# Testing the Reliability and Validity of the Tiffen Decision Making Tool

BY

JENNIFER TIFFEN
B.S.N., Villanova University, 1995
M.S., University of Illinois at Chicago, Chicago, 2001

THESIS

Submitted as partial fulfillment of the requirements
for the degree of Doctor of Philosophy in Nursing
in the Graduate College of the
University of Illinois at Chicago, 2012

CHICAGO, ILLINOIS

Defense Committee:

Julie Zerwic, Chair and Advisor
Mary Ann Anderson
Susan Corbridge
Lynda Slimmer
Barbara Simmons
Patrick Robinson, Chamberlin College of Nursing

## ACKNOWLEDGEMENTS

I am very grateful to my research chair and dissertation advisor, Dr. Julie Zerwic. Dr. Zerwic was a wonderful mentor to me and provided me with constant guidance and support. I would also like to thank my wonderful committee, including Mary Ann Anderson, Susan Corbridge, Patrick Robinson, Lynda Slimmer, and Barbara Simmons.

I am also grateful to the consultants and experts who volunteered their time and expertise with this dissertation. I especially want to thank Dr. Carol Thompson, Dr. Ruth Kleinpell, and Dr. Fran Hicks for their decision making expertise; Dr. Judith Haber, Dr. Ron Hickman, and Dr. Jane Kapustin for their content validity expertise; Karen Vuckovic and Charlie Yingling for their case content expertise; and Dr. Jean Berry, Leah Burt and Alicia Maloney for their assistance with grading cases.

There are many, many other people who helped me, encouraged me and supported me through this journey. I would like to especially thank my husband Simon, my children Nora, Jameson and Bailey, my parents Lawrence M. O'Rourke and Patricia C. O'Rourke, my siblings Chris, Katie and Tim, and my in-laws Jane and Howard Tiffen. In addition I would like to thank my friends for their patience, humor and many coffee breaks.

## TABLE OF CONTENTS

CHAPTER PAGE

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

## SUMMARY

Decision making is the process of collecting, interpreting and evaluating information to make a decision and it is a required competency in the education and training of nurse practitioners. However, there is a lack of an accepted method for evaluating these skills. The inability to evaluate these skills hinders understanding how decision making can be best taught and learned as an individual makes the progression from a student to a novice practitioner and then expert practitioner. The purpose of this study was to develop a tool for measuring decision making along this continuum.

A descriptive, comparative study was used to examine the psychometric properties of the instrument. Content validity of the instrument was assessed through expert nurse educators and practitioners who had experience teaching or researching decision making. Construct validity was examined by comparing TDM scores across a diverse sample of nurse practitioner students, novice nurse practitioners and experienced nurse practitioners. In addition, the reliability of the TDM was explored by measuring the inter-rate reliability of the scoring system as well as the stability of the TDM scores over a month period.

The TDM was found to differentiate between the data collection abilities of students as compared to experienced practitioners however practitioners were not found to have a greater ability to correctly diagnose the patient cases. Scores on the TDM were found to be stable over a month period. The ability to evaluate a nurse practitioner's decision making in a controlled and standardized environment could provide useful information for the education, practice, licensure and accreditation of nurse practitioners.

# I. INTRODUCTION

Safe and competent delivery of healthcare saves lives (National Quality Forum, 2010). Given today's complex healthcare environment, there is an even greater demand for healthcare providers to be safe and effective clinicians. The recent Institute of Medicine (IOM) report suggests that 20th century nursing education is not sufficient for dealing within the complex health care environment in the 21st century (2010). To this end, there has been a shift in healthcare education to move beyond focusing on what students know, and instead focus on the student's ability to assess and organize information, to apply knowledge appropriately in situations, and to use knowledge to understand and take action (Herman, 1997).

Nurse practitioners rank as one of the fastest growing healthcare professions in the United States. They are licensed, independent practitioners who practice autonomously and collaboratively with other healthcare practitioners to provide direct patient care to individuals, families and communities. Strengthening the quality of nurse practitioner education and ultimately care, depends in large part on how educators can facilitate the development and application of clinical knowledge and expertise. Decision making has often been used as an umbrella term in the nursing literature to describe the fundamental role of the nurse practitioner where they use their knowledge and expertise to collect data in order to make a decision. Despite decision making being a required competency in the education and training of nurse practitioners, there is a lack of effective and accepted methods for evaluating decision making abilities. Traditionally schools of nursing have utilized a variety of methods to teach decision making, however the development of these abilities has often been implied rather than measured. Upon graduation, students become nationally certified to practice as a nurse practitioner by sitting for a licensure exam in a defined role and clinical area of practice; however, most nurse

practitioners will only take the exam once in their career with no further competency based evaluation.

The lack of an effective and universal method for evaluating decision making complicates the ability to understand if we are using the best teaching methods to prepare nurse practitioner students for successful transition into practice. At the same time, the inability to monitor the progression and abilities of practicing nurse practitioners may place nurse practitioners a step behind in their ability to demonstrate their clinical knowledge and abilities. The purpose of this study was to develop an instrument to measure decision making along the continuum of a nurse practitioner student to practicing nurse practitioner.

## A. Background

The International Council of Nurses, Nurse Practitioner/Advanced Practice Network defines a nurse practitioner as "a registered nurse who has acquired the expert knowledge base, complex decision-making abilities and clinical competencies for expanded practice" (http://icn-apnetwork.org/). A nurse practitioner is an advanced practice nurse who has completed an accredited master's program or doctoral degree and has a state license as well as board certification in a practice specialty (Illinois Society for Advanced Practice Nursing, n.d.). Nurse practitioners rank as one of the fastest growing healthcare professionals in the United States. In contrast to primary care physicians who are decreasing in number, primary care nurse practitioners are projected to increase annually by an average of 9 percent (United States Government Accountability Office, 2008). In addition, nurse practitioners are increasing in areas of pediatrics, women's health, and acute care.

Decision making is an essential component of nurse practitioner training (American Association of Colleges of Nursing (AACN), 2011; AACN 1996; National Organization of

Nurse Practitioner Faculties (NONPF), 2011). According to AACN, there should be a focus on the development of sound decision making abilities throughout the entire advanced practice nurse curriculum. This includes preparing students to assess, diagnose, manage, and evaluate a wide range of acute and chronic health problems. Students learn how to be decision makers through history taking, performing a physical exam, evaluating the data to determine the relevancy, and then interpreting the data in order to formulate a diagnosis.

The decision making process used by nurse practitioners may be simple and straightforward or complex with many steps. This process can be best explained by using exemplars. A young adult male patient comes in to see a nurse practitioner for an annual exam. The visit starts with the practitioner taking a comprehensive history and physical exam where the only significant finding is a small, painless but swollen lymph node in the axillary region. Rather than developing a tentative diagnosis about the cause of the lymph node, the practitioner decides to collect more information by having labs drawn. The initial blood work comes back normal however the practitioner decides to order a biopsy because the patient now reports having a fever and feeling tired. When she is asked for the rationale for ordering the biopsy she lists a tentative diagnosis of Lymphoma. The biopsy results come back positive and the practitioner then initiates a referral to a hematologist. This is an example of decision making over time where the provider collects initial data from the patient, determines the need for additional information, evaluates the data in light of new information and then takes further action to formulate a diagnosis. At other times decision making may be more rapid with a tentative diagnosis developed earlier in the process. For example, a middle aged adult comes into a fast track clinic complaining of left sided chest pain and shortness of breath. The patient has a history of high blood pressure. The practitioner rapidly makes the decision to call for the paramedics and tells them she thinks the

patient may be having a heart attack. She collects some initial data from the patient such as his vital signs, and personal and family history while she puts the patient on oxygen. The practitioner is later notified by the hospital that the patient did suffer a heart attack.

These two examples highlight how important but diverse the decision making process can be. Nurse practitioners are front line healthcare providers who must be able to effectively diagnose, manage and care for a variety of patients. Often decision making may develop over time where the information will lead the practitioner to a diagnosis; however, in certain environments there may be the need to develop an early tentative diagnosis in order to stabilize a patient until more information is known. A nurse practitioner must be prepared to respond effectively to all situations using the decision making abilities that are developed as a student and strengthened as a practitioner.

## B. Study Significance

The increasingly complex healthcare environment of today requires nurse practitioners to have safe and effective decision making abilities. Decision making abilities are essential in order to optimize patient outcomes, improve clinical practice, achieve cost-effective care and ensure accountability and transparency. According to a 2006 report in the Annals of Internal Medicine, the leading factor (79%) contributing to medical errors is a failure of judgment by providers (Gandhi, Kachalia, Thomas, Puopolo, Yoon, Brennan, et al.). This failure of judgment, which may lead to fatal diagnostic errors, includes the clinicians' failure to obtain an adequate history or conduct a physical exam, failure to order the right test or failure to correctly interpret a diagnostic result. These examples are aspects of the decision making process that nurse practitioners use on a daily basis.

The recent IOM report provides tangible recommendations for the role of nurse

practitioners in advancing healthcare during the next decade (2010). A primary recommendation is the ability of nurse practitioners to practice to the fullest extent of their education and training. This includes creating opportunities for graduates to develop and practice the abilities that will lead to safe, quality care. In addition, nurses will be encouraged to participate in, and also lead decision making and be accountable for these decisions. Given these recommendations, it is essential that we have effective methods for teaching and evaluating nurse practitioners across the continuum from student to practitioner. Currently, there are no commonly accepted methods for evaluating decision making abilities.

Improving the quality of care provided by nurse practitioners depends in large part on improving the training of nurse practitioners, thus the lack of an effective means to evaluate these abilities is troublesome (Thompson & Stapley, 2011). By not being able to consistently and accurately evaluate decision making, nursing educators will be challenged to understand if they are using the best teaching methods to prepare nurse practitioner students for successful transition into practice.

## C. Problem Statement

The development of decision making abilities, but also the ability to evaluate these abilities, is essential in order to promote a greater understanding of nurse practitioner education and practice. Currently there is no universal, valid and reliable method for evaluating nurse practitioner decision making abilities along the continuum of a nurse practitioner student to a practicing nurse practitioner.

## D. Purpose

The purpose of this study was to develop a valid and reliable instrument to measure decision making in nurse practitioner students as well as practicing nurse practitioners. This

study is a first step in creating a decision making prototype that could ultimately measure decision making across a variety of clinical situations and allow nursing faculty, employers of nurse practitioner employers or even large credentialing bodies to tailor cases using a standardized instrument.

## E. Study Aims

The specific goal of this research study was to create an instrument with evidence of psychometric reliability and validity that measures decision making abilities. The study specifically addressed the following research aims:

- To determine if the TDM tool has appropriate sensitivity in measuring differences in decision making abilities between a nurse practitioner student, a novice nurse practitioner and an experienced nurse practitioner.
- To determine if the TDM tool is a reliable method for measuring decision making abilities among nurse practitioner students, novice nurse practitioners and experienced nurse practitioners.
- To determine the relationship between participant's demographic variables and their responses on the TDM tool.

## F. Framework

In the literature there is a lack of a predominant theoretical framework of decision making. The frameworks that have appeared most often in the nursing and medical literature are Decision Analysis, Information Processing Theory (often called a hypothesis driven theory), and Intuition; however, none of these theories is a good fit with nurse practitioner education and practice. A new framework was developed to guide this study and future work in the area of nurse practitioner decision making. This new model is depicted in Figure 1. The model depicts

the clinician as the primary decision maker in an evolving process where data may be gathered, interpreted and evaluated to formulate a decision. Practitioner factors are attributes of the clinician, such as their experience and their clinical specialty that may influence how that provider engages in this process.

The decision making process includes four potential steps. Data gathering involves the collection of information that will lead the practitioner forward. The two most important aspects to data gathering are collecting a history and performing a physical examination. Nurse practitioners are taught how to take a history by collecting essential data about the patient and their family. These activities include getting a detailed description of the history of the present illness (HPI), asking about the patient and family past medical history, social history and other relevant information about the patient and their complaint. The history will usually lead the practitioner forward to determining a pertinent physical examination and then subsequently lead them to begin to interpret the collected data and seek additional information as necessary. Data interpretation involves examining the initial history and physical assessment data in order to make a determination about how to proceed in the clinical decision making process. A practitioner may often develop an early diagnosis(s) that then is used to guide their collection of additional data such as laboratory or other diagnostic tests.

After the practitioner has identified an initial differential diagnosis and collected additional data, they will then evaluate the data to determine which information is pertinent. This process is often described as developing a differential diagnosis where the clinician may tentatively or definitively choose a diagnosis from the potential alternatives. The practitioner considers the discriminating features of the tentative diagnosis(s) and these features by their presence or absence help to narrow down the diagnosis.

Decision making may involve formulating a final decision as depicted in the model. A decision is a comprehensive term that may include the practitioner choosing a final diagnosis, collecting further data, establishing a management plan, and providing patient education. By keeping the outcome of the decision making process broad, the model is applicable at all levels of advanced practice, as well as potentially applicable for other healthcare providers such as nurses, physicians and physician assistants.

Figure 1. A model of decision making for nurse practitioners

The model depicts the decision making process as a fluid rather than linear process. A clinician may begin the process with data gathering and move forward in the process using each step, or the clinician may move in a more back and forth manner depending on attributes of the clinician and the situation. The sunrise colors are meant to express a process that is evolving.

## II. REVIEW OF THE LITERATURE

### A. The Definition and Process of Decision Making

Decision making has often been defined as process of choosing between alternatives or options (Matteson & Hawkins, 1990; Thompson & Stapley, 2011). It is a complex process where data is gathered and evaluated and then a decision, judgment or intervention is formulated (Chumbler, Geller, & Weier, 2000; Hoffman, Duffield, & Donoghue, 2004; Pirret, 2007; Pritchard, 2006; White, Nativio, Kobert, & Engberg, 1992). It has also been similarly defined as a series of decisions (Lauri & Salantera, 1998); an ability to identify, prioritize and establish a plan (Grossman, Campbell, & Riley, 1996); a problem solving activity (Higuchi & Donald, 2002); and as a formulation of hypotheses or nursing interventions (Shin, 1998; Tschikota, 1993).

Some authors have defined decision making as a process that includes clinical reasoning as part of the decision process where information is collected, evaluated and then an action or decision is taken (Clack, 2009; Croskerry, 2002; Jefford, Fahy, & Sundin, 2010; Matteson & Hawkins, 1990; Orme & Maggs, 1993). A decision in this context may be the outcome, but the term decision making describes a process that may include antecedents like the consideration of information, gathering information and weighing the risks and consequences (Matteson & Hawkins).

In a 1990 concept analysis of decision making, Matteson & Hawkins described the attributes, antecedents and consequences of decision making. She found that decision making is a deliberate mental choice where the decision maker chooses between two or more options and then takes committed action based on the evidence. Antecedents of a decision include gathering and considering information while having an awareness of the options available and weighing

any potential risks or consequences of that action. The consequences of the decision include taking action, considering subsequent decisions and/or putting an end to any doubt about the decision.

### 1. The process of decision making

Decision making has most often been examined in relationship to nursing students and registered nurses rather than to nurse practitioners. In fact to date, fewer than 10 published studies have examined aspects of decision making among advanced practice nurses. In several of these studies, authors sought to better understand the process and activities involved in decision making specific to nurse practitioners.

In an early study conducted by White and colleagues (1992), practicing nurse practitioners were given a computerized patient case and had to ask questions, collect patient data and formulate a differential diagnosis. The small sample ($n = 26$) of experienced and inexperienced nurse practitioners were found to use a decision making process that mirrored a diagnostic reasoning or hypothesis driven framework, however, there were some noticeable differences between the two groups. Inexperienced providers were more likely to use a symptom-driven decision making process where they acquired subjective data, then objective data followed by the formation of hypotheses. Some experienced practitioners used an expanded physical process where they performed more in-depth exams in order to fit within an early hypothesis. In addition, it was found that in-experienced practitioners generated a greater number of early patient hypotheses as well as working hypotheses as compared to the experienced practitioners who seemed to be more definitive in their generated hypotheses.

In a 2002 study by Burman and colleagues, the process primary care nurse practitioners use in making decisions and the factors that influence this process were explored. The authors

did not provide a definition of decision making that guided the study. The decision making process was explored using case vignettes read to the practitioners over the phone. Nurse practitioners ($n$ = 36) were found to use an iterative process where they collect data, formulate an early hypothesis and then often return to collect additional data. Within this process nurse practitioners would search for red-flags in the history and physical to narrow down their focus, they used a cognitive schema where they compared the patient to other patients they had seen in practice, and they used their intuition to make gut decisions. The use of intuition by nurse practitioners was also supported by Kosowski and Roberts (2003) who used a phenomenologic approach to understand decision making among novice nurse practitioners. They also found that decision making is an iterative process where knowledge from one component is used to make decisions and move forward to the next component using a progressive process of data collection, data analysis, data interpretation and decision making.

Cioffi and Markham (1997) examined decision making in a sample of midwives ($n$ = 30). Subjects were given simulated patient cases and asked to think aloud about their patient decisions. The researchers found that the midwives used heuristics or rules of thumb to make patient decisions and that the more complex the patient case, the more frequently heuristics were used. Dowding and colleagues (2009) found that heart failure clinical nurse specialists ($n$ = 6) use a combination of processes when making decisions about their patients. This may include a trial and error approach based largely on their intuition and experience or through practice guidelines and collaborating with colleagues.

Other aspects of decision making among nurse practitioners have been explored. Everitt, Avorn, & Barker (1990) conducted a study to examine nurse practitioner and physician's decision making using an insomnia patient case. They found that nurse practitioners sought

significantly more historical patient information than physicians, asked more information about sleep pattern and were more likely to suggest a non-pharmacologic therapy than physicians. Cioffi et al., (2005), compared decision making between a groups of students who participated in learning material through a traditional lecture versus through a simulated patient experience. Using a think aloud approach to measure decision making, she found that students in the simulation group collected more clinical information, revisited collected information less, made fewer formative inferences, and made decisions more quickly than students in the traditional learning group.

Finally, Chumbler and colleagues (2000) conducted a study to determine the effect of demographic variables upon nurse practitioners' decision making and to determine if decision making correlates with productivity. They defined decision making as a process used to gather information, appraise it, and make decisions that result in an essential and integral aspect of clinical practice. They found that nurse practitioners who work in a primary care practice had greater perceived decision making abilities as compared to their peers from specialty practice areas. However, if the same provider changed to a new area, it was unclear whether their decision making abilities would be sustained or change as a result of becoming a novice in a new area.

Several studies have examined decision making within the context of other healthcare providers, including nurses, which may be applicable to nurse practitioners. Decision making has been described as a process that mirrors the hypothetico-deductive process where the nurse generates an early hypothesis, collects patient data, refines their hypothesis, collects more data or revisits data already collected, performs diagnostic tests, and develops a final hypothesis with a diagnosis and sometimes then evaluates the process (Ellis, 1997; Taylor, 2006; Twycross &

Powls, 2006). In addition to a hypothetico-deductive decision process, nurses may use both intuition and rational approaches in a complex decision making (Kosowski & Roberts, 2003; Watkins, 1998). The gut feeling that something is wrong with the patient combined with patient data, can be simultaneously processed to assist in the decision making process. Pattern matching has been termed as a conscious alternative to the unconscious approach of intuition (Offredy, Kendall, & Goodman, 2008).

