USING THE NURSING INTERVENTIONS CLASSIFICATION (NIC) TO CODIFY THE NURSING ACTIVITIES OF ADVANCED BEGINNER, COMPETENT/PROFICIENT, AND EXPERT NURSES

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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ABSTRACT

Sharon Ann Milligan

USING THE NURSING INTERVENTIONS CLASSIFICATION (NIC) TO CODIFY THE NURSING ACTIVITIES OF ADVANCED BEGINNER, COMPETENT/PROFICIENT, AND EXPERT NURSES

There is an increasing awareness of the need to achieve interoperability, the capability of different clinical documentation systems to communicate with each other. This sharing of data can only be achieved by the implementation of structured terminologies, such as the Nursing Interventions Classification (NIC). The classification of nursing data will enable nursing practice to be measured consistently. A nursing research study on the complexity of nursing provided a unique opportunity for the secondary analysis of actual observed nursing activities. An evaluation of these activities was conducted to determine if the NIC could be used to code the data. Observational data from two advanced beginner nurses, two competent/proficient nurses, and two expert nurses were coded with the NIC by two health informatics graduate students. The agreement between coders in the identification of a nursing intervention, unitizing inter-rater reliability, was calculated as 91.55%. The consistency of coding between coders, interpretive inter-rater reliability, was calculated as 75.60%. The results of this study show that the flexibility inherent in the design of the NIC can pose issues in the consistent assignment of interventions to the observed nursing activities. The challenges of implementing the NIC in a complex nursing environment can also be seen.

CHAPTER ONE: INTRODUCTION & BACKGROUND

Introduction to the Nursing Interventions Classification (NIC)

In this day of information technology, the health care industry tends to generate an overabundance of data from its research efforts and administrative requirements. The ability to classify data allows nurse researchers to perform quantitative analyses on nursing generated data, as well as qualitative analyses for the purpose of evaluating the nursing process. But as Clark and Lang (1992, p. 110) state, "If we cannot name it, we cannot control it, finance it, teach it, research it, or put it into public policy." By operationally applying the Nursing Interventions Classification (NIC) nursing activities can finally be controlled, financed, taught, researched, and put into public policy.

While paper forms and electronic systems have been developed prospectively with the NIC, it has yet to be determined whether the actual work of nursing can be operationally classified. Can a list of nursing activities that are observed real-time be coded retrospectively with the NIC? By determining the NIC interventions that are applicable to the actual work performed, it will be possible to analyze the data and convert it to information and, subsequently, knowledge.

LaDuke (2000) cites the Nursing Interventions Classification (NIC) as a common language that empowers nurses to describe, validate, and control their practice. Communication is enabled with the standardized language of NIC. Activities that are visibly apparent, such as 'perform an ECG', can be incorporated along with other critical-thinking activities, such as 'monitor hemodynamic response to dysrhythmia', that are then represented in an intervention, 'dysrhythmia management'. Other activities that may

not be as visible, such as ‘emotional support’, are captured and validated also. In short, the NIC provides the words to describe what nurses really do.

During the 16th Annual Summer Institute in Nursing Informatics that was held during July, 2006, at the University of Maryland in Baltimore, Maryland, one consistent theme was emphasized throughout the conference. Nursing informatics professionals must contribute to the standards for data and terminology that define their profession in order to promote interoperability. Interoperability refers to the ability of different clinical information systems to communicate with each other.

Dochterman and Bulechek (2004) identified how a structured terminology, such as the Nursing Interventions Classification (NIC), can standardize and define the knowledge base for nursing curricula and practice. This classification is an organized set of codes with a limited number of categories that allows for and supports the aggregation of data. It describes and assigns meaning to nursing activities.

The hierarchical structure of the NIC consists of 7 domains (Level 1), 30 classes (Level 2), 514 interventions (Level 3), and a multitude of activities (Figure 1.1). The 7 domains are: 1) Physiological: Basic, 2) Physiological: Complex, 3) Behavioral, 4) Safety, 5) Family, 6) Health System, and 7) Community. Appendix A lists all domains and classes along with their descriptions.

Each intervention has a unique code, label name, description, list of activities, and a short list of background readings. The interventions have been systematically organized and are based on similarities that can be considered a conceptual framework. A single intervention can reside in more than one class and domain. For example, the intervention ‘Physical Restraint’ resides in both the ‘Immobility Management’ class, ‘Physiological:

Basic' domain and the 'Risk Management' class, 'Safety' domain.

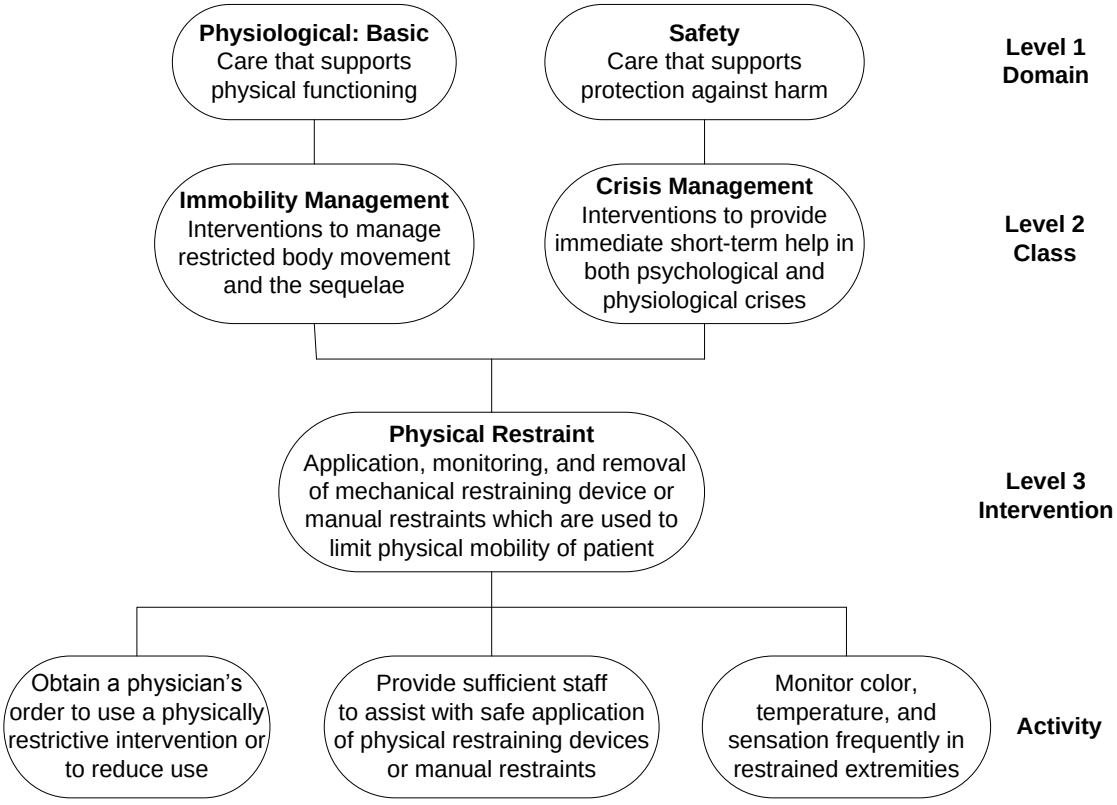

Figure 1.1 NIC Taxonomy

Knowledge Gap

The NIC classification was first developed by generating a list of interventions. Activities were gathered from various sources such as nursing textbooks, nursing care planning guides, and information systems. The available data were then grouped into categories which became known as the initial list of interventions. The interventions and list of activities were refined using expert surveys and focus groups. The NIC taxonomy was constructed in later phase of development (Dochterman & Bulechek, 2004). What has yet to be determined is if the NIC reflects the actual work of the nurse. For the system to be utilized by nurses, it must accurately describe the work that they perform.

