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Constructing the Cornerstones for C.A.T.E.S.

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Constructing the Cornerstones for C.A.T.E.S.

by

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Dedication

I dedicate this work to my sons, Magnum and Maveric. I want them to remember to always work unto the Lord and not unto man (Colossians 3:23); know that through Christ all things are possible (Philippians 4:13). Nothing is too big or too hard. Always reach for the stars!

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Constructing the Cornerstones for C.A.T.E.S.

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The objective of this study was to establish content and face validity for C.A.T.E.S. (**C**ompetency, **A**ssessment, **T**echnology, **E**ducation, & **S**imulation) through four specific aims: 1) identify which dimension (cognitive, technical, or behavioral) of Neonatal Nurse Practitioner (NNP) competency accurately reflects each of the global statements; 2) map each of the global statements to a National Association of Neonatal Nurse Practitioners (NANNP) core competency domain; 3) define the operational definitions for the novice to expert performance subscales, and 4) determine the essential scenarios to assess multidimensional competency of NNPs. The approach was a Real Time Delphi (RTD) Method, a technologically based single round survey process providing simultaneous delivery of each of the participant's responses as answers are submitted. This method allowed each participant to have immediate cognitive examination of their responses compared anonymously with other participants' responses. The sample consisted of NNPs, simulation specialists, neonatal clinical nurse specialists, healthcare educators and experts in simulation instrumentation. The percentage of participant agreement for each answer was calculated, and those answers that received 80 % or greater agreement were identified as eligible to forward to future studies, while those with less than 80 % were identified for revision. The findings aided in establishing content and face validity for C.A.T.E.S. as a viable tool to evaluate multidimensional competency.

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List of Abbreviations

UTMB	University of Texas Medical Branch
GSBS	Graduate School of Biomedical Science
TDC	Thesis and Dissertation Coordinator
C.A.T.E.S.	**C**ompetency, **A**ssessment, **T**echnology, **E**ducation, & **S**imulation
NNP	Neonatal Nurse Practitioner
APRN	Advanced Practice Registered Nurse
RN	Registered Nurse
NICU	Neonatal Intensive Care Unit
OSCE	Observed Structured Clinical Examination
ACGME	Accreditation Council for Graduate Medical Education
NANNP	National Association of Neonatal Nurse Practitioners
RTD	Real Time Delphi

CHAPTER ONE: INTRODUCTION

SIGNIFICANCE

The United States' (U.S.) economic turmoil, dynamic healthcare system, healthcare reform efforts, nursing shortages and reduced funding resources have converged to create a "perfect storm" (Hinshaw, 2008 p. S4). In response to these challenges, there have been debates on evaluation and documentation of competency as well as mandatory continuing competence in all areas of healthcare delivery and education; indeed, Lenburg (1999a) asserted that "competent practice is more essential than ever" (p. 2). Chapter one will explain the current state of competency evaluation in healthcare, provide theoretical frameworks of competency, describe competency variables, define relevant terms, explore study purpose and goals, delineate research questions and hypotheses and describe C.A.T.E.S. (**C**ompetency, **A**ssessment, **T**echnology, **E**ducation, & **S**imulation) an instrument proposed to evaluate Neonatal Nurse Practitioner (NNP) student and provider competency.

CURRENT STATE OF COMPETENCY EVALUATION IN HEALTHCARE

Florence Nightingale (1859) first introduced the concepts of patient safety and medical error avoidance; however, these concepts have yet to be successfully implemented. Now, over 150 years later, The Pew Health Professions Commission (1995) recommended that each Board of Nursing (BON) develop, implement and evaluate continuing competency, and that healthcare professionals demonstrate such competencies throughout their careers. In response, the Citizens for Advocacy Center questioned whether healthcare professionals could continue to demonstrate minimum levels of competence after decades of practice (Citizen Advocacy Center [CAC], 1996 2001, 2004, 2011).