Much of the literature has described aspects of decision making outside the context of a specific framework. The diverse activities that occur in decision making include specific steps to collect a diagnosis and methods used to validate decision making. Nurses elicit information from a variety of sources during decision making including collecting data on the patient's pre-existing condition, collecting history and physical data and making observations (de la Cruz, 1994; Fry & Burr, 2001; Hedberg & Satterlund Larsson, 2003; McCaughan, Thompson, Cullum, Sheldon, & Raynor, 2005). Nurses then organize the data to select important features of the case, formulate hypotheses about the patient and evaluate their findings while weighing the advantages and disadvantages of their decisions (Hedberg & Satturlund Larsson, 2003; Ramezani-Badr, Nasrabadi, Yekta, & Taleghani, 2009). Nurses may validate their decisions through their own knowledge and experience, through information sources like clinical guidelines, and through nursing colleagues, physicians and patients (de la Cruz, 1994; Dowding et al., 2009; Jenks, 1993; McCaughan et al., 2005; Montori, Tabini, & Ebbert, 2002; Rycroft-Malone, Fontenla, Seers, & Bick, 2009; Watson, 1994).

### 2. Factors that influence decision making

Several factors may influence decision making including the experience, education, knowledge, and other characteristics of the decision maker, the patient and the

situation in which the decision takes place. However, these factors have not been shown to consistently strengthen or hinder decision making (O'Reilly, 1993).

**a. Experience**

Experience has been widely identified as one of the most important influences of decision making abilities (Bakalis, 2006; O'Reilly, 1993). Hicks and colleagues (2003) found that greater years of critical care nursing experience increased the likelihood of decision consistency ($X^2$ (3, $N$ = 54) = 4.22, $p$ = .04) as measured by an investigator-developed case scenario. Grossman and colleagues (1996) examined the decision making ability of critical care nurses and found that after completing a four week orientation program there was no difference in decision making abilities based on the experience of the nurses (reported as $F$ = 1.38, $p$ < .4361) as measured by investigator developed case studies.

The vast majority of the literature has addressed nurses' subjective views of experience rather than measuring it objectively by years of nursing practice. Nursing students, practicing nurses and nurse practitioners subjectively perceive experience to be an important factor in how they make decisions and experienced nurses express greater certainty in their decisions and less decision difficulty as compared to less experienced nurses (Brannon & Carson, 2003; Brooks & Thomas, 1997; Burman et al., 2002; Cioffi, 1998; Chumbler et al., 2000; Currey, Browne, & Botti, 2006; Garrett, 2005; Luker & Kenrick, 1992; Tabak, Bar-Tal, & Cohen, 1996; Thiele, Holloway, Murphy, Pendarvis & Stucky, 1991; Watson, 1994). This past experience may allow nurses to hone in on more pertinent information and eliminate irrelevant information so that they can formulate a judgment or make a diagnosis faster (O'Neil, Dluhy, Hansen, & Ryan, 2006). However, Junnola and colleagues (2002) found that nurses do not always identify their

experience as a primary reason for being able to better collect information and identify patient problems.

The specific number of years of experience may influence how a decision is made but it may additionally be related to the specialty or environment that provider works in. For example, Chumbler and colleagues (2000) found that nurse practitioners who work in a primary care practice had greater perceived decision making abilities as compared to their peers from specialty practice areas. However, if the same provider changed to a new area, it was unknown whether their decision making abilities would be sustained or change as a result of becoming a novice in a new area.

### b. Education

Education has been identified as a factor that may influence decision making ability; however, a review of the literature found mixed outcomes. Brooks and Shepherd (1990) evaluated decision making abilities among four groups of nursing students (seniors from a 4-year program; seniors from an associate program; seniors from a diploma program; and seniors from an upper division program that was not defined). Using the multi-item Nursing Performance Simulation instrument, they found on post hoc testing that senior nursing students from the four-year program had significantly higher decision making scores ($M$ = 38.0, $SD$ = 4.2) than either senior level associate degree students ($M$ = 32.2, $SD$ = 6.5), senior level diploma students ($M$ = 32.3, $SD$ = 4.2), or seniors from an upper level program ($M$ = 32.2, $SD$ = 4.8). However, they found no differences when comparing decision making across associate, diploma and generic level students. In a subsequent study, where the same Nursing Performance Simulation instrument was used, Shin (1998) found that baccalaureate nursing students had

significantly higher decision making scores than associate degree nursing students ($t(232) = 4.68$, $p < .001$.).

Jenkins (1985) developed and reported results from testing the Jenkins Clinical Decision Making in Nursing scale and found no difference in perceived decision making ability in post hoc testing between sophomores ($M = 37.89$), juniors ($M = 37.21$) and seniors ($M = 39.68$). Girot (2000) used the same decision making instrument and found on post hoc testing that mature nurses had higher decision making scores than undergraduate students (reported as $F = 13.82$, $p < .001$) and recent graduates (reported as $F = 13.82$, $p < .001$); however she found no difference between recent graduates and 4th year nursing students (specific results not reported).

Pardue (1987) used an investigator-developed instrument to measure frequency of decision making and perceived difficulty making decisions among associate degree, diploma, baccalaureate and masters-prepared nurses. She found no significant differences in the frequency of decision making (reported as $F = 1.95$, $p = .125$) as well as no difference in the difficulty of decision making (reported as $F = 1.38$, $p = .250$). Grossman et al., (1996) and Chumbler et al., (2000) respectively found that education was not a significant predictor of decision making ability among critical care nurses (specific results not reported) or among nurse practitioners (reported as $\beta = -.046$). Hoffman and colleagues (2004) used a decision making questionnaire to measure perceived and normative decision making of nurses working in Australia and found that nurses with higher education want to participate in decision making more than they currently do ($r(92) = .561$, $p < .01$).

### c. Knowledge

Nurses subjectively link their own knowledge to their perceived decision making ability (Brooks and Thomas, 1997; Garrett, 2005). They perceive knowledge to be a

prerequisite for facilitating decisions, and decisions are more difficult when nurses perceive that they have a lack of knowledge (Hagbaghery, Salsali, & Ahmadi, 2004; Luker & Kenrick, 1992; Watson, 1994). Bucknall and Thomas (1997) investigated critical care nurses perceptions of their problems associated with decision making and found that 28% of nurses reported having difficulty making decisions on a weekly basis because of a lack of knowledge.

#### d. Other influences

Other factors like the attributes of the practitioner may also influence decision making. Grossman and colleagues (1996) found that age is the highest predictor of decision making among practicing critical care nurses (reported as $p < .01$) with experience and educational preparation found to be second and third but non-significant. However, in an earlier study, Jenkins (1985) found that age did not affect decision making scores among undergraduate nursing students (specific results not reported).

Confidence, uncertainty and stress have been examined in relationship to decision making. Subjectively, student nurses, practicing nurses and nurse practitioners perceive their confidence to be helpful in facilitating effective decision making (Burman et al., 2002; Hagbaghery, Salsali, & Ahmadi, 2004; White, 2003). Healthcare providers verbalize feeling uncertainty and stress during decision making which may influence how they make decisions (Cioffi, 2000; Farnan, Johnson, Meltzer, Humphrey, & Arora, 2008; Tabak et al., 1996).

## B. Methods to Evaluate Decision Making

The development of decision making abilities, but also the ability to evaluate these abilities, is essential in order to promote a greater understanding of nurse practitioner education and practice. Evaluation can be defined as a way to appraise learning, quality, and productivity against a standard of performance (Bourke & Ihrke, 2005). In nursing there is opportunity to

evaluate student's cognitive learning, psychomotor abilities as well as affective abilities through a variety of evaluation methods; however, rarely have these methods been examined in relationship to the development of decision making. In addition, rarely have these methods been used to evaluate the abilities of practicing nurse practitioners.

### 1. Methods for evaluating students

Most often nurse practitioner student's clinical performance abilities are evaluated by a clinical preceptor during their clinical practicum courses; however, this process can be flawed and unreliable (Isaacson & Stacy, 2008; Whitaker & Connors, 2004). For example, preceptors may be hesitant to give poor evaluations, the evaluations may be long and tedious to complete, and ultimately it is a subjective assessment that may not allow for a comparison of students across a cohort or even a comparison in the same student across clinical sites. Nursing faculty often make site visits to assess a student's clinical progress but this too may not afford an objective assessment of the student because there is no standardization in the types of patient experiences a faculty is liable to observe (Isaacson & Stacy). Clinical observation by itself may not be the most valid and reliable way to evaluate decision making.

Multiple choice tests have long been used in nursing education to evaluate student competency. They provide a measurable outcome of student learning that can be used to assess formative and summative learning outcomes (Twigg, Rasmussen, & Speck, 2005). The challenges of using multiple choice exams are directly related to the challenges associated with developing the items. Often times nursing faculty are not formally trained in how to construct a multiple choice test and the consequence may be a test that contains item-writing flaws such as implausible distracters, unclear stems, multiple answer options and most significant, a test that has a high percentage of lower cognitive level items (Clifton & Schriner, 2010; Tarrant, Knierim,

Hayes, & Ware, 2006). Very few studies have focused on evaluating the quality of test items in nursing education which may limit the ability to use them as a single reliable and valid measure of decision making.

Simulation is an experiential learning and teaching strategy that allows for exposure to novel information on a continuum, with rapid conversion of information into knowledge and skill acquisition, potentially strengthening decision making and critical thinking ability along the way (Nehring & Lashley, 2009). Scenarios can be tailored and standardized, so there is the ability to more objectively evaluate students across the same scenario using simple to complex cases. The literature does support standardized patients as a gold standard for evaluating medical students and physicians, but less is known about its effectiveness in nursing (Badger et al., 1995; Colliver & Swartz, 1997). The high cost of using standardized patients may also limit the ability to regularly utilize them to evaluate practitioners' clinical abilities.

Case studies, as compared to standardized patients, are a less expensive evaluation method but they offer a similar ability to evaluate students in a standardized manner. Paper based clinical vignettes have been shown to be a valid method for measuring physician performance (Peabody, Luck, Glassman, Dresselhaus, & Lee, 2000; Peabody et al., 2004). They offer a standardized method for applying diverse clinical scenarios that can be simple to complex and they are generally easy to use in educational settings and beyond. DXR clinician offers web-based case scenarios that many nurse practitioner programs across the United States use. The cases are designed to have students investigate a patient problem by interviewing them, doing a simulated physical exam, ordering tests, developing a differential diagnosis and creating a management plan. Although the web-based DXR is more expensive than using paper-based cases, it offers the advantages of giving students greater flexibility in accessing cases, the

grading is built in to the system, and the cases have been reviewed and validated by experts. A disadvantage of DXR clinician is that a check-box system is used rather than an open-ended method for the data collection. Students can choose from a set of alternatives rather than identifying the data themselves, which may influence how the student's full ability is assessed. In addition little evaluation data exists on the ability of DXR to measure decision making.

**2. Methods for evaluating practitioners**

High-stakes multiple choice exams, such as the American Nurses Credentialing Center (ANCC) specialty exams, are required by most states in order for nurse practitioners to practice. According to ANCC, the tests validate a nurse's skills, knowledge, and abilities in a defined role and clinical area of practice (2010). The exams are rigorously developed and evaluated using a blueprint of clearly defined test content, through a review by content experts, pilot testing and also continuous review of the items for content currency. Although the exam may provide a valid and reliable method for assessing competency to begin practice, the multiple-choice method may not fully capture the full range of a graduate student's decision making abilities.

After initial certification, nurse practitioners are not required to demonstrate repeat proficiency through testing. Instead nurse practitioners may be recertified every five years by providing proof of practice hours, and through several methods of accruing continuing education credits. Recertification, for nurse practitioners, could provide a quality measure of care that is encouraged by the Institute of Medicine (Stuetz, 2006). Physicians must regularly maintain their clinical competency through maintenance of their certification; however physicians have been struggling with methods to improve this process. Specifically they desire a test that reflects what physicians need to know depending on their specialty, and testing their ability to assess, interpret

and apply information rather than just recalling it (Drazen & Weinstein, 2010). The ability to assess, interpret and apply information is decision making; however it appears that neither nursing nor medicine has an effective method for adequately capturing the decision making abilities of practicing clinicians.

### 3. Validated decision making instruments

There are several instruments that have been used to specifically measure decision making among nurses, nurse practitioners and physicians; however the vast majority of the instruments lack substantial reliability and validity. Several self-report instruments have been developed to measure a provider's decision making. These instruments have measured clinicians' perceptions of their role in decision making (Chumbler et al., 2000; Hoffman et al., 2004; Rhodes, 1985), their perception of the importance of tasks involved in decision making (Fry & Burr, 2001), their perception of the importance of interventions (Hicks et al., 2003), their perception of the types of decision making (Lauri & Salantera, 1998), and their perception of using intuition (Rew, 2000). Rarely was an explanation of the validation of these instruments described in any of the studies.

Most often, in studies where decision making has been evaluated, the researcher has developed their own instrument for the purpose of a single study. For example, Grossman and colleagues (1996) developed an instrument to measure decision making of critical care nurses by asking them open ended questions around 10 critical care patient cases. They reported that the instrument had face validity as well as a reliability coefficient of .80 and an inter-rater reliability of .95. Everitt and colleagues (1990) used a case vignette format to measure decision making by asking physicians and nurse practitioners open-ended questions about a patient with a sleep

problem. The interview was conducted by a survey company but no information was provided on how the case was developed.

Only a few instruments have been cited and used to measure decision making in more than one study. The Gover Nursing Performance Simulation instrument was used to measure decision making among two samples of undergraduate nursing students (Brooks & Shepherd, 1990; Shin, 1998). The instrument includes four clinical simulations and in each simulation respondents are asked to decide whether statements about the cases are true, determine the priority level (immediate or deferred) of the patients, choose between pairs of alternative actions or indicate how they would refer the patient. One total numerical score is generated from 0 to 53. Content validity of the instrument, cited as "established" was included from the original instrument developer as well as a test-retest of $r = .63$ (time frame unspecified). The authors did not report on the reliability of the instrument in their own studies.

In three studies the Jenkins Clinical Decision Making Nursing Scale was used to measure nurses' perceived decision making abilities (Girot, 2000; Jenkins, 1985; Thiele et al, 1991). Jenkins developed the instrument using the Janis and Mann criteria for a vigilant decision maker and in her paper she extensively described her review of the literature and the use of the framework to develop the instrument. She also described how the instrument was put through content validation using experts and the criteria she used to pick the experts. She assessed the internal consistency of the instrument with a final Cronbach alpha of .83. The instrument uses a Likert-scale with subjects rating their decision making abilities on 40 items broken into four sections. These sections, each with 10 items, are a) search for alternatives or options; b) canvassing of objectives and values; c) evaluation and re-evaluation of consequences; d) search

for information. Evidence of the psychometric properties of the instrument was not reported in the other studies.

The Hughes Analytic Questionnaire and a modified version of it were used in two studies with samples of undergraduate nurses (Hughes & Young, 1990; Hicks et al., 2003). The instrument was created using the decision analysis framework. Using two critical care clinical scenarios, respondents are asked to rank the probability that the specific actions would lead to specific outcomes on a 0 to 100 scale. Content validation was "established through "experts" and test-retest in pilot testing was reported as .82. Hughes and Young indicated that the internal consistency of the instrument was not evaluated because the items in the instrument lack inter-item relationships.

Peabody and colleagues developed a case vignette approach to measure physician's clinical practice against explicit quality criteria that was developed from evidence-based medicine and accepted standards of practice (2000). Data has supported the ability of the instrument to consistently measure how a provider makes decisions about specific patients. The eight developed vignettes focus on 4 diagnoses including depression, chronic obstructive pulmonary disease, diabetes mellitus, and vascular disease. Rather than focusing on how the physician performs a single task, the vignettes are used as a method to comprehensively evaluate a range of abilities needed to care for a patient. The instrument offers a method for examining how the practitioner takes a relevant history, performs a relevant physical examination, orders the necessary lab or imaging tests, makes the correct diagnosis including the etiology and prescribes a complete management plan. Prior to scoring the vignettes, a predetermined set of actions that should be taken and should not be taken were developed to yield an explicit set of criteria that is then judged as a yes or no action.

Psychometric evidence supporting this instrument as valid and reliable has been limited but positive. In 2004 Peabody and colleagues conducted a study to validate if the instrument can measure clinical practice of internal medicine physicians in comparison to standardized patients and medical record abstraction. They found that the instrument provided an equal ability to measure clinical practice as compared to the gold standard, the use of standardized patients, and a better ability than record abstraction. Although Peabody and colleagues provide a detailed description of how the instrument was developed, they do not provide data supporting content validity, or predictive validity. In addition, no data were found regarding the reliability of the instrument including its stability, internal consistency or inter-rater reliability of the scoring.

**4. Summary of methods to evaluate decision making**

There are some clear limitations of the decision making instruments reported here. First, the majority of the decision making instruments were created for use in undergraduate nurses not nurse practitioners. The decision making process is very different for these two levels of providers and it would be difficult to adapt them for use in nurse practitioner students or practicing nurse practitioners. Another major concern is whether the available instruments truly measure the attributes of the decision making process. Often a checklist of clinician performance or a list of the decisions that clinicians make were defined as decision making rather than comprehensively measuring the entire decision making process. In addition, many of the instruments measured a provider's perception of decision making. Although one's perception of their own decision making abilities may be important, it is most likely not a valid or reliable measure of a student's true abilities.

A case scenario approach was commonly used to measure decision making by having subjects list information they collected, give a differential diagnosis and a rationale for the

diagnosis; however, there was little discussion of the validity of the scenarios by the vast majority of authors. In addition, in most studies, only one case was used to measure decision making. A case scenario approach may be an effective method for capturing decision making abilities; however, an effective instrument may need to incorporate several case scenarios rather than one in order to comprehensively capture decision making across specialties. In addition, the case should be based around the steps of the decision making process rather than focusing primarily on the diagnosis or on one aspect of the process.

There was a substantive lack of reported reliability and validity for most of the decision making instruments. For example, often the instruments were described as having content validity through expert review; however, it was not always clear if it was really content or face validity. The original reliability of the measures was sometimes reported as either the internal consistency of the instrument with Cronbach alpha or the stability of the instrument with test-retest reliability; however, very few studies reported on the reliability of the instrument in their own study sample.

The Peabody instrument appears to have promise in measuring decision making; however, it may not be the best method for examining the decision making process of a diverse group of nurse practitioner students, and practicing practitioners who have heterogeneous clinical specialties. For example, the Peabody instrument assesses the practitioner's complete management plan for specific diagnoses. Although providers who have specific knowledge of that disease process and evidence-based management may be comfortable and knowledgeable about how to manage the patients depicted in the cases, many practitioners work in specialty settings like dermatology or women's health where they might not have the same comfort or knowledge to manage the same diseases as their colleagues. Therefore, the most appropriate

method for examining the decision making abilities of a diverse group of nurse practitioners includes evaluating their ability to collect, interpret and evaluate data but not manage specific conditions.