CHAPTER TWO: LITERATURE REVIEW

Validation of the Nursing Interventions Classification (NIC) Taxonomy

Dochterman & Bulechek (2004) describe the methodology that was used to establish a valid taxonomic structure for NIC. The Iowa Intervention Project resulted in the publication of the NIC in 1992 and the NIC taxonomy structure followed in the fall of 1993. Research team members used various methodologies such as content analysis, expert survey, and focus-group interviews to develop and validate the interventions. In addition, the team standardized the principles of applying labels, adding definitions, and identifying activities to the interventions (Dochterman & Bulechek, 2004).

A sample of nurses who belonged to the Midwest Nursing Research Society participated in a qualitative and quantitative study to determine the meaningfulness of the taxonomy (Dochterman & Bulechek, 2004). Four basic principles for the revision of the taxonomy were identified in the research. Only changes were made that were evidence-based. The language was kept simple. The taxonomy structure was to represent current, not future practice. And an attempt to place each intervention into only one class was made.

Each participant was asked to rate each domain and each class as to how characteristic it was using a five-point Likert scale (1, not at all characteristic, to 5, very characteristic) according to five criteria. The criteria were:

- Clarity: The class label and definition are stated in clear understandable terms.
- Homogeneity: All interventions are variations of the same class.
- Inclusiveness: The class includes every possible intervention.
- Mutual exclusiveness: The class excludes interventions that do not belong.

- Theory neutral: The class can be used by any institution, nursing specialty, or care delivery model regardless of philosophical orientation.

The results of this assessment indicated that 77% of the respondents rated these domains as quite characteristic or very characteristic according to all criteria. And 88% of the respondents rated the classes as either quite characteristic or very characteristic according to all criteria. The Physiological: Complex domain received the highest ratings and the Health System domain received the lowest ratings. The majority of indirect care interventions reside in the Health System domain, which indicated the need for further validation. Based on these results revisions were made to the taxonomy.

Research using the Nursing Interventions Classification

In 1998, Columbus Regional Hospital in Columbus, Indiana, collaborated with the University of Iowa to develop a paper documentation form to standardize the pulmonary education of hospitalized patients using the Nursing Interventions Classification (NIC) and the Nursing Outcomes Classification (NOC) (Hajewski, Maupin, Rapp, Sitterding, & Pappas, 1998). Issues were identified in their current process for patient education. Education was found to be poorly documented and the teaching plan was underused. There were multiple versions of patient education materials, sometimes with inaccurate or conflicting information in them.

The team chose to develop, standardize, and code all educational materials, patient handouts, the teaching plan, and a paper documentation form with the NIC and the NOC. Interventions and outcomes that were relative to the pulmonary patient population were selected first and then incorporated into the paper documentation forms.

Findings by the staff nurses indicated the need to develop teaching cues, such as 'Describe the common signs and symptoms of the disease (Pneumonia)', to ensure that consistent content be delivered to each patient for each intervention. The staff found these forms reduced documentation time and allowed the educational content to be recorded consistently.

A four year comparison study of nursing terms from 201 hospitalized patients with a diagnosis of AIDS and *pneumocystitis jerovici* (previously known as *pneumocystitis carinii*) pneumonia was done to compare the frequency with which nursing terms could be categorized with the NIC and Current Procedural Terminology (CPT®), a hospital coding system for diagnostic services (Henry, Holzemer, Randell, Hsieh, & Miller, 1997). The researchers collected terms from patient interviews, nurse interviews, care plans, flowcharts, nursing notes, and inter-shift reports. Activity statements were recorded verbatim by RN research assistants and transcribed into a database for coding and analysis.

In this study, the text was first examined to verify that each recorded statement was a nursing activity and eliminated any non-nursing activity statements from the population. Statements that were judged not to be nursing activities were generalized statements from the patients about the nursing care, representing 2.1% of the total statements. Decision rules were identified to ensure consistency of coding. The basic principle was to place the activity into the most specific possible intervention. These rules became necessary because a nursing activity could be in more than one NIC intervention classification and because an intervention could be an activity in another intervention classification.

The findings of this descriptive study were that all terms in the data set could be classified using the NIC, while a significant number were not classifiable with CPT® codes. The researcher established an 82% inter-rater reliability at the intervention level, 95% at the class level, and 96% at the domain level. The researchers experienced some difficulty in assigning a nursing activity to an intervention category when it could fit under two or three intervention categories.

Thoroddsen (2005) utilized the NIC Use Survey to determine the applicability of the NIC for use in a future Nursing Information System for documenting nursing care. This survey was administered to 198 Icelandic nurses who scored each intervention as to whether they performed it in their practice and, if so, how often they used each one. The surveyed nurse responses were ranked using a rating scale of 1 through 6; the closer to 6, the more frequently the intervention was used by the nurse. The value 7 represented 'I don't know or don't understand' and was not used in the calculations for frequency.

There were 36 interventions with a mean above 3.60. Approximately half of these interventions (n=19) fell into the domains of 'Physiological: Basic' and 'Physiological: Complex'. The remaining interventions fell into the domains of 'Behavioral' (n=6), 'Risk Management' (n=2), and 'Health System' (n=9). Documentation was the most frequently used intervention. Both direct interventions, such as 'Analgesic Administration' and 'Medication Administration', and indirect interventions, such as 'Order Transcription' and 'Shift Report', were used daily by more than 50% of the nurses. Analysis of variance by the researchers found significant differences by nursing specialties in all classes, except 'Crisis Management'. Highly specialized interventions, such as 'Leech Therapy' and 'Unilateral Neglect Management', had high missing values or 'I don't know'

answers.

Keenan, Stocker, Geo-Thomas, Soparkar, Barkauskas, and Lee (2002) describe a project entitled ‘Hands-on Automated Nursing Data System (HANDS)’. HANDS is an automated application that is designed to store and retrieve a core set of clinical nursing data across settings and institutions. Built into the design of the prototype system were the following structured terminologies: North American Nursing Diagnosis Association (NANDA), Nursing Outcomes Classification (NOC), and Nursing Interventions Classification (NIC).

The study was rolled out in three phases. First the database was designed, hardware and software were selected, and the user interface was programmed, with the second phase rolling out the application in five clinical test sites. The final phase tested the methodology for the collection of comparable data.

In phase one preliminary clinical testing of the HANDS prototype by a software usability expert who was a non-health care professional found the application easy to navigate and the search, help, and documentation functions intuitive to use. Pilot testing by nurse data collectors in phase one revealed the time savings required to enter study data. They estimated a time savings of 30 to 35 minutes per data set with the use of the HANDS application. The complexity of the nursing process in relation to nursing outcomes was highlighted in this project

Keenan, Falan, Heath, and Treder (2003) educated staff nurses on North American Nursing Diagnosis Association (NANDA), the NIC, and the Nursing Outcomes Classification (NOC). Nineteen pairs of staff nurses received an eight-hour educational session on each terminology. The education included the history and

structure of the terminology, instructions on HANDS software, and instructions on how to create, update, and print nursing care profiles.

As a part of the study the primary nurse created a patient case using the standardized terminologies and a secondary nurse classified the same case independently. Comparing the two datasets NANDA was coded with a 46% average inter-rater agreement per case. NOC was coded with a 30% average inter-rater agreement per case. And NIC was coded with a 20% average inter-rater agreement per case.

Current Understanding

In developing the NIC, Dochterman and Bulechek (1995) assigned codes to the items in the various levels of the taxonomy. These codes allowed for electronic representation of the NIC. An example of a code would be '4U-6140.01'. The first digit (4) to the left of the decimal point represents the domain. The second digit (U) signifies the class. The remaining four digits (6140) indicate the intervention. The two digits to the right of the decimal point (01) identify the specific nursing activity, which is the most discrete level.

There are several methods to find and assign an intervention. A nursing activity can be coded by using either an alphabetical search by the name of the activity or by searching within a domain or class. If one knows the name of the intervention, one can locate it to see the listing of activities and background readings.

