/beliefs	1	0.15	99.85
Weakened supporting pelvic structures	1	0.15	100.00

Table C.2 Signs/Symptoms below 50% of the total

Signs/Symptoms	Freq	%	Cum%
Abnormal heart rate or blood pressure response to activity	33	2.50	53.19
Variations in blood pressure readings	31	2.35	55.54
Dyspnea	29	2.20	57.74
Chest congestion	25	1.90	59.64
Inappropriate behaviors	23	1.75	61.38
Ability to identify object of fear	21	1.59	62.97
Restlessness	18	1.37	64.34
Difficulty with sputum	17	1.29	65.63
Aversion to eating	14	1.06	66.69
EKG changes indicating arrhythmia s or ischemia	14	1.06	67.75
Ineffective or absent cough	14	1.06	68.82
Reported inadequate food intake less than RDA	12	0.91	69.73
Tachycardia	12	0.91	70.64
Grimacing	11	0.83	71.47
Inaccurate performance of test	11	0.83	72.31
Lethargy	11	0.83	73.14
Dry mouth	10	0.76	73.90
Pitting edema	10	0.76	74.66
Abnormal rate, rhythm,depth of breathing	9	0.68	75.34
Change in respiratory pattern	9	0.68	76.02
Dependent edema	9	0.68	76.71
Lack of knowledge	9	0.68	77.39
Fatigue	8	0.61	78.00
Weight gain over short period	8	0.61	78.60
Change in pulse rate	7	0.53	79.14
Concentrated urine	7	0.53	79.67
Interest in improving health behaviors	7	0.53	80.20
Rales	7	0.53	80.73
Change in BP	6	0.46	81.18
Decreased ejection fraction Stroke Volume Index (SVI), Left Ventricular Stroke Work Index (LVSWI)	6	0.46	81.64
Disruption of skin surface	6	0.46	82.09
Edema	6	0.46	82.55
Shortness of breath/dyspnea	6	0.46	83.00
Whining	6	0.46	83.46
Reported or observed inability to take responsibility for meeting basic health practice in function patterns area	5	0.38	83.84
Altered Contractility Restlessness	4	0.30	84.14
Anxious	4	0.30	84.45
Apathetic	4	0.30	84.75
Destruction of skin layers	4	0.30	85.05
Gait changes, e.g.; decreased walk speed, difficulty initiating gait, small steps, shuffles feet, exaggerated lateral postural sway	4	0.30	85.36
Hypoxemia	4	0.30	85.66
Lack of adaptive behaviors	4	0.30	85.96
Anxiety	3	0.23	86.19
Cold/clammy skin	3	0.23	86.42
Crying	3	0.23	86.65
Decreased vital capacity	3	0.23	86.87
Difficulty turning	3	0.23	87.10

Table C.2 Continued

Signs/Symptoms	Freq	%	Cum%
Fluctuation in cognition	3	0.23	87.33
Increased tension	3	0.23	87.56
Intake exceeds output	3	0.23	87.78
Normal serum sodium	3	0.23	88.01
Oliguria	3	0.23	88.24
Pleural effusion	3	0.23	88.47
Reports pain is present	3	0.23	88.69
Use of accessory muscles	3	0.23	88.92
Apprehension	2	0.15	89.07
Bladder distention	2	0.15	89.23
Body weight 20% or more under less than ideal	2	0.15	89.38
Bounding, full pulse	2	0.15	89.53
Change in bowel pattern	2	0.15	89.68
Clinical evidence of organic impairment	2	0.15	89.83
Cough	2	0.15	89.98
Decreased frequency	2	0.15	90.14
Decreased inspiratoyr/expiratory pressure	2	0.15	90.29
Drowsy	2	0.15	90.44
Elevated hematocrit	2	0.15	90.59
Fecal staining of clothing/bedding	2	0.15	90.74
Fluctuation in level of conciousness	2	0.15	90.90
Inability to Go to toilet or commode	2	0.15	91.05
Inability to Manipulate clothing	2	0.15	91.20
Inability to Obtain or get to water source	2	0.15	91.35
Inability to Put on clothing on lower body	2	0.15	91.50
Inability to Put on clothing on upper body	2	0.15	91.65
Inability to maintenance appearance at satisfactory level	2	0.15	91.81
Inability to meet role expectations	2	0.15	91.96
Inability to take off necessary item of clothing	2	0.15	92.11
Inadequate problem solving	2	0.15	92.26
Inappropriate	2	0.15	92.41
Increased anxiety	2	0.15	92.56
Increased muscle tension	2	0.15	92.72
Irritability	2	0.15	92.87
Lack of goal directed behavior/resolution of problem	2	0.15	93.02
Loss of weight with adequate food intake	2	0.15	93.17
Murmurs	2	0.15	93.32
Orthopnea	2	0.15	93.47
Orthopnea/paroxysmal noctural dyspnea	2	0.15	93.63
Poor eye contact	2	0.15	93.78
Residual urine	2	0.15	93.93
Scared	2	0.15	94.08
Sleep disturbances	2	0.15	94.23
Tired	2	0.15	94.39
Whimpering	2	0.15	94.54
Worried	2	0.15	94.69
Abdominal pain	1	0.08	94.76
Able to completely empty bladder	1	0.08	94.84
Abnormal arterial blood gases	1	0.08	94.92
Altered interpretation/response to stimuli	1	0.08	94.99

Table C.2 Continued

Signs/Symptoms	Freq	%	Cum%
Apprehension about possible institutionalization of care receiver	1	0.08	95.07
Confusion	1	0.08	95.14
Confusion/disorientation	1	0.08	95.22
Decreased hematocrit	1	0.08	95.30
Decreased muscle mass/strength	1	0.08	95.37
Decreased reaction time	1	0.08	95.45
Delayed decision-making	1	0.08	95.52
Depressed mood	1	0.08	95.60
Difficulties watching the care receiver go through the illness	1	0.08	95.68
Distended abdomen	1	0.08	95.75
Distressed	1	0.08	95.83
Does not or cannot speak	1	0.08	95.90
Emotional strength	1	0.08	95.98
Evidence of lack of food	1	0.08	96.05
Facial tension	1	0.08	96.13
Fearful	1	0.08	96.21
Feeling uncertainty with changed relationship	1	0.08	96.28
Fluctuation in sleep/wake cycle	1	0.08	96.36
Focus on self	1	0.08	96.43
Hallucinations	1	0.08	96.51
Hard stools	1	0.08	96.59
Hypo or hyperactive Bowel sounds	1	0.08	96.66
Impaired memory (short term, long term)	1	0.08	96.74
Impaired socialization	1	0.08	96.81
Inability to carry out proper toilet hygiene	1	0.08	96.89
Inability to complete caregiving tasks	1	0.08	96.97
Inability to delay defecation	1	0.08	97.04
Inability to determine if a behavior was performed	1	0.08	97.12
Inability to empty bowel or bladder	1	0.08	97.19
Inability to fasten clothing	1	0.08	97.27
Inability to get in & out of bathroom	1	0.08	97.34
Inability to maintain usual routine	1	0.08	97.42
Inability to purposefully move	1	0.08	97.50
Inability to recognize & respond to full bladder	1	0.08	97.57
Inability to recognize urge to defecate	1	0.08	97.65
Inability to regulate temperature or flow	1	0.08	97.72
Inability to wash body or body parts	1	0.08	97.80
Increased agitation or restlessness	1	0.08	97.88
Insomnia	1	0.08	97.95
Invasion of body structures	1	0.08	98.03
Lack of energy/inability to maintain usual level of physical activity	1	0.08	98.10
Lack of information	1	0.08	98.18
Lack of motivation to initiate and/or follow through with goal-directed purposeful behavior	1	0.08	98.25
Limited ability to perform fine motor skills	1	0.08	98.33
Loss of urine before reaching toilet	1	0.08	98.41
Low urinary sodium	1	0.08	98.48
Misperceptions	1	0.08	98.56
Moaning	1	0.08	98.63
Movement induced shortness of breath	1	0.08	98.71
Observed or reported experiences of forgetting	1	0.08	98.79