The ability to evaluate a nurse practitioner student's decision making ability in a controlled and standardized environment, would allow faculty to better appraise if students can assess and organize information, apply that information, and make appropriate and safe decisions. The ability to evaluate these same abilities as a student progressed to a novice and then expert clinician could provide further useful information for the education, practice, licensure and accreditation of nurse practitioners. What is needed is a universally accepted method to evaluate decision making across this continuum.

# III. METHODS

This chapter describes the methods and procedures used to develop and test the Tiffen Decision Making (TDM) instrument. The process used to develop the TDM tool is first described followed by a description of a pilot study to assess the feasibility and readiness of the instrument for the larger main study. Lastly the main study, assessing the psychometric properties of the instrument, is described. The research aims for this study were:

- To determine if the TDM tool has appropriate sensitivity in measuring differences in decision making abilities between a nurse practitioner student, a novice nurse practitioner and an experienced nurse practitioner.
- To determine if the TDM tool is a reliable method for measuring decision making abilities of nurse practitioner students, novice nurse practitioners and experienced nurse practitioners.
- To determine the relationship between participant's demographic variables and their responses on the TDM tool.

## A. Instrument Development

Prior to the development of the instrument, a conceptual definition of decision making was developed from the literature and then reviewed by three nurse decision experts. Expert 1 (C.T.) was an internationally known nursing professor with a wealth of publications in the area of decision making. Expert 2 (F.H.) was an associate dean and nursing professor with a wealth of publications in the area of clinical reasoning/decision making and Expert 3 (R.K.) was a nursing professor and nationally known clinician who taught decision making to nurse practitioner students. The experts provided feedback on the original definition of decision making which was then used to revise the definition. The final conceptual definition of decision making that

guided this study was: Decision making is a contextual, continuous and evolving process, where data is gathered, interpreted and evaluated in order to formulate a choice that is based on evidence-based guidelines.

Based on the review of the literature and an examination of available decision making measures, it was determined that a decision making instrument, applicable to nurse practitioners, needed to be developed. The Peabody instrument, described in the literature review, was used as a guide to develop an instrument that could capture the process of decision making where a nurse practitioner collects data, interprets the data and then evaluates the data using an evolving case study approach.

Although the long term goal of the instrument is to be able to broadly measure decision making across a variety of clinical situations, for the purpose of this study it was determined that two case vignettes needed to be developed and tested. Thus the first step in developing the instrument was to select sample case vignettes. The literature was probed to determine what were the most common diagnoses seen by direct care providers in outpatient settings. The top diagnoses were then evaluated to determine if national evidenced-based guidelines were available to help develop and validate each case vignette. The final two cases selected were a male patient with a complaint of chest discomfort (Angina) and a female patient with a complaint of fatigue (Depression).

The next step in developing the instrument was to create an outline of how the case vignettes would flow. The major sections of each case were focused around the three areas of data gathering, data interpretation and data evaluation. These steps were congruent with the developed decision making definition as well as the conceptual framework described in Chapter

I. Each of these steps and the activities that occur in each step are described below and are also outlined in Appendix A.

- Data Collection - collecting data
- Data Interpretation - examining and determining the need for additional data collection based on an early differential diagnosis
- Data Evaluation - evaluating the data and selecting a tentative diagnosis

An evolving case vignette format was created where initially the chief complaint of the patient is presented, followed by a series of questions that are all related to data collection. More information is presented with additional questions related to data interpretation and finally the last section reveals more information and concludes with the last series of questions related to data evaluation. All of the questions or items were written as open-ended questions and abbreviations, and technical terms were avoided. The cases themselves were developed by merging several case studies found in the literature and also from aligning the cases with the National Guideline Clearinghouse evidenced-based practice guidelines. Drafts of the case vignettes were critiqued and then revised based on the consultation of two practicing nurse practitioners, one working in cardiology and one working in mental health. The final versions of the two case vignettes used in the primary study are available upon request.

A grading or scoring system sheet was then developed for each case vignette which is available upon request. The grading system reflects information that is asked of the respondents in each case, so the case itself actually guides how specific questions are asked and graded. Thus each case includes slightly different questions to capture the most pertinent information for that case vignette. The grading system was developed around the three areas of data collection, data interpretation and data evaluation. Each of these areas is a subscale of the instrument to allow for

comparisons across the case vignettes. Each subscale has a calculated mean total score as well as a weighted mean total score so that each subscale has the same weight in the final calculated score. The weighted score was developed by transforming each subscale into a 100 point scale. The weighted score allows the scores to be examined as percentages which may facilitate educator's ability to easily use the tool in larger samples and as a reporting tool.

**1. Content validity**

Content validity of the TDM tool was examined by asking nurse consultants in the field of decision making to judge the case vignettes, the grading system, and the overall TDM instrument. Rather than using a content validation index which generally requires 3 raters at a minimum, the individual case items and each case vignette were examined using a percent agreement between 2 nurse consultants. The consultants were selectively chosen for their expertise in the content area they reviewed and for their ability to provide constructive, relevant feedback.

Consultant 1 (J.H.) was a nursing professor and nurse practitioner in mental health. She had experience writing, presenting and researching mental health issues relevant to nurse practitioners and also had done work in instrument development. She evaluated the fatigue (depression) case vignette. Consultant 2 (R.H.) was a nursing professor and nurse practitioner in cardiology. He had experience in researching family decision making and an extensive cardiology background. He evaluated the chest discomfort (angina) case vignette. Consultant 3 (J.K.) was a nursing professor and nurse practitioner in primary care. She was a nationally recognized leader in nurse practitioner education and was practicing in chronic disease management. Because of her primary care background, she evaluated both the chest discomfort and fatigue case vignettes.

The content validity index tool is available upon request. The panel of nurse consultants rated the content importance of each item using a 3-point Likert scale: 1) Very Important, 2) Somewhat Important, 3) Not Important. The goal of content validation was to have at least 80% agreement that each question in the vignette, each scoring item and the total case vignette itself was very important. Results are presented in Chapter IV.

## B. Pilot Feasibility Study

A pilot study was done to assess the feasibility of using a computerized version of the TDM tool, to assess any areas where changes needed to be made to the case itself or the grading system, as well as to assess subject satisfaction with the study experience.

### 1. Study setting and sample

The target population for the pilot study was a sample of 31 University of Illinois at Chicago (UIC) nurse practitioner students as well as practicing nurse practitioners who were easily accessible to the principal investigator. The sample of 31 subjects included 11 experienced nurse practitioners, 7 novice nurse practitioners, and 13 nurse practitioner students.

### 2. Procedures

Subjects for the pilot study were recruited directly by the principal investigator. Students known to the investigator were contacted and asked to participate in the study as well as graduates of the university and known nurse practitioner preceptors. Potential subjects were sent an email link to Survey Monkey where the TDM tool was housed. Each subject was asked to complete the TDM tool as well as a satisfaction survey following their experience.

### 3. Data collection and analysis

The Institutional Review Board (IRB) approved all procedures for the pilot study and subjects consented to study participation by advancing forward in the survey to complete the

case vignettes (Appendix B, # 2011-0497). Data was collected over a month-long period. The data was downloaded into SPSS from Survey Monkey and the principal investigator examined and graded each case. Results are presented in Chapter IV.

## C. Main Study

A quantitative, descriptive, comparative design was used to assess the psychometric properties of the TDM tool across a sample of nurse practitioner students, novice nurse practitioners and experienced nurse practitioners. Data collection occurred at two time points. Subjects completed the TDM tool during a primary data collection period that occurred over a two month period and then subjects were asked to complete the TDM tool again one month following their initial survey completion.

### 1. Study aims and hypotheses

Aim 1. To determine if the TDM tool has appropriate sensitivity in measuring differences in decision making abilities between a nurse practitioner student, a novice nurse practitioner and an experienced nurse practitioner.

- Hypothesis 1a. Student nurse practitioners will have the highest mean scores on subscale 1 indicating their ability as a group to collect the greatest amount of patient data for each case
- Hypothesis 1b. Novice and experienced nurse practitioners will have the highest mean scores on question 7 indicating their ability as a group to correctly identify the most likely diagnosis for each case and support that diagnosis with the correct rationale
- Hypothesis 1c. Novice and experienced nurse practitioners will have the highest total mean TDM scores as compared to nurse practitioner students

- Hypothesis 1d. Novice and experienced nurse practitioners will complete the TDM tool in the fewest number of minutes as compared to nurse practitioner students
- Hypothesis 1e. The chest discomfort case vignette total score and the fatigue case vignette total score will demonstrate a positive linear correlation

Aim 2. To determine if the TDM tool is a reliable method for measuring decision making abilities of nurse practitioner students, novice nurse practitioners and experienced nurse practitioners.

- Hypothesis 2a. Nurse practitioner students, novice practitioners, and experienced nurse practitioners will have stable scores on the TDM tool over a month period as evidenced by a Pearson's r correlation coefficient $\geq .70$
- Hypothesis 2b. The TDM scoring system will demonstrate evidence of high inter-rater reliability ($\geq .90$) using the intra-class correlation coefficient.

Aim 3. To determine the relationship between participant's demographic variables and their responses on the TDM tool.

## 2. Sample

A convenience sample of nurse practitioner students, novice nurse practitioners and experienced nurse practitioners were recruited for the study. Group 1 was students currently enrolled in a nurse practitioner program. Students who were enrolled in an adult, acute or family nurse practitioner program were specifically targeted because of their ability to oversee the care of adult patients, both male and female, which the two case vignettes represented. The inclusion criteria for the student sample included master's level nursing students currently enrolled in a nurse practitioner program. Recruitment of group 1 occurred through several methods. Initially a random sample of nurse practitioner faculty coordinators at schools of nursing across the United

States were contacted, followed by an expansion of that sample to include a larger outreach of schools who were contacted using the membership list of NONPF. Faculty coordinators were sent a formal email letter (Appendix C) and asked to send out an information letter to students describing the study (Appendix D).

Groups 2 and 3 were practicing nurse practitioners. Group 2 was novice nurse practitioners, defined as practitioners with two years or less of nurse practitioner experience. Experienced nurse practitioners were defined as practitioners with greater than two years of nurse practitioner experience. Practitioners certified in the areas of adult, acute, and family programs were targeted for the study. Inclusion criteria for groups 2 and 3 included practicing nurse practitioners. Practicing practitioners were recruited through several methods. Nursing faculty at schools of nursing was asked to send out an email letter to their nurse practitioner alumni as well as to their nurse practitioner preceptors. In addition, nurse practitioners were recruited through the NONPF and AANP LinkedIn and Facebook websites.

### 3. Human subject approval

Approval for the study was obtained from the UIC IRB (Appendix E, #2011-0836). The purpose, risks and benefits of the study were included in the Survey Monkey introduction page and subjects had to agree to participate in the study by advancing forward in the survey. Subjects were informed of the voluntary nature of the study, that they could withdraw from the study at any time, and that there was minimal risk. No names were collected from subjects, the IP address of the subject was not collected and the raw data was only viewed by the principal investigator and a student research assistant.

### 4. Instruments

Demographic data sheets were developed in order to collect participant data of all subjects. This data was collected through Survey Monkey however it is included in the Appendix format. Two versions of the demographic sheet were developed, one for students and one for the novice and experienced providers. The demographic sheet consists of questions encompassing the subject's gender, age, ethnicity, regional location, type of educational program, and years of experience. Participants then completed the TDM tool which was previously provided.

### 5. Procedures

Recruited subjects were directed to the Survey Monkey website where they were initially provided with the study consent form and asked to acknowledge their consent by clicking on the *Next* button. Participants were then asked if they were a student nurse practitioner student or practicing nurse practitioner. If they answered *no* then they were advanced to a disqualification page. Participants answering *yes,* were given information about the case format and then were advanced to the demographic data sheet. Following completion of the demographic data, participants were advanced to the first case. Two versions of the study were used. In version 1, participants started with the chest discomfort case and then moved to the fatigue case and in version 2 the case order was flipped. This was done so that if participants completed only one case, there would still be sufficient partial data available for both cases.

Subjects were asked to try to complete the entire TDM tool in one sitting. This was made clear to them because they were not permitted to log back into Survey Monkey if they disconnected prior to completing the entire study. In addition, participants were not allowed to go back once they completed a section of the study. This was done because of the evolving

nature of the case. The time subjects started the study and ended the study was also recorded. This data provided a rough estimate of the time to complete the cases.

The data was then downloaded from Survey Monkey into SPSS. This data included the descriptive responses rather than scores. The individual cases were graded by three nursing faculty. Grader 1 (A.M.) graded all of the chest discomfort cases. Grader 2 (L.B.) graded all of the fatigue cases and grader 3 (J.B.) graded 25% of the cases previously graded by grader 1 and 2 to assess for inter-rater reliability. Each grader was trained in a 45 minute training session using sample cases from the pilot study. The principal investigator methodically went through one chest discomfort case and one fatigue case with each grader and then discussed additional examples and how they would be graded according to the grade sheet until the grader felt comfortable with the grading process.

All subjects were asked if they would be willing to participate with completing the TDM tool again one month following the initial testing period. Those who agreed were sent the TDM tool in the same format. One in every 10 subjects in the main study was randomly selected to receive a $25 gift certificate through Amazon.com. In addition, every subject who completed the follow-up TDM tool was given a $15 Amazon.com gift certificate.

### 6. Data Analysis and Management

Data was downloaded from Survey Monkey into SPSS by the principal investigator. Data cleaning began by ensuring the accuracy of the data entry into SPSS and all data was double checked for accuracy prior to statistical analyses by the principal investigator and a student research assistant. In addition, data was screened for outliers and skewness.

Data was analyzed for each specific aim and hypothesis using the SPSS statistical package 19.0. The level of significance was $p \leq .05$. The aims and the statistical analysis plan for each are discussed below.

- Aim 1. Descriptive statistics and ANOVA were used to examine item and subscale mean scores as well as differences across the groups. Pearson's r correlation was used to examine if there was a strong positive linear correlation between the total mean scores of the chest discomfort case vignette and the total mean score of the fatigue case vignette.
- Aim 2. Stability of the TDM tool was assessed by calculating the Pearson's r correlation coefficient between subject's scores at time 1 and time 2. The inter-rater reliability of the TDM tool was assessed by calculating the intra-class correlation coefficient between two graders using a sample of 25% of cases.
- Aim 3. Demographic statistics as well as regression statistics were used to examine what variables influenced mean TDM scores.

# IV. RESULTS

In this chapter the results of the content validation process will be examined as well as the psychometric analysis of the TDM tool. In the first section results of the content validation of the tool will be discussed followed by a discussion of TDM tool pilot testing. In the third section the demographic attributes of the sample are described which is then followed by the results of the psychometric properties of the TDM tool and hypotheses 1 through 3 assessed in the main study. Additional variables of interest are also discussed throughout.

## A. Content Validation

An important step in the development of the TDM tool was to determine the degree of relevance of individual items and the overall scale using a content validity percent agreement approach. The goal of content validation was to have three nurse experts' rate items on a 3-point scale of Very Important, Somewhat Important or Not Important. From the original items in the chest discomfort and the fatigue case vignettes there was 100% agreement that each vignette question and the scoring items for each question were Very Important or Somewhat Important to the case. No questions or items were evaluated as Not Important.

The nurse experts provided some additional comments and suggestions for improvement of the case vignettes as well as the scoring sheet. In general the consultants felt both cases represented typical cases of angina and depression seen in a primary care setting. Both cases were also described as simple to moderate complexity. Each suggestion made by the consultants was considered and several changes were incorporated into a revised version of the case vignettes and scoring system that were then tested in the pilot study.

## B. Pilot Feasibility Study

Data was downloaded into SPSS and an extensive review of the data by the principal investigator followed. Tables I and II include demographic variables of interest. The majority of the sample were female, non-Hispanic whites from a mix of acute, adult and family nurse practitioner specialties.

**TABLE I**
DEMOGRAPHIC SUMMARY OF PILOT SAMPLE

| Characteristic | Students *n* (%) | Novice *n* (%) | Experienced *n* (%) |
|---|---|---|---|
| Gender | | | |
| Female | 9 (100) | 7 (88) | 10 (91) |
| Male | 0 (0) | 1 (12) | 1 (9) |
| Ethnicity | | | |
| Hispanic | 0 (0) | 1 (12) | 1 (9) |
| Not Hispanic | 9 (100) | 7 (88) | 10 (91) |
| Race | | | |
| American Indian/Alaska Native | 0 (0) | 0 (0) | 0 (0) |
| Asian | 0 (0) | 1 (13) | 1 (9) |
| Black or African American | 0 (0) | 1 (13) | 0 (0) |
| Native Hawaiian/Pacific Islander | 0 (0) | 0 (0) | 0 (0) |
| White | 9 (100) | 5 (88) | 9 (82) |
| Advanced Practice Specialty Program/Certification | | | |
| Acute | 1 (11) | 3 (38) | 9 (82) |
| Adult | 7 (78) | 4 (50) | 1 (9) |
| Family | 1 (11) | 0 (0) | 1 (9) |
| Cumulative Grade Point Average | | | |
| A | 6 (67) | Not applicable | Not applicable |
| B | 3 (33) | | |

**TABLE II**
CONTINUOUS DEMOGRAPHIC PILOT STUDY VARIABLES

| Characteristic | Students ($n$ = 9) *M (SD)* | Novice ($n$ = 8) *M (SD)* | Experienced ($n$ = 11) *M (SD)* |
|---|---|---|---|
| Age | 35 (10.55)** | 35 (7.96)** | 46 (5.37) |
| RN Years of Experience | 10.67 (8.76) | 8.88 (6.83) | 11.36 (6.56) |
| NP Years of Experience | Not applicable | 1.14 (.38)** | 11.27 (3.29) |

**sig at $p \leq .05$; **sig at $p \leq .01$*

A one-way ANOVA as well as independent t-tests were used to examine demographic differences between the three groups. Experienced practitioners were found to be significantly older than novice practitioners and student nurse practitioners ($F$ (2, 25) = 5.77, $p$ = .009). As expected experienced nurse practitioners were found to have greater years of mean NP experience ($t$ = -8.026, $df$ = 16, $p$ = .001) however there was no significant difference found between the groups with respect to their mean years of RN experience ($F$ (2, 25) = .268, $p$ = .767).

Mean scores for each case vignette are included in Tables III through IX. A one-way ANOVA was used to test for differences between the three groups with respect to each case vignette. For the chest discomfort case a significant difference in mean scores was found for question 1 (Q1: History of the Present Illness) ($F$ (2, 25) = 6.704, $p$ = .005) as seen in Table III. Tukey's post-hoc comparisons of the three groups indicated that the students ($M$ = 6.00, 95% CI [4.24, 7.76]) had significantly higher scores than experienced practitioners ($M$ = 4.18, 95% CI

[3.46, 4.91], $p$ =.044). In addition, novice nurse practitioners ($M$ = 6.75, 95% CI [5.78, 7.72]) had significantly higher scores than experienced practitioners ($p$ =.005). Comparisons between the students and the novice practitioners were not statistically significant at $p \leq .05$. Although there was no significant difference between the groups with respect to subscale scores, for Data Collection (subscale 1), experienced practitioners were found to overall collect less information than novice practitioners and students (power = .281) and for Data Evaluation (subscale 3), novice and experienced practitioners were found to have higher scores overall than students (power = .349) indicating a potentially greater ability to formulate a correct final diagnosis and provide a rationale for their diagnosis. Data Interpretation (subscale 2) mean scores were very similar between all three groups.