Another method to identify the correct code is to utilize the NIC taxonomy. The researcher can identify related interventions by first locating the related domain and class. One can also use a list of suggested interventions which are associated with a North American Nursing Diagnosis Association (NANDA) diagnosis.

And, lastly, core interventions are listed by specialty, enabling the individual to narrow the search. The authors warn that an individual should not be overwhelmed by the number of interventions as it does not take long for one to become familiar with the classification (Dochtermann & Bulechek, 2004).

Garvin, Kennedy, and Cissna (1988) describe the process for determining inter-rater reliability in category coding system, such as the NIC. The first step is to determine unitizing reliability. The authors define unitizing reliability as "consistency in the identification of what is to be categorized across time and/or judges" (p.328-329). Unitizing reliability can be analyzed by comparing consistency of the identification of observed nursing activities in transcribed lists between two independent coders as NIC activities or non-NIC activities. A simple computation is performed using the following equation:

$$\frac{\text{number of agreements}}{\text{number of possible agreements}}$$

According to Garvin et al. (1988), the second phase of establishing inter-rater reliability is to determine interpretive reliability. This provides assurance that the intervention classifications are consistently applied to the observed nursing activities. A global estimate of reliability is reported as the percentage of agreement between two coders on the assignment of the codes to a random sample of observed nursing activities.

Research Question

The purpose of the study was to evaluate the applicability of the NIC coding in quantifying nursing data that was collected for a nursing research project. The research question was: *Can a list of nursing activities that are observed real-time be coded*

retrospectively using the NIC with a high degree of reliability? The secondary analysis was conducted using data that were recorded by nurses in a study entitled "A Comparison of Priority Setting among Advanced Beginner, Competent/Proficient, and Expert Nurses on Cardiovascular Patient Care Units". The Nursing Interventions Classification (NIC) was used to codify the observed nursing activity data obtained from this study.

CHAPTER THREE: METHODOLOGY

Data Source

The source of data used for this research project was from a study being conducted to determine if there are differences in how advanced beginner, competent/proficient, and expert nurses prioritize planning for patient care during their work shift and to determine what factors influence change in those plans. Researchers observed cardiovascular unit nurses during normal routine activities using a combination of field notes and audio tapes to capture nursing activities. Transcribed lists of the observed nursing activities were provided as the data source for this study. Included in each of the lists was the participant's study code, date of the observations, time of each observed task, and the observed task.

Materials and Instruments

The NIC is published and copyrighted by Mosby, Inc. According to Dochterman & Bulechek (2004), schools of nursing and health care agencies that want to use NIC in their own organizations and have no intent of selling a resulting product are free to do so. An evaluation of the requirements indicated that the NIC was covered under the fair use provisions of the copyright for this project. The NIC system was used to codify the data for analysis.

In addition to the observational data, demographic worksheets were used to collect the level of competency for each nurse. The nurse demographics worksheet (Appendix B) was completed by each nurse prior to participating in the study. This worksheet described the age, gender, level of education, certifications, and years of

experience as a nurse. The nurse was self-rated for level of nurse competency. Additionally, the nurse's manager rated the level of competency. The nurse manager's rating was used to categorize the nurse level of competency, as defined by Benner (1982), in the study.

The first level of competency, the advanced beginner, was defined as a nurse who demonstrated marginally acceptable performance, recognized and could cope with aspects of common clinical situations on the unit, and was typically a new RN graduate with up to one year of experience in one clinical area. The competent/proficient nurse performed conscious, deliberate planning, recognized an overall picture of the situation, delivered efficient patient care, grasped the situation based on background knowledge, met clinical expectations consistently, and typically had two to five years of experience in one clinical area. The expert nurse showed expertise in theoretical and practical knowledge, intuitively grasped situations based on past experiences and deep background understanding, compared the similarities and dissimilarities among clinical situations, consistently exceeded clinical competence expectations, and typically had experience in one clinical area for more than five years according to Benner (1982).

Samples and Subjects

In the original observational study, a convenience sample of nurses was recruited with representation from each group under study. Participation was voluntary. Informed consent was obtained from each of the participants (Appendix C). Each participant was given a research code name or alias to maintain confidentiality.

The researcher used purposive sampling to select the six cases for this study. The selection was based on the availability of the transcribed observations and the level of

competency of the nursing subjects. Two cases were selected from each of the advanced beginner, competent/proficient, and expert levels.

Methods

A database was designed to provide a means to organize, access, and share information. Tables were designed for the participant information and observational data. In addition, a table was created for the NIC interventions, descriptions, classes, and domains. Data were obtained by the researcher from the primary study and were entered into the study database verbatim, without any changes in the transcribed information. These data were then coded by the investigator using the NIC classification system.

Non-NIC activities were divided into three categories: assessment activity, non-intervention activity, and travel. The categories were determined by grouping and labeling similar non-NIC activities. In addition to the NIC category, these three categories were utilized to classify any non-NIC activities. Assessment activity was defined as a systematic gathering of data about the patient for the purpose of making a nursing or medical diagnosis. Travel was defined as an activity where the nurse moved from one location to another location. A non-intervention activity was defined as any activity that could not be classified as travel or assessment and could not be coded with the NIC. Examples of non-intervention activities were “Took a break”, “Straightened mini-nurse station”, and “Talked with co-worker”.

Initially, the coder utilized the NIC taxonomy to determine whether the observed activity was a NIC activity or non-NIC activity. The observed activity was evaluated for its relevance to each of the domains. For example, the question was asked for the activity “Was this care that supports physical functioning (Domain 1)?” If the answer was ‘Yes’,

then the observed activity was evaluated for its relevance to the various classes under Domain 1 and placed into the appropriate class. If the answer was 'No', then the observed activity was evaluated for its relevance to Domain 2. All 7 domains were evaluated in the same way, until all domains had been exhausted and the observed activity was classified as a non-NIC activity or placed into the appropriate domain.

Once the coder had determined that a NIC intervention existed, the various interventions under the designated class were evaluated for appropriateness and the NIC intervention was assigned an intervention code. Methods used to assign the NIC included the utilization of the electronic database and reference to the Nursing Interventions Classification (NIC), Fourth Edition (Dochterman & Bulechek, 2004). When an observed activity could be categorized with more than one intervention, the most specific intervention was chosen. For example, when the nurse teaches the patient about a new medication, this intervention could be coded as 'Teaching: Individual' or as 'Teaching: Prescribed Medication'. The more specific intervention, 'Teaching: Prescribed Medication', was assigned by the coder.

In order to determine coding reliability, a second health informatics graduate student was enlisted to code the same data set. The student was provided with a listing of interventions and descriptions of interventions, a copy of the database, and a copy of the *Nursing Interventions Classification (NIC)* by Dochterman & Bulechek (2004). Instructions were given describing the methodology to be used in the assignment of the NIC and non-NIC codes.

CHAPTER FOUR: RESULTS

A total of 545 observed nursing activities were recorded for six nurse participants. The number of observed activities by the level of nurse competency were divided as follows: advanced beginner nurses (110 activities in 170 minutes of observation time), competent/proficient nurses (139 activities in 183 minutes of observation time), and expert nurses (296 activities in 229 minutes of observation time). The mean number of observed activities per hour per level of nurse competency was advanced beginner nurses (39 activities per hour), competent/proficient nurses (46 activities per hour), and expert nurses (77 activities per hour). The mean number of observed activities per hour for all nurses was 56 activities.

Results indicated that the two coders agreed on the classification of 499 observed activities out of a possible 545 observed activities as determining whether the activity was a NIC activity versus a non-NIC activity. This represents a unitizing inter-rater reliability of 91.55%. The two coders agreed on 412 observed activities out of a possible 545 observed activities on the codes assigned to the nursing activities. A 75.60% interpretive inter-rater reliability rate was determined.