Table C.2 Continued

Signs/Symptoms	Freq	%	Cum%
Orthostatic hypotension	1	0.08	98.86
Painful and persistent increased helplessness	1	0.08	98.94
Physical energy	1	0.08	99.01
Physical signs of distress or tension (increased heart rate, increased muscle tension, restlessness, etc.)	1	0.08	99.09
Poor skin turgor	1	0.08	99.17
Purse lip breathing	1	0.08	99.24
Questioning personal values and beliefs while attempting a decision	1	0.08	99.32
Senses need to void	1	0.08	99.39
Slowed movement	1	0.08	99.47
Somatic preoccupation	1	0.08	99.54
Speaks or verbalizes with difficulty	1	0.08	99.62
Time	1	0.08	99.70
Unable to speak dominant language	1	0.08	99.77
Uncoordinated or jerky movements	1	0.08	99.85
Vacillation between alternative choices	1	0.08	99.92
Weakness of muscles required for swallowing or mastication	1	0.08	100.0

Table C.3 NOC Outcomes frequency (Below ten times used)

NOC Outcomes	Freq	%	Cum Freq	Cum %
Coping	9	0.41	2062	93.47
Fear Control	9	0.41	2071	93.88
Nutritional Status	9	0.41	2080	94.29
Circulation Status	7	0.32	2087	94.61
Safety Behavior: Personal	7	0.32	2094	94.92
Wound Healing: Secondary Intention	7	0.32	2101	95.24
Cognitive Ability	6	0.27	2107	95.51
Health Promoting Behavior	6	0.27	2113	95.78
Nutritional Status: Nutrient Intake	6	0.27	2119	96.06
Tissue Perfusion: Cardiac	6	0.27	2125	96.33
Endurance	5	0.23	2130	96.55
Hydration	5	0.23	2135	96.78
Ambulation: Walking	4	0.18	2139	96.96
Aspiration Control	4	0.18	2143	97.14
Bowel Elimination	4	0.18	2147	97.33
Knowledge: Health Resources	4	0.18	2151	97.51
Mobility Level	4	0.18	2155	97.69
Neurological Status: Consciousness	4	0.18	2159	97.87
Cognitive Orientation	3	0.14	2162	98.01
Communication: Receptive Ability	3	0.14	2165	98.14
Distorted Thought Control	3	0.14	2168	98.28
Self-Care: Eating	3	0.14	2171	98.41
Urinary Elimination	3	0.14	2174	98.55
Acceptance: Health Status	2	0.09	2176	98.64
Immobility Consequences: Physiological	2	0.09	2178	98.73
Self-Care: Dressing	2	0.09	2180	98.82
Self-Care: Grooming	2	0.09	2182	98.91
Self-Care: Hygiene	2	0.09	2184	99.00
Self-Care: Toileting	2	0.09	2186	99.09
Tissue Perfusion: Peripheral	2	0.09	2188	99.18
Transfer Performance	2	0.09	2190	99.27
Ambulation: Wheelchair	1	0.05	2191	99.32
Bowel Continence	1	0.05	2192	99.37
Caregiver Stressors	1	0.05	2193	99.41
Caregiver-Patient Relationship	1	0.05	2194	99.46

Table C.4 NIC interventions frequency (Below ten times used)

NIC Interventions	Freq	%	Cum Freq	Cum %
Calming Technique	9	0.34	2370	90.05
Nutrition Therapy	9	0.34	2379	90.39
Dementia Management	8	0.3	2387	90.69
Decision-Making Support	7	0.27	2394	90.96
Distraction	7	0.27	2401	91.22
Health Education	7	0.27	2408	91.49
Pressure Management	7	0.27	2415	91.76
Skin Care: Topical Treatments	7	0.27	2422	92.02
Aspiration Precautions	6	0.23	2428	92.25
Bedrest Care	6	0.23	2434	92.48
Family Support	6	0.23	2440	92.71
Mutual Goal Setting	6	0.23	2446	92.93
Pressure Ulcer Care	6	0.23	2452	93.16
Reality Orientation	6	0.23	2458	93.39
Counseling	5	0.19	2463	93.58
Family Involvement	5	0.19	2468	93.77
Sleep Enhancement	5	0.19	2473	93.96
Activity Therapy	4	0.15	2477	94.11
Cardiac Care: Acute	4	0.15	2481	94.26
Cough Enhancement	4	0.15	2485	94.41
Exercise Promotion	4	0.15	2489	94.57
Exercise Therapy: Ambulation	4	0.15	2493	94.72
Feeding	4	0.15	2497	94.87
Hair Care	4	0.15	2501	95.02
Incision Site Care	4	0.15	2505	95.17
Mood Management	4	0.15	2509	95.33
Oral Health Maintenance	4	0.15	2513	95.48
Self Care Assistance	4	0.15	2517	95.63
Tube Care: Urinary	4	0.15	2521	95.78
Bowel Management	3	0.11	2524	95.9
Decision Making Support	3	0.11	2527	96.01
Embolus Precautions	3	0.11	2530	96.12
Exercise Therapy: Balance	3	0.11	2533	96.24
Exercise Therapy: Joint Mobility	3	0.11	2536	96.35
Foot Care	3	0.11	2539	96.47
Medication Management	3	0.11	2542	96.58
Nail Care	3	0.11	2545	96.69
Safety	3	0.11	2548	96.81
Simple Relaxation Therapy	3	0.11	2551	96.92
Active Listening	2	0.08	2553	97
Bathing	2	0.08	2555	97.07
Bowel Incontinence Care	2	0.08	2557	97.15
Conflict Mediation	2	0.08	2559	97.23
Crisis Intervention	2	0.08	2561	97.3
Dressing	2	0.08	2563	97.38
Exercise Therapy: Muscle Control	2	0.08	2565	97.45
Eye Care	2	0.08	2567	97.53
Heat/Cold Application	2	0.08	2569	97.61

Table C. 4 Continued

NIC Interventions	Freq	%	Cum Freq	Cum %
Hypervolemia Management	2	0.08	2571	97.68
Immunization/Vaccination Administration	2	0.08	2573	97.76
Neurologic Monitoring	2	0.08	2575	97.83
Positioning: Wheelchair	2	0.08	2577	97.91
Referral	2	0.08	2579	97.99
Self Care Assistance: Bathing/Hygiene	2	0.08	2581	98.06
Self Care Assistance: Dressing/Grooming	2	0.08	2583	98.14
Self Care Assistance: Toileting	2	0.08	2585	98.21
Touch	2	0.08	2587	98.29
Transcutaneous Electrical Nerve Stimulation (TENS)	2	0.08	2589	98.37
Urinary Catheterization	2	0.08	2591	98.44
Urinary Elimination Management	2	0.08	2593	98.52
Wound Irrigation	2	0.08	2595	98.59
Acid-Base Management	1	0.04	2596	98.63
Airway Suctioning	1	0.04	2597	98.67
Allergy Management	1	0.04	2598	98.71
Analgesic Administration: Intraspinal	1	0.04	2599	98.75
Behavior Modification	1	0.04	2600	98.78
Body Mechanics Promotion	1	0.04	2601	98.82
Bowel Incontinence Care: Encopresis	1	0.04	2602	98.86
Bowel Irrigation	1	0.04	2603	98.9
Circulatory Care: Arterial Insufficiency	1	0.04	2604	98.94
Cognitive Stimulation	1	0.04	2605	98.97
Communication Enhancement: Speech Deficit	1	0.04	2606	99.01
Constipation/Impaction Management	1	0.04	2607	99.05
Delusion Management	1	0.04	2608	99.09
Ear Care	1	0.04	2609	99.13
Environmental Management: Attachment Process	1	0.04	2610	99.16
Family Integrity Promotion	1	0.04	2611	99.2
Family Mobilization	1	0.04	2612	99.24
Family Process Maintenance	1	0.04	2613	99.28
Family Therapy	1	0.04	2614	99.32
Hemodialysis Therapy	1	0.04	2615	99.35
Hyperglycemia Management	1	0.04	2616	99.39
Memory Training	1	0.04	2617	99.43
Oral Health Restoration	1	0.04	2618	99.47
Pruritis Management	1	0.04	2619	99.51
Reminiscence Therapy	1	0.04	2620	99.54
Security Enhancement	1	0.04	2621	99.58
Seizure Precautions	1	0.04	2622	99.62
Self-Responsibility Facilitation	1	0.04	2623	99.66
Shock Prevention	1	0.04	2624	99.7
Support System Enhancement	1	0.04	2625	99.73
Swallowing Therapy	1	0.04	2626	99.77
Teaching: Infant Care	1	0.04	2627	99.81
Teaching: Psychomotor Skill	1	0.04	2628	99.85
Urinary Incontinence Care	1	0.04	2629	99.89
Values Clarification	1	0.04	2630	99.92
Ventilation Assistance	1	0.04	2631	99.96
Wound Care: Closed Drainage	1	0.04	2632	100