The Joint Commission (JC) concurred with the stipulation that hospitals must perform annual competency analysis of all healthcare personnel (Joint Commission, 2010). This requirement allows patient safety to be expressly linked to nursing

competence; an absence of competency may result in medical errors such as "failure to rescue" (Clarke & Aiken, 2003, p. 42; Silber et al., 1992). Yet Del Bueno (2005) reported that less than 40 % of newly registered nurses (RNs) were able demonstrate competent entry into practice, regardless of education or training. Axeley (2008) insisted that evaluation of healthcare provider competence was necessary for public protection, healthcare safety and maintenance of credibility. Moreover, O'Shea (2002) posited that foundational competency was the springboard to exceptional care. Finally, Eder Van-Hook (2004) stated that healthcare providers' prudent actions were essential actions towards ensuring positive outcomes, regardless of setting.

The Institute of Medicine (IOM) defined a medical error as "the failure to complete a planned action as intended or the use of a wrong plan to achieve an aim" (IOM, 1999, p. 1). IOM's (2001) follow-up report emphasized development of performance standards and environments designed for patient safety. This report highlighted the role of licensing and credentialing processes in performance standard creation, yet some questioned whether such methods adequately assessed healthcare professionals' competency. To wit, multiple-choice exams have remained the sole competency evaluation method for all nursing levels; are essential in all areas of healthcare.

The healthcare field has benefited from the knowledge gained in the aviation industry through their use of innovative training strategies and being proactive in reducing errors. Reviews of in-flight emergencies have indicated that nearly 70 % of errors were caused by miscommunication and skill incompetence (Billings & Reynard, 1984). Such findings have prompted the aviation and space industries to mandate annual crew resource management (CRM) training and flight simulation to evaluate pilots' actual cognitive, technical and behavioral competency in realistic situations. The end result of this CRM testing has been the creation of safer industries for consumers (Helmreich et al., 1990; Weiner et al., 1993).

Similar to flight simulators, healthcare simulations use computerized mannequins and human actors to generate a lifelike and rigorous learning and testing environment. Healthcare simulations are based on well-designed scenarios, occur in settings similar to

those found in practice and immerse participants in a suspension of disbelief. Participants in healthcare simulations are able to display their team-based skills in patient communication, assessment, diagnosis and treatment as if they were in an actual situation. Such simulations are both realistic and interactive, and can help improve outcomes that are difficult to demonstrate or assess by typical educational means. In fact, certifying bodies such as the Medical Council of Canada, General Medical Council (UK), Professional Linguistics and Assessment Board, National Board of Osteopathic Medical Examiners and the United States Medical Licensing Examination (USLME) have utilized simulation in their certification and licensing process to evaluate such competencies (Nehring, 2008). Furthermore, the IOM (1999) has stated that healthcare organizations and teaching institutions should implement simulation in healthcare provider training and evaluation to prevent medical error and increase patient safety.

BACKGROUND AND SIGNIFICANCE OF COMPETENCY EVALUATION

Errors made in patient care have been estimated to be the fifth leading cause of death in the U.S., resulting in nearly 100,000 deaths per year (Classen et al., 2011; IOM, 1999). Moreover, children account for nearly 4,500 of annual patient care error deaths (Miller & Zhan, 2004). Roughly $1.5 billion is spent annually in the U.S. due to surgical error (Agency for Healthcare Research and Quality [AHRQ], 2012). In addition, there are estimated to be two million preventable acquired hospital infections each year (Jackson 2007). Approximately $24 billion is spent annually in the U.S. related to medical error (IOM 1999). The U.S. ranked last (13^{th}) for low-birth-weight infants, neonatal mortality and infant mortality overall among wealthy countries, and ranked 11th for post-neonatal mortality (Guyer et al., 1999). Crucially, nursing shortages are expected to reach 20 % by 2020, resulting in mandatory overtime and increased patient loads and increasing the propensity for medical errors (Eder-Van Hook, 2004). Furthermore, the future healthcare education system is threatened by reduced work hours for resident physicians and diminished clinical placement sites for nursing students at all levels.

