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# Standardized Nursing Languages:

## Essential for the Nursing Workforce

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## Abstract

The evolution of standardized nursing languages (SNLs) has been occurring for more than four decades. The importance of this work continues to be acknowledged as an effective strategy to delineate professional nursing practice. In today's health care environment, the demand to deliver cost-effective, safe, quality patient care is an essential mandate embedded in all health reform policies. Communicating the contributions of professional nursing practice to other nurses, health providers, and other members of the health care team requires the articulation of nursing's focus of concern and responses to these concerns to improve patient outcomes. The visibility of the electronic health record (EHR) in practice settings has accelerated the need for nursing to communicate its practice within the structure of the electronic format. The integration of SNLs into the patient record offers nurses an opportunity to describe the focus of their practice through the identification of nursing diagnosis, interventions and outcomes (IOM, 2010). Continued development, testing, and refinement of SNLs offers nursing an accurate and reliable way to use data elements across populations and settings to communicate nursing practice, enable nursing administrators and leaders in health care to delineate needed resources, cost out nursing care with greater precision, and design new models of care that reflect nurse-patient ratios and patient acuity that are data driven (Pesut & Herman, 1998). The continued use of nursing languages and acceleration of nursing research using this data can provide the needed evidence to help link nursing knowledge to evidence-driven, cost-effective, quality outcomes that more accurately reflect nursing's impact on patient care as well as the health care system of which they are a part. The evaluation of research to support the development, use, and continued refinement of nursing language is critical to research and the transformation of patient care by nurses on a global level.

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## STANDARDIZED NURSING LANGUAGES: ESSENTIAL FOR THE NURSING WORKFORCE

The development and use of standardized nursing languages (SNLs) are essential for the nursing workforce because discipline-focused languages, also referred to as data sets, nomenclatures, classifications, taxonomies, and terminologies, provide names for the clinical phenomena of concern to the nursing profession (refer to Table 10.1). Such names are needed to communicate and collaborate within the disciplines and with others, that is, patients, families, and system-wide stakeholders (Hayakawa & Hayakawa, 1990; Rutherford, 2008). The process of naming clinical phenomena (e.g., nursing diagnoses, nursing interventions, and patient outcomes) enables advancement of the profession as a discipline and a science through research and knowledge development (Avant, 1990; Gordon, 1994). By definition, one of the most important characteristics of a profession is a unique body of knowledge that defines the foundations of practice for members (Greenwood, 1957).

Smith and McCarthy (2010) state “the body of knowledge of the professional discipline distinguishes its practice, differentiates it from technical practice, and is comprised of the philosophies, ethics, theories, research, and art of the discipline” (p. 44). Continued progression of the nursing discipline is constantly needed to link the contribution of nursing knowledge to the achievement of high quality, cost-effective nursing care. The goal of SNLs is to name the phenomena of nursing concern so that locally, nationally, and internationally, nurses have access to the labels, definitions, and descriptions of clinical phenomena for communication with patients and others (Baernholdt & Lang, 2003).

Consistency of communicating the content of nursing science through use of SNLs: (a) contributes to patient safety and other quality-based goals, (b) meets the requirements for participation in electronic health records (EHRs), (c) promotes greater autonomy and control of nursing practice, and (d) provides the clinical data for nurse administrators to meet many workforce goals. Patient safety and other quality-based goals are achieved through the aggregation, analysis, and interpretation of clinical data (Institute for Healthcare Improvement, n.d.; Institute of Medicine, 2000, 2003, 2004, 2010; Joint Commission, 2008). Using the standardized labels of nursing diagnoses, interventions and outcomes enables the establishment of databases to determine the nursing phenomena of concern, and isolate the interventions needed to help patients with specific problems (and identify those that do not) to achieve specific outcomes (Dochterman et al., 2005; Jenny, 1995). From such data, evidence-based and cost-effective quality care can be planned and implemented (Faster Cures, 2006).

The international growth of the electronic health record (EHR) has provided increased need for SNLs to communicate care. Implementation of EHRs requires use of standardized terms and the standard terms should be national and international in order to develop benchmarks and compare quality across localities. The integration of SNLs into patient documentation helps to foster nursing autonomy and control over clinical phenomena of concern that are clearly delineated and communicated to the public, other disciplines, and health care systems. In addition, nurse administrators will have access to needed clinical data to achieve

optimum staffing patterns, address issues of patient acuity, cost out nursing care more accurately, attain desired patient outcomes in a timely manner, and describe professional practice to stakeholders (Lyon, 1990).

The purposes of this chapter are to identify the SNLs for clinical practice, describe the existing research support for SNLs, describe the methodologies that can be used for ongoing development, relate existing and future research to evidenced-based nursing, and explain the importance of nursing languages to the nursing workforce.

## SNLs FOR CLINICAL PRACTICE

The SNLs for clinical practice have been developing since 1973 with the start of the organization that is now known as NANDA International (NANDA-I). In this section, the existing SNLs will be described, the research support for SNLs will be reviewed, and the relation of SNLs to evidenced-based nursing will be explained.

### Existing SNLs

The initial call to address the development of SNLs occurred at the *First Task Force to Name and Classify Nursing* Diagnosis, in St. Louis, MO, in 1973. At that meeting, Gebbie and Lavin charged 100 invited nurse experts from the United States and Canada to develop and classify the health problems that are within the domain of nursing (Gebbie & Lavin, 1975). The meeting was guided by the need to increase the visibility of nursing in patient care, identify the names for computer files to record and organize nursing data, assign costs to nursing care, and link the judgments and decisions of nurses to actions and outcomes

The organization held the second conference in 1975, the third conference in 1978, and biannually since then. In 1982, the organization name was changed to the North American Nursing Diagnosis Association (NANDA). In 2002, it was decided that this name no longer applied because of the extensive involvement of nurses from many countries. In 2002, the name of North American Nursing Diagnosis Association was changed to NANDA International (I). The most recent meeting of NANDA-I, and first meeting external to the United States, was held in Madrid, Spain in May 2010.

Since 1973 to the present, a number of data sets, terminologies, and classifications have emerged in different ways. NANDA-I is a membership-driven group with committee structures (Kritek, 1978; Martin, 2005; Saba, 1997; Saba & Taylor, 2007), for example, the Taxonomy and Diagnosis Development Committees, working to maintain the NANDA-I taxonomy. The developers of the Nursing Interventions Classification (NIC) and the Nursing Outcomes Classification (NOC) were NANDA-I members but developed NIC and NOC with funding from the National Institutes of Health, using large research teams based at the University of Iowa (Bulechek, Butcher, & Dochterman, 2008; Johnson, Maas, & Moorhead, 1997–2002; Moorhead, Johnson, Maas, & Swanson, 2008). The University of Iowa continues to support maintenance of NIC and NOC at the Center for Nursing Classification and Clinical Effectiveness (CNCCE, n.d.).

The Omaha System and the Clinical Care Classification (CCC) were originated by community health nurses based on the perceived need for SNLs in home health care nursing

(Martin & Scheet, 1992; Saba, 1997). Both classifications have since evolved for use in other settings including academic nurse-managed centers and nursing education (Canham, Mao, Yoder, Connolly, & Dietz, 2008; Feeg, Saba, & Feeg, 2008). These languages continue to evolve, for example, the Omaha System holds regular meetings and conferences to advance this model. In the last few years, the CCC was made available free in the reference database, SNOMED–CT. The Perioperative Nursing Data Set was developed and is promoted by the Association of Operating Room Nurses for specific use in perioperative nursing (e.g., Westendorf, 2007). The SNLs of were first developed and disseminated in the United States and Canada. Today, they are used internationally in countries such as Japan, Spain, and France.

### International Classification of Nursing Practice

International Classification of Nursing Practice (ICNP) is described as a unified language system. It is an information tool that describes nursing practice within health information systems (ICN, 2007). It has been under development, and exposed to testing and translation since 1990; ICNP is described as an information tool that is able to articulate the nursing practice. The ICNP framework contains data elements that represent nursing practice in health information systems (Hyeoun-Ae, Hardiker, Bartz, & Coenen, 2005).