Several sources of disagreement between coders centered on the medication interventions. The interventions, ‘Medication Management’, ‘Medication Administration’, ‘Analgesic Administration’, ‘Medication Administration: Oral’, ‘Medication Administration: Intravenous (IV)’, and ‘Intravenous (IV) Therapy’ were examples of interventions that were disagreed upon by the two coders. The more specific intervention was chosen to be used in the analysis.

There were 45 distinct NIC codes selected by the first coder. The 45 were 8.2% of

the possible 514 NIC interventions that could have been assigned. There were 36 distinct NIC codes selected by the second coder. The 36 represented 7.2% of the possible 514 NIC interventions that could have been assigned. Only 4.7% of the possible 514 NIC interventions for a total of 24 unique interventions were used by both coders.

Table 4.1 shows the number and percentage of all observed activities by category. Table 4.2 shows the number and percentage of all observed activities by category and by level of competency. Note: See Appendices for graphical displays of all tables.

Category		n (%)
NIC Activities		339 (62.2)
Non-NIC Activities		
	Assessment Activity	16 (2.9)
	Non-Intervention Activity	84 (15.4)
	Travel	106 (19.5)

Table 4.1 Number & Percentage of Observed Activities by Category

Category		Advanced Beginner n (%)	Competent/ Proficient n (%)	Expert n (%)
NIC Activities		79 (71.8)	86 (61.9)	174 (58.8)
Non-NIC Activities				
	Assessment Activity	4 (3.6)	8 (5.8)	4 (1.3)
	Non-Intervention Activity	17 (15.5)	12 (8.6)	55 (18.6)
	Travel	10 (9.1)	33 (23.7)	63 (21.3)

Table 4.2 Number & Percentage of Observed Activities by Category & Level of Competency

Most of the NIC activities fell into the domains of ‘Physiological: Complex’ (36.5%) and ‘Health System’ (29.4%). There were no NIC activities that were represented in the ‘Community’ domain (Table 4.3). Table 4.4 represents the number and percentage of NIC activities by both domain and level of nurse competency.

NIC Domain	n (%)
Behavioral	15 (4.4)
Community	0 (0.0)
Family	11 (3.2)
Health System	100 (29.4)
Physiological: Basic	29 (8.5)
Physiological: Complex	124 (36.5)
Safety	61 (17.9)

Table 4.3 Number & Percentage of NIC Activities by Domain

NIC Domain	Advanced Beginner n (%)	Competent/ Proficient n (%)	Expert n (%)
Behavioral	1 (1.3)	2 (2.3)	12 (6.9)
Community	0 (0.0)	0 (0.0)	0 (0.0)
Family	0 (0.0)	1 (1.2)	10 (5.7)
Health System	23 (29.1)	37 (42.5)	40 (23.0)
Physiological: Basic	1 (1.3)	5 (5.7)	23 (13.2)
Physiological: Complex	42 (53.1)	32 (36.8)	50 (28.7)
Safety	12 (15.2)	10 (11.5)	39 (22.5)

Table 4.4 Number & Percentage of NIC Activities by Domain & Level of Competency

All classes in the ‘Physiological: Basic’ and ‘Health’ System domains were used. There were no classes in the ‘Community’ domain used. The following classes were not observed in the study: ‘Electrolyte and Acid-Base Management’, ‘Perioperative Care’, ‘Skin/Wound Management’ ‘Thermoregulation’, ‘Behavior Therapy’, ‘Cognitive Therapy’, ‘Coping Assistance’, ‘Psychological’, ‘Crisis Management’, ‘Childbearing Care’, and ‘Childrearing Care’. Table 4.5 depicts the NIC classes that were used in the study.

The top five classes for all levels of competency were ‘Drug Management’, ‘Risk Management’, ‘Information Management’, ‘Tissue Perfusion Management’, and ‘Health

System Management'.

NIC Class	n (%)
Activity and Exercise Management	1 (0.3)
Communication Enhancement	9 (2.6)
Drug Management	80 (23.2)
Elimination Management	6 (1.7)
Health System Management	39 (11.3)
Health System Mediation	9 (2.6)
Immobility Management	1 (0.3)
Information Management	52 (15.1)
LifeSpan Care	11 (3.2)
Neurologic Management	1 (0.3)
Nutrition Support	5 (1.4)
Patient Education	6 (1.7)
Physical Comfort Promotion	9 (2.6)
Respiratory Management	3 (0.9)
Risk Management	61 (17.7)
Self-Care Facilitation	12 (3.5)
Tissue Perfusion Management	40 (11.6)

Table 4.5 Number & Percentage of NIC Classes

Table 4.6 represents the number and percentage of interventions by level of competency.

NIC Intervention	Advanced Beginner n (%)	Competent/ Proficient n (%)	Expert n (%)
Active Listening	1 (1.3)	0 (0.0)	8 (4.6)
Admission Care	1 (1.3)	2 (2.3)	6 (3.4)
Analgesic Administration	0 (0.0)	3 (3.5)	0 (0.0)
Bowel Management	1 (1.3)	0 (0.0)	1 (0.6)
Cardiac Care	0 (0.0)	0 (0.0)	2 (1.1)
Cardiac Care: Acute	0 (0.0)	1 (1.2)	0 (0.0)
Circulatory Care: Arterial Insufficiency	1 (1.3)	2 (2.3)	2 (1.1)
Consultation	0 (0.0)	1 (1.2)	5 (2.9)
Diet Staging	0 (0.0)	1 (1.2)	0 (0.0)
Documentation	7 (8.9)	7 (8.1)	12 (6.9)
Environmental Management	0 (0.0)	0 (0.0)	19 (10.9)
Environmental Management: Comfort	0 (0.0)	0 (0.0)	9 (5.2)

Exercise Therapy: Ambulation	0 (0.0)	1 (1.2)	0 (0.0)
Family Involvement Promotion	0 (0.0)	0 (0.0)	1 (0.6)
Family Support	0 (0.0)	1 (1.2)	9 (5.2)
Health Care Information	7 (8.9)	3 (3.5)	5 (2.9)
Infection Control	1 (1.3)	5 (5.8)	11 (6.3)
Intravenous (IV) Insertion	0 (0.0)	4 (4.7)	2 (1.1)
Intravenous (IV) Therapy	1 (1.3)	6 (7.0)	18 (10.3)
Invasive Hemodynamic Monitoring	0 (0.0)	1 (1.2)	0 (0.0)
Laboratory Data Interpretation	0 (0.0)	0 (0.0)	5 (2.9)
Medication Administration	13 (16.5)	10 (11.6)	19 (10.9)
Medication Administration: Oral	18 (22.8)	0 (0.0)	4 (2.3)
Medication Management	9 (11.4)	1 (1.2)	2 (1.1)
Neurologic Monitoring	0 (0.0)	1 (1.2)	0 (0.0)
Nutrition Management	0 (0.0)	1 (1.2)	2 (1.1)
Oxygen Therapy	0 (0.0)	2 (2.3)	0 (0.0)
Preceptor: Student	4 (5.1)	20 (23.3)	0 (0.0)
Respiratory Monitoring	0 (0.0)	0 (0.0)	1 (0.6)
Self-Care Assistance: Bathing/Hygiene	0 (0.0)	0 (0.0)	3 (1.7)
Self-Care Assistance: Dressing/Grooming	0 (0.0)	0 (0.0)	4 (2.3)
Self-Care Assistance: Toileting	0 (0.0)	0 (0.0)	3 (1.7)
Self-Care Assistance: Transfer	0 (0.0)	0 (0.0)	1 (0.6)
Shift Report	1 (1.3)	0 (0.0)	4 (2.3)
Specimen Management	0 (0.0)	4 (4.7)	0 (0.0)
Staff Supervision	3 (3.8)	0 (0.0)	0 (0.0)
Supply Management	0 (0.0)	0 (0.0)	3 (1.7)
Swallowing Therapy	0 (0.0)	1 (1.2)	0 (0.0)
Teaching: Prescribed Medication	0 (0.0)	1 (1.2)	0 (0.0)
Teaching: Procedure/Treatment	0 (0.0)	1 (1.2)	4 (2.3)
Urinary Elimination Management	0 (0.0)	1 (1.2)	0 (0.0)
Vital Signs Monitoring	11 (13.9)	5 (5.8)	9 (5.2)

Table 4.6 Number & Percentage of NIC Interventions by Level of Competency

CHAPTER FIVE: DISCUSSION

Explanation of Outcomes

Coding Reliability

Unitizing Reliability

The unitizing reliability between the two coders was 91.55%. This rate indicates that the coders could discern NIC-activities from non-NIC activities with a high degree of reliability.