Table C.5 NNN linkages for patients hospitalized with CHF (below 10 times used)

NANDA-I	NOC	NIC	N
Activity Intolerance	Safety Behavior: Fall Prevention	Dysrhythmia Management	9
Airway Clearance Ineffectiveness	Symptom Control Behavior	Respiratory Monitoring	9
Cardiac Output Alteration	Fluid Balance		9
Infection, Risk For	Immune Status	Nutritional Monitoring	9
Infection, Risk For	Risk Control		9
Infection, Risk For	Risk Control	Venous Access Device (VAD) Maintenance	9
Knowledge Deficit	Knowledge: Diet	Teaching: Individual	9
Knowledge Deficit	Knowledge: Diet	Teaching: Prescribed Diet	9
Knowledge Deficit	Knowledge: Health Behaviors	Teaching: Prescribed Medication	9
Knowledge Deficit	Knowledge: Medication	Discharge Planning	9
Knowledge Deficit	Knowledge: Medication	Teaching: Individual	9
Knowledge Deficit	Knowledge: Medication	Teaching: Prescribed Activity/Exercise	9
Knowledge Deficit	Knowledge: Treatment Procedure	Discharge Planning	9
Knowledge Deficit	Knowledge: Treatment Regimen	Discharge Planning	9
Knowledge Deficit	Knowledge: Treatment Regimen	Teaching: Prescribed Diet	9
Nutrition Less Than Body Requirements Altered	Nutritional Status: Food & Fluid Intake		9
Activity Intolerance	Energy Conservation	Weight Management	8
Airway Clearance Ineffectiveness	Respiratory Status: Ventilation	Oxygen Therapy	8
Airway Clearance Ineffectiveness	Symptom Control Behavior	Oxygen Therapy	8
Airway Clearance Ineffectiveness	Treatment Behavior: Illness or Injury	Respiratory Monitoring	8
Fear		Presence	8
Health Maintenance, Altered	Health Beliefs: Perceived Threat	Discharge Planning	8
Infection, Risk For	Immune Status	Risk Identification	8
Infection, Risk For	Immune Status	Wound Care	8
Infection, Risk For	Knowledge: Infection Control	Venous Access Device (VAD) Maintenance	8
Infection, Risk For	Risk Control	Nutritional Monitoring	8
Infection, Risk For	Tissue Integrity: Skin & Mucous Membranes		8
Infection, Risk For	Tissue Integrity: Skin & Mucous Membranes	Venous Access Device (VAD) Maintenance	8
Infection, Risk For	Tissue Integrity: Skin & Mucous Membranes	Wound Care	8
Knowledge Deficit	Knowledge: Diet	Teaching: Prescribed Activity/Exercise	8
Knowledge Deficit	Knowledge: Health Behaviors	Teaching: Individual	8
Knowledge Deficit	Knowledge: Health Behaviors	Teaching: Prescribed Activity/Exercise	8
Knowledge Deficit	Knowledge: Medication	Learning Facilitation	8
Tissue Integrity, Impaired	Knowledge: Treatment Regimen	Circulatory Care	8

Table C.5 Continued

NANDA-I	NOC	NIC	N
Tissue Integrity, Impaired	Knowledge: Treatment Regimen	Wound Care	8
Tissue Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Circulatory Care	8
Airway Clearance Ineffectiveness	Respiratory Status: Gas Exchange	Respiratory Monitoring	7
Airway Clearance Ineffectiveness	Respiratory Status: Ventilation	Teaching: Disease Process	7
Cardiac Output Alteration	Cardiac Pump Effectiveness	Electrolyte Monitoring	7
Fear			7
Fear		Emotional Support	7
Fluid Volume Excess	Fluid Balance	Fluid/Electrolyte Management	7
Health Maintenance, Altered	Health Beliefs: Perceived Threat	Health System Guidance	7
Infection, Risk For	Knowledge: Infection Control	Fluid Monitoring	7
Knowledge Deficit	Knowledge: Medication	Learning Readiness Enhancement	7
Knowledge Deficit	Knowledge: Medication	Teaching: Prescribed Diet	7
Knowledge Deficit	Knowledge: Prescribed Activity	Teaching: Prescribed Medication	7
Skin Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Positioning	7
Activity Intolerance	Energy Conservation	Cardiac Care: Rehabilitative	6
Airway Clearance Ineffectiveness	Treatment Behavior: Illness or Injury	Oxygen Therapy	6
Airway Clearance Ineffectiveness	Treatment Behavior: Illness or Injury	Teaching: Disease Process	6
Fear		Coping Enhancement	6
Health Maintenance, Altered	Health Orientation	Discharge Planning	6
Health Maintenance, Altered	Health Orientation	Health System Guidance	6
Infection, Risk For	Immune Status	Venous Access Device (VAD) Maintenance	6
Infection, Risk For	Knowledge: Infection Control	Nutritional Monitoring	6
Infection, Risk For	Risk Control	Wound Care	6
Infection, Risk For	Tissue Integrity: Skin & Mucous Membranes	Nutritional Monitoring	6
Knowledge Deficit	Knowledge: Diet	Learning Facilitation	6
Knowledge Deficit	Knowledge: Diet	Learning Readiness Enhancement	6
Knowledge Deficit	Knowledge: Diet	Teaching: Procedure/Treatment	6
Knowledge Deficit	Knowledge: Health Behaviors	Learning Readiness Enhancement	6
Knowledge Deficit	Knowledge: Prescribed Activity	Learning Facilitation	6
Knowledge Deficit	Knowledge: Prescribed Activity	Teaching: Disease Process	6
Knowledge Deficit	Knowledge: Prescribed Activity	Teaching: Individual	6
Knowledge Deficit	Knowledge: Prescribed Activity	Teaching: Prescribed Diet	6
Knowledge Deficit	Knowledge: Prescribed Activity	Teaching: Procedure/Treatment	6

Table C.5 Continued

NANDA-I	NOC	NIC	N
Pain, Acute	Comfort Level	Anxiety Reduction	6
Pain, Acute	Comfort Level	Environmental Management: Comfort	6
Pain, Acute	Comfort Level	Pain Management	6
Pain, Acute	Comfort Level	Positioning	6
Pain, Acute	Pain Control Behavior	Analgesic Administration	6
Pain, Acute	Pain Control Behavior	Anxiety Reduction	6
Pain, Acute	Pain Control Behavior	Environmental Management: Comfort	6
Pain, Acute	Pain Control Behavior	Pain Management	6
Pain, Acute	Pain Control Behavior	Positioning	6
Pain, Acute	Pain Level	Anxiety Reduction	6
Pain, Acute	Pain Level	Positioning	6
Skin Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Perineal Care	6
Skin Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Pressure Management	6
Skin Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Skin Surveillance	6
Activity Intolerance	Safety Behavior: Fall Prevention	Cardiac Care: Rehabilitative	5
Airway Clearance Ineffectiveness	Symptom Control Behavior	Teaching: Disease Process	5
Breathing Pattern Ineffectiveness	Respiratory Status: Gas Exchange	Oxygen Therapy	5
Breathing Pattern Ineffectiveness	Respiratory Status: Gas Exchange	Respiratory Monitoring	5
Cardiac Output Alteration	Circulation Status	Electrolyte Monitoring	5
Cardiac Output Alteration	Circulation Status	Fluid Monitoring	5
Cardiac Output Alteration	Fluid Balance	Electrolyte Monitoring	5
Gas Exchange Impairment	Respiratory Status: Ventilation	Oxygen Therapy	5
Gas Exchange Impairment	Respiratory Status: Ventilation	Respiratory Monitoring	5
Health Maintenance, Altered	Health Beliefs: Perceived Threat	Decision-Making Support	5
Health Maintenance, Altered	Health Beliefs: Perceived Threat	Health Education	5
Health Maintenance, Altered	Health Orientation	Health Education	5
Infection, Risk For	Knowledge: Infection Control	Nutrition Management	5
Infection, Risk For	Knowledge: Infection Control	Wound Care	5
Knowledge Deficit	Knowledge: Health Behaviors	Learning Facilitation	5
Knowledge Deficit	Knowledge: Health Behaviors	Teaching: Prescribed Diet	5
Knowledge Deficit	Knowledge: Health Behaviors	Teaching: Procedure/Treatment	5
Knowledge Deficit	Knowledge: Prescribed Activity	Discharge Planning	5
Knowledge Deficit	Knowledge: Prescribed Activity	Learning Readiness Enhancement	5