The ICN began work on the development of ICNP in 1990. Over the years, versions of ICNP were developed and tested. The data can be used by clinicians, researchers and administrators to describe nursing practice and the contributions of the discipline to patient care. The current version of ICNP is considered an effective resource to measure quality nursing care and is useful for research (Rotegaard, 2009; Simpson, 2007; Warren & Coenen, 1998). ICNP has several centers to continue refinement of the language including Deutschsprachiege ICNP, for German speaking group users, The Research Center for Nursing Practice (Australian Capital Territory and the University of Canberra) and the Chilean Center for ICNP Research and Development. There have been research studies conducted across cross-cultures using ICNP. These include cross mapping studies, validation studies and computer data base analysis (Dykes et al., 2009).

### American Nurses Association—Nursing Practice Information and Infrastructure

In 2006, the American Nurses Association's (ANA *Committee on Nursing Practice Information and Infrastructure* developed a web site to update nurses on the SNLs and documentation. There are currently 13 nursing data sets, nomenclatures and classification systems approved by ANA for use in EHRs. Five terminology sets of nursing languages that include diagnoses, interventions and outcomes are included in the ANA approved list (ANA, 2006; Anderson, Keenan, & Jones, 2009). These are the (a) CCC, (b) ICNP, (c) combination of NANDA-I, the NIC, and the NOC, (d) Omaha System, and (e) Perioperative Nursing Data Set. Table 10.2 provides a list of ANA approved classifications, terminologies and data sets).

Within each of these five classification systems, the concepts common to professional nursing are addressed. These include, for example, self care, anxiety, fear, mobility, sleep, nutrition, constipation, skin breakdown, stress, coping, and self management of illnesses

(e.g., NANDA-I, 2009). The current versions of NANDA-I, NIC, and NOC (NNN) taxonomies contain 1,147 research-based labels, definitions, and descriptions. Extensive numbers of research studies and position papers can be found related to these concepts in the Proceedings of Conferences in groups like NANDA-I since 1973 (NANDA-I Archives Boston College at burns.library@bc.edu NIC and NOC; e.g., Carroll-Johnson, 1990). The development of SNOMED RT is designed to create a reference terminology to allow for the use of multiple languages in a standardized format within EHR. Within SNOMED RT, all of the ANA approved languages can be mapped to accommodate NNN as well as other terminologies (refer to Table 10.2).

## NANDA-I, NIC, and NOC

Over the years, conferences focusing on the combined work of NNN have been held nationally. NNN are the largest group of language developers within North America, focusing on the expansion of the Classification of nursing diagnosis, nursing interventions and nursing outcomes, respectively. The goal of these meetings has been to explore further terminology development, especially around the development of a common structure for the three languages, and research methodologies. The availability of a common structure was thought to critical to the increased use of SNLs, articulation of the content and focus of nursing, future development of databases for advanced research, support prediction of staffing patterns and workload, and isolating costs associated with patient acuity and complexity.

In 2001, leaders from NNN received funding from the National Library of Medicine (R13LMO7243) to develop, implement and evaluate a project that supported “the assumptions underlying the languages of nursing diagnosis, interventions and outcomes; examine the existing taxonomic structures (NNN), and prepare the first draft of a common structure that united diagnosis, interventions and outcomes (Dochterman & Jones, 2003). A desired framework or *Desiderata* (Dochterman & Jones, 2007) was identified to guide development of a new organizing structure. Guidelines for the new language NNN structure included: (a) simplicity of structure that was theory neutral, (b) parsimony of groups, (c) clear language, (d) distinct definitions of diagnoses, interventions, and outcomes, and (e) useful to other disciplines to communicate with nursing.

## The Proposed NNN Classification

The proposed NNN Classification consisted of four domains and 28 classes and met the guidelines for a desired structure. The proposed structure allows for the placement of the three languages in the same domains and classes. Currently, NNN are working with this common structure with the hope that, over time, and with modification a unified structure for organizing nursing diagnoses, interventions, and outcomes could be realized. Kautz, Kuiper, Pesut, and Williams (2006) studied the use of NNN in a BSN program and found inconsistencies in the use of terminology by faculty and students. The authors recommended that faculty and students could benefit from using NNN throughout the curriculum to insure consistency in communicating and documenting nursing practice and to prepare nurses for the 21st century (e.g., Johnson et al. 2006).

## Impact of SNLs

From the beginning, the goal of developing SNLs was to reflect and build upon nursing knowledge. Nursing has an established body of knowledge that has experienced accelerated growth in the past 45 years. Knowledge development, including the growth of grand, mid-range and practice-based theories, has reflected the philosophical underpinnings of the discipline. The core of nursing knowledge is relationships, that is, the nurse-patient, family, and community relationships. The SNLs capture these interactions by articulating the phenomena of concern that embody the knowledge and focus of the discipline (Jones, 2007).

Development of the existing SNLs reflects the social contract of nurses with society, as described in the Social Policy Statement (ANA, 2004) and the Nurse Practice Acts of many states in the United States, for example, New York State. The New York State Nurse Practice Act of 1972 states that nurses diagnose and treat human responses. Today, in conjunction with the social policy statement, most of the SNLs reflect that nurses address health promotion, risks or threats to health, and responses of individuals and groups to illness.

The SNLs link disciplinary knowledge to the delivery of care and offer nurses standardized approaches for describing their practice. The labels for nursing diagnoses, interventions, and patient outcomes are defined and described so that the meaning of the terms are as clear as possible to all those who use the labels. The structures used to organize SNLs are designed to create systems that are easily communicated and usable. For example, frameworks such as Gordon's functional Health Patterns have been used to organize nursing diagnosis. Table 10.1 provides a list of ANA approved nursing data sets, Classifications and terminologies.

## RESEARCH AND SNLs

The significant research support for use of SNLs provides strong evidence for nurse leaders to select SNLs for clinical practice (Gordon, 1987). In a bibliometric study of the CINAHL database to map the existing knowledge of SNLs, Anderson et al. (2009) searched for all types of literature sources, including books, chapters, journal articles, dissertations, brief reports, and abstracts, from 1982 to 2006 for the five terminology sets approved by ANA. A total of 1,140 unique items were identified and classified to one terminology set or another. The results were that the terminology set of NNN had the most extensive literature support ($n$ = 879 of 1,140 sources; Anderson et al., 2009). The research support for standardized nursing diagnoses, nursing interventions, nursing-sensitive patient outcomes, and for combining NNN will be reviewed.

### Research Support and Standardized Nursing Diagnoses

Since the beginning of NANDA-I in 1973, the Committee that accepts new diagnoses and changes in previously approved diagnoses has expected research studies to be submitted as one of the bases for diagnosis submissions. Diagnoses are only included on the approved list when there is sufficient research and literature support for the concept (NANDA-I, 2009).

In 1989, NANDA-I held a conference to explore the research methods being used and to propose methods for support of the inclusion of SNLs in the EHR (Carroll-Johnson,

1990). The topics that were explored included methods of validation, and other types of qualitative (Mc Farlane, 1990) quantitative, and integrative methods (Kim, 1990; Gordon, 1979; Schroeder, 1990). Many of the studies at that time were descriptive studies (Ferhing, 1986, 1987) and included concept analyses, diagnostic content and construct validity, frequency studies, and inter-rater reliability studies. Few studies reached predictive validity or focused on statistical methodologies, such as regression analyses. It was determined that instruments need to be developed that reflect the content and concepts of the discipline so that more rigorous investigations can be conducted.

The types of studies to develop knowledge of nursing diagnoses vary widely, are still mostly descriptive, and a large number of the studies presented at the 2010 AENTDE/NANDA-I conference in Madrid, Spain used experimental designs (e.g., Paans, Serrmeus, Nieweg, & Van Der Schano, 2010, May). A Pub med literature search of research studies in the last decade, year 2000 to 2010, revealed 162 published research studies that focused on, or included, nursing diagnoses from NANDA-I and other terminologies such as the ICNP or the PNDS. From the beginning of nursing diagnosis knowledge development, a strong focus has been on validating the existence of specific nursing diagnoses, defining characteristics, and risk factors in specific populations.

The content and construct validity of individual nursing diagnoses for use with specific populations have been established by nurses worldwide. The number of studies available is too extensive to identify, especially considering the many nursing organizations besides NANDA-I that focus on advancement of nursing diagnosis knowledge, for example, the Japan Society of Nursing Diagnosis, the Association of Common European Nursing Diagnoses, Interventions, and Outcomes (ACENDIO), the Brazilian Nursing Diagnosis Association, and the Spanish Nursing Diagnosis Society (AENTDE). Each of these organizations conduct annual or biannual conferences in which nursing diagnosis studies are presented and many are later published in a wide variety of international literature sources. For example, 674 papers and posters were presented at the May 2010 AENTDE-NANDA-I conference in Madrid, most of which were research.