Interpretive Reliability

The inter-rater reliability between the two coders in assigning the same NIC codes to the activities or interpretive reliability was generally high at 75.60%. In a similar study, Henry et al. (1997) found an 82% inter-rater reliability at the intervention level. In the Henry et al. (1997) study, the researchers eliminated 'non-nursing activities' from the inter-rater reliability calculation. The inter-rater reliability in this study was 74.3% when both coders selected the NIC to code an observed activity. This rate was comparable to the inter-rater reliability (75.60%) for all observed nursing activities.

However, Keenan, Falan, Heath & Treder (2003) evaluated inter-rater reliability of the NIC and found that 19 pairs of staff nurses agreed on only 20% of the NIC interventions describing the actual care provided. The difference between inter-rater reliabilities between this current study and Keenan et al. (2003) could be attributed to the different methodologies that were selected to assign the NIC code. Alphabetical search and the NIC taxonomy were used to assign interventions to observed activities in this study. The NIC code was the only focus for coding a nursing intervention. Whereas, Keenan et al. (2003) employed a different methodology by associating interventions with

the NANDA diagnosis and NOC classification codes to formulate a plan of care.

In addition, the skill sets of the coders can play a role in inter-rater reliability. Keenan et al. (2003) used staff nurses who scored generally low on familiarity with the NIC and even lower on frequency of the NIC use in practice in their study. Two health informatics professionals who are familiar with coding schemas assigned the NIC codes in this study. Both of these professionals were certified in health care quality and detail oriented. Each coder was highly motivated to assign the most appropriate intervention code.

The variability in classifying with the NIC in this study can be partially attributed to the ability to classify a nursing activity in more than one intervention and the level of discreteness that was used by the coder. For example, the activity "Gathered gown and shower linens for the patient" was coded as 'Self-Care Assistance: Bathing/Hygiene' by the first coder, but coded as 'Self-Care Assistance' by the second coder.

Medication administration proved to be a source of coding discrepancies likewise. There were several records to which the first coder assigned 'Medication Management' to the activity and the second coder assigned 'Medication Administration' to the same activity. The intervention 'Medication Administration' is broken down into other codes that signify the route of the administration, such as 'Medication Administration: Oral'. This proved to be a source of disagreement between coders, as well as the use of 'Analgesic Administration'. The activity, "Documentation of a pain pill", could be coded as any one of these three interventions, as well as the 'Documentation' code. The same type of discrepancy occurred between 'Intravenous (IV) Therapy' and 'Medication Administration: Intravenous (IV)'.

Differences between Levels of Competency

Interesting differences were seen in the coded activities across the three levels of nurse competencies. Expert nurses performed almost double the number of activities per hour as the advanced beginner nurses. As the level of expertise increased, so did the volume of activity. When one examined the type of interventions that were represented, the advanced beginner nurse had the largest volume of activity in the medication process and vital signs monitoring. Both of these activities are technical by nature, which may reflect the task oriented nature of the advanced beginner nurse.

The expert nurse exhibited more of a balance in all the identified NIC interventions. 'Active Listening' and 'Family Support' were used more by the expert nurse. These are interpersonal skills that indicate more advanced nursing practice. The percentage of the 'Consultation' intervention was twice as high in the expert nurse than in the competent/proficient nurse. And the advanced beginner did not have any 'Consultation' interventions. This reflects the increased knowledge of the expert nurse. The differences in coded activities are consistent with hypothesized practice patterns of novice versus expert nurses and lend support to the validity of NIC for capturing the actual work of nurses in practice.

Assessment versus Monitoring

The two coders were able to recognize activities and code them either with the NIC or as a non-NIC activity with a high degree of reliability (91.55%). Dochterman and Bulechek (2004) identified nurse behaviors, which captured all assessment, intervention, and evaluation activities that nurses perform. The following types of behaviors were listed: 1) Assessment behaviors to make a nursing diagnosis, 2) Assessment behaviors to

gather information for a physician to make a medical diagnosis, 3) Nurse-initiated treatment behaviors in response to nursing diagnoses, 4) Physician-initiated treatment behaviors in response to medical diagnoses, 5) Behaviors to evaluate the effects of nursing and medical treatments, including assessment behaviors done for purposes of evaluation, and 6) Administrative and indirect care behaviors that support interventions. The NIC does not include assessment behaviors which are performed to make a nursing or medical diagnosis or administrative and indirect care behaviors that support interventions.

In actual practice, nurses use the term 'assessment' interchangeably with the term 'monitoring' to reflect both nursing activities that are done for the purpose of the evaluation of care, as well as nursing activities that are done for the purpose of forming a nursing diagnosis. The only assessment activities which are included in the NIC are activities that are done for the purposes of evaluation and are labeled as 'monitoring' activities. While the structure of the NIC is very clearly defined and makes the distinction between assessment and monitoring activities, nurses merge the two terms in their conceptual and practical use of the word 'assessment'.

In this study, when looking at an isolated observed activity it was difficult to determine the purpose of the assessment. The coders had to review the observed activity in context with the sequence of events in order to determine whether to code the activity as a NIC activity or non-NIC activity.

Implications of Results

Interoperability cannot be achieved without improving the reliability of the coding. The amount of variability that is built into the NIC requires a technological

structure that will support the standardization needed to assign the NIC in such a way that all institutions can use the system more consistently. Without this consistency in coding we will not be able to compare the effectiveness of nursing interventions on nursing outcomes either within institutions or between institutions. With the size of the database, 514 interventions and a multitude of activities in the NIC, the education of the nurses on the taxonomies, while improving the recognition of the need to use them, will only provide temporary improvement to the reliable use of the system. The structure must be provided to support the process. This structure should be both specific and mutually exclusive.

An effective search engine greatly assists in the use of the NIC. The ability to find results with all of the words, with the exact phrase, with at least one of the words, or without the words would greatly improve the data retrieval of the classifications. The ability to search within a specific domain or class would increase the likelihood of implementing the NIC more reliably.

Specific coding guidelines have been developed as a basis for the coding of morbidity, mortality, and procedural data by health information professionals. The use of these guidelines to produce consistent, reliable data aids health care providers in information retrieval to meet the many demands for accurately coded data in the medical record. The development, implementation, and use of coding guidelines for the NIC would achieve the same results. The coded data could then be included in data sets that would be used to evaluate the processes and outcomes of nursing care. Internal uses would include quality improvement activities, planning, marketing, and other administrative and research activities. External benchmarking of nursing activities would

be accommodated through consistent coding supported through the use of coding guidelines.

In order to be able to incorporate the nursing taxonomies fully into everyday activities there must be a full appreciation for and understanding of the nursing process. The distinction of the purpose of performing assessment activities to gather data at the practice level must be recognizable by the clinician. Assessment can no longer by used as a blanket term for all data gathering activities. For if the concepts of 'assessment' and 'monitoring' continue to be merged in our nursing practice, nursing will never fully distinguish the different stages of the nursing process, the development of nursing diagnoses, the implementation of interventions, and the monitoring of patient outcomes, and their relationship to each other. The current terminology continues to blur the two terms and does not support this distinction.

The recognition of the differences in purpose for gathering patient data supports the critical thinking of the nurse and keeps the patient on track. A patient assessment validates the current patient care plan with its accompanying nursing diagnoses, interventions, and expected outcomes. Patient monitoring evaluates the effectiveness of interventions and determines whether expected outcomes are being met.