The current healthcare paradigm is far removed from days when doctors and nurses visited sick patients and administered home-based care. Healthcare exists as a

maze of technology, evidence-based practice and multi-level systems. Healthcare professionals must analyze numerous data points, disorders and contrasting or unique medical conditions; such an atmosphere is cognitively challenging and offers little room for error (Sitterding et al., 2012). In response to this newfound complexity, the IOM (2001) created six aims for improving health care quality—safe care, effective care, patient-centered care, timely care, efficient care and equitable care – to create an environment where competencies are incorporated into everyday practice. Simulation that reflects and directly tests these IOM aims by placing the learner in an environment in which they must use their cognitive, technical and behavioral competencies exactly as they would on the job.

L.A.C.E. & COMPETENCY

For all advanced practice registered nurses (APRNs)—e.g., nurse practitioners, clinical nurse specialists, nurse midwives, nurse anesthetists—competency is intertwined with the L.A.C.E. model (i.e., licensure, accreditation, certification, education). According to the Consensus Model for APRN regulation (2008), licensure varies by state and is defined as permission to practice as an APRN. Accreditation for APRNs requires review and approval by a recognized agency of a formal educational program. Certification is the official recognition of achievement for knowledge, skills and experience for professional standards for a specific population. Finally, education is considered to be the formal preparation in individual accredited healthcare programs (APRN Consensus Workgroup & The National Council of State Boards of Nursing APRN Advisory Committee, 2008).

Licensure

All nurses in the United States are required to attain state licensure to practice. However, APRN licensure varies by state, which further promotes lack of consensus. Normally, licensure is accomplished by applying to a state's BON, providing proof of acceptable education and evidence that an APRN has passed a population-focused certification exam. Some BONs have developed standard competencies and mandate

integration of these into nursing programs' curricula. The Texas Board of Nursing has published explicit competencies for knowledge, clinical judgment and behaviors required for graduation (Texas Board of Nursing, 2010). APRN competence is neither currently assessed nor regulated at state levels; rather, it is determined by separate professional organizations. Therefore, there is no requirement for observable demonstration of an APRN graduate's multidimensional competency to gain licensure.

Accreditation

Competency may also be assessed via accreditation, a process whereby a certifying organization has stated that an institution or facility meets their standards for approval. According to the APRN Consensus Model (2008), accrediting bodies for APRN educational programs must meet standards that include: 1) the accrediting agency must have rigorous accreditation standards to ensure a reliable agency with sufficient accrediting authority; 2) the accrediting agency must have effective evaluation mechanisms to reach a decision and ensure agency compliance; 3) the accrediting agency must have meticulous and detailed descriptions of the survey process; 4) the agency must also have a data management system associated with its accreditation decisions to produce verifiable reports, tables, and figures; 5) policies and procedures must be in place for investigation of complaints; 6) policies and procedures must be in place in respect to the withholding or removal of accreditation status for certifying bodies that fail to meet standards or requirements; and 7) the accrediting agency must submit annual reports of accrediting findings to the National Council with any proposed changes. Each of these steps helps ensure that each accredited APRN educational program meets the highest standards and that competent APRNs will enter the workforce.

The most recognized accrediting bodies, for hospital-based facilities, are the Joint Commission (JC, formerly called JACHO) and The American Nurses Credentialing Center (ANCC) Nursing Skills Competency Program. Both organizations require that all nursing staff be assessed for competence in the areas of quality of care, autonomy, interdisciplinary relationships and professional development. Each holds institutional leaders accountable for ensuring that staff competency is assessed, maintained,

demonstrated and continually improved to receive accreditation (Joint Commission, 2010; American Nurse Credentialing Center, 2008). Although it is highly recommended, simulation–based training and testing is not yet required.