Descriptive studies established the content and construct validity of the concepts that represent nurses' diagnoses, that is, the responses or experiences of people to health problems and life processes (NANDA-I, 2009). An example is a clinical study in two hospitals of patients ($n = 76$) who experienced one or more of the three respiratory diagnoses, Ineffective Breathing Pattern, Ineffective Airway Clearance, and Impaired Gas Exchange (Carlson-Catalano et al., 1998). The data collection instrument showed good validity and reliability, including both interrater and intrarater reliability. The findings and conclusions of the study were presented to the NANDA Diagnosis Review Committee and were used for refinement of these three diagnoses.

In a comprehensive review of the validation studies reported in Pub med and CINAHL databases, Berger (2008) noted that most of the identified studies were quantitative using nurse validation and clinical validation methods. Berger concluded that additional studies are needed for many diagnoses. For 72 diagnoses, at least one validation study was noted. For 59 diagnoses, one to four studies were found. For 84 diagnoses, no studies were found,

but studies must have been done because submitters of new diagnoses are expected to submit research studies to NANDA-I with new diagnoses. Studies may have been conducted that were not published or were not traced in Berger's systematic review. Clinical methodologies, which are preferred for validation of diagnoses (Carlson-Catalano & Lunney, 1995), were used with 50 studies analyzed by Berger. The need for additional studies using multivariate methods such as magnitude estimation scaling, Q sorting, factor analysis, and discriminate analysis were noted.

### Naming Interventions, Research

A Classification focused on nursing interventions is needed to provide consistent terms and definitions for the treatments nurses provide. The NIC provides guidelines for the selection of nursing interventions by nurses (Bulechek et al., 2008). This activity is a critical part of the clinical reasoning process that nurses use to select diagnoses, interventions and outcomes. Six factors are important to consider when choosing an intervention. First, selection of a nursing intervention for a particular nursing diagnosis is greatly influenced by the outcome the nurse is attempting to achieve. This requires the nurse to communicate with the patient and family members and to consider the time frame in which care is delivered. Outcomes provide the criteria to judge whether the nursing intervention is improving the status of the patient on a particular outcome. Second, the nurse chooses outcomes and interventions based on the characteristic of the nursing diagnosis. The intervention should target the etiological factors to eliminate or reduce the problem. In some cases, this is not possible so the nurse chooses an intervention to address the symptoms the patient is experiencing. The third factor for choosing an intervention is the research base of the intervention. This helps the nurse determine how effective the intervention has been in similar situations and with certain populations of patients. The fourth consideration focuses on the feasibility of providing an intervention. This includes factors such as the cost of providing the intervention, time for implementation, and how the intervention fits the total plan of care for all providers. The fifth factor to consider is the acceptability of the intervention to the patient. This must take into consideration the values, beliefs, religion and culture of the patient. The final factor is the capability of the nurse. This involves the nurse knowing the scientific rationale for the intervention, having the necessary skills (psychomotor and interpersonal) and the ability to function in the health care setting in which the intervention is performed (Bulechek et al., 2008). The selection of the right intervention based on these factors improves the quality of care provided to patients. Each intervention has a list of suggested activities that nurses can select to customize the intervention based on the needs of the patient. Any safety issue must be addressed in the plan of care and the selection of nursing interventions.

At the organizational level, the NIC has been used to measure nurse competency on specific interventions. Nolan (1998) describes how one organization used NIC to address competency validation on nursing interventions provided frequently in their organization. Nolan (1998, p. 27) defines competency as "an individual's *actual performance* in a particular situation. It describes how well an individual integrates knowledge, skill, attitudes and behavior in delivering care according to expectations. Competency is a complex phenomenon, and requires and evaluation of the employee's ability to meet job expectations

and subsequent continuous effective care for assigned patients (del Bueno, 2001). This competency assessment, according to Nolan (1998), is based on the organization being able to identify the most frequent interventions (also diagnoses and outcomes) performed in the organization as a whole and for each individual unit so that education and testing of competency can be relevant to practice patterns. This knowledge informs nurses planning orientation for new employees as well as continuing education programs. Educational sessions can include clinical reasoning case studies focused on intervention selection to improve nurse's skills in this area. The frequently used nursing interventions need to be validated over time since changes in practice impact care delivery and because patient needs change when new medical treatments are introduced by other disciplines. Ongoing data at the organization and unit level is needed to address nurse competency and its impact on quality care and safety issues in any organization across health care settings. The Classification has domains focused on safety and the health system to assist nurses in identifying interventions to ensure quality care and safety part of the plan of care.

## SNLs and Measuring Outcomes

The NOC is essential to capturing the effectiveness of nursing interventions performed for identified nursing diagnoses. NOC provides standardized terms and definitions to identify patient outcomes. In the past, nurses have relied on goal statements to evaluate care. These were specific to the patient and difficult to compare across patient populations and settings. The NOC outcomes are designed to facilitate comparison of outcomes for populations of patients that nurses treat in a variety of settings and across settings as the patient moves across the continuum of care. The measurement scale(s) identified for each outcome in the Classification allow nurses to measure the outcome prior to providing interventions and at selected times such as when the condition of the patient changes suddenly, at the end of a shift, prior to transfer to another unit, and at discharge. Nurses selecting outcomes must contemplate several factors as they select the best options. These factors include the type of health concern, the nursing, medical, and health problems that patient is encountering, the characteristics of the patient, patient resources, patient preferences, patient capacities and their treatment potential (Moorhead, Johnson, Maas, & Swanson, 2008). Clinical evaluation of the measurement scales in NOC was completed for 169 of the outcomes in the 2nd edition of NOC (Moorhead, Johnson, & Maas, 2004; Ruland & Bakken, 2003). The scales were found to be reliable and were able to capture changes in patient status even for short hospitalizations in acute care setting. This study also made it clear that holding an outcome rating steady over time for elderly patients in long-term care facilities was important in the assessment of quality care in these settings. Nurses need clinically useful tools to measure the day-to-day care of patients. Outcomes measurement is important to communicate the quality of care provided to patients, to system administrators and to the public policy makers (Jenkins, 1985).

Many organizations have focused their attention on the measurement of outcomes for "never events" such as falls, pressure ulcers, and urinary tract infections. NOC provides a systematic way to measure patient focused outcomes that measure the positive effects of nursing interventions and depict the results of interventions that prevent adverse events. The outcomes can be measured post intervention to identify the effectiveness of the plan of

care. The response of the patient may be dramatic such as moving a rating from “1” to “5” or show incremental change over time. The benefits of using NOC outcomes is that both the patient and the provider can measure the effects of interventions and nurses can follow trends in specific outcomes with a population of patients they frequently treat.

## Research Support for Linking NNN

In previous decades, studies focused on NNN as distinct and separate languages. Increasingly, studies are being conducted that test the value of using the three languages together, for example, Muller-Staub, Needham, Odenbriet, Lavin, and Achterberg (2006a, 2006b, 2007, 2008). When these three languages were studied separately, the types of studies and the focus of research differed. In the past, studies of NANDA-I diagnoses mainly focused on the one or more individual diagnoses of interest to specific members; studies of NIC and NOC have been larger studies of the two systems, in contrast to individual concepts within the systems. Research from Switzerland, Sweden, The Netherlands, and the United States support the combining of NNN.

In a pretest-posttest design, Muller-Staub et al. (2007) studied the effects of an educational intervention on the quality of documentation and effect on patient outcomes with nurses of 12 wards in a Swiss hospital. The educational intervention included how to implement nursing diagnoses, nursing interventions, and nursing-sensitive patient outcomes. Before and after the educational intervention, two sets of 36 randomly selected patient records were judged for quality, using the valid and reliable instrument, Quality of Nursing Diagnoses, Interventions and Outcomes (Q-DIO; Muller-Staub et al., 2010). Before the educational intervention, the mean score on quality of nursing diagnoses was .92 (SD = 0.41); one year after the intervention the mean score was 3.50 (SD = 0.55; $p < .0001$). Similarly, for identification of nursing interventions and patient outcomes, the mean scores were significantly higher one year after the education of nurses.