**TABLE III**
PILOT STUDY CHEST DISCOMFORT MEAN SCORES FOR DATA COLLECTION

| Variable | Students ($n$ = 13) *M (SD)* | Novice ($n$ = 7) *M (SD)* | Experienced ($n$ = 11) *M (SD)* |
|---|---|---|---|
| Question 1: *What are the most relevant questions you would like to ask this patient to assess the history of HIS present illness?* | 6.00 (2.29)** | 6.75 (1.16) | 4.18 (1.08) |
| Question 2: *What are the most relevant questions you would like to ask this patient about HIS prior personal medical diagnoses, excluding family history?* | 2.00 (1.32) | 1.88 (.99) | 2.00 (1.34) |
| Question 3: *What are the most relevant questions you would like to ask this patient about HIS social habits history?* | 1.78 (.44) | 1.63 (.52) | 1.46 (.52) |
| Question 4: *What are the most relevant physical examination data that you need to collect and perform on this patient?* | 3.22 (1.30) | 3.25 (.707) | 3.64 (1.21) |
| Subscale 1 | 13.00 (3.77) | 13.50 (2.14) | 11.27 (2.90) |

**sig at $p \leq .05$; **sig at $p \leq .01$*

**TABLE IV**
PILOT STUDY CHEST DISCOMFORT MEAN SCORES FOR DATA INTERPRETATION

| Variable | Students ($n$ = 13) *M (SD)* | Novice ($n$ = 7) *M (SD)* | Experienced ($n$ = 11) *M (SD)* |
|---|---|---|---|
| Question 5: *At this point, what diagnosis(s) would you include in your working differential?* | 5.33 (1.32) | 5.25 (1.39) | 4.36 (2.46) |
| Question 6: *At this point, what priority laboratory tests, imaging or other diagnostic tests would you order for this patient?* | 2.67 (1.00) | 2.75 (1.04) | 2.73 (1.01) |
| Subscale 2 | 8.0 (1.93) | 8.00 (1.60) | 7.09 (2.91) |

**sig at $p \leq .05$; **sig at $p \leq .01$*

**TABLE V**
PILOT STUDY CHEST DISCOMFORT MEAN SCORES FOR DATA EVALUATION

| Variable | Students ($n$ = 13) *M (SD)* | Novice ($n$ = 7) *M (SD)* | Experienced ($n$ = 11) *M (SD)* |
|---|---|---|---|
| Question 7: *Based on the information you have collected from this patient, what would you now include as your ONE priority diagnosis? What are the most important data that help to support that diagnosis?* | .78 (2.33) | 3.63 (3.89) | 2.73 (3.80) |
| Question 8: *Based on the information you have collected from this patient, what additional secondary diagnosis(s) or medical issues would you consider addressing today?* | .56 (.73) | .88 (.64) | .73 (.79) |
| Subscale 3 | 1.33 (2.92) | 4.50 (3.78) | 3.45 (3.70) |

**sig at $p \leq .05$; **sig at $p \leq .01$*

A one-way ANOVA was used to test differences between the three groups with respect to the fatigue case. A significant difference in mean scores was found for question 1 (Q: History of the Present Illness) ($F$ (2, 23) = 14.84, $p$ = .001) as well as Data Collection (subscale 1) ($F$ (2, 23) = 9.01), $p$ = .001) as shown in Table VI. Tukey's post-hoc comparisons of the three groups indicated that the students ($M$ = 5.13, 95% CI [3.99, 6.26]) had significantly higher scores than experienced practitioners ($M$ = 1.70, 95% CI [.94, 2.46], $p$ = .001). In addition, novice nurse practitioners ($M$ = 4.63, 95% CI [3.02, 6.23]) had significantly higher scores than experienced practitioners ($p$ = .001). The comparisons between students and novice practitioners were not statistically significant at $p \leq .05$. For Data Collection (subscale 1), Tukey's post-hoc

comparisons of the groups, indicated that students ($M$ = 9.25, 95% CI [7.65, 10.85], $p$ = .004) and novice practitioners ($M$ = 9.13, 95% CI [6.96, 11.29], $p$ = .005) had significantly higher scores than experienced practitioners ($M$ = 5.20, 95% CI [3.42, 6.98]) indicating their ability to collect more information.

**TABLE VI**
PILOT STUDY FATIGUE MEAN SCORES FOR DATA COLLECTION

| Variable | Students ($n$ = 8) *M (SD)* | Novice ($n$ = 8) *M (SD)* | Experienced ($n$ = 10) *M (SD)* |
|---|---|---|---|
| Question 1: *What are the most relevant questions you would like to ask this patient to assess the history of HER present illness?* | 5.13 (1.36)** | 4.63 (1.92) | 1.70 (1.06) |
| Question 2: *What are the most relevant questions you would like to ask this patient about HER prior personal medical diagnoses, excluding family history?* | .88 (.99) | 1.38 (1.19) | .90 (1.37) |
| Question 3: *What are the most relevant questions you would like to ask this patient about HER social habits history?* | 1.75 (.46) | 1.63 (.74) | 1.40 (.70) |
| Question 4: *What are the most relevant physical examination data that you need to collect and perform on this patient?* | 1.50 (.93) | 1.50 (.93) | 1.20 (.63) |
| Subscale 1 | 9.44 (1.88)** | 8.86 (2.67) | 5.20 (2.49) |

**sig at p ≤ .05; **sig at p ≤ .01*

As shown in Tables VII and VIII, for Data Interpretation (subscale 2) the means were very similar and for Data Evaluation (subscale 3), although not a significant difference, novice practitioners were found to have greater mean scores indicating a greater ability to formulate a correct final diagnosis (power = .263).

**TABLE VII**
PILOT STUDY FATIGUE MEAN SCORES FOR DATA INTERPRETATION

| Variable | Students ($n$ = 8) *M (SD)* | Novice ($n$ = 8) *M (SD)* | Experienced ($n$ = 10) *M (SD)* |
|---|---|---|---|
| Question 5: *At this point, what diagnosis(s) would you include in your working differential?* | 3.75 (2.66) | 4.50 (2.27) | 4.50 (2.12) |
| Question 6: *At this point, what priority laboratory tests, imaging or other diagnostic tests would you order for this patient?* | 3.75 (.71) | 3.75 (.71) | 4.00 (.00) |
| Subscale 2 | 7.78 (2.77) | 8.00 (2.65) | 8.50 (2.12) |

**sig at p ≤ .05; **sig at p ≤ .01*

**TABLE VIII**
PILOT STUDY FATIGUE MEAN SCORES FOR DATA EVALUATION

| Variable | Students ($n$ = 8) *M (SD)* | Novice ($n$ = 8) *M (SD)* | Experienced ($n$ = 10) *M (SD)* |
|---|---|---|---|
| Question 7: *Based on the information you have collected from this patient, what would you now include as your ONE priority diagnosis? What are the most important data that help to support that diagnosis?* | 2.25 (3.11) | 4.50 (2.78) | 2.00 (3.00) |
| Question 8: *Based on the information you have collected from this patient, what additional secondary diagnosis(s) or medical issues would you consider addressing today?* | .63 (.92) | .25 (.71) | .22 (.67) |
| Subscale 3 | 2.88 (3.76) | 4.75 (3.01) | 2.22 (2.91) |

**sig at $p \leq .05$; **sig at $p \leq .01$*

**TABLE IX**
PILOT STUDY TOOL MEAN SCORES FOR CASE VIGNETTES

| Variable and Ranges | Students *M (SD)* | Novice *M (SD)* | Experienced *M (SD)* |
|---|---|---|---|
| Chest Discomfort (0-38) | 22.33 (6.60) | 26.00 (5.97) | 21.82 (6.63) |
| Fatigue (0-34) | 20.44 (6.64) | 21.43 (5.26) | 16.00 (4.74) |

**sig at $p \leq .05$; **sig at $p \leq .01$*

The time to complete the cases was also examined to determine if there were any differences between the three groups. Only those subjects who completed the entire two cases were included in the time analysis. Before the analysis was run the data was explored to determine if there were any outliers. This was important because the timing was an estimate of the time to complete rather than an exact number and several factors could have influenced it. Two respondents were removed from the analysis including one novice practitioner who took 166 minutes to complete the survey and 1 expert practitioner who took 147 minutes to complete the survey. Table X gives the mean time to complete the study by group. A significant difference between the groups was found ($F$ (2, 20) = 5.051, $p$ = .017). Tukey's post-hoc comparisons of the three groups indicated that the students ($M$ = 53.89, 95% CI [40.83, 66.95)] had a significantly higher time to complete the survey as compared to experienced practitioners ($M$ = 33.50, 95% CI [21.89, 45.11)]. The difference between students and novice practitioners was not significant.

**TABLE X**
PILOT STUDY COMPLETION TIME BY GROUP

| | Students ($n$ = 9) | Novice ($n$ = 6) | Experienced ($n$ = 8) |
|---|---|---|---|
| | *M (SD)* | *M (SD)* | *M (SD)* |
| Time in Minutes | 53.89 (16.99) | 36.67 (8.21) | 33.50 (13.89) |

Included in Table XI are the satisfaction data collected from subjects following their completion of the cases. Most study participants were highly satisfied with the overall study experience. Several additional comments were shared including participants who wanted to be able to have the results following the study and also one participant who wanted to be able to toggle back and forth between the information provided in each step of the case.

**TABLE XI**
PILOT STUDY SATISFACTION DATA

| Question | Very Satisfied<br>*n* (%) | Somewhat Satisfied<br>*n* (%) | Somewhat Dissatisfied<br>*n* (%) | Very Dissatisfied<br>*n* (%) |
|---|---|---|---|---|
| Ease of Use | 20 (74) | 2 (7) | 0 (0) | 0 (0) |
| Screen Layout | 18 (67) | 4 (15) | 0 (0) | 0 (0) |
| Use of terminology throughout the tool | 20 (74) | 3 (11) | 0 (0) | 0 (0) |
| Instructions displaced on screens | 20 (74) | 3 (11) | 0 (0) | 0 (0) |
| Questions displayed on screens | 19 (70) | 3 (11) | 0 (0) | 0 (0) |
| Ability to answer questions ins a straightforward manner | 17 (63) | 6 (22) | 0 (0) | 0 (0) |
| Organization of question, instruction and response option in the survey | 21 (78) | 2 (7) | 0 (0) | 0 (0) |
| Length of time to complete a survey | 18 (67) | 4 (15) | 1 (4) | 0 (0) |
| Overall experienced of completing the survey | 18 (67) | 3 (11) | 1 (4) | 0 (0) |

Based on an extensive evaluation of the pilot study data, including examining the specific narrative responses to each item, changes were made to the grading system and a minor format change was made to the case vignettes themselves. Based on the pilot data, a power analysis was conducted to determine the probability that the planned statistical analyses would detect statistically significant relationships and differences. Using a standard moderate effect size of .25, an alpha of 0.05, and power of 0.80 for three groups, the calculated sample size was 159. Using the pilot data, effect sizes were calculated for the total mean chest discomfort case (.33) and the fatigue case (.40) followed by a recalculation of a sample size. The calculated sample size needed with an alpha of 0.05 and power of 0.80 was 147 and 102 respectively. For the main study therefore, the goal was to recruit a sample size of 146 subjects or approximately 48 subjects per group.

## C. Description of the Main Study Sample

Study participants were recruited from across the country in order to include as heterogeneous a sample as possible. Three subject groups were recruited including nurse practitioner students, novice nurse practitioners (defined as having 2 years or less of nurse practitioner experience), and experienced practitioners (defined as having more than 2 years of nurse practitioner experience). The final sample included 171 subjects with 118 experienced practitioners, 17 novice practitioners and 36 students.

The collected demographic data included subject's gender, age, ethnicity, race, state, cumulative grade point average (GPA), their advanced practice student certification type, RN and NP years of experience as well as the specialty area of practice for nurse practitioners. As summarized in Table XII the groups were very similar with respect to many of the demographic characteristics. The majority of subjects were female, non-Hispanic white, and they were drawn

from 31 States. The majority of student nurse practitioners were enrolled in a family nurse practitioner program and the majority of practicing nurse practitioners were certified as family nurse practitioners. All students self-reported a cumulative GPA at or above a B.

**TABLE XII**
DEMOGRAPHIC SUMMARY OF STUDY SAMPLE

| Characteristic | Students n (%) | Novice n (%) | Experienced n (%) |
|---|---|---|---|
| Gender | | | |
| Female | 34 (94) | 13 (77) | 112 (95) |
| Male | 2 (6) | 4 (23) | 6 (5) |
| Ethnicity | | | |
| Hispanic | 2 (6) | 0 (0) | 2 (2) |
| Not Hispanic | 34 (94) | 17 (100) | 116 (98) |
| Race | | | |
| American Indian/Alaska Native | 0 (0) | 0 (0) | 1 (1) |
| Asian | 1 (3) | 1 (6) | 2 (2) |
| Black or African American | 1 (3) | 1 (6) | 2 (2) |
| Native Hawaiian/Pacific Islander | 1 (3) | 0 (0) | 0 (0) |
| White | 33 (91) | 15 (88) | 113 (96) |
| States Represented | 10 | 11 | 23 |
| Advanced Practice Specialty Program/Certification | | | |
| Acute | 9 (25) | 4 (24) | 16 (14) |
| Adult | 7 (19) | 2 (12) | 26 (22) |
| Family | 19 (53) | 10 (59) | 71 (60) |
| Other | 0 (0) | 1 (6) | 4 (4) |
| Cumulative Grade Point Average | | | |
| A | 27 (75) | Not applicable | Not applicable |
| B | 9 (25) | | |

Table XIII includes continuous demographic variables of interest including the participant's age, RN years of experience and NP years of experience. A one-way ANOVA and independent *t-tests* were conducted to assess the extent to which the three groups were similar. As expected, a significant difference was found between the groups with respect to mean age ($F$ (2, 170) = 31.22, $p$ = .001). Tukey's post-hoc testing found that students had a significantly lower mean age ($M$ = 34.50, 95% CI [31.40, 37.60]) than experienced practitioners ($M$ = 48.64, 95% CI [46.94, 50.35] $p$ = .001) and novice practitioners ($M$ = 45.12, 95% CI [39.82, 50.41] $p$ = .001). Comparisons between the novice practitioners and experienced practitioners were not statistically significant at $p \leq .05$. Similarly, a significant difference in the number of mean RN years of experience was found between the groups ($F$ (2, 170) = 5.80, $p$ = .001). Tukey's post-hoc testing found that students ($M$ = 8.81, 95% CI [6.56, 11.05) had significantly lower mean years of RN experience as compared to experienced practitioners ($M$ = 12.70, 95% CI [11.38, 14.02] $p$ = .015) and novice practitioners ($M$ = 15.35, 95% CI [10.86, 19.85] $p$ = .007). Comparisons between the novice practitioners and experienced practitioners were not statistically significant at $p \leq .05$.

**TABLE XIII**
CONTINUOUS DEMOGRAPHIC DATA SUMMARY

| Characteristic | Students ($n$ = 34) *M (SD)* | Novice ($n$ = 17) *M (SD)* | Experienced ($n$ = 119) *M (SD)* |
|---|---|---|---|
| Age | 35 (9.16)** | 45 (10.30) | 49 (9.34) |
| RN Years of Experience | 8.81 (6.63)** | 15.35 (8.74) | 12.70 (7.24) |
| NP Years of Experience | Not applicable | 1.12 (.33)** | 8.84 (6.34) |

**sig at p ≤ .05; **sig at p ≤ .01*

As expected, there was a significant difference in the mean number of NP years of experience between experienced and novice practitioners ($t$ = -6.644, $df$ = 133, $p$ = .001). Data was also collected on the specialty areas where novice and experienced nurse practitioners worked. As can be seen in Table XIV, the majority of the subjects self-identified themselves as practicing in primary care which included family practice and internal medicine.

**TABLE XIV**
NURSE PRACTITIONER SPECIALTY AREAS OF PRACTICE

| Specialty Area | Novice<br>n (%) | Experienced<br>n (%) |
|---|---|---|
| Primary Care/Family Practice/Internal Medicine | 6 (35) | 54 (46) |
| Critical Care | 2 (12) | 5 (4) |
| Emergency Room | 1 (6) | 10 (8) |
| Cardiology | 0 (0) | 13 (11) |
| Mental Health | 2 (12) | 5 (4) |
| Other | 6 (35) | 31 (26) |

## D. Main Study Analysis

Data was carefully downloaded from Survey Monkey into the SPSS statistical software package 19.0 and after the grading of the case vignettes, individual item scores and mean scores were manually entered into SPSS. All data were double checked for accuracy by the principal investigator as well as a student research assistant. Next histograms were plotted to examine the distribution of the data and to identify potential outliers. Several data entry errors were found and corrected and then a second round of screening was done. Several outliers were found in the variable Mean Time to Complete the TDM tool and those outliers were removed only when the analysis of the time variable was analyzed. In addition for the time variable, only those subjects who completed both cases in their entirety were included in the time analysis. No missing data were corrected or transformed.

Normality of the results for the two cases, using the total mean scores, was assessed through examining the histograms for skewness and kurtosis. In addition a Kolmogorov-Smirnov was run. For both the chest discomfort case and the fatigue case the null hypothesis was not rejected indicating that the variables were normally distributed. Levene's test was used to assess for homogeneity of variance between the three groups for the total mean chest discomfort and fatigue scores. There was no significant difference in variance between the three groups for the chest discomfort mean total score ($F$ (2, 157) = 1.340, $p$ = .265), or the fatigue mean total score ($F$ (2, 143) = .620, $p$ = .539).

## 1. Specific Aims and Hypotheses

The first aim of the main study was to determine if the TDM tool had appropriate sensitivity in measuring differences in decision making abilities between a nurse practitioner student, a novice nurse practitioner and an experienced nurse practitioner. Descriptive statistics for each of the case vignette items, subscales and total scores are presented in Tables XV through XXI.