Certification

Certification for APRNs is obtained in a specific population foci such as neonatal, pediatrics, or adult through use of a multiple choice advanced practice certification exam (APRN Consensus Work Group & National Council of State Boards of Nursing APRN Advisory Committee, 2008). Thus, competency is currently determined solely by a pass or fail score on a multiple choice test. Likewise, certification is maintained by obtaining continuing education hours in specified areas of practice or by passing a re-certification exam. Studies have not adequately demonstrated that exams are linked to competency or better patient outcomes (Whittaker et al., 2000). There exists no healthcare requirement for practitioners to physically demonstrate their combined cognitive (knowledge), technical (psychomotor) or behavioral (leadership, teamwork, communication) skills sets—i.e., multidimensional competency—to acquire or maintain their licensure or certification. Lack of instrumentation for scoring, documenting, mapping, tracking and retrieving Neonatal Nurse Practitioners' (NNPs) multidimensional competency during simulation impedes advancement toward multidimensional competency-based assessment.

Education

Healthcare practitioners are not the only ones affected by changes in competency assessments. The Carnegie Foundation challenged nursing educators to transform their practice through education focused on students' sense of situational awareness, actions to take in clinical situations, clinical reasoning, increased ways of thinking and identity formation (Benner et al., 2010). Subsequently, students' plea for radical transformation also detailed the importance of joint efforts between educational institutions and partnering clinical facilities, resulting in numerous nurse residency programs for new graduate registered nurses (RN).

Increases in information and research are essential for APRN preparation, but exceed APRN programs' curricular capacities. The traditional "hands-on" or apprenticeship model is no longer a valid means of educating future providers. Healthcare trends have been moving towards a competency-based education format focused on outcomes rather than strictly curricula-based memorization (Commission of Collegiate Nursing Education [CCNE], 2009; Frank et al., 2010; National League for Nursing Accrediting Commission [NLNAC], 2008). This paradigm shift is transpiring as healthcare aims to improve competency and create better patient safety and quality outcomes.

Concurrently, APRNs' formal education must include core course competencies such as pathophysiology, pharmacology and advanced health assessment. An IOM (2010) report highlighted the importance of assessing, documenting and tracking student competence to develop nursing education. The American Association of Colleges of Nursing's (AACN) educational standard documents included QSEN essential core competencies; knowledge, skills and attitudes (KSAs); and outcomes expected of all APRN programs (American Association of Colleges in Nursing, 2006, 2008, 2011). Nursing programs should develop their own curricula using these competency guidelines to adequately prepare graduate nurses in these core essentials. Although no consensus exists for ways in which to handle these requirements while adjusting for healthcare changes and verifying competency, use of simulation-based training and testing is a promising pedagogy.

CORE COMPETENCIES

As competency-based education and assessment become the foundation of education in healthcare, governing bodies have compiled core competency domains deemed essential for the field. The Accreditation Council for Graduate Medical Education (ACGME) has adopted six domains that are often evaluated using the Objective Structured Clinical Examination (OSCE)—a series of encounters with standardized actors trained to portray multiple medical conditions and rate subject performance (ACGME, 2013).

Nursing has also developed numerous core competencies. AACN's *The Essentials of Education in Nursing* has delineated outcomes expected of baccalaureate, masters and doctoral nursing program graduates (AACN, 2006, 2008, 2011). The Quality and Safety Education in Nursing (QSEN) Institute created an innovative framework to prepare future nurses for improved quality and safety of their healthcare systems (Strategic Advisory Group for Graduate-Level QSEN Competencies [QSEN], 2012). Phase I was led by Dr. Linda Cronenwett; it identified essential KSAs for competent and reliable care (Smith et al., 2007). Phase II, which was executed by QSEN faculty, a National Advisory Board and 17 leaders from 11 professional organizations representing advanced nursing practice, delineated graduate-level quality and safety competencies for nursing education and proposed objectives for all competency-specific KSAs (Cronenwett et al., 2009). Phase III will facilitate faculty integration of KSAs and QSEN competency domains into curricula. Additionally, the National Organization of Nurse Practitioner Faculties (NONPF) has developed competency domains to specifically drive nurse practitioner education (National Organization of Nurse Practitioner Faculties [NONPF], 2013). Subsequently, the National Association of Neonatal Nurse Practitioners (NANNP) established their own set of core competencies for NNPs (NANNP, 2010a; see Appendix A).