In a pretest–posttest study of nursing process documentation after a yearlong education effort in a large hospital system (50 inpatient wards and 30 outpatient clinics), documentation improved in nursing assessment ($p \leq .05$), nursing diagnosis ($p \leq .01$), and nursing interventions ($p \leq .01$; Thoroddsen & Enfors, 2007). The SNLs of NANDA-I and the NIC were used to teach and document nursing diagnoses of human responses and nursing interventions. Patient outcomes were not taught using SNLs and it was the only aspect of the nursing process that did not improve with education.

The accuracy of six aspects of nurses’ documentation was studied in a random sample of 10 medical centers of the Netherlands selected from 94 centers (Paans, Sermeus, Nieweg, & van der Schans, 2010b). Patient records ($n = 341$) were assessed by two independent trained reviewers using the D-Catch instrument to measure accuracy of the (a) record structure, (b) admission documentation, (c) diagnosis documentation, (d) intervention documentation, (e) progress and outcome evaluation, and (f) legibility. The results were that “28% contained all of the nursing process stages, 34% were more or less structured according to the nursing process stages and 38% were not structured at all according to these stages” (p. 4). The investigators conclude that EHRs should support nurses in their accuracy of documentation by providing guidelines and logically structured systems.

Consensus validation studies using action research methods were conducted with staff nurses for them to identify the nursing diagnoses, interventions, and outcomes that are relevant for specific populations served in hospitals, long-term care, ambulatory settings, and end-of-life care (Carlson, 2006; Lunney, McCaffrey, & Umbro, 2010; Lunney, McGuire, Endozo, & McIntosh-Waddy, 2010; Lunney, Parker, Fiore, Cavendish, & Pulcini, 2004; Minthorn & Lunney, in press). One of the purposes of the study design was to reduce the complexity of using NNN in clinical units that serve patients with specific types of health problems. Carlson (2006, 2010) developed the Total Consensus Method to achieve 100% consensus among experienced nurses of the specific terms to be used in standards of care and in the front screens of an EHR. This method was used for nurses to identify the terms that would be included in an Electronic Nursing Documentation System (ENDS) used by military nurses who specialize in care of persons with latent tuberculosis infection (Carlson, 2010).

In a study to identify the nursing diagnoses, nursing interventions, and patient outcomes that are relevant for adults with traumatic brain injury (TBI), “29 nursing diagnoses, each with 3–11 NIC interventions, and 1–13 NOC outcomes were identified as relevant to the TBI population served by nurses in the facility” (Lunney, McGuire, et al., 2010, p. 163).

A hospital-based study reported that nurses who provide care for adults with diabetes, 17 nursing diagnoses, each with 7–19 NIC interventions ($N = 78$) and 4–14 NOC outcomes ($N = 76$) were identified as relevant for adults with diabetes (Minthorn & Lunney, in press). This consensus validation method shows great promise for nurses in health care units to select the relevant terms for specific types of patient care from the 1,147 concepts in NNN.

## Decision Support and NNN

The next generation of studies to support use of NNN will be those that test decision support systems (e.g., Carlson, 2010; Keenan, Tschannen, & Ford, 2010; Odenbreit, 2010; O’Neill, Dluhy, & Chin, 2005; O’Neill, Dulhy, Hansen, & Ryan, 2006). Carlson tested the ENDS in two army military settings, one in Hawaii and one in Texas ($N = 13$ nurses). The purposes were to capture the value of nursing care, especially by identifying patient care outcomes that were positively affected by nurses using the ENDS, provide standards of practice to guide nursing care, provide data for resource management, develop a reliable patient acuity index, and identify a revenue generation method. The ENDS performed as expected. The results included that the nurses used the nursing diagnoses for a majority of patients, the linked NIC interventions were used to address the nursing diagnoses, the linked NOC outcomes that resulted from the nursing interventions were rated, and the time it took for nursing interventions was identified. A majority of scores on the patient outcomes after nursing interventions were significantly higher than the baseline scores, demonstrating the positive effects of nursing diagnoses and interventions.

The HANDS documentation system (also discussed later in the chapter) uses NNN to be interoperable on technical, semantic, and process levels, to support continuity of care through data and information that are gathered in the same way, always available and easily accessible, in a consistent format, and retain the same meaning for those who use it (Keenan et al., 2010, May; Keenan, Tschannen, & Wesly, 2008; Keenan, Yakel, & Tschannen, 2008).

With a decade of research data, it has been established that the HANDS system is cost effectively maintained and sustained over time, automatically generates new evidence from the data collected, and delivers data immediately back to the point of care.

The WiCareDoc expert system uses 26 questions to help nurses identify the best terms for use in clinical practice, for example, it reminds nurses to evaluate hypothetic diagnoses and proposes interventions and outcomes based on diagnoses (Odenbreit, 2010). The WiCareDoc was developed and tested in Switzerland; these types of expert systems are also being developed by nurses in other countries, for example, Spain, Brazil, and Japan.

## SNLs and Evidence-Based Nursing

The visibility of the concept of evidence-based practice (EBP) serves as an important opportunity for nursing language development, utilization, and subsequent evaluation. The demand for EBP offers nurses opportunities to use the best research literature available, including the research on SNLs, to inform clinical decisions and decide on treatments and outcomes (Melynk & Fineout-Overholt, 2005). The best available evidence suggests that SNLs should be used in clinical practice and in EHRs (Kautz & Horn, 2008). The use of SNLs within EHRs gives nurses opportunities to ask research questions that can be answered using existing local databases (e.g., Dochterman et al., 2005).

At a follow-up meeting of the Institute of Medicine (2004), the group stressed the need for improved documentation around five chronic health problems to improve quality, cost-effective, high-quality patient care. Problems included diabetes, acute pain, heart failure and asthma. The report addressed the need for better measurements of patient-centered outcomes, standardized systems for disseminating information and sharing of EBPs that promoted self-management and led to the development of new models of care that could be costed out more accurately (Swan, Lang, & McGinley, 2004). Evidence contained in using SNLs consistently in nursing documentation can help make this goal a reality and promote the expansion of research driven nursing care.

Seven levels of evidence were identified in the literature, ranging from the highest level, that is, systematic reviews of randomized control trials, to the lowest level of evidence, which is that of expert opinion (Melynk & Fineout-Overholt, 2005). While the research on SNLs continues to grow, there is more work needed. It is essential that nurses continue to build research around the development, implementation, and evaluation of the SNLs and integrate the languages into EHRs. It is only when large data bases are available with standardized languages that we can test, refine and evaluate the languages, and identify predictive models that accurately link patient care elements with cost and staffing demands. Table 10.3 links the evidence available and links it with levels of evidence as proposed by nurse researchers.

## SNLs, NURSING ADMINISTRATION, AND EHRs

The use of SNLs offer nurse executives and administrators an effective way to account for the complex demands of the work environment, while creating a professional practice environment that clearly communicates practice, decreases staff burdens, optimizes patients' experiences, and enhances satisfaction for nurses, patients, and families (Ebright, Patterson, Chalko, & Render, 2003). The importance of SNLs to the nursing workforce relates to

the value and opportunities that can be derived from clear communication of nursing phenomena. Clear communication using standardized terms for nursing care enables the storage of data on nursing care in EHRs, contributes to improved quality and patient safety, improves the efficiency and effectiveness of care, and enables the autonomy and control of professional practice for nursing to grow as a profession and science.

## Storage of Nursing Data in Electronic Health Records

Internationally, all paper-based health records will be replaced by an EHR in standardized formats that include multiple aspects of patient care currently recorded in other formats. In each health care setting, for example, primary care, acute care, ambulatory care, and so forth (HIMSS, 2010; Institute of Medicine [IOM], 2003b; National Committee on Vital and Health Statistics [NCVHS], 2010; Olsson, Lymberts, & Whitehouse, 2004), data will be communicated using prescribed formats to local, regional, national and international levels. In EHRs, the majority of patient care is recorded by using standard terminology, that is, file names that health providers use to store similar information (IOM, 2003b). Without standardized file names, the specific types of health care data could not be identified, aggregated, analyzed, or compared.

The goal of EHRs is to be able to describe the care that is being provided, to communicate that care to others, that is, interoperability, and to decide whether or not patient care meets the benchmarks for quality-based care, that is, meaningful use (IOM, 2003b; NCVHS, 2010). For nursing care to be visible in EHRs, nurses must use file names that depict nursing, not the file names of medicine, psychiatry and other health care disciplines. These ANA-approved SNLs provide the standardized file names to be used to communicate nursing care in EHRs.