**TABLE XV**
CHEST DISCOMFORT MEAN SCORES FOR DATA COLLECTION

| Variable | Students ($n$ = 36) *M (SD)* | Novice ($n$ = 17) *M (SD)* | Experienced ($n$ = 113) *M (SD)* | Power |
|---|---|---|---|---|
| Question 1: *What are the most relevant questions you would like to ask this patient to assess the history of HIS present illness?* | 5.44 (2.26)** | 4.35 (1.73) | 4.12 (1.84) | .871 |
| Question 2: *What are the most relevant questions you would like to ask this patient about HIS prior personal medical diagnoses, excluding family history?* | 1.89 (1.24) | 1.65 (1.11) | 1.63 (.98) | .145 |
| Question 3: *What are the most relevant questions you would like to ask this patient about HIS social habits history?* | 3.28 (.85) | 3.29 (.69) | 2.98 (.97) | .407 |
| Question 4: *What are the most relevant physical examination data that you need to collect and perform on this patient?* | 3.03 (1.16) | 2.94 (1.48) | 3.01 (1.19) | .056 |
| Subscale 1 | 13.64 (3.13)** | 12.24 (3.47) | 11.74 (3.11) | .767 |

**sig at $p \leq .05$; **sig at $p \leq .01$*

**TABLE XVI**
FATIGUE MEAN SCORES FOR DATA COLLECTION

| Variable | Students ($n$ = 34) *M (SD)* | Novice ($n$ = 16) *M (SD)* | Experienced ($n$ = 115) *M (SD)* | Power |
|---|---|---|---|---|
| Question 1: *What are the most relevant questions you would like to ask this patient to assess the history of HER present illness?* | 3.41 (1.99)** | 3.38 (2.25) | 2.48 (1.56) | .822 |
| Question 2: *What are the most relevant questions you would like to ask this patient about HER prior personal medical diagnoses, excluding family history?* | 1.47 (.90) | 1.88 (1.36) | 1.53 (1.14) | .231 |
| Question 3: *What are the most relevant questions you would like to ask this patient about HER social habits history?* | 3.35 (.85) | 2.69 (.95) | 3.08 (.97) | .632 |
| Question 4: *What are the most relevant physical examination data that you need to collect and perform on this patient?* | 1.42 (.94) | 1.44 (.89) | 1.47 (.89) | .074 |
| Subscale 1 | 9.79 (2.72)** | 9.38 (2.63) | 8.56 (2.57) | .556 |

**sig at $p \leq .05$; **sig at $p \leq .01$*

**TABLE XVII**
CHEST DISCOMFORT MEAN SCORES FOR DATA INTERPRETATION

| Variable | Students ($n$ = 36) *M (SD)* | Novice ($n$ = 17) *M (SD)* | Experienced ($n$ = 113) *M (SD)* | Power |
|---|---|---|---|---|
| Question 5: *At this point, what diagnosis(s) would you include in your working differential?* | 7.25 (3.56) | 7.23 (3.47) | 8.17 (3.17) | .302 |
| Question 6: *At this point, what priority laboratory tests, imaging or other diagnostic tests would you order for this patient?* | 2.64 (.72) | 2.24 (.90) | 2.42 (.84) | .338 |
| Subscale 2 | 9.89 (3.62) | 9.47 (3.36) | 10.58 (3.38) | .249 |

**sig at $p \leq .05$; **sig at $p \leq .01$*

**TABLE XVIII**
FATIGUE MEAN SCORES FOR DATA INTERPRETATION

| Variable | Students ($n$ = 34) *M (SD)* | Novice ($n$ = 16) *M (SD)* | Experienced ($n$ = 115) *M (SD)* | Power |
|---|---|---|---|---|
| Question 5: *At this point, what diagnosis(s) would you include in your working differential?* | 5.47 (3.99) | 7.06 (3.13) | 6.21 (3.77) | .229 |
| Question 6: *At this point, what priority laboratory tests, imaging or other diagnostic tests would you order for this patient?* | 1.79 (.48) | 2.06 (.57) | 1.94 (.43) | .444 |
| Subscale 2 | 7.26 (4.17) | 9.13 (3.54) | 8.15 (3.87) | .285 |

**sig at p ≤ .05; **sig at p ≤ .01*

**TABLE XIX**
CHEST DISCOMFORT MEAN SCORES FOR DATA EVAULATION

| Variable | Students ($n$ = 36) *M (SD)* | Novice ($n$ = 17) *M (SD)* | Experienced ($n$ = 113) *M (SD)* | Power |
|---|---|---|---|---|
| Question 7: *Based on the information you have collected from this patient, what would you now include as your ONE priority diagnosis? What are the most important data that help to support that diagnosis?* | 5.11 (4.84) | 4.95 (4.37) | 5.97 (4.96) | .153 |
| Question 8: *Based on the information you have collected from this patient, what additional secondary diagnosis(s) or medical issues would you consider addressing today?* | 1.14 (1.00) | .82 (1.01) | 1.10 (1.00) | .158 |
| Subscale 3 | 6.40 (4.97) | 5.76 (4.52) | 7.12 (5.17) | .163 |

**sig at p ≤ .05; **sig at p ≤ .01*

**TABLE XX**
FATIGUE MEAN SCORES FOR DATA EVALUATION

| Variable | Students ($n$ = 34) *M (SD)* | Novice ($n$ = 16) *M (SD)* | Experienced ($n$ = 115) *M (SD)* | Power |
|---|---|---|---|---|
| Question 7: *Based on the information you have collected from this patient, what would you now include as your ONE priority diagnosis? What are the most important data that help to support that diagnosis?* | 3.61 (4.42)* | 7.20 (4.83) | 5.23 (4.77) | .587 |
| Question 8: *Based on the information you have collected from this patient, what additional secondary diagnosis(s) or medical issues would you consider addressing today?* | .44 (.84) | .29 (.73) | .25 (.67) | .189 |
| Subscale 3 | 4.06 (4.60) | 7.43 (5.34) | 5.41 (4.91) | .467 |

**sig at $p \leq .05$; **sig at $p \leq .01$*

**TABLE XXI**
TOTAL MEAN CASE VIGNETTE SCORES

| Variables and Ranges | Students ($n$ = 35) *M (SD)* | Novice ($n$ = 11) *M (SD)* | Experienced ($n$ = 109) *M (SD)* | Power |
|---|---|---|---|---|
| Chest Discomfort (0-51) | 30.03 (7.03) | 27.47 (7.28) | 29.64 (7.90) | .167 |
| Fatigue (0-47) | 20.94 (8.68) | 25.43 (9.20) | 22.26 (8.33) | .288 |

**sig at p ≤ .05; **sig at p ≤ .01*

**a. <u>Aim 1</u>**

Hypothesis 1a was supported. Student nurse practitioners were found to have the highest mean scores on Data Collection (subscale 1) indicating their ability as a group to collect the greatest amount of pertinent patient data for each case.

Mean scores for Data Collection (Subscale 1) were first assessed using the analysis for questions 1-4. For the chest discomfort case vignette a significant difference between the groups was found for question 1 (Q: History of the Present Illness) ($F$ (2, 163) = 6.409, $p$ = .002) and for Data Collection (subscale 1) ($F$ (2, 163), = 4.945, $p$ = .008). For question 1, Tukey's post-hoc testing found that students had significantly higher mean scores ($M$ = 5.44, 95% CI [4.68, 6.21]) than experienced practitioners ($M$ = 4.12, 95% CI [3.78, 4.47] $p$ = .001). For subscale 1, Tukey's post-hoc testing found that students had significantly higher mean scores ($M$ = 13.64, 95% CI [12.58, 14.70]) than experienced practitioners ($M$ = 11.74, 95% CI [11.16, 12.32] $p$ = .008). The difference between students and novice practitioners and the difference between novice and experienced practitioners was not significant for either of these analyses.

For the fatigue case vignette a significant difference between the groups was found for question 1 (Q1: History of the Present Illness) ($F$ (2, 162) = 4.971, $p$ = .008) and Data Collection (subscale 1) ($F$ (2, 161), = 3.182, $p$ = .044). For question 1, Tukey's post-hoc testing found that students had significantly higher mean scores ($M$ = 3.41, 95% CI [2.72, 4.10]) than experienced practitioners ($M$ = 2.48, 95% CI [2.19, 2.77], $p$ = .017). Similarly, for Data Collection (subscale 1), Tukey's post-hoc testing also found that students had significantly higher mean scores ($M$ = 9.79, 95% CI [8.82, 10.75]) than experienced practitioners ($M$ = 8.56, 95% CI [8.08, 9.03] $p$ = .047). The difference between students and novice practitioners and the difference between novice and experienced practitioners was not significant for either analysis.

Hypothesis 1b was partially met. For the fatigue case, novice and experienced nurse practitioners were found to have the highest mean scores on question 7 indicating their ability as a group to correctly identify the most likely diagnosis and support that diagnosis with the correct rationale ($F$ (2, 152), = 3.080, $p$ = .049). Results are shown in Tables XIX and XX. Tukey's post-hoc testing found that students had significantly lower mean scores ($M$ = 3.61, 95% CI [1.99, 5.24]) than novice practitioners ($M$ = 7.20, 95% CI [4.53, 9.87] $p$ = .044).

For the chest discomfort case vignette, 56% of students correctly identified angina as the primary diagnosis as compared to 59% of novice practitioners and 62% of experienced practitioners. Of the 56% ($n$ = 20) of students who identified the correct diagnosis in the chest discomfort case, 6 people or 30% correctly provided a rationale for their diagnosis. Of the 59% ($n$ = 10) of novice nurse practitioners who identified the correct diagnosis in the chest discomfort case, 2 people or 20% correctly provided a rationale for their diagnosis. Of the 62% ($n$ = 68) of experienced nurse practitioners who identified the correct diagnosis in the chest discomfort case vignette, 29 or 43% correctly provided a rationale for their diagnosis.

For the fatigue case vignette, 42% of students correctly identified depression as the primary diagnosis as compared to 73% of novice practitioners and 56% of experienced practitioners. Of the 42% ($n$ = 14) of students that identified the correct diagnosis for the fatigue case, 2 people or 15% correctly provided a rationale for their diagnosis. Of the 73% ($n$ = 11) of novice nurse practitioners that identified the correct diagnosis for the fatigue case, 5 people or 45% correctly provided a rationale for their diagnosis. Of the 56% ($n$ = 61) of experienced nurse practitioners that identified the correct diagnosis for the fatigue case, 18 people or 30% correctly provided a rationale for their diagnosis.

Hypothesis 1c was rejected. No significant difference in mean total TDM tool scores was found between the groups as shown in Table XXI. Because each subscale of the TDM tool had a different mean score, it was important to also calculate weighted scores for each subscale and for each total mean score so that each subscale could be viewed on the same scale. The weighted scores allow for percentage comparisons where each subscale and total score is weighted on a 100 point scale and it takes into account the fact that each subscale has a different point value. As can be seen from Appendices 4 and 5, a weighted score for each case was done by multiplying each subscale by a point value so that each was scored on a 100 point value. The weighted scores for each case are included in Table XII.

**TABLE XXII**
WEIGHTED MEAN AND TOTAL TDM TOOL SCORES

| Variable | Students ($n$ = 35) *M (SD)* | Novice ($n$ = 11) *M (SD)* | Experienced ($n$ = 109) *M (SD)* |
|---|---|---|---|
| Weighted Subscale 1 | | | |
| Chest Discomfort | 58.65 (13.45)** | 52.61 (14.94) | 50.50 (13.36) |
| Fatigue | 48.94 (13.61)* | 46.88 (13.15) | 42.78 (13.19) |
| Weighted Subscale 2 | | | |
| Chest Discomfort | 70.21 (25.73) | 67.24 (23.83) | 75.15 (23.98) |
| Fatigue | 55.94 (33.13) | 70. 26 (27.24) | 62.76 (30.11) |
| Weighted Subscale 3 | | | |
| Chest Discomfort | 45.44 (35.26) | 40.93 (32.10) | 50.55 (36.74) |
| Fatigue | 31. 30 (35.45) | 57.20 (41.16) | 41.63 (37.82) |
| Weighted Total Score | | | |
| Chest Discomfort | 58.34 (15.29) | 53.59 (15.25) | 59.14 (17.20) |
| Fatigue | 44.94 (20.71) | 57.10 (22.58) | 49. 37 (20.47) |

**sig at $p \leq .05$; **sig at $p \leq .01$*

Hypothesis 1d was rejected. Novice and experienced nurse practitioners were found to complete the TDM tool in the fewest number of minutes as compared to nurse practitioner students; however the difference was not statistically significant. Mean scores for the time to complete the TDM tool are included in Table XXIII by group. As shown, experienced and

novice practitioners had lower mean completion times than students but the difference was not statistically significant ($F$ (2, 119), 1.135, $p$ =.325).

**TABLE XXIII**
STUDY COMPLETION TIME BY GROUP

| Completion Time | Students ($n$ = 27) | Novice ($n$ = 10) | Experienced ($n$ = 85) |
|---|---|---|---|
| | *M (SD)* | *M (SD)* | *M (SD)* |
| Time in Minutes | 41.11 (22.32) | 34.80 (15.47) | 35.06 (17.49) |

Hypothesis 1e was supported. The chest discomfort case vignette total score and the fatigue case vignette total score demonstrated a positive correlation. Using the total mean scores for comparison, a small positive relationship was found between the total mean chest discomfort case score and the total mean fatigue case score ($r$ (137) = .228, $p$ = .007). Mean subscale scores were also compared by case across all subjects. Subscale 1 was correlated between the chest discomfort case and the fatigue case ($r$ (157) = .547, $p$ = .001) however subscale 2 and subscale 3 were not correlated between the two cases. In addition, correlations between the subscales and the total score for each case vignette were examined and are included in Tables XXIV and XXV.

**TABLE XXIV**
SELECT CHEST DISCOMFORT CORRELATIONS

| Variable | Subscale 1 | Subscale 2 | Subscale 3 | Total Score |
|---|---|---|---|---|
| Subscale 1 | 1 | | | |
| Subscale 2 | .190* | 1 | | |
| Subscale 3 | .140 | .122 | 1 | |
| Total Score | .568** | .580** | .773** | 1 |

*$p \leq .05$, **$p \leq .01$

**TABLE XXV**
SELECT FATIGUE CORRELATIONS

| Variable | Subscale 1 | Subscale 2 | Subscale 3 | Total Score |
|---|---|---|---|---|
| Subscale 1 | 1 | | | |
| Subscale 2 | .204** | 1 | | |
| Subscale 3 | .193* | .465** | 1 | |
| Total Score | .492** | .783** | .851** | 1 |

*$p \leq .05$, *$p \leq .01$

**b. <u>Aim 2</u>**

The second aim of the study was to determine if the TDM tool is a reliable method for measuring decision making abilities among nurse practitioner students, novice nurse practitioners and expert nurse practitioners.

Hypothesis 2a was supported. Nurse practitioner students, novice practitioners, and expert practitioners were found to have stable scores on the TDM tool over a month period. A total of 61 subjects (35% percent) were included in the final analysis for test-retest reliability. The maximum number of subjects that were able to be recruited was set at 70 due to the availability of funding for subject incentives. A few subjects were not included in the final analyses because they did not have completed TDM tool at either Time 1 or Time 2 and a few subjects used different email addresses to complete Time 2 so they were unable to be matched up to their initial TDM tool.

Of the 61 subjects who completed the TDM tool at time 2, 40 subjects were experienced practitioners, 7 were novice practitioners and 14 were nurse practitioner students.

**TABLE XXVI**

NUMBER AND PERCENTAGE OF SUBJECTS WHO COMPLETED TIME 1 AND TIME 2

| | Time 1<br>*n* (%) | Time 2<br>*n* (%) |
|---|---|---|
| Students | 36 (21) | 14 (23) |
| Novice | 17 (10) | 7 (11) |
| Experienced | 118 (69) | 40 (66) |
| Total | 171 (100) | 61 (100) |

In looking at the test-retest reliability overall across the groups, the correlation was found to be .901 for the chest discomfort case vignette and .827 for the fatigue case vignette. Reliability of the scores was also examined for each group of subjects which is included in Tables XXVII and 28. As can be seen from the Tables, two correlations (Students, Fatigue Case, Subscale 1 and Experienced, Fatigue Case, Subscale 1) was less than .70 and all correlations were significant at the .05 level.

**TABLE XXVII**

CHEST DISCOMFORT TEST-RETEST RELIABILITY BY SUBJECT GROUP

| | Students ($n$ = 14) | Novice ($n$ = 7) | Experienced ($n$ = 40) |
|---|---|---|---|
| | *R* | *r* | *R* |
| Subscale 1 | .816** | .848* | .704** |
| Subscale 2 | .714** | .846* | .923** |
| Subscale 3 | .747** | .952** | .933** |
| Total Score | .867** | .906** | .913** |

**sig at $p \leq .05$; **sig at $p \leq .01$*

**TABLE XXVIII**
FATIGUE TEST-RETEST RELIABILITY BY SUBJECT GROUP

| | Students ($n$ = 14) | Novice ($n$ = 7) | Experienced ($n$ = 40) |
|---|---|---|---|
| | *R* | *r* | *R* |
| Subscale 1 | .688** | .779* | .693** |
| Subscale 2 | .895** | .939** | .886** |
| Subscale 3 | .808** | .831* | .797** |
| Total Score | .827** | .927** | .843** |

**sig at p ≤ .05; **sig at p ≤ .01*

Hypothesis 2b was supported. There was high inter-rater reliability using the TDM scoring system (≥.90) using the intra-class correlation coefficient. Using a sample of 45 cases or approximately 25% of the cases, the interclass correlation coefficient between rater 1 and rater 3 (chest discomfort case vignette) was .967 and between rater 2 and rater 3 (fatigue case vignette) was .955. The average time it took the raters to evaluate cases was assessed for the first few cases and the last few cases. Grader 1 averaged 8 minutes for her first few cases and 3 minutes for her last few cases. Grader 2 averaged 6 minutes for her first few cases and 3 minutes for her last few cases. Grader 3 averaged 13 minutes for her first few cases and 4 minutes for her last few cases.

**c. Aim 3**

The third aim of the study was to determine the relationship between participant's demographic variables and their responses on the TDM tool. Prior to entering independent variables into a regression equation, variables were screened to determine if there

was a significant correlation between total vignette and sub-scale vignette scores and each continuous demographic variable. The continuous variables of age, years of RN experience, and years of NP experience were screened using Pearson's *r* correlation coefficient and are included in Tables XXIX and XXX. A significant positive correlation was found between several of the variables; however, because of the weak correlations regression analysis was not performed.

**TABLE XXIX**
CHEST DISCOMFORT CORRELATIONS OF DEMOGRAPHIC VARIABLES

| Variable | Subscale 1 | Subscale 2 | Subscale 3 | Total Score |
|---|---|---|---|---|
| Age | -.212** | -.060 | .041 | -.071 |
| RN Years of Experience | -.035 | .037 | .056 | .024 |
| NP Years of Experience | .026 | -.022 | .032 | .000 |

**sig at p ≤ .05; **sig at p ≤ .01*

**TABLE XXX**
FATIGUE CORRELATIONS OF DEMOGRAPHIC VARIABLES

| Variable | Subscale 1 | Subscale 2 | Subscale 3 | Total Score |
|---|---|---|---|---|
| Age | -.174* | .076 | .206* | .114 |
| RN Years of Experience | -.031 | .090 | .252** | .184* |
| NP Years of Experience | -.054 | .006 | .020 | .006 |

**sig at p ≤ .05; **sig at p ≤ .01*

Additional demographic variables were also examined in relationship to the case vignette scores. Total mean scores were examined in relationship to the self-indentified certification specialty of practicing nurse practitioners. Nurse practitioners who were certified as acute care, adult and family nurse practitioners had similar mean scores for the chest discomfort case as compared to mental health nurse practitioners who scored the lowest. For the fatigue case, mental health nurse practitioners had the highest and for the chest discomfort case they scored the lowest however the difference between the groups was not significant for either the chest discomfort case ($F$ (4, 154), .773, $p$ = .544) or the fatigue case ($F$ (4, 139), .782, $p$ = .539). Mean total scores by certification specialty are included in Table XXXI. Total mean scores were also examined in relationship to the self-identified current practice area of nurse practitioners. Nurse practitioners who identified themselves as working in cardiology were found to have the highest total mean scores for the chest discomfort case vignette although it was not a significant difference between groups ($F$ (4, 121), 1.199, $p$ = .315). Practitioners, who self-identified as working in mental health, did not have the highest mean scores on the fatigue case vignette. Figures 2 and 3 illustrate mean scores by area of practice.