NEONATAL NURSE PRACTITIONERS AND COMPETENCIES

An NNP has been defined as "a registered nurse with clinical expertise in neonatal nursing who has received formal education with supervised clinical experience in the management of sick newborns and their families" (National Association of Neonatal Nurses, SIG-AP Education Task Force [NANN], 1992). NNPs were developed in the U.S. in the 1970s to account for diminished survival rates of extremely low birth weight babies, physician shortages and a focus on advanced practice roles (Farah et al., 1996). More recently, reductions in resident work hours have increased the need for more NNPs in Neonatal Intensive Care Units (NICUs). Besides their clinical function, NNPs are also responsible for antenatal and neonatal consultations, family and staff education and research. During clinical practice, NNPs provide essential medical care and

management of neonates from birth to discharge, spending approximately 80 % of their time in direct patient care (Buus-Frank et al., 1996). Similar to the physician role, NNPs order and interpret diagnostic and laboratory tests, prescribe treatments and medications and administer enteral or intravenous nutrition. NNPs are trained to and routinely perform lifesaving procedures such as endotracheal intubation, umbilical line placement, needle thoracostomy, chest tube insertion and lumbar puncture. NNPs are expected to lead resuscitations and direct patient care in the delivery room, the NICU and on neonatal transports.

Contemporary competency assessment for newly graduated NNPs consists of a multiple-choice exam administered by the National Certification Corporation (NCC). The testing domains consist of four foci: 1) general assessment; 2) general management; 3) disease process; and 4) professional issues (NCC, 2012). In 2009 NANN compiled a list of core competency domains: 1) Management of Patient Health and Illness Status; 2) The Nurse Practitioner–Patient. Relationship; 3) The Teaching-Coaching Function; 4) Professional Role; 5) Managing and Negotiating Healthcare Delivery Systems; 6) Monitoring and Ensuring the Quality of Healthcare Practice; and 7) Culturally Sensitive Care with two sub-competency domains including pharmacology and skills (NANN, 2009). Subsequently, the National Association of Neonatal Nurse Practitioners (NANNP) (2010b) stated that all NNPs require regular evaluation on core competencies within these domains to provide safe and reliable care. NANNP (2010a) created a "toolkit" used to steer annual performance evaluation of NNPs. This NANN toolkit elaborates on the NNP domains and uses chart reviews, portfolio appraisals, procedure or case logs, patient surveys and 360-degree global evaluation to evaluate NNPs of all skill levels. Nonetheless, demonstration of multidimensional competency has not been a requirement, nor does an instrument exist for assessment, documentation, mapping or tracking.

THEORETICAL FRAMEWORKS

Benner's (1984) seminal theoretical competency research study was adapted from the Dreyfus' Model of Skill Acquisition (Dreyfus & Dreyfus, 1980). Although Benner's work primarily focused on nursing ethics, it also applies to physical demonstration of

competency. Benner's model operationalized practitioners' developmental progression through a series of understanding and performance steps. The model's "novice" step is based on nurses' reliance on strict guidelines. The "advanced beginner" step follows, and then moves to the "competent practitioner," who possesses situational awareness shaped by experience. Competent practitioners draw from their accumulated experience while beginning to lead and plan ahead. Benner's model continues to a "proficient" stage and finally the "expert" phase. An expert is a nurse who uses a rational know-how and performs without need for rules or sequence based on their collected history of experiences and theoretical foundations (Benner, 1984). Dr. Benner's pivotal work prompted the Texas Nurses Association to develop a Continuing Competency Framework; this paradigm stipulated that all nursing competency evaluation systems should use Benner's theoretical framework to properly evaluate competency at each stage (Texas Nurses Association: Task Force on Continuing Competence, 2008). Additionally, research and evidence drive NNPs' care of critically ill neonates; thus NNPs must strive to maintain competence throughout their career trajectory. Furthermore, Benner's model is the theory utilized in the development of the items in the NANNP toolkit. Moreover, Benner's work is the backbone of operational definitions developed for C.A.T.E.S.; the novice to expert operational definitions created for the C.A.T.E.S. will help guide the raters in their overall evaluation of a subject's performance in simulation (Appendix B).