Visibility of nursing in EHRs will enable nurses and others to identify the care being provided, and to analyze the quality of care (Lunney, Delaney, Duffy, Moorhead, & Welton, 2005; Westra, Delaney, Konicek, & Keenan, 2008). Paans, Sermeus, Nieweg, and Van Der Schans (2009, 2010a, 2010b) used SNLs and a measurement schema to determine the accuracy of documentation in patient records. Nursing care quality can only be improved when it is described and compared to benchmarks for quality. For example, the identification of acute pain and provision of appropriate interventions can be examined for whether nursing care meets the standards promulgated by the American Pain Society (2000). Previous studies have shown that there is variance in nursing diagnoses and interventions for pain (McCaffrey & Ferrell, 1997; Puntillo, Neighbor, O'Neill, & Nixon, 2003).

In addition, nurses' use of SNLs in the EHR will help to increase the visibility of nursing practice and enhance the continued growth of concepts essential to the discipline (Dochterman & Jones, 2007). Researchers will have a rich data base to test and refine nursing diagnoses, interventions, and outcomes and guide the development of predictive models to inform staffing and identify costs (Dochterman & Jones, 2003).

## Improved Quality and Patient Safety

Improved quality and patient safety is expected with clear communication of nurses' data interpretations or diagnoses, nursing interventions, and patient outcomes. The phenomena

that nurses address are complex and diverse (Clancy, Delaney, Morrison, & Gunn, 2006; Potter et al., 2004, 2005), making it a significant challenge to select the most appropriate diagnoses, interventions, and outcomes. In addition, the possibilities within human behavior and ways to help people improve their health are so numerous for nurses (1,147 concepts) that nurses are not likely to recall the most appropriate concepts. The availability of SNLs decreases nurses' cognitive demand (Ferrario, 2003) and makes it possible to select the terms that best apply in a particular situation so that high quality care can be achieved and communicated.

With the complexity of understanding and communicating human responses and experiences related to health problems and life processes, accurate interpretations of patient data are extremely difficult to achieve (Lunney, 2008a). Variance in accuracy is expected, whether or not nurses' name their data interpretations using a language of nursing diagnosis. Such variance has been substantiated in numerous studies (see Table 10.4). The risk of low accuracy is related to three broad categories identified by two nurse theorists, Margery Gordon (1994) and Doris Carnevali (Carnevali & Thomas, 1993): the nature of the diagnostic task, the situational context, and the diagnostician (Table 10.4). The SNLs that include possible diagnoses, or data interpretations, offer nurses the labels, definitions, and defining characteristics to consider and validate with patients in partnership models of care (Lunney, 2009c). In each study noted in Table 10.4, it was clear that data interpretations and, thus accuracy of nurses' diagnoses, varied widely. In studies that used the Lunney scoring method (e.g., Lunney, 1992; Lunney et al., 1997; Spies et al., 1994), nurses were scored on seven levels of the accuracy scale, from low (−1) to high (+5).

The use of SNLs in the EHR can lead to better communication of information within, between, and among disciplines. Increased accuracy of the language, improved decision making, and better documentation can help decrease errors, target problems, provide more accurate measures of quality and isolate factors that increase patient risk.

### Improved Effectiveness SNLs and Efficiency of Care

Improvement in effectiveness and efficiency is expected because the languages offer common meanings that are available to all users. When everyone uses the same defined terms, the messages about patient care are clearer, which improves effectiveness and efficiency. After the initial time period of getting used to an EHR, documentation takes less time because the standard terms can be clicked from a list, rather than writing extensive narrative reports. In a 36 hospital time and motion study ($N$ = 767 nurses), it was shown that nurses spend a large majority of their time on documentation (35.3%; Hendrich, Chow, Skierczynski, & Lu, 2008), leaving them too little time to spend on direct patient care. The time needed for documentation needs to be reduced.

Effectiveness and efficiency are facilitated with measurement of nursing workload; the SNLs are invaluable for developing methods of measurement (e.g., Amundsen, 2010; Baumberger, Buchmann, Gilles, Kuster, & Lehmann, 2010; Palese, De Silvestre, Valoppi, & Tomietto, 2009). Both NANDA-I and the NIC are being used for workload measurement.

With growing attention being paid to identifying the cost-benefit ratio of nursing care, it has become critical to include SNLs in EHRs. In testimony provided by all language developers to the National Committee on Health and Vital Statistics in 2000 on the use of standardized languages, developers were asked to provide updated information related to the use of SNLs. All of the nursing developers provided information about the historical development of each language. The response by Insurers and other third party payers was that SNLs needed to be used on a national level. They noted that when nurses can agree on the language of choice opportunities cost out and negotiate reimbursement will be available. This position advanced the work of NNN and SNOWMED RT. With an adequate amount of clinical data that can be generated through use of SNLs, third party reimbursement for nursing care is a possibility for the future.

### Autonomy and Control of the Profession and Science of Nursing

Autonomy is perceived to be a central attribute of a profession. When nurses practice autonomously using SNLs, they engage in the generation of diagnoses and interventions that are grounded in nursing's unique body of knowledge, have actions that are self-controlled, and do not require authorization by others (Lyons, 1990). As far back as 1969, Abdellah said, "Fundamental to the development of nursing science is the nurse's ability to make a nursing diagnosis and prescribe nurse actions or strategies that will result in specific responses in the patient" (1969, p. 390). Without SNLs, the voice of nursing is silent and professional autonomy is threatened (Lyons 1990).

In a study of the influence of SNLs on nurses' autonomy, Mrayyan (2005) concluded that it was important for nurses to use SNLs with each patient encounter in order to foster professional autonomy and clarify nurses' control over their practice. The author viewed the use of SNLs as an effective way to promote professional unity and role clarity within professional practice environments. Without the use of SNLs, communication of disciplinary knowledge is compromised and data to conduct research and advance the discipline are reduced or eliminated. In addition, the absence of SNLs in the workplace renders nursing decisions arbitrary and unscientific (Warren, Welton and Halloran, 2005).

## WORKFORCE AND STANDARDIZED NURSING TERMINOLOGIES

Establishing and justifying nursing workforce targets requires the ability to continuously assess the impact of nurses' numbers and various roles on health care and patient outcomes. Without a clear strategy for demonstrating the impact of nursing care, there is no way to systematically and continuously improve care, justify effective staffing patterns, and promote cost-effective care. Prior to the development of nursing terminologies, it was virtually impossible to capture nursing's contribution in ways that would allow for a quantitative assessment of the impact of nursing care. The absence of meaningful data to characterize nursing's contribution has stifled the profession's ability to make credible workforce projections that are clearly linked to achieving specified outcomes.

The creation and availability of standardized nursing terminologies provide the basic building blocks needed to assess nurses' impact on health care and patient outcomes. Capturing nursing diagnoses, outcomes, and interventions with standardized terminologies

in electronic documentation (EHRs) now make it possible to retrieve information about the focus and type of nursing care provided and the impact of it. The terminologies, though necessary, are not sufficient. If each EHR vendor system and each organization that uses the EHR independently adapt the standardized terminologies to meet unique vendor and organization specifications, the potential for evaluating the impact of nursing is lost or, at best, severely compromised. This "tweaking" is currently the rule rather than the exception and takes place variously at the user interface level, database architecture level, and training level. As a result of the "tweaking" the data captured using nursing terminologies is not reliable and valid and therefore not useful as evidence to characterize nursing practice.

## HANDS Research Team

Needed is a common means to integrate the nursing terminologies into the EHRs that assures the reliability and validity of nursing data for use in accurately characterizing the nursing workforce's impact on health care and patient outcomes.

This has been the goal of the HANDS research team for over a decade. Since 1996, a team of researchers has engaged engaged in numerous rounds of development and testing of what is now a web-based dynamic care plan documentation and handoff communication system. The HANDS utilizes the standardized nursing terminologies of NANDAI, NOC, and NIC to represent nursing diagnoses, outcomes, and interventions respectively. The HANDS can be connected to any EHR and utilized as the coordination of care or care planning component (Dunn-Lopez & Keenan, 2010; Keenan, 2004–2008; Keenan, Falan, Heath, & Treder, 2003a; Keenan, Stocker, Barakauskas, Johnson, Maas, Moorhead, & Reed, 2003b; Keenan, Stocker, Barkauskas, Treder, & Heath, 2003c; Keenan, Stocker, Barkauskas, Treder, & Heath, 2003d; Keenan, Barkauskas, Johnson, Maas, Moorhead, Reed, 2003e; Keenan, Stocker, Geo-Thomas, Soporkar, Barkauskas, & Lee, 2002; Keenan & Yakel, 2005). The HANDS achieves the three levels of interoperability recommended for full interoperability by Health Level 7s EHR Interoperability Work Group (2007) to ensure data captured using HANDS is valid and reliable across all systems that use HANDS. The three levels of interoperability include semantic, technical, and process.