Table C.5 Continued

NANDA-I	NOC	NIC	N
Skin Integrity, Impaired	Nutritional Status	Positioning	5
Skin Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Bedrest Care	5
Skin Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Nutrition Management	5
Tissue Integrity, Impaired	Knowledge: Treatment Regimen	Nutritional Monitoring	5
Activity Intolerance	Endurance	Energy Management	4
Activity Intolerance	Endurance	Nutrition Management	4
Anxiety	Anxiety Control	Anxiety Reduction	4
Anxiety	Anxiety Control	Calming Technique	4
Anxiety	Coping	Anxiety Reduction	4
Anxiety	Coping	Calming Technique	4
Breathing Pattern Ineffectiveness	Respiratory Status: Ventilation	Oxygen Therapy	4
Fluid Volume Deficit	Fluid Balance	Electrolyte Monitoring	4
Fluid Volume Excess	Fluid Balance	Electrolyte Management	4
Gas Exchange Impairment	Respiratory Status: Gas Exchange	Oxygen Therapy	4
Gas Exchange Impairment	Respiratory Status: Gas Exchange	Respiratory Monitoring	4
Health Maintenance, Altered	Health Beliefs: Perceived Threat	Coping Enhancement	4
Health Maintenance, Altered	Health Orientation	Decision-Making Support	4
Infection, Risk For			4
Infection, Risk For	Knowledge: Infection Control	Tube Care: Urinary	4
Infection, Risk For	Risk Control	Tube Care: Urinary	4
Infection, Risk For	Tissue Integrity: Skin & Mucous Membranes	Tube Care: Urinary	4
Injury, High Risk For	Risk Control	Dementia Management	4
Injury, High Risk For	Safety Behavior: Fall Prevention	Dementia Management	4
Injury, High Risk For	Symptom Control Behavior	Fall Prevention	4
Knowledge Deficit	Knowledge: Diet	Discharge Planning	4
Nutrition Less Than Body Requirements Altered	Nutritional Status: Food & Fluid Intake	Nutritional Monitoring	4
Nutrition Less Than Body Requirements Altered	Nutritional Status: Nutrient Intake	Nutrition Management	4
Nutrition Less Than Body Requirements Altered	Nutritional Status: Nutrient Intake	Nutritional Monitoring	4
Pain, Acute	Comfort Level	Distraction	4
Pain, Acute	Pain Control Behavior	Distraction	4
Pain, Acute	Pain Level	Distraction	4
Skin Integrity, Impaired	Nutritional Status	Perineal Care	4
Skin Integrity, Impaired	Nutritional Status	Pressure Management	4

Table C.5 Continued

NANDA-I	NOC	NIC	N
Skin Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Pressure Ulcer Care	4
Skin Integrity, Impaired	Wound Healing: Secondary Intention	Bedrest Care	4
Skin Integrity, Impaired	Wound Healing: Secondary Intention	Nutrition Management	4
Skin Integrity, Impaired	Wound Healing: Secondary Intention	Perineal Care	4
Skin Integrity, Impaired	Wound Healing: Secondary Intention	Positioning	4
Skin Integrity, Impaired	Wound Healing: Secondary Intention	Pressure Management	4
Tissue Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Nutritional Monitoring	4
Activity Intolerance	Energy Conservation	Exercise Therapy: Ambulation	3
Activity Intolerance	Energy Conservation	Mutual Goal Setting	3
Activity Intolerance, Risk For	Energy Conservation	Activity Therapy	3
Activity Intolerance, Risk For	Energy Conservation	Respiratory Monitoring	3
Activity Intolerance, Risk For	Respiratory Status: Gas Exchange	Activity Therapy	3
Activity Intolerance, Risk For	Respiratory Status: Gas Exchange	Respiratory Monitoring	3
Airway Clearance Ineffectiveness			3
Airway Clearance Ineffectiveness	Respiratory Status: Gas Exchange	Oxygen Therapy	3
Airway Clearance Ineffectiveness	Respiratory Status: Gas Exchange	Teaching: Disease Process	3
Anxiety	Anxiety Control	Presence	3
Anxiety	Coping	Presence	3
Aspiration, Risk For	Aspiration Control	Aspiration Precautions	3
Aspiration, Risk For	Self-Care: Eating	Aspiration Precautions	3
Bowel Incontinence	Hydration	Bowel Incontinence Care	3
Bowel Incontinence	Nutritional Status: Food & Fluid Intake	Bowel Incontinence Care	3
Bowel Incontinence	Tissue Integrity: Skin & Mucous Membranes	Bowel Incontinence Care	3
Breathing Pattern Ineffectiveness	Anxiety Control	Oxygen Therapy	3
Breathing Pattern Ineffectiveness	Respiratory Status: Ventilation	Respiratory Monitoring	3
Cardiac Output Alteration	Circulation Status	Dysrhythmia Management	3
Cardiac Output Alteration	Circulation Status	Fluid/Electrolyte Management	3
Cardiac Output Alteration	Tissue Perfusion: Cardiac	Fluid Monitoring	3
Coping Ineffectiveness	Anxiety Control	Anxiety Reduction	3
Coping Ineffectiveness	Coping	Anxiety Reduction	3
Fear		Environmental Management	3
Fear	Fear Control	Emotional Support	3

Table C.5 Continued

NANDA-I	NOC	NIC	N
Fluid Volume Deficit			3
Fluid Volume Deficit	Fluid Balance	Electrolyte Management	3
Fluid Volume Excess	Electrolyte & Acid/Base Balance	Electrolyte Monitoring	3
Fluid Volume Excess	Electrolyte & Acid/Base Balance	Fluid Monitoring	3
Health Maintenance, Altered	Health Beliefs: Perceived Threat	Counseling	3
Health Maintenance, Altered	Health Orientation	Coping Enhancement	3
Health Maintenance, Altered	Health Orientation	Counseling	3
Health Maintenance, Altered	Health Promoting Behavior	Decision-Making Support	3
Health Maintenance, Altered	Health Promoting Behavior	Discharge Planning	3
Health Maintenance, Altered	Health Promoting Behavior	Health Education	3
Health Maintenance, Altered	Health Promoting Behavior	Health System Guidance	3
Infection, Risk For	Knowledge: Infection Control	Incision Site Care	3
Infection, Risk For	Knowledge: Infection Control	Nutrition Therapy	3
Infection, Risk For	Knowledge: Infection Control	Oral Health Maintenance	3
Infection, Risk For	Knowledge: Infection Control	Perineal Care	3
Infection, Risk For	Risk Control	Nutrition Therapy	3
Infection, Risk For	Risk Control	Oral Health Maintenance	3
Infection, Risk For	Risk Control	Perineal Care	3
Infection, Risk For	Tissue Integrity: Skin & Mucous Membranes	Incision Site Care	3
Infection, Risk For	Tissue Integrity: Skin & Mucous Membranes	Perineal Care	3
Injury, High Risk For			3
Injury, High Risk For	Safety Behavior: Personal	Fall Prevention	3
Injury, High Risk For	Symptom Control Behavior	Environmental Management: Safety	3
Injury, High Risk For	Symptom Control Behavior	Surveillance: Safety	3
Knowledge Deficit	Knowledge: Health Behaviors	Discharge Planning	3
Knowledge Deficit	Knowledge: Treatment Procedure	Emotional Support	3
Nutrition Less Than Body Requirements Altered	Nutritional Status: Food & Fluid Intake	Feeding	3
Nutrition Less Than Body Requirements Altered	Nutritional Status: Food & Fluid Intake	Nutrition Therapy	3
Nutrition Less Than Body Requirements Altered	Nutritional Status: Food & Fluid Intake	Weight Management	3
Nutrition Less Than Body Requirements Altered	Nutritional Status: Nutrient Intake	Feeding	3
Nutrition Less Than Body Requirements Altered	Nutritional Status: Nutrient Intake	Nutrition Therapy	3
Pain, Chronic	Pain Control Behavior	Analgesic Administration	3
Pain, Chronic	Pain Control Behavior	Pain Management	3