Spencer and Spencer (1993) studied competency from a business perspective and described it as a giant iceberg. The small portion of the iceberg appearing above the water's surface represents one's cognitive and technical skills—aspects that are easy to observe and evaluate. The large portion lying beneath the water's surface represents behavioral competencies such as teamwork, leadership and communication (Spencer & Spencer, 1993). Realizing that competency is not just what a practitioner or student knows or can physically do but also how they communicate, as well as lead and function as a member of the team is essential to a complete and thorough competency evaluation. The global statements developed for C.A.T.E.S. were developed with this framework in mind. Finally, each of these aspects can be observed and evaluated in simulation (Appendix C).

A third germane theoretical framework is Miller's Assessment of Clinical Skills, Competence & Performance. Miller's Pyramid (1990) helps to join each of the aforementioned theories as well as explain the need to evaluate students' cognitive abilities, know-how (competence) and ability to show how it is done (mastery of the skill). This model may be easily demonstrated through simulation, which allows evaluation of individuals' knowledge base, critical thinking abilities, teamwork, social learning and technical skills. Additionally, simulation use allows for standardized conditions for competency testing. Finally, learners can demonstrate competence and ability to perform via simulation of clinical events, thus exhibiting reflective learning (Miller, 1990). Thus, C.A.T.E.S. will utilize simulations as the means to allow the practitioner or student to demonstrate their multidimensional competency. Furthermore, Mehay & Burns (2009) expanded Miller's Pyramid to Miller's Prism to incorporate the iceberg model (explained through QSEN's knowledge, skills and attitudes), as well as Benner's Novice to Expert theory (see Appendix D). A complete theoretical foundation for C.A.T.E.S. can be depicted through a three-dimensional design using Miller's prism and adding to the base the corresponding NANNP competency domains as well as inserting the essential NCC core testing areas to one additional side (Appendix E).

VARIABLES AND DEFINITIONS OF RELEVANT TERMS

Competency Definitions

The Merriam-Webster Dictionary has defined competence as "a sufficiency of means for the necessities and conveniences of life" and as "having sufficient knowledge, strength or skill" to perform a task (Merriam-Webster, 1993, p. 463). From psychological and legal viewpoints, competence suggests one who acts sensibly in specific instances; a series of actions or behaviors that can be performed, observed and assessed; and the capability to perform a job, reason logically and make decisions (*Dusky v. U.S.*, 1960; Manley & Garbett, 2000; Woodruffe, 1993). Epstein and Hundert (2002) defined professional competency as the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning emotions, values and reflections in daily practice for the benefit of the individual and community being served. Aviation has defined

competency as “the quality of being adequately or well qualified physically and intellectually to accomplish assigned responsibilities” and “possession of the required level of knowledge, skills, experience and where required, proficiency in English, to permit the safe and efficient provision of aviation services” (SKYbrary, 2010, p. 1). McMullan et al. (2003) distinguished between competency and competence—whereas competence focuses on the action or behavior, competency is the motivating factors that underpin one’s competence. This dissertation will use the terms interchangeably, as is common practice in nursing and healthcare.

NURSING DEFINITIONS OF COMPETENCY

Although nursing lacks consensus, several U.S. states’ Boards of Nursing (BONs) have published definitions of competency. Tennessee’s BON described competence as “the application of integrated nursing knowledge and the interpersonal decision-making, psychomotor, communication and leadership skills expected for the nursing practice role within the context of the public health, safety and welfare" (Tennessee Board of Nursing, 2002, p. 1). California’s BON stated that a nurse is competent following demonstration of the ability to transfer knowledge through the nursing process from social, biological and physical sciences (California Board of Nursing, 1995). Texas’s BON defined competency as successful demonstration of comprehension, judgment, aptitude and professional principles derived from nursing and general education (Texas Board of Nursing, 1993).