Semantic interoperability involves ensuring the meaning of the terms remains the same across users. Technical interoperability is achieved through use of a single standardized user interface and database structure. Process interoperability is achieved through adherence to the standardized training modules and same rules of use in practice (e.g., update at every formal nursing handoff; use of plan of plan of care to organize communication during formal handoffs).

In a recently AHRQ funded multi-site study (R01 HS015054–01, 2004–2008), HANDS was implemented and tested in four different types of hospitals in a total of eight diverse medical surgical units where 39,322 episodes of care were captured (episode = admission to discharge from a single unit) over a 2-year period (4 units participated for 1 year and 4 units participated for 2 years; see Table 10.5). Quota sampling was used to ensure broad representation of medical-surgical unit types and organizations. All units selected were required to meet the study readiness criteria, which included adequate staffing and agreement to use HANDS fully as directed to document the plan (an admission, update, or

discharge) and use it to communicate about care at every formal handoff. The main aims of the study were to determine if interoperability could be maintained on all three levels across all units and to evaluate user satisfaction with HANDS and the standardized terminologies. Mixed methods were used to assess the aims and the results provided solid evidence that these three levels of interoperability can be achieved and maintained across very diverse settings. Also, nurses found HANDS significantly more useful than previous methods of care planning ($p \leq .01$) and were more satisfied with NANDAI, NOC, and NIC after one to two years of use compared to that perceptions measured at baseline ($p \leq .01$).

The results of the AHRQ study, published in detail elsewhere (Keenan, 2009; Keenan et al., 2008), provide solid evidence that it is not only possible but also feasible to implement and maintain a single and universally useful plan of care system (interoperable on three levels) that utilizes NANDAI, NIC, and NOC across diverse care settings. These findings are powerful indicators that valid and reliable nursing care dare data can be generated with an electronically supported plan of care system that has been carefully designed and tested to meet both user and secondary stakeholder needs. The data collected with HANDS not only includes the nursing diagnoses, outcomes, interventions and changes in the across episodes but also other patient and nurse demographic information and nursing workload. The data gathered through routine documentation thus is automatically available to support day to day care as well as multiple secondary uses.

## Secondary Uses of HANDS

The focus of the HANDS team at the University of Illinois is currently being directed toward demonstrating how the valid and reliable data captured in a system like HANDS can be used for multiple secondary purposes that can eventually support workforce policy. For the past year, the HANDS team has been conducting two pilot studies, with the help of three engineering teams at UIC (statistical, data mining, and usability). One of the studies has focused on understanding “Pain” management in end-of-life patients through use of a variety of statistical and data mining techniques and translating the evidence into prototype decision support alerts that will soon be tested. We were able to quickly isolate the end-of-life episodes ($n$ = 1,425) in our anonymized database from the AHRQ study through pulling patient episodes of care that included one or more of the following criteria (1) NOC outcome: Comfortable Death; (2) NOC outcome: Dignified Life Closure; (3) NIC intervention: Dying Care; (4) Discharged to hospice medical facility; (5) Discharged to hospice home care; or (6) Expired (see Table 10.5). Our preliminary findings indicate that pain management at end of life is significantly below desirable levels in our “representative set” of acute care units and that certain constellations of nursing interventions are associated with better pain outcomes. These preliminary findings are soon to be published elsewhere.

Data gathered in the above reported AHRQ study is also being used for our second pilot. This pilot is focused on nurse related characteristics. Specifically, we are examining the impact of shift length and number of unique nurses per episode of care (continuity) on expected patient outcomes. Again, we are able to ask and answer these important workforce related questions precisely because this is data that was automatically picked up as nurses

used the HANDS plan of care system to describe and monitor care across time. The findings for this pilot are also expected to be published soon elsewhere.

In summary, in this section we briefly explained why standardized terminologies are necessary but not sufficient to generate reliable and valid evidence to address nursing workforce issues and what is need to fill the gaps. A description of the more than 10-year research trajectory of the HANDS team, now located at the University of Illinois Chicago, was presented as an exemplar of how standardized nursing terminologies can be successfully implemented to generate valid and reliable nursing data to support policy around work force issues. The pilot studies, currently underway were also briefly described. These presentations were designed to provide a glimpse of the enormous range of nursing related questions that can be addressed when standardized terminologies are implemented widely in documentation and communication systems that are interoperable on three levels and acceptable to front line users.

## FUTURE DIRECTIONS

In a recent IOM report on the *Future of Nursing: Leading the Change, Advancing Health* (IOM, 2010) the document stresses the important role nursing will play in leading the way to improved patient care. One of the four major goals in the report states “Effective workforce planning and policy making require better data collection and as an improved information infrastructure” (IOM, 2010 p. 3). The importance of SNLs within our current and future documentation will help address workforce demands, develop predictive models for high quality, safe, efficient and effective care, help cost out nursing services and document nursing’s contribution to patient outcomes. For this to be realized, nursing must be visible within the EHR. This will require the use of standardized languages and educational preparation of nurses to document their Practice (Cronenwett et al., 2007; Cronenwett, Sherwood, & Gelman, 2009). While the use of nursing diagnosis, interventions and outcomes are predicated on good decision making and do not explain the full extent of nursing practice, they do offer some insight into the nature of patient care uniquely influenced by the nurse. The further development testing and refinement of nursing language and the advancement of disciplinary knowledge enhanced by research of the terms will expand our science and related knowledge base. The potential use of SNLs in randomized trials, population based studies and data mining with an established data base will extend nurses opportunities to contribute to deliver knowledge driven care. Qualitative studies that focus on understanding the meaning of a human experience self care (loss, resilience, etc.) can begin to isolate themes (concepts) and eventually lead to the naming of new phenomena of concern. Quantitative studies that focus on the study of phenomena can help validate phenomena, identify links and significant relationships between and among phenomena and generate care models with greater prediction, precision, control to improve care accuracy and comprehensiveness.

Use of a standardized and unified language internationally can increase cross culture/ population studies of the phenomena, focus on instrument development to measure phenomena, generate intervention studies and lead to outcome/evidence-based studies (randomized clinical trial). With the consistent use of standardized language, administrative

models can be developed to improve definitions and determinants of staffing ratios and patterns and integrate the level of provider with increase safe, efficient, cost-effective, and high-quality patient centric care.

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**TABLE 10.1**

Terms, Definitions, and Standardized Languages

| Term | Definition |
|---|---|
| ANA Core Criteria (nursing language criteria and definitions) | Support practice, clinically useful and unambiguous; systematic method of development, documented testing, and continued refinement, maintained on a regular basis. These criteria need to be present in all data sets, terminologies, or classifications |
| Class | A group, division, category, or set used to categorize or classify information |
| Classification | A way to arrange items (e.g., defining characteristics) based on relationships and assignment of names (e.g., interventions and outcomes) to groups of items |
| Data Set | Grouping of identified elements of particular interest within a context |
| Domain | The most abstract term in a taxonomy (e.g., functional domain) |
| Nomenclature | Terms that can be combined to represent more complex concepts; informed by preestablished rules |
| Taxonomy | Organization of concepts based on similarities into a conceptual framework |
| Terminology | Words for a concept or the vocabulary used to communicate a concept |

*Source:* Adapted from Dochterman and Jones, 2003.