**TABLE XXXI**
MEAN SCORES BY CERTIFICATION SPECIALTY

| Specialty | Chest Discomfort Case ($n$ = 158) | Fatigue Case ($n$ = 143) |
|---|---|---|
| | *M* | *M* |
| Acute Care | 28.97 | 20.05 |
| Adult | 29.12 | 21.10 |
| Family | 29.79 | 23.00 |
| Mental Health | 25.33 | 26.00 |

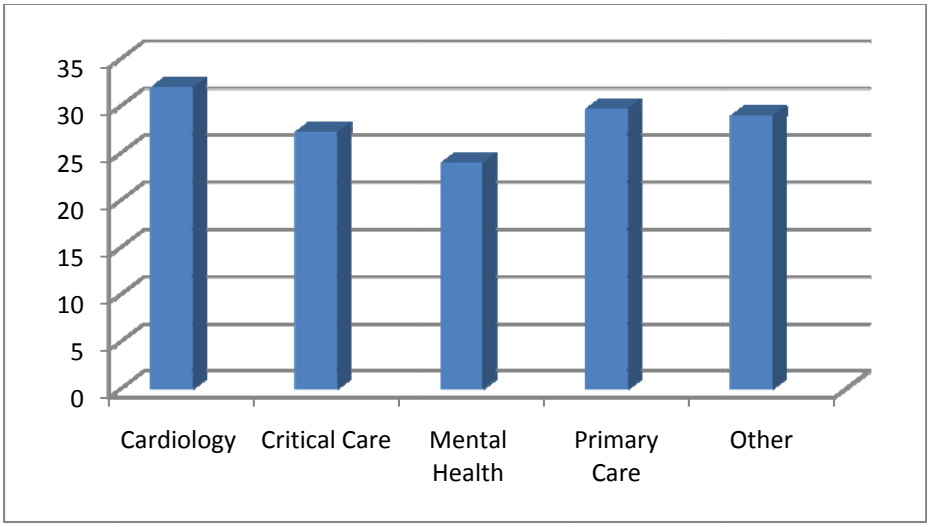


Figure 2. Mean scores by area of practice for the chest discomfort case

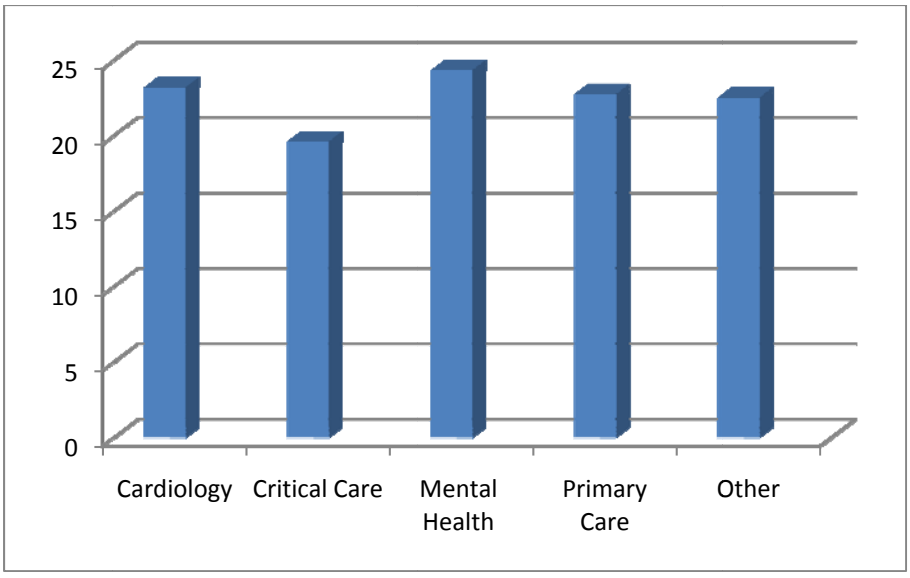


Figure 3. Mean scores by area of practice for the fatigue case

Lastly, total mean scores were examined in relationship to the self-identified GPA of nurse practitioner students. For both cases students who self-reported their GPA as an A scored slightly higher than those who self-reported a GPA of a B however the difference was small and non-significant ($F$ (1, 33), .608, $p$ = .441). Mean scores by GPA are included in XXXII.

**TABLE XXXII**
MEAN SCORES BY GPA

| Specialty | Chest Discomfort Case ($n$ = 35) | Fatigue Case ($n$ = 31) |
|---|---|---|
| | *M* | *M* |
| A average | 30.58 | 22.13 |
| B average | 28.44 | 17.50 |

### d. Additional analysis

In order to assure that case order was not a factor in scores, mean subscale scores and total scores were examined by the order in which respondents completed the cases. Total mean scores for subjects who completed the chest discomfort case first as compared to those that completed it second were not significantly different and the same was found for the fatigue case vignette indicating that case order was an influencing factor.

# V. DISCUSSION

This chapter begins with the purpose and summary of the study followed by an examination of the psychometric analyses of the TDM tool based on the specific aims of this study. The limitations of the study are then addressed and lastly the implications for nursing education and practice are examined.

## A. Purpose and Summary of the Study

The nursing profession represents the largest segment of health professions in the United States and nurse practitioners rank as one of the fastest growing health professions in the 21st century. Nurse practitioners have traditionally been trained to provide safe, quality patient care. Yet in an increasingly fragmented and complex healthcare in which nurse practitioners will be called upon to provide high level decision making and care, it may be necessary to reexamine how we can best educate and prepare them for successful transition into practice and how to foster the continual advancement of knowledge and expertise. As such, there has been a swing in nursing education to nurture student's abilities to be independent decision makers, and encourage them to assess and organize information, to apply knowledge appropriately in situations, and to use knowledge to understand and take action.

Decision making is a required competency in the education and training of nurse practitioners, however there is no widely accepted method for evaluating these abilities. The inability to consistently and accurately evaluate decision making poses a challenge for nursing educators as they engage in the process to prepare nurse practitioner students for successful transition to practice. Thus the purpose of this dissertation study was to begin the process of developing a valid and reliable instrument to measure the decision making abilities of nurse practitioner students as well as practicing nurse practitioners.

The ability to measure decision making as a nurse practitioner student transitions to a practicing provider fills a significant gap. Traditional methods of measuring decision making in nurse practitioner students have included preceptor evaluations, multiple choice exam, simulation and clinical scenario programs such as DXR clinician but these methods do not consistently provide an objective measure of decision making. Preceptor evaluations can be flawed and unreliable because they do not allow for an objective comparison across a student cohort. Multiple choice exams offer a method for evaluating formative and summative learning outcomes however they may not be the best method for evaluating the process of decision making and little is known about the effectiveness of simulation to measure decision making in nursing. A case study approach may offer a less expensive, and effective approach to measuring decision making abilities; however, an effective tool needs to incorporate several case scenarios rather than one in order to comprehensively capture decision making across specialties

The development of the TDM tool was based on an extensive review of the literature and considered the limitations and benefits of other previously developed tools in order to create a unique method to evaluate the decision making abilities of nurse practitioners. The TDM tool includes an evolving case study approach so that the process of decision making can be evaluated as well as the final outcome of the process. This is very different to most of the available tools that often only collect a final diagnosis.

The long term goal of my research is to develop a valid and reliable decision making tool that could be used to evaluate the decision making abilities of the continuum of a nurse practitioner student to a practicing nurse practitioner across a broad mix of clinical specialties and practice situations. The objective of this dissertation study was to develop a prototype of the decision making tool that could then be expanded upon in future work. The central hypothesis of

this study was that the developed tool can reliably measure and differentiate between the decision making abilities of nurse practitioner students, novice nurse practitioners, and experienced nurse practitioners.

## B. Psychometric Analysis

### 1. Aim 1

The objective of Aim 1 was to determine if the TDM tool had appropriate sensitivity in measuring differences in decision making abilities between a nurse practitioner student, a novice nurse practitioner and an experienced nurse practitioner.

Student nurse practitioners were found to collect the greatest amount of patient data for each case vignette as compared to novice and experienced practitioners. This hypothesis was based on the understanding that student nurse practitioners and novice nurse practitioners more closely follow a systematic and broader symptom-driven approach when collecting patient data in order to ultimately formulate a diagnosis. In contrast, an experienced nurse practitioner may hone in on specific questions and data, based on their past experience, and formulate an early tentative diagnosis even before all of the data is collected. The TDM tool, in its current form, may evaluate a decision making process that is systematic rather than intuitive thus capturing a method that may be better able to evaluate students and novice nurse practitioners as compared to experienced nurse practitioners. Further work needs to be done to examine if there are very specific and relevant but also irrelevant key data that each group uniquely collects that would help to further elicit differences between the groups. In addition it might be helpful to include another item on the tool where respondents must provide a list of differentials based solely on the chief complaint.

Although nurse practitioner students may collect more patient information early on in the decision making process, novice and experienced nurse practitioners were hypothesized to be better able to correctly identify the most likely patient diagnosis and provide support for choosing that diagnosis. This was based on the understanding that experience providers a greater ability to definitively and accurately put the data together to make decisions. What was found in this study was that this only held true for the fatigue case vignette. The similarities in mean scores for the chest discomfort case could indicate that the case vignette was too simple or that the content was very familiar to all respondents so that higher level decision making was not necessary to process the case. Little is actually known about how the overall experience or the specialty experience of a nurse practitioner may influence their ability to formulate decisions. It may be helpful to revise the TDM tool to include a way to measure decision certainty of the respondent so that a comparison can be made between that variable and the selection of a final diagnosis. In addition, it may be helpful to gather information about the respondent's familiarity in seeing patients with a similar diagnosis rather than simply measuring decision making with years of experience.

Experienced nurse practitioners were found to demonstrate a greater ability to identify the correct rationale for the chest discomfort case final diagnosis but not for the fatigue case final diagnosis. This hypothesis was based on the understanding that experienced practitioners have a greater overall knowledge bank to draw from, even if that diagnosis is not one they regularly manage, and that they can draw from the patient data the pertinent information to not only formulate the correct diagnosis but also provide data to support that decision. For the fatigue case, the grading system for evaluating the supporting data for the final diagnosis was very subjective versus the supporting data for the chest discomfort case which was very

straightforward to grade. More specifically, a correct response needed to incorporate at least some of the data that would support the DSM-IV diagnosis for depression such as inability to concentrate, anhedonia etc… however it was left up to the grader how many of the items were necessary to get the item correct. A more objective grading method for this question may be necessary.

Overall the total scores on the TDM tool were not found to clearly distinguish between the decision making abilities of the student nurse practitioners, novice nurse practitioner or experienced nurse practitioners. However, it is likely that the individual questions and the subscales themselves are more useful in differentiating between the groups. This is an area that warrants further examination. For example, it would be beneficial to examine how the individual item scores as well as subscale and total scores fall using a large sample of students who have differing abilities. The differences in decision making abilities might be clearer if a more clearly defined subject group was utilized.

It was also hypothesized that experienced and novice nurse practitioners would be able to complete the case vignettes in the least amount of time based again on their experience and comfort collecting, interpreting and evaluating patient data. Although the time difference in the between groups was in the hypothesized direction, a significant difference in time to completion was not found. With subsequent testing of the TDM tool, it may be useful to have subjects complete the instrument in a controlled setting such as a computer lab where the exact time to start and complete each case can be recorded more accurately.

A small positive significant correlation was found between the chest discomfort case vignette and the fatigue case vignette. It was hypothesized, for example, that if a subject could effectively ask a patient the most pertinent questions about their chief complaint of chest

discomfort or about social/habits that they would similarly do an effective job in asking the same questions of a patient with fatigue. The lower correlations between the two cases do not adequately reflect this hypothesis. Much more work is needed to examine if the TDM tool can ultimately provide feedback on decision making abilities in general or if those abilities are case dependent.

**2. Aim 2**

The objective of Aim 2 was to determine if the TDM tool is a reliable method for measuring decision making abilities among nurse practitioner students, novice nurse practitioners and expert nurse practitioners.

Nurse practitioner students, novice practitioners, and expert practitioners were all found to have stable scores on the TDM tool over a one-month period. This is a significant finding because not only was the total TDM score high at time 2, but each subscale in each case vignette was found to be significantly correlated across time. Test-retest reliability rather than Cronbach alpha was used because although items in the tool may be conceptually related, they lack inter-item relationships and therefore Cronbach alpha does not provide a meaningful measure. A month re-test period was chosen because it was thought that it would provide a good measure of the stability of the tool without introducing confounding variables such as an increase in knowledge or clinical experience. Also significant was the finding that the TDM tool can be reliably scored by multiple graders in a minimal amount of time. Comparable decision making methods such as standardized patients often take a much longer amount of time to grade and in addition may not offer the same level of objectivity as the TDM tool

### 3. Aim 3

The objective of Aim 3 was to determine the relationship between participant's demographic variables and their responses on the TDM tool. Although a few significant correlations between these variables and the decision making mean scores were found, the correlations were very small. The association between personal and situational variables of the decision maker has shown an inconsistent relationship in the literature and no real data exists on the association in samples of nurse practitioners. Further work is needed to assess at what point a nurse practitioner can be considered experienced and if experience is transferable when they switch practice specialties.

## C. Limitations

The following section identifies threats that potentially limited the validity and reliability of the findings from the main study. The majority of the limitations of the study are focused around the implications of using a descriptive design. Efforts made to control or minimize these threats are also discussed.

One potential threat to the internal validity of the study was the sample selection. The accessible population was a convenience sample of volunteer subjects who may not have been representative of the larger population of nurse practitioner students and practicing nurse practitioners. Results of the analyses for the sample, however, indicated that there were expected differences between the three groups (age, years of experience). The exception was that novice nurse practitioners were found to have higher RN years of experience as compared to the pilot study. It may be important to examine these demographic findings against national data to see if the sample was representative of the larger sample of nurse practitioners.

Another potential threat was the use of non-equivalent group sizes which could have presented a potential lack of statistical power in the statistical tests. Efforts were made to minimize this threat by determining a desired sample size in advance from the pilot test as well as meeting the appropriate assumptions for each statistical test that's. However, this was a threat to validity because the sample sizes for the student nurse practitioners and the novice nurse practitioners were not at goal. The power for each question on the TDM tool was reported so that a determination could be made to the potential sample sizes needed to see a difference. This helped to reduce the chance for a type II error.

Another significant threat to the internal validity of the study was the reliability of the TDM instrument and subsequent scores. Assumptions, in the form of hypotheses, were made about the nature of how nurse practitioner students and practicing nurse practitioners would perform on the TDM tool, however little was known about the nature of nurse practitioners decision making abilities. It is possible that the tool does not adequately capture how to evaluate the complex and unique decision making abilities of these three unique groups. Attempts were made to minimize this threat. For example the development of the tool was very methodical and involved consultation with decision experts and nursing faculty. The cases were developed using nationally recognized guidelines and were critiqued by practicing nurse practitioners and a review by additional content experts demonstrated that the tool, the cases and the grading system were highly valid. Decision making is a very broad and difficult to define construct. That may explain why few instruments have been developed to measure decision making. It is possible that the TDM tool does not adequately capture a method for evaluating the entire decision making process for nurse practitioner students as well as practicing nurse practitioners. That is a unique

challenge of this project. Unfortunately in this study, a comparison method of decision making was not used because there are limited instruments and methods to do so.

The major threat to the external validity of this study was the population sampled. Although a large, heterogeneous sample of nurse practitioner students and practicing nurse practitioners were recruited from across the country, representing 31 states, the sample was a convenient sample of subjects which may not be representative of the larger population of interest. To maximize the external validity of the study, the demographic data for the subjects were included and analyzed and differences were as expected. Future studies will need to examine more in depth demographic characteristics of the sample.

## D. Study Significance and Implications

According to the 2010 IOM report there is a need for competency-based nursing education. These competencies need to be high level competencies, as opposed to task based, and should represent a student's mastery of patient management in order to provide a foundation for decision-making skills across care settings. In order to understand and evaluate how healthcare education can make the necessary shift towards getting students to assess and organize information, apply knowledge appropriately in situations, and use knowledge to understand and take action, it will be essential to have a method for evaluating decision making abilities. The lack of a commonly utilized, valid and reliable method for evaluating nurse practitioner abilities, along the continuum of a nurse practitioner student to a practicing nurse practitioner, is a potential barrier to understanding if the most effective teaching methods are being used to prepare students for successful transition into practice. The purpose of this study was to begin the process of developing a valid and reliable instrument to measure decision making across the continuum.

### 1. Advantages of this instrument

Decision making is a contextual, continuous and evolving process, where data may be gathered, interpreted and evaluated in order to formulate a choice that is based on evidence-based guidelines. The TDM tool was developed based on this definition of decision making and fits within the developed theoretical framework. There are many potential advantages of the TDM tool.

First, because the tool includes the three sections of data collection, data interpretation and data evaluation, a respondent's strengths and weaknesses in each of these areas can be assessed. This is important for a nursing educator to be able to evaluate and then potentially remediate or adjust their teaching methods in order to address areas of need. Also of benefit, is that the TDM tool can be used to evaluate how well a respondent chooses the correct diagnosis and also what rationale they provide for the diagnosis. Many decision making tools simply collect a final diagnosis. By providing a method for assessing the *why,* educators and employers may be able to determine if the final diagnosis is a guess or if it is based on a good understanding of the collected patient data and clinical situation.

The evolving nature of the TDM tool is a useful technique and may provide a method for teaching the material. The primary purpose of the TDM tool is to evaluate decision making but because the case is evolving, a respondent actually gets the information they would be expected to ask as they progress through the case. The only exception is the final diagnosis where no further information is provided. However, the case could be adapted to include final feedback so the cases could be used as an evaluation and learning tool. Unlike DXR clinician, the TDM tool format uses open ended responses rather than a check box format so the respondent can be better evaluated on their ability to apply information.

The TDM tool was developed as a prototype that could potentially be used to measure decision making across a variety of patient scenarios and situations. The tool is laid out so that almost any case topic could be developed and put into the TDM tool format using the same or very similar scoring system. Based on inter-rater reliability testing, the TDM tool provides a fairly quick method of objectively evaluating decision making using a straightforward grading system. This is ideal because other methods, such as preceptor evaluations and standardized patients, may not always offer such an objective measure.

## E. Recommendations for Future Research

As previously mentioned, the goal of the TDM tool was to develop a prototype that could ultimately be used to measure decision making across a variety of clinical situations and allow nursing faculty, employers of nurse practitioner employers or even large credentialing bodies to tailor cases using a standardized instrument. Further cases and clinical situations will need to be developed to make the tool more applicable across a larger group of practitioners. Another area for future development is to consider at what level a score would be considered to be adequate or below adequate. This is important if the tool is to be used to evaluate students and practitioners at different levels and identify and remediate struggling students and practitioners.

Subsequent development of the TDM tool should include making comparisons with other decision making and traditional evaluation methods such as DXR clinician, standardized patients, and GPA across an entire curriculum or with specific courses. Because students may perform well in one area but not in another and may change in their abilities as they progress through school, it may be necessary to track the progression of student performance from initial entry to completion of a program. This tool could potentially be used to follow an individual student in their progression to a novice nurse practitioner and finally when they have developed

further abilities and experiences. For practicing nurse practitioners, one area of comparison might be whether high scores on the TDM tool are comparable to pass rates on the ANCC exam, participation in CEU events, or employer performance reviews.