Summary of Discussion

In summary, the NIC is a beginning structure with which to build a stronger system. In this study, actual nursing activities were represented by the NIC, as reflected by the reliability calculations and analysis by nursing level of competency. However, a higher interpretive reliability must be achieved in order to fully capitalize on the benefits of the NIC. Nursing interventions are the portion of the nursing process that links

together nursing diagnosis and patient outcomes. Full interoperability will be realized only through the consistent use of the classification and with a full understanding of the nursing process by nursing professionals. This can be accomplished with the development and use of coding guidelines and a mutually exclusive classification system.

CHAPTER SIX: CONCLUSION

Limitations

The recording of the data that were used for the secondary analysis proved to be a limitation for this study. The observers had little to no knowledge of the NIC. And although they used action verbs to describe each activity, there was no control in the way that the activities were recorded. This lack of control required some interpretation to be made by the coders.

Another limitation was the small sample size of six nurses who were used in this study. Although the sample size was small, 545 activities were recorded in a total of 582 minutes of observation time. The study yielded 56 activities per hour.

Summary

The flexibility that is built into the design of the NIC allows the bedside clinician the ability to use the NIC as best fits the clinical situation. But this flexibility can pose an issue when trying to consistently apply the NIC and achieve interoperability. Guidelines for use could prove to be beneficial to the standardized application of the NIC. In addition, less discrete interventions, especially regarding medications, would lower the confusion over which intervention to assign and would support improved interoperability.

This study identified the challenges to operationally apply the NIC to actual nursing interventions in a complex nursing environment. One of those challenges is to increase the knowledge of the clinicians as to the purpose of their interventions and the relationships with the other aspects of the nursing process. The educational disciplines are well prepared with structured methodologies to accomplish this task.

The second challenge is to apply technology at the user level to support and

facilitate the implementation of the standardized nursing taxonomies. The application of recognized data representation and data retrieval techniques, such as the use of a Thesaurus, automated assignments, or advanced searching techniques, will enable the clinician to operationally apply the languages to their practice. And, thus, the foundational structure will be in place to enable true interoperability and the advancement of nursing practice.

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APPENDICES

Appendix A: NIC Domains and Classes

Level 1 Domains; Level 2 Classes

1. Physiological: Basic – Care that supports physical functioning
   - A Activity and Exercise Management – Interventions to organize or assist with physical activity and energy conservation and expenditure
   - B Elimination Management – Interventions to establish and maintain regular bowel and urinary elimination patterns and manage complications due to altered patterns
   - C Immobility Management – Interventions to manage restricted body movement and the sequelae
   - D Nutrition Support – Interventions to modify or maintain nutritional status
   - E Physical Comfort Promotion – Interventions to promote comfort using physical techniques
   - F Self-Care Facilitation – Interventions to provide or assist with routine activities of daily living
2. Physiological: Complex – Care that supports homeostatic regulation
   - G Electrolyte and Acid-Base Management – Interventions to regulate electrolyte/acid base balance and prevent complications
   - H Drug Management – Interventions to facilitate desired effects of pharmacologic agents
   - I Neurologic Management – Interventions to optimize neurologic function
   - J Perioperative Care – Interventions to provide care prior to, during, and immediately after surgery
   - K Respiratory Management – Interventions to promote airway patency and gas exchange
   - L Skin/Wound Management – Interventions to maintain or restore tissue integrity
   - M Thermoregulation – Interventions to maintain body temperature within a normal range
   - N Tissue Perfusion Management – Interventions to optimize circulation of blood and fluids to the tissue

3. Behavioral – Care that supports psychosocial functioning and facilitates lifestyle changes

- O Behavior Therapy – Interventions to reinforce or promote desirable behaviors or alter undesirable behaviors
- P Cognitive Therapy – Interventions to reinforce or promote desirable cognitive functioning or alter undesirable cognitive functioning
- Q Communication Enhancement – Interventions to facilitate delivering and receiving verbal and nonverbal messages
- R Coping Assistance – Interventions to assist another to build on own strengths, to adapt to a change in function, or achieve a higher level of function
- S Patient Education – Interventions to facilitate learning
- T Psychological Comfort: Promotion – Interventions to promote comfort using psychological techniques

4. Safety – Care that supports protection against harm

- U Crisis Management – Interventions to provide immediate short-term help in both psychological and physiological crises
- V Risk Management – Interventions to initiate risk reduction activities and continue monitoring risks over time

5. Family – Care that supports the family

- W Childbearing Care – Interventions to assist in the preparation for childbirth and management of the psychological and physiological changes before, during, and immediately following childbirth
- Z Childrearing Care – Interventions to assist in raising children
- X Lifespan Care – Interventions to facilitate family unit functioning and promote the health and welfare of family members throughout the lifespan

6. Health System – Care that supports effective use of the health care delivery system

- Y Health System Mediation – Interventions to facilitate the interface between patient / family and the health care system
- a Health System Management – Interventions to provide and enhance support services for the delivery of care
- b Information Management – Interventions to facilitate communication about health care

7. Community – Care that supports the health of the community
    c Community Health Promotion – Interventions that promote the health of the whole community
    d Community Risk Management – Interventions that assist in detecting or preventing health risks to the whole community

Appendix B: Nurse Demographics Form

A Comparison of Priority Setting Research Project

Nurse Demographics

Age:

_____

Gender:

_____ Male (1)

_____ Female (2)

Highest Nursing Degree:

_____ ADN (1)

_____ Diploma (2)

_____ BSN (3)

_____ MSN (4)

_____ Higher (5)

National Certification (i.e. CCRN, CEN, CVN):

_____ Yes (1)

_____ No (2)

Years of Experience:

_____ Total Years as an RN

_____ Years on this Unit

Did you work in health care prior to working as an RN?

_____ Yes (1)

_____ No (2)

Rate your nursing competency on a 0-10 scale.

Score 0 for Advanced Beginner, 5 for Competent/Proficient, and 10 for Expert.

Advanced/Beginner				Competent/Proficient				Expert		
0	1	2	3	4	5	6	7	8	9	10

Appendix C: Informed Consent

Title of Study: A Comparison of Priority Setting Among Advanced Beginner, Competent/Proficient, and Expert Nurses on Cardiovascular Patient Care Units

Principal Investigator: Ann White, PhD, RN

Co-Investigators: Cathy O'Nan, MSN, RN; Jerrilee Lamar, PhD, RN; Rebecca Winsett, PhD, RN; Denise Kaetzel, BSN, RN

Purpose of the Study: The purposes of this study are: 1) to compare what activities novice, competent/proficient, and expert nurses prioritize in planning for patient care during their shifts, and 2) to identify what factors influence the change of plans for patient care during nurses' work shift.

Length of the Study: You will be asked to complete a demographic sheet following consent to participate in the study. After listening to report, you will be asked to create a "to do" list, listing activities in the order you would like to see them accomplished. You will be asked to verbally communicate this list to the researcher. At the same time, you will be asked some questions regarding your planning for the day. Later the same shift, you will be asked to look at the list developed that morning and re-order the list. In addition, you will be asked to answer questions related to events that occurred during the shift and factors that affected your day.

You may be involved in a pilot study where your priority setting activities will be observed by researchers. If observation is found to be valuable in the pilot study, your priority setting activities will be observed and documented by researchers.

Risks/Benefits of the Study: This study constitutes no more than minimal risk. The main risk is the time needed to participate in interviews with the researchers. Benefits to you may include increased professional growth as a result of participation in the study. Benefits for the professional of nursing would include insight into how levels of nurses make priority decisions in practice which could assist in educating future nurses.