**TABLE 10.2**

ANA Approved Standardized Languages

| |
|---|
| • North American Nursing Diagnosis Association–Taxonomy II—classifies nursingdiagnosis (NANDA-I) |
| • *Nursing Intervention Classification (NIC)–Taxonomy*, 4th ed.—classifies nursing interventions |
| • *Nursing Outcomes Classification (NOC)–Taxonomy*, 4th ed.—classifies patient outcomes |
| • Gordon's Eleven Function Health Patterns |
| • Home Health Care Classification's (HCCC) classifies specific nursing diagnosis,interventions and outcomes (Homecare) |
| • Omaha system's structure classifies specific nursing diagnosis, interventions, andoutcomes |
| • Patient Care Data Set (PCDS; Ozbolt) |
| • Perioperative Data Set (PNDS) classifies specific nursing diagnosis, interventions andoutcomes (Perioperative care) |
| • International Classification of Nursing Practice (ICNP) classifies specific nursingdiagnosis, interventions and outcomes (ICN) |
| • SNOMED RT (Systemized Nomenclature of Medicine clinical terms) referenceterminology to cross map multiple Classifications, etc. |
| • Clinical LOINC—Logical Observation Identifiers Names and Codes |
| • Nursing Minimum data Sets—NMDS Delaney, C. 2006 |
| • NMMDS—Nursing Management Minimum Data Sets |

**TABLE 10.3**

Levels of Evidence and SNL Research

| Level of Evidence | SNL Research |
|---|---|
| Level 1: Evidence from systematic review meta-analysis of all relevant control trials or evidence-based practice guidelines based upon RCTs | None identified |
| Level 2: Evidence obtained from at least one well-designed randomized clinical trial (RCT) | Studies of teaching SNLs and accuracy of nursing diagnoses (Levin, Lunney, & Krainovich-Miller, 2004; Mueller-Staub et al., 2007; Paans et al., 2010, May) and accuracy of documentation (Paans et al., 2010b) |
| Level 3: Evidence obtained from well controlled clinical trials without randomization (quasi experimental) | Studies of the effect of teaching critical thinking (e.g., Cruz et al., 2009), and of implementing policy (e.g., Thoroddsen & Enfors, 2007) |
| Level 4: Evidence from nonexperimental studies, for example, case control or cohort studies | Extensive numbers of nonexperimental studies (e.g., del Bueno, 2005; Gordon, 1987; Sparks, 1990). Measurement (Hoskins, 1989; Kim, 1990) |
| Level 5: Evidence from systematic reviews of descriptive/qualitative studies | Epidemiological studies on occurrence or frequency (e.g., Schroeder, 1990); testing and refinement, and some systematic reviews related to generation of diagnoses |
| Level 6: Evidence from single descriptive/qualitative studies | Many studies that focused on populations or groups to identify high frequency or commonly occurring nursing diagnoses. The literature continues to report these studies: Flanagan and Jones (2009), Jeffries, Cox, et al. (2010, in press), Gordon, 1987, Gordon and Sweeney (1979) Fehring's validation model (1987) to estimate content and construct validity of the concepts (Whitley, 1996) |
| Level 7: Evidence from opinion of authority or experts | Much of early development used expert opinion (e.g., Gebbie & Lavin, 1975), including Delphi methods, for concept development, testing, and refinement |

**TABLE 10.4**

Selected Studies that Show Variance in Nurses' Data Interpretations Based on Three Categories of Factors That Influence Data Interpretations or Diagnoses

| Categories and Researchers | Factors | Significant Findings |
|---|---|---|
| *Situational Context* | | |
| Gordon, 1980 | Time constraints | When information was deliberately restricted to no more than 12 units of info. subjects were more accurate (88%) than with unlimited information (48%; $p$ =.001). |
| Cianfrani, 1984 | | Increased time to diagnose was associated with lower accuracy. |
| Tanner et al., 1987 | | Increased time to diagnose was associated with lower accuracy. |
| Lenz et al., 1986 | Role in the health care system | Differences in interpretations of data were associated with CNS preparation or role. |
| Hasegawa et al.. 2007 | Diagnostic decision making responsibility | In a national survey of Japanese nurses (N = 376, 85% response rate), those who reported diagnostic responsibility demonstrated significantly higher competence in specific parts of the task case studies. |
| *Nature of the Diagnostic Task* | | |
| Matthews & Gaul, 1979 | Task complexity | With two case studies (CS), there was an inverse relationship between diagnostic ability and complexity of the CS (significance not mentioned, validity & reliability of the cases not established). |
| Corcoran, 1986 | Task complexity | Complexity influenced planning interventions for cancer pain (diagnosis of cancer pain was implied). |
| Hughes & Young. 1990 | Task complexity | Three CS were used with increasing task complexity (n = 101 nurses). Task complexity was associated with less consistency in decision making. Decision making varied with each task; Decision making was task specific. |
| Gordon, 1980 | Task complexity | Subjects did better when information was limited (see above); unlimited amount of data was assoc with continuation of predictive hypothesis testing. |
| Cianfrani, 1984 | Amount of data | With high amounts of data, accuracy decreased with 1 of the 3 CS ($p$ = .001). There was an increase in errors with 2 of the 3 CS ($p$ = .02; $p$ = .001) and an increase in time with 2 of the 3 CS ($p$ = .005; $p$ = .05). More problems were hypothesized with 2 of the 3 CS ($p$ = .05; $p$ = .01). |
| | Relevance of data | Accuracy decreased with low relevance data for all 3 CS ($p$ <.0000). There was an increase in errors with low relevance data with 2 of the 3 CS ($p$ = .04; $p$ = .000). |
| Hicks, Merritt, & Elstein, 2003 | Task complexity | 31% of critical care nurses (N = 54) from 3 hospitals demonstrated consistency of intervention decision making (diagnosis was implied) with a low complexity task; only 11% demonstrated consistent decision making with a high complexity task. |
| *Diagnostician: Education* | | |
| Aspinall, 1976 | Masters<br>BS degree<br>Associate (AAS)<br>Diploma (DIP) | Mean number of correct diagnoses out of 12<br>4<br>3.93<br>3.35<br>3.23<br>Significant difference between BS and AD ($p$ < .05) and between BS and Dip ($p$ < .01). |
| Matthews & Gaul, 1979 | Masters students<br>Baccalaureate students | % stated correct diagnosis ($p$ < .008)<br>62 (Explanation: more use of negative & positive cues)<br>50% who listed task diagnosis (estimated from bar graph) |
| Craig, 1986 | Masters students | 82 (had been taught the diagnostic process) 35 (no previous nursing, 1st year)<br>30 (entered as nurses, 1st year)<br>45 (entered as nurses, 2nd year)<br>42 (generic); 49 (RN) |
| | Baccalaureate students<br>Diploma students | 46 (with internship); 46 (without internship) 52 (with one year experience) |

| Categories and Researchers | Factors | Significant Findings |
|---|---|---|
| Konno et al.. 2000 | Diploma graduates College education Technical education | With a written CS, nurses with college education were more accurate than nurses with technical education. 91% had never learned nursing diagnosis so differences were related to other factors. |
| Lunney, 1992 | Continuing education | BS nurses ($n$ =86) who reported having additional education on nursing diagnosis after graduation were more accurate with 3 written CSs than nurses who reported that they had no additional education ($p < .05$). |
| Lunney et al.. 1997 | Continuing education | Nurses ($n = 62$) who reported having additional education on nursing diagnosis after graduation were more accurate with actual cases than nurses who reported they had no additional education. |
| Mueller-Staub et al., 2007 | Continuing education | In a pretest-posttest study of nurses from 6 randomly selected wards of a Swiss hospital, the quality of patient records showed significant improvement in formulating nursing diagnoses ($p < .0001$). |
| Cruz, Pimenta, & Lunney, 2009 | Continuing education (CE) | A 16-hour CE course on critical thinking for clinical judgment was offered to experienced nurses ($N = 39$); a pretest-posttest design was used to measure the effects. Accuracy of diagnosis improved with case study one ($p = .008$), case study two ($p = .042$ ) and overall ($p = .001$). |
| Hasegawa et al., 2007 | Knowledge of nursing diagnosis definitions | Those nurses who scored higher on the test of nursing diagnosis definitions demonstrated higher accuracy with the two case studies. |
| *Diagnostician: Use of Teaching Aids* | | |
| Aspinall, 1979 | Decisions trees List of problems No teaching aid | Three groups (gp), matched for education & experience, one experimental, two controls, t tests done, $p < .001$<br>Experimental gp; m = 3.8; highest possible score = 6<br>Control gp; m = 2.567 Control gp; m = 1.667 |
| Craig, 1986 | Taught the diagnosis process | 82% listed task diagnosis ($p < .001$)<br>7 other groups (see above) ranged from 30% to 56% |
| Tanner, 1982 | Not taught Taught hypothesis testing | No significance between pre and post test; One explanation: Scoring of accuracy did not allow for variations in statements. |
| Thiele et al., 1986 | Computer simulation | Junior and senior sts improved in cue recognition, cue sorting/linking, & clinical decision making with computer simulation ($p < .05$). |
| Fredette & O'Neill, 1987 | 5 hours didactic content on diagnostic process | 2 studies, experimental & control gps.<br>1st study-experimental gp identified more diagnoses<br>2nd study-exp gp did better overall in diagnosing a case study & in written papers, did better in two categories |
| Pinnell et al., 1992, & Spies et al., 1994 | 20-hour course on nursing process with 4 hours on diagnostic reasoning | Average pre-course accuracy ($n = 73$ nurses) was 2.6 on Lunneys 7 point scale; after the course accuracy improved to n average of 3.1 ($p < .05$). |
| Lasater & Nielson, 2009 | Concept-based learning | The intervention group ($n = 15$ students) who were taught using a concept-based approach scored statistically higher ($p < .05$) than the control group students ($n = 13$) on four types of clinical judgment, including data interpretation. |
| Paans et al., 2010, May | Education about the PES system | In a randomized factorial design study with four groups, knowledge of the PES system was significantly related to accuracy of nursing diagnoses. |
| *Diagnostician: Nursing Experience* | | |
| Aspinall, 1976 | Below 10 years | Greater number of correct diagnoses |
| | Over 10 years | Fewer number of correct diagnoses |
| Aspinall, 1979 | Below 2 years | Scored highest; doubled score with decisions trees |
| | 2–10 years | Scored lowest; profited least with decision trees |
| | Over 10 years | Scored low; profited most with decision trees |
| Tanner et al., 1987 | Junior students | Positive association of gp status & accuracy |
| | ($n = 15$) | ($p < .05$) |
| | Senior students | Generally, no difference between gps in |
| | ($n = 13$) | 4 categories of data acquisition. |