Maintenance of professional competence is a lifelong process so continuing to assess decision making skills, as a student progresses to a novice and then experienced clinician, is key. Based on the initial testing of the TDM tool, it is possible that the TDM tool does not fully capture the same decision making process for a student that it does for a practicing nurse practitioner. Thus, more work will need to be done to examine if there is a way to use the TDM tool to evaluate more general competencies rather than such specific ones or if nurse practitioners, similar to physicians, need to be assessed by a tool that is very specific to their individual practice area and certification.

## F. Conclusion

The complex healthcare environment of today requires effective thinkers and decision makers and these abilities lead to professional accountability and practice autonomy for nurse practitioners (Mantzoukas, 2006). Having a clear and unique understanding of clinical decision making and the ability to consistently and accurately evaluate these skills using a standardized approach will allow nursing educators to talk the same talk as they move towards redefining nursing education in the 21st century.

## REFERENCES


American Association of Colleges of Nursing. (2011). *The essentials of master's education in nursing.* Washington, DC.

American Association of Colleges of Nursing. (1996). *The essentials of master's education for advanced practice nursing*. Washington, DC.

American Nurses Credentialing Center. (2010). *2010 general testing and renewal handbook.* Silver Spring, MD.

Badger, L.W., deGruy, F., Hartman, J., Plant, M.A., Leeper, J., Ficken, R., et al. (1995). Stability of standardized patients' performance in a study of clinical decision making. *Family Medicine, 27*, 126-131.

Bakalis, N. (2006). Clinical decision making in cardiac nursing: A review of the literature. Nursing Standard, 21(12), 39-46.

Bourke, M., & Ihrke, B.A. (2005). The evaluation process: an overview. In D. Billings & J. A. Halstead (Eds.), *Teaching in Nursing: A guide for Faculty*, 2nd ed. (pp. 443-464). St. Louis, MI: Elsevier Saunders.

Brannon, L. A., & Carson, K. L. (2003). Nursing expertise and information structure influence medical decision making. *Applied Nursing Research: ANR, 16*(4), 287-290.

Brooks, K. L., & Shepherd, J. M. (1990). The relationship between clinical decision-making skills in nursing and general critical thinking abilities of senior nursing students in four types of nursing programs. *The Journal of Nursing Education, 29*(9), 391-399.

Brooks, E. M., & Thomas, S. (1997). The perception and judgment of senior baccalaureate student nurses in clinical decision making. *Advances in Nursing Science, 19*(3), 50-69.

Bucknall, T., & Thomas, S. (1996). Clinical decision-making in critical care. *Australian Journal of Advanced Nursing, 13*(2), 10-17.

Bucknall, T., & Thomas, S. (1997). Nurses' reflections on problems associated with decision-making in critical care settings. *Journal of Advanced Nursing, 25*(2), 229-237.

Burman, M. E., Stepans, M. B., Jansa, N., & Steiner, S. (2002). How do NPs make clinical decisions? *The Nurse Practitioner, 27*(5), 57-64.

Cader, R., Campbell, S., & Watson, D. (2005). Cognitive continuum theory in nursing decision-making. *Journal of Advanced Nursing, 49*(4), 397-405.

Carnevali, D., & Thomas, M. (1993). *Diagnostic reasoning and treatment decision making in nursing*. Philadelphia, PA: J.B. Lippincott.

Chumbler, N. R., Geller, J. M., & Weier, A. W. (2000). The effects of clinical decision making on nurse practitioners' clinical productivity. *Evaluation & the Health Professions, 23*(3), 284-305.

Cioffi, J. (2000). Nurses' experiences of making decisions to call emergency assistance to their patients. *Journal of Advanced Nursing, 32*(1), 108-114.

Cioffi, J. (1998). Decision making by emergency nurses in triage assessments. *Accident and Emergency Nursing, 6*(4), 184-191.

Cioffi, J., & Markham, R. (1997). Clinical decision-making by midwives: managing case complexity. *Journal of Advanced Nursing, 25*(2), 265-272.

Cioffi, J., Purcal, N., & Arundell, F. (2005). A pilot study to investigate the effect of a simulation strategy on the clinical decision making of midwifery students. *Journal of Nursing Education, 44*(3), 131-134.

Clack, G. (2009). Decision making in nursing practice: A case review. *Paediatric Nursing, 21*(5), 24-27.

Clifton, S.L., & Schriner, C.L. (2010). Assessing the quality of multiple-choice test items. *Nurse Educator, 35*(1), 12-16.

Colliver, J.A. & Swartz, M.H. (1997). Assessing clinical performance with standardized patients. *Journal of the American Medical Association, 278*, 1164-1168.

Croskerry, P. (2002). Achieving quality in clinical decision making: Cognitive strategies and detection of bias. *Academic Emergency Medicine: Official Journal of the Society for Academic Emergency Medicine, 9*(11), 1184-1204.

Currey, J., Browne, J., & Botti, M. (2006). Haemodynamic instability after cardiac surgery: Nurses' perceptions of clinical decision-making. *Journal of Clinical Nursing, 15*(9), 1081-1090.

de la Cruz, F. A. (1994). Clinical decision-making styles of home healthcare nurses. *Image--the Journal of Nursing Scholarship, 26*(3), 222-226.

Dowding, D., Spilsbury, K., Thompson, C., Brownlow, R., & Pattenden, J. (2009). The decision making of heart failure specialist nurses in clinical practice. *Journal of Clinical Nursing, 18*, 1313-1324.

Drazen, J.M., & Weinstein, D.F. (2010). Considering recertification. *The New England Journal of Medicine, 362*(10), 946-947.

Ellis, P. A. (1997). Processes used by nurses to make decisions in the clinical practice setting. *Nurse Education Today, 17*(4), 325-332.

Everitt, D. E., Avorn, J., & Baker, M. W. (1990). Clinical decision-making in the evaluation and treatment of insomnia. *The American Journal of Medicine, 89*(3), 357-362.

Farnan, J. M., Johnson, J. K., Meltzer, D. O., Humphrey, H. J., & Arora, V. M. (2008). Resident uncertainty in clinical decision making and impact on patient care: A qualitative study. *Quality & Safety in Health Care, 17*(2), 122-126.

Fry, M., & Burr, G. (2001). Current triage practice and influences affecting clinical decision-making in emergency departments in NSW, Australia. *Accident and Emergency Nursing, 9*(4), 227-234.

Gandhi, T.K., Kachalia, A., Thomas, E.J., Puopolo, A.L., Yoon, C., Brennan, T.A., et al. (2006). Missed and delayed diagnoses in the ambulatory setting: a study of closed malpractice claims. *Annals of Internal Medicine, 145*(7), 488-496.

Garrett, B. (2005). Student nurses' perceptions of clinical decision-making in the final year of adult nursing studies. *Nurse Education in Practice, 5*(1), 30-39.

Girot, E. A. (2000). Graduate nurses: Critical thinkers or better decision makers? *Journal of Advanced Nursing, 31*(2), 288-297.

Grembowski, D., Milgrom, P., & Fiset, L. (1989). Clinical decision making among dental students and general practitioners. *Journal of Dental Education, 53*(3), 189-192.

Grossman, S., Campbell, C., & Riley, B. (1996). Assessment of clinical decision-making ability of critical care nurses. *Dimensions of Critical Care Nursing, 15*(5), 272-279.

Hagbaghery, M. A., Salsali, M., & Ahmadi, F. (2004). The factors facilitating and inhibiting effective clinical decision-making in nursing: A qualitative study. *BMC Nursing, 3*(1), 1-11.

Hedberg, B., & Satterlund Larsson, U. (2003). Observations, confirmations and strategies - useful tools in decision-making process for nurses in practice? *Journal of Clinical Nursing, 12*(2), 215-222.

Herman, J. (1997). Assessing new assessments: How do they measure up? *Theory into Practice, 36*, 196-204.

Hicks, F. D., Merritt, S. L., & Elstein, A. S. (2003). Critical thinking and clinical decision making in critical care nursing: A pilot study. *Heart & Lung : The Journal of Critical Care, 32*(3), 169-180.

Higuchi, K. A., & Donald, J. G. (2002). Thinking processes used by nurses in clinical decision making. *The Journal of Nursing Education, 41*(4), 145-153.

Hoffman, K., Duffield, C., & Donoghue, J. (2004). Barriers to clinical decision-making in nurses in Australia. *Australian Journal of Advanced Nursing, 21*(3), 8-13.

Hughes, K. K., & Young, W. B. (1990). The relationship between task complexity and decision-making consistency. *Research in Nursing & Health, 13*(3), 189-197.

Illinois Society of Advanced Practice Nursing. *Advanced practice nurses: FAQ.* Retrieved July 7, 2010, from http://www.isapn.org/?page=WhatisanAPN

Institute of Medicine. (2010). *The future of nursing: leading change, advancing health.* Washington, DC: National Academy of Sciences.

Isaacson, J.J., & Stacy, A.S. (2008). Rubrics for clinical evaluation: Objectifying the subjective experience. *Nurse Education in Practice, 9*, 134-140.

Jefford, E., Fahy, K., & Sundin, D. (2010). A review of the literature: Midwifery decision-making and birth. *Women and Birth: Journal of the Australian College of Midwives.*

Jenkins, H. M. (1985). A research tool for measuring perceptions of clinical decision making. *Journal of Professional Nursing: Official Journal of the American Association of Colleges of Nursing, 1*(4), 221-229.

Jenks, J. M. (1993). The pattern of personal knowing in nurse clinical decision making. *The Journal of Nursing Education, 32*(9), 399-405.

Junnola, T., Eriksson, E., Salantera, S., & Lauri, S. (2002). Nurses' decision-making in collecting information for the assessment of patients' nursing problems. *Journal of Clinical Nursing, 11*(2), 186-196.

Kosowski, M. M., & Roberts, V. W. (2003). When protocols are not enough: Intuitive decision making by novice nurse practitioners. *Journal of Holistic Nursing, 21*, 52.

Lauri, S., & Salantera, S. (1998). Decision-making models in different fields of nursing. *Research in Nursing & Health, 21*(5), 443-452.

Luker, K. A., & Kenrick, M. (1992). An exploratory study of the sources of influence on the clinical decisions of community nurses. *Journal of Advanced Nursing, 17*(4), 457-466.

Lynn, M.R. (1986). Determination and quantification of content validity. *Nursing Research, 35*, 382-385.

Mantzoukas, S. (2006). A review of evidence-based practice, nursing research and reflection: leveling the hierarchy. *Journal of Clinical Nursing, 17*(2), 214-223.

Matteson, P., & Hawkins, J. W. (1990). Concept analysis of decision making. *Nursing Forum, 25*(2), 4-10.

McCaughan, D., Thompson, C., Cullum, N., Sheldon, T., & Raynor, P. (2005). Nurse practitioner and practice nurses' use of research information in clinical decision making: Findings from an exploratory study. *Family Practice, 22*(5), 490-497.

Montori, V. M., Tabini, C. C., & Ebbert, J. O. (2002). A qualitative assessment of 1st-year internal medicine residents' perceptions of evidence-based clinical decision making. *Teaching and Learning in Medicine, 14*(2), 114-118.

National Organization of Nurse Practitioner Faculties. (2011). *Nurse practitioner core competencies*. Washington, DC: National Organization of Nurse Practitioner Faculties.

National Quality Forum (NQF). *Safe Practices for Better Healthcare–2010 Update: A Consensus Report.* Washington, DC: NQF; 2010.

Nehring, W.M., & Lashley, F.R. (2009). Nursing simulation: a review of the past 40 years. *Simulation and Gaming, 40*(4), 528-552.

Offredy, M., Kendall, S., & Goodman, C. (2008). The use of cognitive continuum theory and patient scenarios to explore nurse prescriber's' pharmacological knowledge and decision-making. *International Journal of Nursing Studies, 45*(6), 855-868.

O'Neill, E. S., Dluhy, N. M., Hansen, A. S., & Ryan, J. R. (2006). Coupling the N-CODES system with actual nurse decision-making. *Computers, Informatics, Nursing: CIN, 24*(1), 28-34.

O'Reilly, P. (1993). *Barriers to effective clinical decision making in nursing*. Retrieved online at: www.ciap.health.nsw.gove.au/hospolicstvincents/1993/a04.html

Orme, L., & Maggs, C. (1993). Decision-making in clinical practice: How do expert nurses, midwives and health visitors make decisions? *Nurse Education Today, 13*(4), 270-276.

Pardue, S. F. (1987). Decision-making skills and critical thinking ability among associate degree, diploma, baccalaureate, and master's-prepared nurses. *The Journal of Nursing Education, 26*(9), 354-361.

Peabody, J.W., Luck, J., Glassman, P., Dresselhaus, T., & Lee, M. (2000). Comparison of vignettes, standardized patients, and chart abstraction: a prospective validation study of 3 methods for measuring quality. *Journal of the American Medical Association, 283*(13), 1715-1711.

Peabody, J.W., et al. (2004). Measuring the quality of physician practice by using clinical vignettes: a prospective validation study. *Annals of Internal Medicine, 141*, 771-780.

Pirret, A. M. (2007). The level of knowledge of respiratory physiology articulated by intensive care nurses to provide rationale for their clinical decision-making. *Intensive & Critical Care Nursing, 23*(3), 145-155.

Pritchard, M. J. (2006). Making effective clinical decisions: A framework for nurse practitioners. *British Journal of Nursing, 15*(3), 128-130.

Ramezani-Badr, F., Nasrabadi, A. N., Yekta, Z. P., & Taleghani, F. (2009). Strategies and criteria for clinical decision making in critical care nurses: A qualitative study. *Journal of Nursing Scholarship: An Official Publication of Sigma Theta Tau International Honor Society of Nursing, 41*(4), 351-358.

Rew, L. (2000). Acknowledging intuition in clinical decision making. *Journal of Holistic Nursing : Official Journal of the American Holistic Nurses' Association, 18*(2), 94-108, 109-13.

Rycroft-Malone, J., Fontenla, M., Seers, K., & Bick, D. (2009). Protocol-based care: The standardization of decision-making? *Journal of Clinical Nursing, 18*(10), 1490-1500.

Shin, K. R. (1998). Critical thinking ability and clinical decision-making skills among senior nursing students in associate and baccalaureate programmes in korea. *Journal of Advanced Nursing, 27*(2), 414-418.

Simmons, B. (2010). Clinical reasoning: concept analysis. *Journal of Advanced Nursing, 66*(5), 1151-1158.

Stuetz, B.J. (2006). *A Plan to revise PA recertification*. Retrieved January 5, 2011 from http://nurse-practitioners-and-physician-assistants.advanceweb.com/Article/A-Plan-to-Revise-PA-Recertification-5.aspx.

Tabak, N., Bar-Tal, Y., & Cohen-Mansfield, J. (1996). Clinical decision making of experienced and novice nurses. *Western Journal of Nursing Research, 18*(5), 534-547.

Tarrant, M., Knierim, A., Hayes, S.K., & Ware, S. The frequency of item writing flaws in multiple-choice questions used in high stakes nursing assessments. *Nurse Education in Practice, 6*, 354-363.

Taylor, F. (2006). A comparative study examining the decision-making processes of medical and nursing staff in weaning patients from mechanical ventilation. *Intensive & Critical Care Nursing: The Official Journal of the British Association of Critical Care Nurses, 22*(5), 253-263.

Thiele, J. E., Holloway, J., Murphy, D., Pendarvis, J., & Stucky, M. (1991). Perceived and actual decision making by novice baccalaureate students. *Western Journal of Nursing Research, 13*(5), 616-626.

Thompson, C., & Stapley, S. (2011). Do educational interventions improve nurses' clinical decision making and judgment? A systematic review. *International Journal of Nursing Studies, 48*(7), 881-893.

Tschikota, S. (1993). The clinical decision-making processes of student nurses. *The Journal of Nursing Education, 32*(9), 389-398.

Twigg, P., Rasmussen, L., & Speck, D.J. (2005). Developing and using classroom tests. In D. Billings & J. A. Halstead (Eds.), *Teaching in Nursing: A guide for Faculty*, 2nd ed. (pp.493-519). St. Louis, MI: Elsevier Saunders.

Twycross, A., & Powls, L. (2006). How do children's nurses make clinical decisions? two preliminary studies. *Journal of Clinical Nursing, 15*(10), 1324-1335.

United States Government Accountability Office. (2008). *Primary care professionals: Recent supply trends, projections, and valuation of services.* (No. GAO-08-472T).

Watkins, M. P. (1998). Decision-making phenomena described by expert nurses working in urban community health settings. *Journal of Professional Nursing, 14*(1), 22-33.

Watson, S. (1994). An exploratory study into a methodology for the examination of decision making by nurses in the clinical area. *Journal of Advanced Nursing, 20*(2), 351-360.

White, J. E., Nativio, D. G., Kobert, S. N., & Engberg, S. J. (1992). Content and process in clinical decision-making by nurse practitioners. *Image: Journal of Nursing Scholarship, 24*(2), 153-158.

Whitaker, E., & Connors, H. (2004). Standardized patient experiences: Evaluation of clinical performance and nurse practitioner student satisfaction. *Nursing Education Perspectives, 25*(1), 12-15.

# APPENDICES

# Appendix A
## Tiffen Decision Making Instrument Outline

| Major sections | Subsections | Activities Occurring |
|---|---|---|
| (1) Data Gathering *collecting data* | | |
| | (a) Collecting a history | |
| | | History of the Present Illness |
| | | Past Medical History |
| | | Social history/Personal factors |
| | (b) Performing a physical examination | |
| | | Vital signs |
| | | Pertinent Examination of Systems |
| (2) Data Interpretation – *examining and determining the need for additional data collection based on an early differential diagnosis* | | |
| | (a) Development of an early differential diagnosis list | |
| | (b) Obtaining selective diagnostic tests to refine the diagnosis(s) | |
| (3) Data Evaluation *evaluating the data and selecting a tentative diagnosis* | | |
| | (a) Refinement of early diagnosis(s) | |
| | (b) Determining which data helps to support that diagnosis(s) | |
| | (c) Determining the need for additional areas of patient need | |

Appendix B
Pilot Study IRB Letter

UNIVERSITY OF ILLINOIS
AT CHICAGO

Office for the Protection of Research Subjects (OPRS)
Office of the Vice Chancellor for Research (MC 672)
203 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612-7227

**Exemption Granted**

July 6, 2011

Jennifer Tiffen, RN, MS, APN
Department of Biobehavioral Health Science
845 S. Damen, Rm 640 NURS, M/C 802
Chicago, IL 60612
Phone: (312) 996-2185 / Fax: (312) 996-4978

**RE: Research Protocol # 2011-0497**
**"Development of a Tool to Measure Clinician Decision Making"**

Dear Dr. Tiffen:
Your Claim of Exemption was reviewed on July 6, 2011 and it was determined that your research meets the criteria for exemption. You may now begin your research.