Table C.5 Continued

NANDA-I	NOC	NIC	N
Physical Mobility Alteration	Self-Care: Activities of Daily Living (ADL)	Fall Prevention	3
Skin Integrity, Impaired	Nutritional Status	Bedrest Care	3
Skin Integrity, Impaired	Nutritional Status	Nutrition Management	3
Skin Integrity, Impaired	Nutritional Status	Wound Care	3
Skin Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Skin Care: Topical Treatments	3
Skin Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Wound Care	3
Skin Integrity, Impaired	Wound Healing: Secondary Intention	Pressure Ulcer Care	3
Skin Integrity, Impaired	Wound Healing: Secondary Intention	Skin Surveillance	3
Skin Integrity, Impaired	Wound Healing: Secondary Intention	Wound Care	3
Activity Intolerance			2
Activity Intolerance	Endurance	Exercise Therapy: Ambulation	2
Activity Intolerance	Endurance	Mutual Goal Setting	2
Activity Intolerance	Endurance	Sleep Enhancement	2
Activity Intolerance	Energy Conservation	Energy Management	2
Activity Intolerance	Energy Conservation	Family Involvement	2
Activity Intolerance	Energy Conservation	Sleep Enhancement	2
Activity Intolerance	Safety Behavior: Fall Prevention	Weight Management	2
Activity Intolerance, Risk For	Coping	Activity Therapy	2
Activity Intolerance, Risk For	Coping	Cardiac Care	2
Activity Intolerance, Risk For	Coping	Energy Management	2
Activity Intolerance, Risk For	Coping	Nutritional Monitoring	2
Activity Intolerance, Risk For	Coping	Respiratory Monitoring	2
Activity Intolerance, Risk For	Energy Conservation	Cardiac Care	2
Activity Intolerance, Risk For	Energy Conservation	Energy Management	2
Activity Intolerance, Risk For	Energy Conservation	Nutritional Monitoring	2
Activity Intolerance, Risk For	Respiratory Status: Gas Exchange	Cardiac Care	2
Activity Intolerance, Risk For	Respiratory Status: Gas Exchange	Energy Management	2
Activity Intolerance, Risk For	Respiratory Status: Gas Exchange	Nutritional Monitoring	2
Airway Clearance Ineffectiveness	Respiratory Status: Ventilation	Cough Enhancement	2
Airway Clearance Ineffectiveness	Symptom Control Behavior	Cough Enhancement	2
Airway Clearance Ineffectiveness	Treatment Behavior: Illness or Injury	Airway Management	2
Anxiety	Anxiety Control	Conflict Mediation	2
Anxiety	Anxiety Control	Coping Enhancement	2

Table C.5 Continued

NANDA-I	NOC	NIC	N
Anxiety	Coping	Conflict Mediation	2
Anxiety	Coping	Coping Enhancement	2
Anxiety	Coping	Mood Management	2
Bowel Incontinence	Bowel Elimination	Bowel Incontinence Care	2
Bowel Incontinence	Hydration	Bowel Incontinence Care: Encopresis	2
Bowel Incontinence	Hydration	Bowel Irrigation	2
Bowel Incontinence	Hydration	Perineal Care	2
Bowel Incontinence	Nutritional Status: Food & Fluid Intake	Bowel Incontinence Care: Encopresis	2
Bowel Incontinence	Nutritional Status: Food & Fluid Intake	Bowel Irrigation	2
Bowel Incontinence	Nutritional Status: Food & Fluid Intake	Perineal Care	2
Bowel Incontinence	Tissue Integrity: Skin & Mucous Membranes	Bowel Incontinence Care: Encopresis	2
Bowel Incontinence	Tissue Integrity: Skin & Mucous Membranes	Bowel Irrigation	2
Bowel Incontinence	Tissue Integrity: Skin & Mucous Membranes	Perineal Care	2
Breathing Pattern Ineffectiveness	Anxiety Control	Respiratory Monitoring	2
Breathing Pattern Ineffectiveness	Respiratory Status: Gas Exchange	Anxiety Reduction	2
Breathing Pattern Ineffectiveness	Respiratory Status: Gas Exchange	Teaching: Disease Process	2
Cardiac Output Alteration	Cardiac Pump Effectiveness	Cardiac Care: Acute	2
Cardiac Output Alteration	Tissue Perfusion: Cardiac	Dysrhythmia Management	2
Cardiac Output Alteration	Tissue Perfusion: Cardiac	Electrolyte Monitoring	2
Cardiac Output Alteration	Tissue Perfusion: Cardiac	Fluid/Electrolyte Management	2
Confusion, Acute	Cognitive Ability	Calming Technique	2
Confusion, Acute	Cognitive Ability	Emotional Support	2
Confusion, Acute	Cognitive Ability	Fall Prevention	2
Confusion, Acute	Cognitive Ability	Reality Orientation	2
Confusion, Acute	Distorted Thought Control	Calming Technique	2
Confusion, Acute	Distorted Thought Control	Emotional Support	2
Confusion, Acute	Distorted Thought Control	Fall Prevention	2
Confusion, Acute	Distorted Thought Control	Reality Orientation	2
Coping Ineffectiveness	Acceptance: Health Status	Anxiety Reduction	2
Coping Ineffectiveness	Acceptance: Health Status	Environmental Management	2
Coping Ineffectiveness	Acceptance: Health Status	Mood Management	2
Coping Ineffectiveness	Acceptance: Health Status	Presence	2
Coping Ineffectiveness	Anxiety Control	Environmental Management	2

Table C.5 Continued

NANDA-I	NOC	NIC	N
Coping Ineffectiveness	Anxiety Control	Presence	2
Coping Ineffectiveness	Coping	Environmental Management	2
Coping Ineffectiveness	Coping	Mood Management	2
Coping Ineffectiveness	Coping	Presence	2
Fear	Fear Control		2
Fear	Fear Control	Coping Enhancement	2
Fear	Fear Control	Presence	2
Fluid Volume Deficit	Electrolyte & Acid/Base Balance	Electrolyte Monitoring	2
Fluid Volume Excess	Electrolyte & Acid/Base Balance		2
Fluid Volume Excess	Fluid Balance		2
Health Maintenance, Altered	Health Beliefs: Perceived Threat		2
Health Maintenance, Altered	Health Beliefs: Perceived Threat	Referral	2
Health Maintenance, Altered	Health Orientation		2
Health Maintenance, Altered	Health Orientation	Referral	2
Health Maintenance, Altered	Health Promoting Behavior		2
Health Maintenance, Altered	Health Promoting Behavior	Coping Enhancement	2
Health Maintenance, Altered	Health Promoting Behavior	Counseling	2
Health Maintenance, Altered	Health Promoting Behavior	Referral	2
Infection, Risk For	Immune Status	Oral Health Maintenance	2
Infection, Risk For	Immune Status	Perineal Care	2
Infection, Risk For	Immune Status	Skin Care: Topical Treatments	2
Infection, Risk For	Immune Status	Tube Care: Urinary	2
Infection, Risk For	Knowledge: Infection Control		2
Infection, Risk For	Risk Control	Incision Site Care	2
Injury, High Risk For		Fall Prevention	2
Injury, High Risk For	Risk Control	Reality Orientation	2
Injury, High Risk For	Safety Behavior: Fall Prevention	Calming Technique	2
Injury, High Risk For	Safety Behavior: Fall Prevention	Embolus Precautions	2
Injury, High Risk For	Safety Behavior: Fall Prevention	Reality Orientation	2
Injury, High Risk For	Safety Behavior: Personal		2
Injury, High Risk For	Safety Behavior: Personal	Environmental Management: Safety	2
Injury, High Risk For	Safety Behavior: Personal	Surveillance: Safety	2
Injury, High Risk For	Symptom Control Behavior	Risk Identification	2