| Categories and Researchers | Factors | Significant Findings |
|---|---|---|
| Westfall et al.,1986 | Nurses ($n$ = 15) | Experienced nurses generated more complex |
| | Same population/study as Tanner et al. | hypotheses than either group of students ($p$ = .03) |
| Holden & Klingner, 1988 | Students | Task was to diagnose why an infant was |
| | 1st semester | crying (teething). Experienced gp (nurses |
| | juniors | and parents) asked for more information than |
| | Last semester | inexperienced gp ($p$ < .05). Experienced gp |
| | seniors | was more likely to ask for valid and reliable |
| | Parents | cue on 1st choice than inexperienced gp |
| | (juniors & | ($p$ < .01). The experience of parenting was |
| | seniors) | associated with 100% accuracy |
| Konno et al., 1999, 2000 | Experienced nurses | Experienced nurses were less accurate than students. |
| | Years of experience | There was no difference in accuracy by years of experience. |
| Junnola et al.,2002 | Perceptions of influence of experience | 90% of nurse participants (N = 107) said that professional experience influenced their identification of problems in an oncology case simulation |
| delBueno, 2005 | Years of Experience | With 10 years of competency data from more than 30,000 nurses, it showed that ability to use clinical judgment for identification of patients' problems in 3 case simulations varied widely, with new nurses significantly worse than experienced nurses |
| Hasegawa et al.,2007 | Years of Experience | Years of nursing experience was associated with higher diagnostic competency in all three measures of competency ($p$ < .05). Only 35% (n = 131) of 376 nurses met all three levels of competency. |
| *Diagnostician: Cognitive Strategies* | | |
| Gordon, 1980 | Hypothesis generation | Number of hypotheses generated is not as important as the correct one being considered early in the task.<br>Cessation of this strategy in the first half of the task was associated with accuracy. |
| | Predictive hypothesis testing | Use of this strategy in the second half of the task was associated with accuracy. |
| | Specific hypothesis testing | Number of hypotheses generated is not as important as "correct" one being considered early in the task. |
| Tanner, 1982 | Hypothesis generation | Even when hypotheses are generated, they were not necessarily tested. |
| | Hypothesis testing Activation of early hypotheses | In one of the 3 CS (videotapes & hospital records), more experienced nurses activated early hypotheses (73%) than junior (27%) or senior students (38%) ($p$ = .029). |
| Tanner et al., 1987 | Question relevance | For 1 of the 3 CS, experienced nurses asked more relevant questions than students ($p$ = .022). |
| | # of hypotheses<br># of questions | No difference among 3 gps with different levels of education and experience. |
| Matthews & Gaul, 1979 | Types of cues used | Use of both negative and positive cues specific to the case was associated with accuracy; supports Gordons results re: hypothesis testing |
| Thiele et al., 1991 | Cue selectionrelevant or nonrelevant | In a perioperative simulation, the pattern of cue selection of 86 junior sts was 68–85% accurate for relevant cues but also, with overselection, there was 50–60% selection of nonrelevant cues. 72% selected accurate diagnoses & 72% selected appropriate Nursing interventions; also 50–60% selected inaccurate diagnoses and inappropriate interventions. |
| Brannon & Carson, 2003 | Representative Heuristic | Both nurses and student nurses (N = 182) dismissed the appropriate physical diagnoses when situational variables such as loss of job were included, showing that the representative heuristic was being used. |

| Categories and Researchers | Factors | Significant Findings |
|---|---|---|
| Ferrario, 2003 | Four types of heuristics | With a national random sample of experienced (n = 173) and inexperienced (n = 46) emergency room nurses (n = 173) judged cases by causal factors significantly more often than inexperienced nurses (n = 46). |
| Junnola et al..2002 | Information Acquisition | With a computer-based oncology case simulation, the four most important problems were mentioned by 65% of nurses (N = 107). Information acquisition in general was associated with identification of problems ($p < .05$). |
| Paans et al. 2010. May | Critical thinking Disposition | In a randomized study with four groups, truth-seeking and open-mindedness were positively related to accuracy of nursing diagnoses. |
| *Diagnostician: Cognitive Abilities* | | |
| Gordon, 1980 | Inferential ability | No relationship with accuracy using the results from the Graduate record Exam & Miller Analogies Test. |
| Matthews &Gaul, 1979 | Critical thinking | No relationship between nursing diagnosis and critical thinking, as measured by the Watson-Glaser critical thinking appraisal. |
| Lunney, 1992 | Divergent production of semantic units | Three valid and reliable case studies were used. Scores were low on the tests of divergent thinking. |
| | (Fluency) | Accuracy was positively related to fluency with CS 2 ($p = .002$) |
| | Divergent production of | Accuracy was positively related to flexibility with CS 2 ($p = .03$). |
| | semantic classes (Flexibility) | Accuracy was positively related to elaboration with CS 2 ($p = .03$) and CS 3 ($p = .03$). |
| | Divergent production of semantic implications (Elaboration) | Divergent thinking is probably more relevant to actual cases than written cases with defined amounts of data. |
| Paans et al.,2010, May | Analysis & Inference | In a randomized study with four groups, analysis and inference, as measured by the health sciences reasoning test were positively related to accuracy of nursing diagnoses. |

**TABLE 10. 5**

All EOL Episodes and Those with NANDA: Pain Diagnoses

| Hospital | Unit | Unit Type | Total No. Episodes of Care | Total No. EOL | % EOL Episodes | No. EOL Episodes With Pain | % Pain Out of EOL Episodes |
|---|---|---|---|---|---|---|---|
| LCH1 | 1 | General Medical | 5,451 | 189 | 3.5 | 72 | 38.1 |
| LCH1 | 2 | Medical ICU | 1,065 | 163 | 15.0 | 69 | 42.3 |
| LCH1 | 3 | Gerontology | 9,046 | 519 | 5.7 | 113 | 21.8 |
| UH | 4 | Cardiac Surgical | 6,061 | 51 | 0.8 | 33 | 64.7 |
| UH | 5 | Neuro Surgical | 8,119 | 97 | 1.2 | 65 | 67.0 |
| LCH2 | 6 | Medical Gerontology | 1,557 | 116 | 7.5 | 71 | 61.2 |
| LCH2 | 7 | General Medical | 3,276 | 156 | 4.8 | 104 | 66.7 |
| SCH | 8 | Medical Surgical | 4,747 | 134 | 2.8 | 69 | 51.5 |
| Total | | | 39,322 | 1,425 | 3.6 | 596 | 41.8 |

Number of EOL patients as a percentage of all patients and the number of EOL patients with pain diagnosis as a percentage of all EOL patients in the HANDS database from 2005 to 2007.

LCH1, large community hospital 1; UH, university hospital; LCH2, large community hospital 2; SCH, small community hospital, all in the Midwest.