The American Nurses Association (ANA) (2000) convened a panel of nursing experts to develop multiple definitions of competency, which included continuing competence, professional nursing competence and continuing professional nursing competence. Continuing competence was deemed “the ongoing professional nursing competence according to level of expertise, responsibility and domains of practice” (American Nurses Association [ANA], 2000, p.10). Professional Nursing Competence was defined as behavior based on beliefs, attitudes and knowledge matched to and in the

> context of a set of expected outcomes as defined by nursing scope of practice, policy, *Code for Nurses*, standards, guidelines and benchmarks that assure safe performance of professional activities” (American Nurses Association [ANA],

2000, p.10). Continuing Professional Nursing Competence was described as ongoing professional nursing competence according to level of expertise, responsibility and domains of practice as evidenced by behavior based on beliefs, attitudes and knowledge matched to and in the context of a set of expected outcomes as defined by nursing scope of practice, policy, *Code of Ethics*, standards, guidelines and benchmarks that assure safe performance of professional activities (American Nurses Association [ANA], 2000 p.11).

C.A.T.E.S. DEFINITION OF COMPETENCY

C.A.T.E.S. stands for Competency, Assessment, Technology, Education, & Simulation. The competency construct for C.A.T.E.S. was developed through review of current definitions in the literature and use of Walker and Avant's (2011) concept analysis technique. C.A.T.E.S. defines competency as an observable demonstration of knowledge, psychomotor skills and behaviors required for quality, safe and reliable practice. Attributes defining competency arise from nurses' knowledge, actions, professional behaviors and self-regulation. Competency in healthcare is ascribed to intelligent, coordinated professionals who are good communicators, listeners, leaders and team players. According to C.A.T.E.S., a competent provider motivates others using positive attitudes, persuasive communication skills and strong ethical foundations. Competent individuals constantly adapt to changing healthcare systems in actual or simulated experiences. Competencies should be observable, standardized and used to improve outcomes (Cates, 2011).

Utilization of C.A.T.E.S. requires a basic understanding of several concepts and terms. Once there is rater understanding of these terms, subject scoring in simulations becomes more straightforward. The following is a list of variables used within C.A.T.E.S.

- Competency: Demonstration of the knowledge, psychomotor skills and behaviors required for safe and reliable practice.
- Cognitive Competency: Demonstration of knowledge through one's ability to recognize and properly diagnose disease states and order appropriate treatment.

- Technical Competency: Psychomotor ability to perform procedures required to manage patient symptoms.
- Behavioral Competency: Demonstration of professionalism, teamwork, leadership and communication skills required to direct patient care and empathize with families and patients.
- Transparent Thinking: Subjects' verbal expression of mental models to team members.
- Quality Communication: The sharing of information in a complete, clear, concise and timely manner.
- SBAR Communication: Explanation of the Situation (i.e., what is happening with the patient); description of the Background (i.e., what is the clinical background); depiction of the Assessment (i.e., what do I think the problem is); and provision of a Recommendation (i.e., what would I recommend).
- Situational Awareness: The thorough evaluation of one's surroundings to provide awareness of existing resources (e.g., human, technological, equipment) and ways in which to access them quickly.
- Team Leader: Subjects who provide guidance, instruction and direction to others (i.e., the team) in order to achieve a primary goal.
- Professional: Subjects who dress appropriately and behave respectfully when interacting with others.

PURPOSE AND GOALS

The purpose of this study was to establish content and face validity for C.A.T.E.S. via four specific aims: 1) identify which dimension (cognitive, technical or behavioral) of NNP competency accurately reflects each of the global statements; 2) map each of the global statements to a National Association of Neonatal Nurse Practitioners (NANNP) core competency domain; 3) define the operational definitions for the novice to expert performance subscales; and 4) determine the essential scenarios to assess multidimensional competency of NNPs.