Confidentiality: You will be given a research code name or alias. A separate list of code

names and nurse names will be kept. The coding sheet, consent forms, and completed interviews will be kept separately. All data collection materials will be kept in a locked file cabinet in a locked room available only to the research team until the project has been completed. Following data collection, the coding sheet will be shredded. Consent forms and completed interviews will be kept for 3 years and the shredded. The information and data resulting from this study may be presented at professional conferences or published in professional journals. Any report of individual comments from this study will use aliases or code names.

My participation is voluntary. I am free to stop taking part at any time without penalty. I have received a copy of this consent form.

Based on the above statements, I agree to take part in this study.

Participant's Signature: _____ Date _____

Principal Investigator's Signature: _____ Date _____

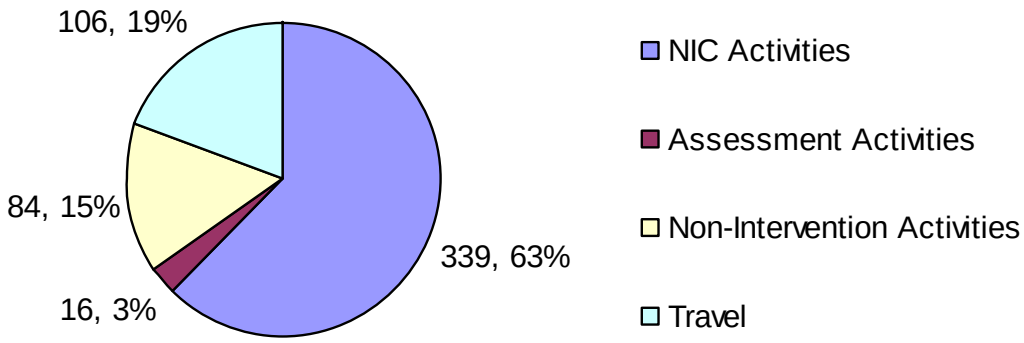
I do _____ I do not _____ agree to have my interviews audiotaped.

Participant's Signature: _____ Date _____

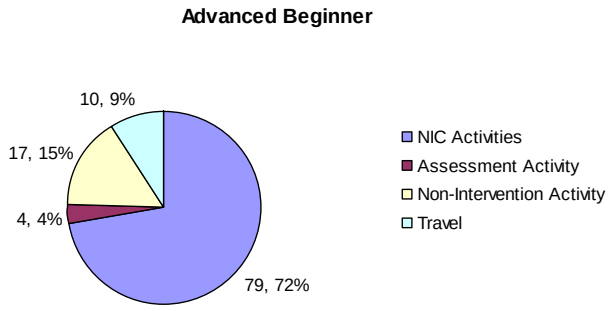
Principal Investigator's Signature: _____ Date _____

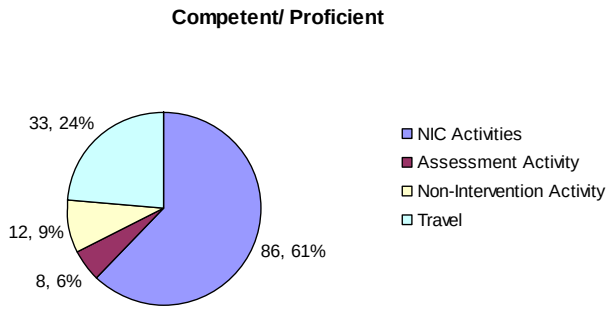
Names of investigator(s)

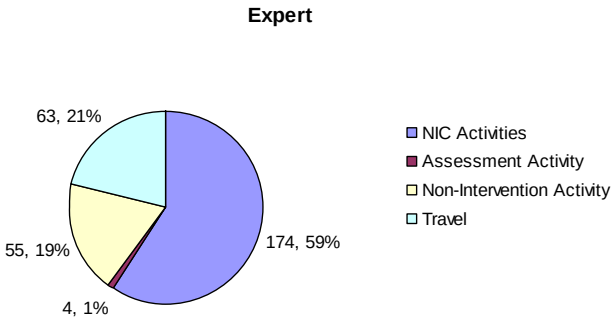
Appendix D: Number & Percentage of Observed Activities by Category Graphic Display



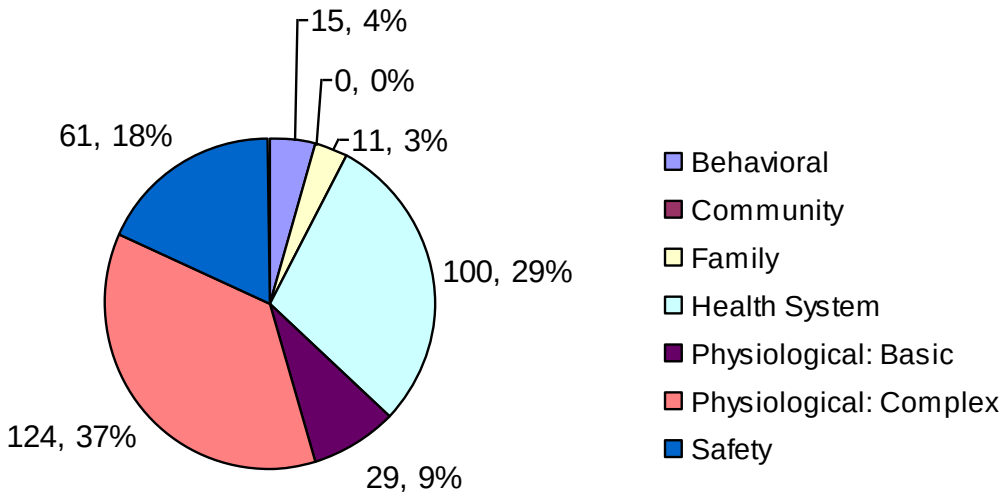
Appendix E: Number & Percentage of Observed Activities by Category & Level of Competency Graphic Display