Table C.5 Continued

NANDA-I	NOC	NIC	N
Knowledge Deficit		Teaching: Procedure/Treatment	2
Knowledge Deficit	Knowledge: Disease Process	Mutual Goal Setting	2
Knowledge Deficit	Knowledge: Health Behaviors	Mutual Goal Setting	2
Knowledge Deficit	Knowledge: Health Resources	Learning Facilitation	2
Knowledge Deficit	Knowledge: Health Resources	Teaching: Individual	2
Knowledge Deficit	Knowledge: Health Resources	Teaching: Prescribed Activity/Exercise	2
Knowledge Deficit	Knowledge: Health Resources	Teaching: Prescribed Medication	2
Knowledge Deficit	Knowledge: Health Resources	Teaching: Procedure/Treatment	2
Knowledge Deficit	Knowledge: Treatment Procedure		2
Pain, Acute			2
Pain, Acute	Comfort Level	Heat/Cold Application	2
Pain, Acute	Pain Control Behavior		2
Pain, Acute	Pain Control Behavior	Heat/Cold Application	2
Pain, Acute	Pain Level	Heat/Cold Application	2
Pain, Chronic	Anxiety Control	Analgesic Administration	2
Pain, Chronic	Anxiety Control	Pain Management	2
Physical Mobility Alteration	Ambulation: Walking	Energy Management	2
Physical Mobility Alteration	Immobility Consequences: Physiological	Energy Management	2
Physical Mobility Alteration	Immobility Consequences: Physiological	Fall Prevention	2
Physical Mobility Alteration	Mobility Level	Fall Prevention	2
Physical Mobility Alteration	Self-Care: Activities of Daily Living (ADL)	Energy Management	2
Self Care Deficit, Bathing/Hygiene	Self-Care: Activities of Daily Living (ADL)	Bathing	2
Self Care Deficit, Bathing/Hygiene	Self-Care: Activities of Daily Living (ADL)	Eye Care	2
Self Care Deficit, Bathing/Hygiene	Self-Care: Activities of Daily Living (ADL)	Hair Care	2
Self Care Deficit, Bathing/Hygiene	Self-Care: Activities of Daily Living (ADL)	Nail Care	2
Self Care Deficit, Bathing/Hygiene	Self-Care: Activities of Daily Living (ADL)	Perineal Care	2
Self Care Deficit, Bathing/Hygiene	Self-Care: Activities of Daily Living (ADL)	Self Care Assistance	2
Self Care Deficit, Bathing/Hygiene	Self-Care: Activities of Daily Living (ADL)	Self Care Assistance: Bathing/Hygiene	2
Self Care Deficit, Bathing/Hygiene	Self-Care: Hygiene	Bathing	2
Self Care Deficit, Bathing/Hygiene	Self-Care: Hygiene	Eye Care	2
Self Care Deficit, Bathing/Hygiene	Self-Care: Hygiene	Hair Care	2
Self Care Deficit, Bathing/Hygiene	Self-Care: Hygiene	Nail Care	2
Self Care Deficit, Bathing/Hygiene	Self-Care: Hygiene	Perineal Care	2
Self Care Deficit, Bathing/Hygiene	Self-Care: Hygiene	Self Care Assistance	2

Table C.5 Continued

NANDA-I	NOC	NIC	N
Self Care Deficit, Bathing/Hygiene	Self-Care: Hygiene	Self Care Assistance: Bathing/Hygiene	2
Self Care Deficit, Dressing/Grooming	Self-Care: Activities of Daily Living (ADL)	Dressing	2
Self Care Deficit, Dressing/Grooming	Self-Care: Activities of Daily Living (ADL)	Energy Management	2
Self Care Deficit, Dressing/Grooming	Self-Care: Activities of Daily Living (ADL)	Hair Care	2
Self Care Deficit, Dressing/Grooming	Self-Care: Activities of Daily Living (ADL)	Self Care Assistance: Dressing/Grooming	2
Self Care Deficit, Dressing/Grooming	Self-Care: Dressing	Dressing	2
Self Care Deficit, Dressing/Grooming	Self-Care: Dressing	Energy Management	2
Self Care Deficit, Dressing/Grooming	Self-Care: Dressing	Hair Care	2
Self Care Deficit, Dressing/Grooming	Self-Care: Dressing	Self Care Assistance: Dressing/Grooming	2
Self Care Deficit, Dressing/Grooming	Self-Care: Grooming	Dressing	2
Self Care Deficit, Dressing/Grooming	Self-Care: Grooming	Energy Management	2
Self Care Deficit, Dressing/Grooming	Self-Care: Grooming	Hair Care	2
Self Care Deficit, Dressing/Grooming	Self-Care: Grooming	Self Care Assistance: Dressing/Grooming	2
Self Care Deficit, Toileting	Mobility Level	Perineal Care	2
Self Care Deficit, Toileting	Mobility Level	Self Care Assistance	2
Self Care Deficit, Toileting	Self-Care: Activities of Daily Living (ADL)	Perineal Care	2
Self Care Deficit, Toileting	Self-Care: Activities of Daily Living (ADL)	Self Care Assistance	2
Skin Integrity, Impaired	Nutritional Status	Positioning: Wheelchair	2
Skin Integrity, Impaired	Nutritional Status	Pressure Ulcer Care	2
Skin Integrity, Impaired	Tissue Integrity: Skin & Mucous Membranes	Positioning: Wheelchair	2
Skin Integrity, Impaired	Wound Healing: Secondary Intention	Positioning: Wheelchair	2
Skin Integrity, Impaired	Wound Healing: Secondary Intention	Skin Care: Topical Treatments	2
Urinary Retention	Urinary Elimination	Urinary Catheterization	2

Table C.6 Comparison of admission and discharge of NOC scores

NOC	N	First Mean	SD	Last Mean	SD	Ave Change	P value
Acceptance: Health Status	4	2.000	0.000	2.000	0.000	0.000	-
Ambulation: Walking	6	2.667	0.516	2.667	0.516	0.000	1.000
Ambulation: Wheelchair	2	2.000	0.000	2.000	0.000	0.000	-
Anxiety Control	20	2.200	0.767	2.300	0.801	0.100	0.690
Aspiration Control	2	2.000	0.000	4.000	0.000	2.000	-
Bowel Elimination	4	1.500	0.577	1.500	0.577	0.000	1
Cardiac Pump Effectiveness	186	2.709	0.521	3.129	0.677	0.419	<.0001
Caregiver Stressors	2	2.000	0.000	2.000	0.000	0.000	-
Caregiver-Patient Relationship	2	2.000	0.000	3.000	0.000	1.000	<.0001
Circulation Status	8	2.750	0.462	2.750	0.462	0.000	1.000
Cognitive Ability	6	2.333	0.516	3.666	0.516	1.333	0.000
Cognitive Orientation	4	2.500	0.577	3.000	0.000	0.500	0.180
Comfort Level	8	3.000	0.755	3.250	0.886	0.250	0.550
Coping	16	2.125	0.341	2.125	0.341	0.000	1.000
Distorted Thought Control	4	2.500	0.577	3.000	1.154	0.500	0.470
Electrolyte & Acid/Base Balance	8	2.500	0.534	2.750	0.163	0.250	0.330
Endurance	10	2.400	0.516	2.600	0.516	0.200	0.400
Energy Conservation	116	2.741	0.512	3.172	0.622	0.430	<.0001
Fluid Balance	146	2.849	0.614	3.287	0.751	0.438	<.0001
Health Beliefs: Perceived Threat	12	3.000	0.852	2.880	1.114	-0.166	0.680
Health Orientation	8	3.000	0.755	2.000	1.195	-0.500	0.330
Health Promoting Behavior	4	3.000	0.000	2.000	1.732	-0.500	0.580
Hydration	6	2.000	0.000	2.000	0.000	0.000	-
Immobility Consequences: Physiological	4	2.500	0.577	2.500	0.577	0.000	1.000
Immune Status	150	3.000	0.634	3.413	0.696	0.413	<.0001
Knowledge: Diet	18	2.666	0.485	2.666	0.485	0.000	1.000
Knowledge: Disease Process	46	2.739	0.584	2.956	0.630	0.217	0.080
Knowledge: Health Behaviors	20	2.700	0.470	2.800	0.410	0.100	0.480
Knowledge: Health Resources	4	3.000	0.000	3.000	0.000	0.000	-
Knowledge: Infection Control	32	2.875	0.609	3.062	0.759	0.187	0.280
Knowledge: Medication	28	2.642	0.488	3.071	0.716	0.428	0.010