Please note the following regarding your research:

**Exemption Period:** **July 6, 2011 – July 5, 2014**

**Sponsor(s):** None

**Performance Site(s):** UIC

**Subject Population:** Adult (18+ years) subjects only

**Number of Subjects:** 30

**The specific exemption category under 45 CFR 46.101(b) is:**

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly

Appendix B (continued)

or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

**Please note the Review History of this submission:**

| Receipt Date | Submission Type | Review Process | Review Date | Review Action |
|---|---|---|---|---|
| 06/17/2011 | Initial Review | Exempt | 06/23/2011 | Modifications Required |
| 07/01/2011 | Response to Modifications | Exempt | 07/06/2011 | Approved |

**Current Investigator Training periods for approved Key Research Personnel:**

1) Tiffen, Jennifer: March 28, 2010 – March 28, 2012
2) Shrestha, Shakuntala: February 28, 2011 – February 28, 2013
3) Zerwic, Julie Johnson A.: June 30, 2011 – June 30, 2013

You are reminded that investigators whose research involving human subjects is determined to be exempt from the federal regulations for the protection of human subjects still have responsibilities for the ethical conduct of the research under state law and UIC policy. Please be aware of the following UIC policies and responsibilities for investigators:

1. Amendments You are responsible for reporting any amendments to your research protocol that may affect the determination of the exemption and may result in your research no longer being eligible for the exemption that has been granted.

2. Record Keeping You are responsible for maintaining a copy all research related records in a secure location in the event future verification is necessary, at a minimum these documents include: the research protocol, the claim of exemption application, all questionnaires, survey instruments, interview questions and/or data collection instruments associated with this research protocol, recruiting or advertising materials, any consent forms or information sheets given to subjects, or any other pertinent documents.

3. Final Report When you have completed work on your research protocol, you should submit a final report to the Office for Protection of Research Subjects (OPRS).

Appendix B (continued)

4. Information for Human Subjects UIC Policy requires investigators to provide information about the research protocol to subjects and to obtain their permission prior to their participating in the research. The information about the research protocol should be presented to subjects in writing or orally from a written script. When appropriate, the following information must be provided to all research subjects participating in exempt studies:

    a. The researchers affiliation; UIC, JBVMAC or other institutions,
    b. The purpose of the research,
    c. The extent of the subject's involvement and an explanation of the procedures to be followed,
    d. Whether the information being collected will be used for any purposes other than the proposed research,
    e. A description of the procedures to protect the privacy of subjects and the confidentiality of the research information and data,
    f. Description of any reasonable foreseeable risks
    g. Description of anticipated benefits
    h. A statement that participation is voluntary and subjects can refuse to participate or can stop at any time
    i. A statement that the researcher is available to answer any questions that the subject may have and which includes the name and phone number of the investigator(s).
    j. A statement that the UIC IRB/OPRS or JBVMAC Patient Advocate Office is available if there are questions about subject's rights, which includes the appropriate phone numbers.

Please be sure to:

→ Use your research protocol number (2011-0497) on any documents or correspondence with the IRB concerning your research protocol.

We wish you the best as you conduct your research. If you have any questions or need further help, please contact the OPRS office at (312) 996-1711 or me at (312) 355-2908. Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

Sincerely,

Charles W. Hoehne, B.S., C.I.P.
Assistant Director, IRB # 2
Office for the Protection of Research Subjects

# Appendix C
## Recruitment Letter to Nursing Faculty

Dear Nurse Practitioner Faculty Coordinator,

I am a doctoral candidate at the University of Illinois-Chicago College of Nursing and I am conducting a study to better understand how nurse practitioners make decisions. I am writing to request your help in recruiting subjects for the study.

I am seeking to recruit nurse practitioner students currently enrolled in a master's program as well as practicing nurse practitioners with a mix of experience and clinical backgrounds. One idea for accessing practicing nurse practitioners would be to send it out to your NP student preceptors. The criteria for each group are as follows:

Nurse Practitioner Students
Must be at least 18 years of age
Currently enrolled in a master's nurse practitioner program or have graduated within the last 2 months
Should be adult, acute or family specialty

Nurse Practitioners
Need Practitioners with a range of experience including new graduates

The research protocol was reviewed by the University of Illinois at Chicago Office for the Protection of Research Subjects and was determined to be exempt minimal risk research. I would be happy to provide a copy of the exemption determination.

I have attached an information letter for potential subjects. This letter can be used by you to send out to selected students as well as practicing nurse practitioners. Study participation for the subjects involves completing online questionnaires and case vignettes.

Thank you very much for considering helping me to recruit subjects for my study. Please let me know if you have any questions. I can be reached by email at jtiffen@uic.edu or by cell at (773) 213-4989.

Jennifer Tiffen, MS, APN
Doctoral Candidate, University of Illinois at Chicago

# Appendix D
## Recruitment Letter to Students and Practicing Nurse Practitioners

Dear Nurse Practitioner Students and Practicing Nurse Practitioners,

Thank you for taking the time to read this email. My name is Jennifer Tiffen, MS, APN, and I am a doctoral candidate at the University of Illinois at Chicago. In am interested in conducting a study to better understand how nurse practitioners make decisions.

I am contacting you to see if you would be interested in participating in my research study. Study participation involves completing online questionnaires and case vignettes. Specifically you would be asked to complete a demographic data questionnaire and two case vignettes. We anticipate that the entire process will take approximately 60 minutes of your time.

I hope you will consider participating in this study. If you would like to do so, please use the following link to access the online study (Link here).

Thank you very much for considering my invitation to participate and taking the time to assist me to better understand nurse practitioner decision making.

Best wishes for your semester.

Jennifer Tiffen, MS, APN
Doctoral Candidate, University of Illinois at Chicago

Appendix E
Primary Study IRB Letter

UNIVERSITY OF ILLINOIS
AT CHICAGO

Office for the Protection of Research Subjects (OPRS)
Office of the Vice Chancellor for Research (MC 672)
203 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612-7227

October 13, 2011

Jennifer Tiffen, RN, MS, APN
Department of Biobehavioral Health Science
845 S. Damen, Rm 640 NURS, M/C 802
Chicago, IL 60612
Phone: (312) 996-2185 / Fax: (312) 996-4978

**RE: Research Protocol # 2011-0836**
**"Testing the Reliability and Validity of the Tiffen Decision Making Tool"**

Dear Ms. Tiffen:

Your Claim of Exemption was reviewed on October 10, 2011 and it was determined that your research meets the criteria for exemption. You may now begin your research

**Exemption Period:** **October 10, 2011 – October 9, 2014**

**The specific exemption category under 45 CFR 46.101(b) is:**

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Appendix E (continued)

**Please note the Review History of this submission:**

| Receipt Date | Submission Type | Review Process | Review Date | Review Action |
|---|---|---|---|---|
| 10/03/2011 | Initial Review | Exempt | 10/04/2011 | Modifications Required |
| 10/06/2011 | Response to Modifications | Exempt | 10/10/2011 | Approved |

You are reminded that investigators whose research involving human subjects is determined to be exempt from the federal regulations for the protection of human subjects still have responsibilities for the ethical conduct of the research under state law and UIC policy. Please be aware of the following UIC policies and responsibilities for investigators:

5. Amendments You are responsible for reporting any amendments to your research protocol that may affect the determination of the exemption and may result in your research no longer being eligible for the exemption that has been granted.

6. Record Keeping You are responsible for maintaining a copy all research related records in a secure location in the event future verification is necessary, at a minimum these documents include: the research protocol, the claim of exemption application, all questionnaires, survey instruments, interview questions and/or data collection instruments associated with this research protocol, recruiting or advertising materials, any consent forms or information sheets given to subjects, or any other pertinent documents.

7. Final Report When you have completed work on your research protocol, you should submit a final report to the Office for Protection of Research Subjects (OPRS).

8. Information for Human Subjects UIC Policy requires investigators to provide information about the research protocol to subjects and to obtain their permission prior to their participating in the research. The information about the research protocol should be presented to subjects in writing or orally from a written script. When appropriate, the following information must be provided to all research subjects participating in exempt studies:
   g. The researchers affiliation; UIC, JBVMAC or other institutions,
   h. The purpose of the research,
   i. The extent of the subject's involvement and an explanation of the procedures to be followed,
   j. Whether the information being collected will be used for any purposes other than the proposed research,
   k. A description of the procedures to protect the privacy of subjects and the confidentiality of the research information and data,
      e. Description of any reasonable foreseeable risks,

Appendix E (continued)

k. Description of anticipated benefit,
l. A statement that participation is voluntary and subjects can refuse to participate or can stop at any time,
m. A statement that the researcher is available to answer any questions that the subject may have and which includes the name and phone number of the investigator(s).
n. A statement that the UIC IRB/OPRS or JBVMAC Patient Advocate Office is available if there are questions about subject's rights, which includes the appropriate phone numbers.

Please be sure to:

→ Use your research protocol number (2011-0836) on any documents or correspondence with the IRB concerning your research protocol.

We wish you the best as you conduct your research. If you have any questions or need further help, please contact the OPRS office at (312) 996-1711 or me at (312) 355-2908. Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

Sincerely,

Charles W. Hoehne, B.S., C.I.P.
Assistant Director, IRB # 2
Office for the Protection of Research Subjects

# VITA

## PROFESSIONAL EDUCATION

| | | |
|---|---|---|
| University of Illinois at Chicago<br>*Specialty: Family Nurse Practitioner* | Master of Science | 2001 |
| Villanova University | Bachelor of Science in Nursing, | 1995 |

## PROFESSIONAL EXPEREINCE

| | |
|---|---|
| 2009-present | Coordinator, Primary Care Adult Gerontology Nurse Practitioner Program<br>University of Illinois at Chicago, College of Nursing |
| 2004-2009 | Clinical Nursing Instructor<br>University of Illinois at Chicago, College of Nursing |
| 2007-2007 | Nurse Practitioner, Palliative Care Grant Consultant<br>Jesse Brown Veterans Administration Medical Center |
| 2004-2006 | Nurse Practitioner, Dr. Larson COPD Study<br>University of Illinois at Chicago, College of Nursing |
| 2003-2004 | NCLEX Content Associate<br>National Council of State Boards of Nursing |
| 2001-2003 | Nurse Practitioner, Ovarian Cancer Early Detection Program<br>Northwestern Memorial Hospital |
| 1996-2001 | Staff Nurse, Gynecologic Oncology<br>Northwestern Memorial Hospital |
| 1995-1996 | Staff Nurse, Leukemia and Bone Marrow Transplant<br>John Hopkins Hospital |

## HONORS AND AWARDS

2012 Nomination for UIC CON graduate faculty member for excellence in diversity
2012 Nomination for Graduate Student Organization Faculty Award of Excellence
2012 University of Illinois-Chicago College of Nursing PhD Student Research Award
2011 Marjorie Powers Graduate Student Research Award
2011 University of Illinois-Chicago Provost Graduate Student Research Award
2011 Nomination for Graduate Student Organization Faculty Award of Excellence
2010 Nurse Educators of Illinois Student Scholarship Award
2010 Nomination for Graduate Student Organization Faculty Award of Excellence
2009 University of Illinois at Chicago, Departmental Teaching Excellence Award
2004 Oncology Nursing Society New Writer Award

**PUBLICATIONS (<u>*Denotes peer reviewed. **Denotes data based, peer-reviewed.</u>**

****Tiffen, J**., Corbridge, S., Shen, B., & Robinson, P. (2011). Patient simulators for teaching heart and lung assessment skills to advanced practice nursing students. *Clinical Simulation in Nursing, 7(3).*

**Corbridge, S., Robinson, P., **Tiffen, J.,** & Corbridge, T. (2010). Online learning versus simulation for teaching principles of mechanical ventilation to nurse practitioner students. *International Journal of Nursing Education Scholarship, 7*(1).

****Tiffen, J**., Graf, N., & Corbridge. (2009). Effectiveness of a low-fidelity simulation experience in building confidence among advanced practice nursing students. *Clinical Simulation in Nursing, 5*(3), e113-e117.

**Corbridge, S., McLaughlin, R., **Tiffen, J**. et al. (2008). Using simulation to enhance knowledge and confidence. *The Nurse Practitioner, 33*, 12-13.

*Swart, S., **& Tiffen, J**. (2007). Acute pericarditis. *American Association of Occupational Health Nurses, 55*, 44-46.

***Tiffen, J**., & Mahon, S. (2006). Cervical cancer: what should we tell women about screening? *Clinical Journal of Oncology Nursing, 10*, 527-531.

***Tiffen, J**., & Mahon, S. (2006). Educating women regarding the early detection of endometrial cancer—what is the evidence? *Clinical Journal of Oncology Nursing, 10*, 102-104.

****Tiffen, J.**, Sharp, L., & O'Toole, C. (2005). Depressive symptoms prescreening and post screening among returning participants in an ovarian cancer early detection program. *Cancer Nursing,* 28, 325-330.

**O'Neill, T.R. & Tannenbaum, R.J., & **Tiffen, J**. (2005). Recommending a minimum English proficiency standard for entry-level nursing. *Journal of Nursing Measurement, 13*, 129-146.

***Tiffen, J.,** & Mahon, S. (2005). Evidenced-Based Practice. Ovarian cancer screening: Are there any options? *Clinical Journal of Oncology Nursing, 9*, 369-372.

***Tiffen, J**., & Novak, K. (2004). Consult corner. Ovarian cancer. *Clinical Journal of Oncology Nursing, 8*, 80-3.

***O'Rourke-Tiffen, J**., & Pfeifer, K. (2003). Genetic risk for breast and ovarian cancer. *Advance for Nurse Practitioners, 11*, 40-48.

*Fishman, D., **O'Rourke, J**., Karnik, N., Singh, D., & Cohen, L. (2003). Will high-tech tests revolutionize the early detection of ovarian ca? *Contemporary OB/GYN, 48*, 44-56.

***O'Rourke, J.** (2003). Recent Developments in the early detection of ovarian cancer. *Prevention and Early Detection, 13*, 1-9.

***O'Rourke, J**., & Mahon, S. (2003). A comprehensive look at the early detection of ovarian cancer. *Clinical Journal of Oncology Nursing, 7*, 41-47.

*Fishman, D., Cohen, L., Bozorgi, K., Singh, D., O'Donnell, A., Donnelly, M., **O'Rourke, J**., et al.(2002). The Future of Early Detection of Epithelial Ovarian Carcinoma. *The Female Patient, 27*, 11-15.

*Fishman, D., Cohen, L., Bozorgi, K., Singh, D., O'Donnell, A., Donnelly, M., **O'Rourke, J**., et al. (2002). Detection of Early Stage Epithelial Ovarian Carcinoma. *The Female Patient, 27*, 11-15.

## BOOK CHAPTERS

Fishman, D., & **O'Rourke, J.** (2002). *Breast Cancer.* In N. Liskar (Ed.), Women's Health and Wellness (pp. 77-78). Illinois: Lippincott Williams and Wilkins Publishing.

Fishman, D., & **O'Rourke, J.** (2002). *Endometrial Cancer*. In N. Liskar (Ed.), Women's Health and Wellness (pp. 81-82). Illinois: Lippincott Williams and Wilkins Publishing.

Fishman, D., & **O'Rourke, J.** (2002). *Ovarian Cancer*. In N. Liskar (Ed.), Women's Health and Wellness (pp. 85-86). Illinois: Lippincott Williams and Wilkins Publishing.

## PRESENTATIONS

**Tiffen, J.** (2011). Innovative Curriculum Models and Teaching Gerontological and Geriatric Content in the New Curricular Model. American Academy of Nurse Practitioners. Webinar Presentation.

**Tiffen, J.** (2011). Innovative Curriculum Models and Teaching Gerontological and Geriatric Content in the New Curricular Model. National Organization of Nurse Practitioner Faculties (NONPF) Annual Conference, Albuquerque, New Mexico. Podium Presentation and Roundtable Discussion.

**Tiffen, J.** (2011). Clinical Decision Making: Context and Application for Advanced Practice Nursing. National Organization of Nurse Practitioner Faculties (NONPF) Annual Conference, Albuquerque, New Mexico. Abstract Presentation.

**Tiffen, J.,** & Corbridge, S. (2010). Does the use of intermediate-fidelity patient simulation lead to increased student confidence, knowledge, and student satisfaction among advanced practice nursing students? National Organization of Nurse Practitioner Faculty (NONPF) Annual Conference. Washington, DC. Abstract Presentation.

Corbridge, S., & **Tiffen, J.** (2009). Patient simulation versus narrated PowerPoint for teaching mechanical ventilation skills to nurse practitioner students. National Organization of Nurse Practitioner Faculty (NONPF) Annual Conference. Portland, Oregon. Abstract Presentation.

**Tiffen, J.**, Shen, B., & Corbridge, S. (2009). Does the use of intermediate-fidelity patient simulation lead to increased student confidence, knowledge and satisfaction among advanced practice nursing students? University of Illinois at Chicago Evidence Based Research Conference. Chicago, IL. Abstract Presentation.

Corbridge, S., & **Tiffen, J.** (2008). Teaching clinical skills to acute care nurse practitioner students. National Organization of Nurse Practitioner Faculty (NONPF) Annual Conference. Denver, CO. Abstract Presentation.

**Tiffen, J.,** & Corbridge, S. (2008). The use of patient simulation as a method of teaching assessment skills to nurse practitioner students. 5th International Council of Nurses International Nurse Practitioner/Advanced Practice Nursing Network (INP/APNN) Conference. Toronto, Canada. Abstract Presentation.

**Tiffen, J.,** Powell, K. Implementation of an integrated academic-service partnership model to enhance end-of-life care. Poster, 5th (2008) International Council of Nurses International Nurse Practitioner/Advanced Practice Nursing Network (INP/APNN) Conference. Toronto, Canada. Abstract Presentation.

Graf, N., **Tiffen, J**., Corbridge, S. (2008). Does a simulator experience increase self-confidence in heart and lung assessment among advanced practice nursing students? University of Illinois at Chicago Research Day. Abstract Presentation.

**Tiffen, J.,** Powell, K., O'Donnell, L., Wilkie, D. (2007). Implementation of a hospital-based end-of-life nursing continuing education program. Oncology Nursing Society Annual Meeting. Chicago, IL. Abstract Presentation.

**O'Rourke, J**., Sharp, L., Uziel-Miller, N., O'Toole, C. (2004). Depressive symptoms in a sample of women participating in an ovarian cancer early detection program. Oncology Nursing Society Congress. Denver, CO. Abstract Presentation.

## PROFESSIONAL ACTIVITIES

2010-present Peer Review Editor, International Journal of Nursing Education Scholarship
2009-present Peer Review Editor, Clinical Journal of Simulation in Nursing
2009-2009 Mentor, International Advanced Practice Nursing Fellowship Program
2005-2007 Board Member, Sigma Theta Tau Nursing Honor Society
2003-2008 Peer Review Editor, Clinical Journal of Oncology Nursing

## PROFESSIONAL ORGANIZATIONS

| | |
|---|---|
| 2008-present | National Association of Nurse Practitioner Faculties |
| 2007-present | American Academy of Nurse Practitioners |
| 2005-present | Sigma Theta Tau Nursing Honor Society |
| 1998-2008 | Oncology Nursing Society |

## CERTIFICATIONS AND LICENSURE

Illinois Advanced Practice Nurse Licensure
Illinois Registered Nurse Licensure
Board Certified ANCC Family Nurse Practitioner
Basic Cardiac Life Support Provider