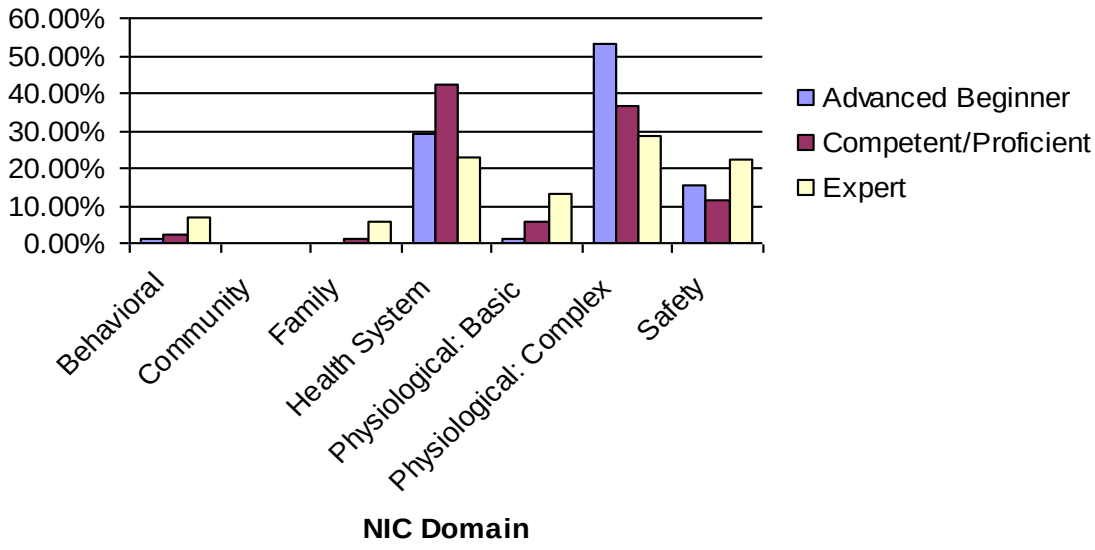




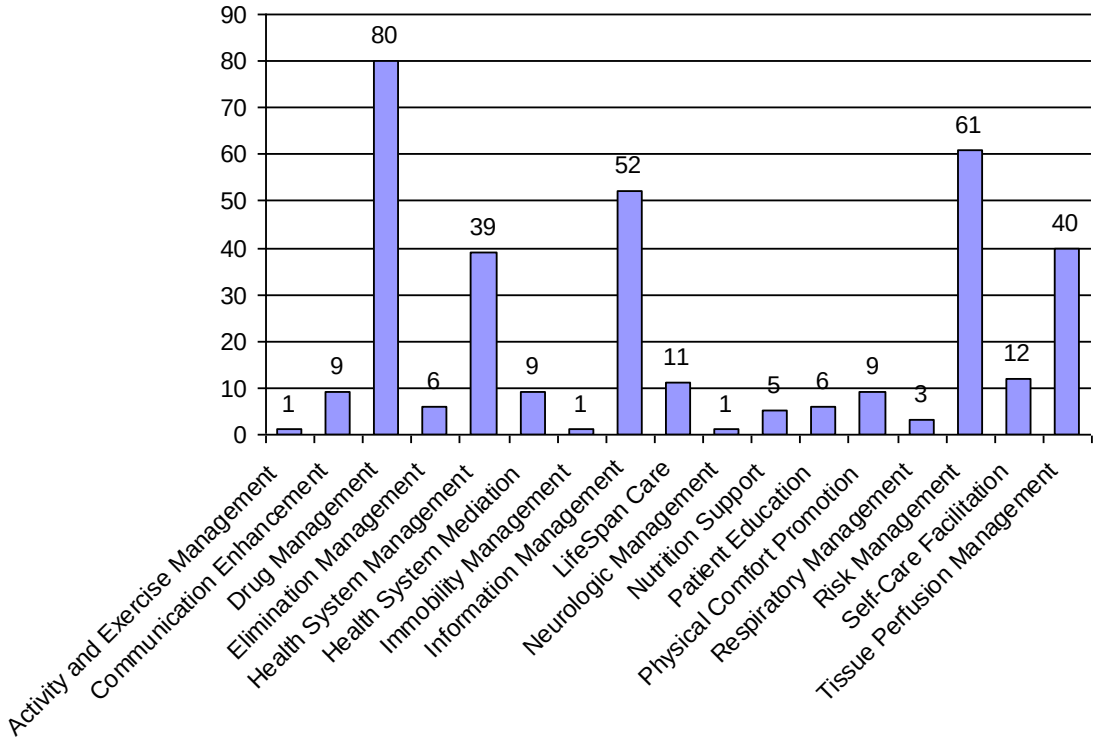
Appendix F: Number & Percentage of NIC Activities by Domain Graphic Display



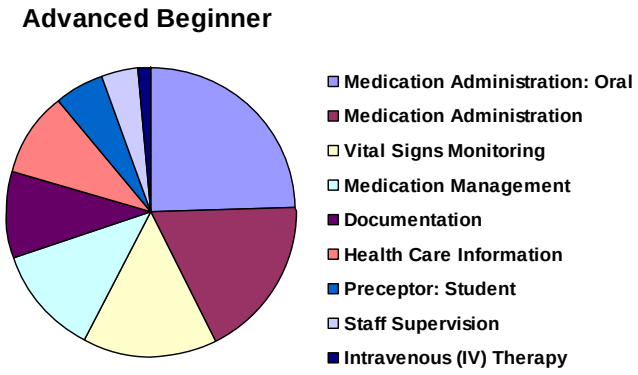
Appendix G: Number & Percentage of NIC Activities by Domain & Level of Competency Graphic Display

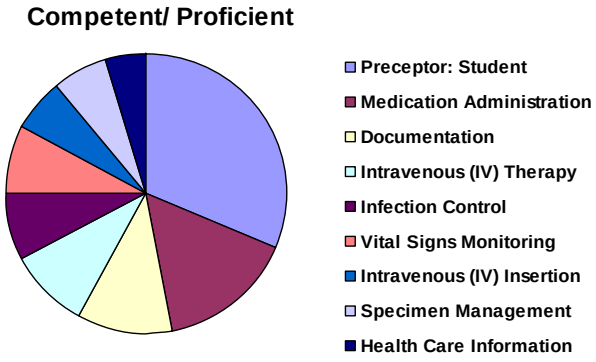


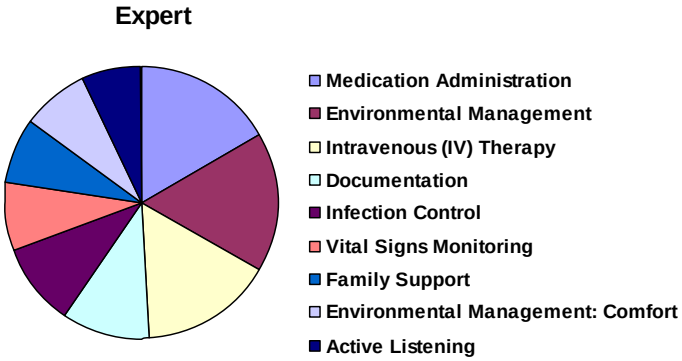
Appendix H: Number & Percentage of NIC Classes Graphic Display



Appendix I: Number & Percentage of NIC Interventions by Level of Competency Graphic Display







CURRICULUM VITAE

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Education:

- Master of Science in Health Informatics, 2007 — Indiana University
- Post-Graduate Nursing Informatics Course, 1997 — Indiana University
- Bachelor of Science in Nursing, 1991 — Purdue University
- Associate Degree of Science, 1975 — Vincennes University

Honors, Awards, Fellowships:

HIMSS MANI Scholarship Winner, 2/06

Inducted into Sigma Theta Tau, 5/05

Certified Professional in Healthcare Quality, 8/03

Professional Experience:

St. Mary's Medical Center - Evansville, IN 47750 — 9/04 - Present

Health Informatics Specialist

- Analyzes current practice and workflow, integrates requirements into a vision.
- Incorporates principles and recognized methodologies into issue identification.
- Determines user and technical requirements for issues.
- Plans, designs, oversees, analyzes studies.
- Manages multiples projects simultaneously.

Quality Improvement Analyst — 5/02-9/04

- Facilitated the process of performance measurements and improvement.
- Led the system-wide medication safety team.
- Trended data.
- Worked with all departments in the hospital.
- Coordinated reports and activities for performance improvement teams.

Floyd Memorial Hospital - New Albany, IN 47150 — 4/98 - 5/02

Senior Clinical Systems Analyst

- Monitored multiple systems usage.
- Conducted system analysis. Implemented solutions for user issues.
- Utilized CQI techniques to help implement system improvements.

- Interacted with vendors for system selection and implementation.
- Served on multiple committees: Value Analysis, Clinical Products, Forms, JCAHO
- Developed project plans and timelines.
- Actively participated in systems implementations and upgrades:

Perinatal Information Network	Physician View
CBord	ESI
DiabetesChart	MUSE
Lotus Notes	Pathways HomeCare
m3	Comparative Outcomes Profile
Series Pharmacy	Series Radiology
Series Order Entry/Results Reporting	

Good Samaritan Hospital - Vincennes, IN 47591 11/97 - 4/98

Clinical Systems Analyst

- Assisted in using databases to make data-driven decisions. Developed productivity reports for providers in ORSOS to facilitate the implementation of block scheduling in surgery.
- Conducted systems analysis. Analyzed the integrity of the database for a DOS to Windows conversion in ORSOS.
- Developed and conducted training programs for staff.

Nurse manager, Perioperative Services	1994-1997
Assistant Head Nurse, Surgery, PACU, CVS	1992-1994
Staff Nurse, Surgery	1981-1992

Conferences Attended:

Presenter, McKesson Insight Users' Conference, "Improve Project Success with Quality Management", 9/15/06.

Co-Presenter, InAHQ 26th Annual Education Conference, "Racing for Quality: The Informatics Edge", 4/28/05.

Poster Presentation, CareScience 2005 National Conference, "Using Quality Improvement Software to Manage Data and Improve Process", 3/13-16/05.