Table C.6 Continued

NOC	N	First Mean	SD	Last Mean	SD	Ave Change	P value
Knowledge: Prescribed Activity	12	3.000	0.603	3.000	0.603	0.000	1.000
Knowledge: Treatment Procedure	46	2.652	0.640	2.913	0.838	0.260	0.100
Knowledge: Treatment Regimen	292	2.616	0.600	3.171	0.840	0.554	<.0001
Memory	2	2.000	0.000	2.000	0.000	0.000	-
Mobility Level	4	2.000	0.000	2.500	0.577	0.500	0.130
Neurological Status: Consciousness	2	4.000	0.000	2.000	0.000	2.000	<.0001
Nutritional Status	6	2.333	0.516	1.666	0.516	-0.666	0.050
Nutritional Status: Food & Fluid Intake	32	2.312	0.780	2.625	0.870	0.312	0.140
Nutritional Status: Nutrient Intake	4	2.000	0.000	2.000	0.000	0.000	-
Pain Control Behavior	16	2.875	0.619	3.125	0.085	0.250	0.170
Pain Level	100	3.160	0.706	3.900	0.070	0.740	<.0001
Respiratory Status: Gas Exchange	34	2.647	0.597	3.235	0.553	0.588	<.0001
Respiratory Status: Ventilation	174	2.839	0.545	3.333	0.723	0.494	<.0001
Risk Control	244	2.811	0.632	3.188	0.882	0.377	<.0001
Safety Behavior: Fall Prevention	266	2.911	0.604	3.300	0.798	0.389	<.0001
Safety Behavior: Personal	6	2.666	0.516	3.666	0.516	1.000	0.010
Self-Care: Activities of Daily Living (ADL)	8	2.500	0.462	2.500	0.534	0.250	0.330
Self-Care: Bathing	2	2.000	0.000	2.000	0.000	0.000	-
Self-Care: Eating	2	2.000	0.000	4.000	0.000	2.000	<.0001
Self-Care: Hygiene	2	2.000	0.000	2.000	0.000	0.000	-
Symptom Control Behavior	24	3.000	0.589	3.500	0.780	0.500	0.020
Tissue Integrity: Skin & Mucous Membranes	216	3.000	0.721	3.361	0.867	0.361	<.0001
Tissue Perfusion: Cardiac	8	3.000	0.755	3.250	0.462	0.250	0.440
Transfer Performance	2	2.000	0.000	2.000	0.000	0.000	-
Treatment Behavior: Illness or Injury	12	3.000	0.603	3.333	0.492	0.333	0.150
Urinary Continence	2	3.000	0.000	3.000	0.000	0.000	-
Urinary Elimination	4	2.000	0.000	3.000	0.000	1.000	<.0001
Wound Healing: Secondary Intention	6	2.666	0.516	2.333	0.516	-0.333	0.290

Table C.7 NOC Mean scores changes according to NIC interventions

NIC- NOC Linkages			N	Mean	SD	Median	Min	Max	P value
NIC	**NOC**	Class							
Airway Management	Respiratory Status: Gas Exchange	after	3	3.33	0.58	3.00	3.00	4.00	0.230
		before	3	2.67	0.58	3.00	2.00	3.00	
	Respiratory Status: Ventilation	after	18	3.61	0.70	3.50	3.00	5.00	<.0001
		before	18	2.50	0.62	2.00	2.00	4.00	
Analgesic Administration	Pain Level	after	16	3.63	0.62	4.00	3.00	5.00	0.140
		before	16	3.25	0.77	3.00	2.00	4.00	
Cardiac Care	Cardiac Pump Effectiveness	after	77	3.13	0.69	3.00	2.00	5.00	<.0001
		before	77	2.65	0.56	3.00	1.00	4.00	
	Energy Conservation	after	38	3.32	0.70	3.00	2.00	5.00	0.0002
		before	38	2.74	0.55	3.00	2.00	4.00	
	Fluid Balance	after	29	3.38	0.82	3.00	2.00	5.00	0.02983
		before	29	2.97	0.57	3.00	2.00	4.00	
	Safety Behavior: Fall Prevention	after	20	3.25	0.91	3.00	1.00	5.00	0.0515
		before	20	2.75	0.64	3.00	2.00	4.00	
Cardiac Care: Rehabilitative	Cardiac Pump Effectiveness	after	14	3.14	0.53	3.00	2.00	4.00	0.0614
		before	14	2.79	0.43	3.00	2.00	3.00	
Discharge Planning	Knowledge: Treatment Procedure	after	6	3.33	1.03	3.00	2.00	5.00	0.5155
		before	6	3.00	0.63	3.00	2.00	4.00	
Dysrhythmia Management	Cardiac Pump Effectiveness	after	20	3.05	0.76	3.00	2.00	5.00	0.0193
		before	20	2.55	0.51	3.00	2.00	3.00	
	Fluid Balance	after	12	3.33	0.65	3.00	3.00	5.00	0.2068
		before	12	3.00	0.60	3.00	2.00	4.00	

Table C.7 Continued

NIC- NOC Linkages		Class	N	Mean	SD	Median	Min	Max	P value
NIC	NOC								
Electrolyte Monitoring	Fluid Balance	after	15	3.00	0.65	3.00	2.00	4.00	0.0388
		before	15	2.53	0.52	3.00	2.00	3.00	
Emotional Support	Energy Conservation	after	18	3.28	0.96	3.00	2.00	5.00	0.1686
		before	18	2.89	0.68	3.00	2.00	4.00	
	Knowledge: Treatment Regimen	after	48	3.19	0.91	3.00	1.00	5.00	0.0011
		before	48	2.67	0.56	3.00	1.00	4.00	
	Safety Behavior: Fall Prevention	after	21	3.62	0.59	4.00	3.00	5.00	0.0055
		before	21	3.05	0.67	3.00	2.00	4.00	
Environmental Management: Comfort	Pain Level	after	15	3.80	0.77	4.00	3.00	5.00	0.0787
		before	15	3.33	0.62	3.00	2.00	4.00	
Environmental Management: Safety	Risk Control	after	19	3.32	0.89	3.00	2.00	5.00	0.0330
		before	19	2.79	0.54	3.00	2.00	4.00	
	Safety Behavior: Fall Prevention	after	14	3.14	0.66	3.00	2.00	4.00	0.4939
		before	14	3.00	0.39	3.00	2.00	4.00	
Fall Prevention	Risk Control	after	41	3.46	0.84	3.00	2.00	5.00	0.0002
		before	41	2.83	0.59	3.00	2.00	4.00	
	Safety Behavior: Fall Prevention	after	54	3.24	0.82	3.00	1.00	5.00	0.0098
		before	54	2.89	0.54	3.00	2.00	4.00	

Table C.7 Continued

NIC-NOC Linkages			N	Mean	SD	Median	Min	Max	P value
NIC	**NOC**	**Class**							
Fluid Management	Fluid Balance	after	20	3.20	0.70	3.00	2.00	4.00	0.2327
		before	20	2.95	0.60	3.00	2.00	4.00	
Fluid Monitoring	Cardiac Pump Effectiveness	after	52	3.23	0.73	3.00	2.00	5.00	<.0001
		before	52	2.63	0.53	3.00	2.00	4.00	
	Fluid Balance	after	80	3.26	0.71	3.00	2.00	5.00	0.0003
		before	80	2.88	0.60	3.00	2.00	4.00	
	Immune Status	after	24	3.46	0.66	3.00	3.00	5.00	0.0758
		before	24	3.13	0.61	3.00	2.00	5.00	
	Risk Control	after	7	3.57	0.98	4.00	2.00	5.00	0.0349
		before	7	2.57	0.53	3.00	2.00	3.00	
	Tissue Integrity: Skin & Mucous Membranes	after	28	3.36	0.78	3.00	2.00	5.00	0.0514
		before	28	2.96	0.69	3.00	2.00	4.00	
Fluid/Electrolyte Management	Cardiac Pump Effectiveness	after	46	3.13	0.58	3.00	2.00	5.00	0.0013
		before	46	2.76	0.48	3.00	2.00	4.00	
	Fluid Balance	after	35	3.23	0.84	3.00	2.00	5.00	0.0375
		before	35	2.86	0.60	3.00	2.00	4.00	

Table C. 7 Continued

NIC-NOC Linkages			N	Mean	SD	Median	Min	Max	P value
NIC	**NOC**	**Class**							
Infection Control	Immune Status	after	15	3.67	0.82	3.00	3.00	5.00	0.0278
		before	15	3.00	0.76	3.00	2.00	4.00	
	Knowledge: Treatment Regimen	after	13	2.85	0.80	3.00	2.00	5.00	0.0917
		before	13	2.38	0.51	2.00	2.00	3.00	
	Risk Control	after	17	3.00	0.87	3.00	1.00	4.00	0.8250
		before	17	2.94	0.66	3.00	2.00	4.00	
	Tissue Integrity: Skin & Mucous Membranes	after	34	3.44	0.86	4.00	1.00	5.00	0.0052
		before	34	2.88	0.73	3.00	1.00	4.00	
Infection Protection	Immune Status	after	11	3.36	0.92	3.00	2.00	5.00	0.7740
		before	11	3.27	0.47	3.00	3.00	4.00	
	Risk Control	after	36	3.42	0.84	3.00	2.00	5.00	0.0005
		before	36	2.78	0.64	3.00	2.00	4.00	
	Tissue Integrity: Skin & Mucous Membranes	after	18	3.33	0.84	3.00	2.00	5.00	0.0330
		before	18	2.78	0.65	3.00	2.00	4.00	
Learning Facilitation	Knowledge: Disease Process	after	9	2.89	0.60	3.00	2.00	4.00	0.4829
		before	9	2.67	0.71	3.00	2.00	4.00	

Table C. 7 Continued

NIC-NOC Linkages			N	Mean	SD	Median	Min	Max	P value
NIC	**NOC**	**Class**							
Nutrition Management	Energy Conservation	after	17	3.29	0.85	3.00	2.00	5.00	0.0335
		before	17	2.71	0.69	3.00	2.00	4.00	
	Immune Status	after	22	3.59	0.80	3.50	2.00	5.00	0.0242
		before	22	3.09	0.61	3.00	2.00	4.00	
	Nutritional Status: Food & Fluid Intake	after	16	3.13	1.15	3.00	1.00	5.00	0.1081
		before	16	2.56	0.73	3.00	1.00	3.00	
	Tissue Integrity: Skin & Mucous Membranes	after	17	3.65	0.61	4.00	3.00	5.00	0.0345
		before	17	3.18	0.64	3.00	2.00	4.00	
Nutritional Monitoring	Immune Status	after	9	3.00	0.71	3.00	2.00	4.00	0.5504
		before	9	2.78	0.83	3.00	2.00	4.00	
Oxygen Therapy	Respiratory Status: Gas Exchange	after	8	3.25	0.46	3.00	3.00	4.00	0.2851
		before	8	2.88	0.83	3.00	2.00	4.00	
	Respiratory Status: Ventilation	after	12	2.92	0.29	3.00	2.00	3.00	0.5575
		before	12	2.83	0.39	3.00	2.00	3.00	
Pain Management	Pain Level	after	49	3.92	0.70	4.00	2.00	5.00	<.0001
		before	49	3.24	0.75	3.00	2.00	6.00	
Respiratory Monitoring	Respiratory Status: Ventilation	after	65	3.45	0.75	3.00	2.00	5.00	<.0001
		before	65	2.77	0.52	3.00	2.00	4.00	

Table C. 7 Continued

NIC-NOC Linkages			N	Mean	SD	Median	Min	Max	P value
NIC	**NOC**	**Class**							
Risk Identification	Risk Control	after	8	3.25	0.46	3.00	3.00	4.00	0.0901
		before	8	2.88	0.35	3.00	2.00	3.00	
	Safety Behavior: Fall Prevention	after	8	3.00	1.20	3.00	1.00	5.00	0.4637
		before	8	2.63	0.74	3.00	1.00	3.00	
Surveillance: Safety	Knowledge: Treatment Regimen	after	7	3.00	0.82	3.00	2.00	4.00	0.1473
		before	7	2.43	0.53	2.00	2.00	3.00	
	Safety Behavior: Fall Prevention	after	44	3.23	0.71	3.00	1.00	5.00	0.0156
		before	44	2.89	0.58	3.00	2.00	4.00	
Teaching: Prescribed Medication	Knowledge: Treatment Procedure	after	10	3.00	0.94	3.00	2.00	5.00	0.4240
		before	10	2.70	0.67	3.00	2.00	4.00	
Teaching: Procedure/Treatment	Knowledge: Treatment Procedure	after	12	3.25	0.87	3.00	2.00	5.00	0.0548
		before	12	2.67	0.49	3.00	2.00	3.00	
	Knowledge: Treatment Regimen	after	94	3.27	0.84	3.00	2.00	5.00	<.0001
		before	94	2.72	0.54	3.00	1.00	4.00	
	Respiratory Status: Ventilation	after	12	3.58	0.67	4.00	2.00	4.00	0.0352
		before	12	3.00	0.60	3.00	2.00	4.00	
Weight Management	Energy Conservation	after	13	3.69	0.63	4.00	3.00	5.00	0.0677
		before	13	3.23	0.60	3.00	2.00	4.00	

APPENDIX D: DOCUMENTATION OF SUPPORT

September 2, 2008

Hye Jin Park
Doctoral Student
The University of Iowa
College of Nursing
50 Newton Road
Iowa City, IA 52242

Dear Ms. Park:

I am writing to you to confirm Genesis Medical Center's intent to serve as a site for your proposed study on "*Evidence Based Nursing Care Plan for CHF, TJR (THR, TKR) with NANDA, NOC and NIC"* Genesis Medical Center has a long demonstrated commitment to care of the elderly and in using research findings to improve our clinical and functional outcomes.

All of us here at Genesis Medical Center look forward to working with you on this very important research project. If we can be of any assistance to you in the interim, please feel free to contact us.

Sincerely,

Judith K. Pranger, MSN, RN
Interim Vice President of Patient Services/Chief Nurse Executive

1227 E. Rusholme St. | Davenport, IA 52803 | 563.421.1000 | www.genesishealth.com

APPENDIX E: HUMAN SUBJECTS APPROVAL

Human Subjects Office
340 Medicine Administration Building
Iowa City, Iowa 52242-1101
319-335-6564 *Fax* 319-335-7310
irb@uiowa.edu
http://research.uiowa.edu/hso

IRB ID #: 200903783

To: Hye Jin Park

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

Re: NANDA-I, NOC, and NIC Linkages Using OPT (Outcome Present state Test) Model for Congestive Heart Failure.

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

Approval Date: 03/27/09

Next IRB Approval Due Before: 03/27/10

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:
Catherine Woodman, MD
03/27/09 1811

1227 E. Rusholme St. | Davenport, IA 52803 | 563.421.1000 | www.genesishealth.com

GENESIS HEALTH SYSTEM INSTITUTIONAL REVIEW BOARD

A Committee of Genesis Health System for the Protection of Human Subjects of Research

DATE: March 20, 2009
TO: Hye Jin Park
FROM: Genesis Health System Institutional Review Board
STUDY TITLE: [107036-2] NANDA-I, NOC, and NIC Linkages Using OPT (Outcome Present State Test) Model for Congestive Heart Failure

IRB REFERENCE #: 09-004
SUBMISSION TYPE: Response/Follow-Up
ACTION: APPROVED
APPROVAL DATE: March 20, 2009
EXPIRATION DATE: February 13, 2009
REVIEW TYPE: Administrative Review

Thank you for your submission of Response/Follow-Up materials for this research study. Genesis Health System Institutional Review Board has APPROVED your submission of this new study. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized.

This submission has received Administrative Review based on the applicable federal regulation. You have the following responsibilities to the IRB as you conduct your clinical investigation:

1. Conduct all research in accordance with this approved submission.
2. Provide a Continuing Review report concerning the progress of the clinical investigation every year or at any time requested by the IRB.
3. Promptly report any changes in the research protocol to the IRB.
4. Do not initiate any changes in your approved research without IRB review and approval except when necessary to eliminate apparent immediate hazards to the human subjects.
5. Promptly report to the IRB any serious or unanticipated problems involving risks to subject or others, as outlined in the GHS-IRB Guidelines for Reporting Adverse Events.
6. Notify the IRB when your study is terminated, by submitting a Study Closure Report.

The IRB is governed by Genesis Health System and is regulated by the Food and Drug Administration's standards for the composition, operation and responsibility of Institutional Review Boards. If you have any questions, please contact Andy Burman at (563) 421-1395 or burmana@genesishealth.com. Please include your study title and reference number in all correspondence with this office.

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