The proposed research was expected to contribute to the creation of an instrument by serving to establish content and face validity for C.A.T.E.S. This instrument will be expected to accurately score, document, map, track and retrieve past evaluations of NNPs' multidimensional competency. C.A.T.E.S. will significantly contribute to the research field as well as practice because it will enable NNPs to be evaluated in simulated clinical situations that require multidimensional competencies of providers. Furthermore, C.A.T.E.S. can be extended to additional nursing specialties, paramedical areas and other medical disciplines, in turn improving healthcare quality and promoting public safety.

RESEARCH QUESTIONS AND HYPOTHESES

- Specific Aim 1 Research Question: Are the global statements accurate reflections of a competency dimension?
- Specific Aim 2 Research Question: Are the global statements accurate reflections of a NANNP competency domain?
- Specific Aim 3 Research Question: Are the novice to expert operational definitions accurate reflections of NNP performance subscales?
- Specific Aim 4 Research Question: What are the essential scenarios to evaluate multidimensional NNP competency?

STUDY DESIGN

The study design was the Real Time Delphi Method (RTD) developed by Gordon and Pease (2006). Participants were presented with series of questions through an on-screen format while statistics from other participants' answers were revealed. Statistics displayed included total number of participant answers and answer rationales.

Unlike its predecessor (the traditional Delphi method), the RTD eliminated repeated rounds, by which web-based software analyses and reports results in real-time (allowing participants to immediately view and compare results). Thus, RTD is an uninterrupted process that dramatically shortened the time requirements to conduct large-scale, complex studies.

The study sample included 25 panelists that were chosen based on their ability to contribute to the process of creating a valid and reliable instrument, C.A.T.E.S., for the assessment of NNP multidimensional competency. The expert panel was a heterogeneous sample of seasoned NNPs, neonatal simulation specialists, practiced neonatal clinical nurse specialist, experienced healthcare educators with a background in competency assessment or creation and individuals that have previously worked on other instruments used to assess learners performing simulation.

The run-time was one month, but could have run longer if response rate had been low or ended sooner when a pre-determined cutoff point was reached, which is normally when participant feedback has resulted in a steady state (Gordon, 2012). Upon study completion the PI used RTD software (version 10.17.13) and SPSS (version 20) to condense the results and conduct statistical analysis.

CONCLUSION

Healthcare has lacked a valid and reliable instrument that assesses the multidimensional nature of competency, is technologically based, has solid theoretical underpinnings, can map subjects' essential core competencies and tracks the performance of healthcare providers over time. Valid and reliable instruments are the foundation of quality research. The scope, potential and quality of research are limited by poorly developed or inadequate instruments (DeVellis, 2003). Excellence in nursing research and education requires evidence-based teaching and evaluation methods (Oermann, 2009, p. 2). This innovative research study sought to establish content and face validity for the C.A.T.E.S. instrument, including the precise mapping of global statements to each competency dimension and domain, accurate operational definitions of novice to expert scales and identification of essential scenarios for use in future studies.

C.A.T.E.S. will be the first instrument designed to assess NNPs' cognitive, technical and behavioral competency during simulation while using technology to 1) gather demographic information; 2) assess physical demonstration of multidimensional competency; 3) score subjects on a global novice to expert scale; 4) map core competencies for subjects; and 5) track performance of high-stakes procedures. An

ultimate long-term goal is for this information to be collected in a national database repository. Such a database could be used for evaluation of student readiness to practice or graduation requirements, medical staff credentialing, acquisition and maintenance of licensure or certification, application toward accreditation, future employment, as well as quality and safety research. Finally, use of C.A.T.E.S. combined with quality healthcare simulation may allow for increased accountability and transparency for NNP certification acquisition and maintenance for institutions and the public alike.

CHAPTER TWO: LITERATURE REVIEW

INTRODUCTION

Many industries have recognized the lifesaving importance of identifying, assessing and reducing human error as well as increasing provider competency. This chapter details an extensive review of literature concerning competency. The literature review included competency assessment models, competency assessments using simulation across various professions and actual instruments used to evaluate simulation-based competency. Articles exploring perceptions of competency and leaders in healthcare competency evaluation were also incorporated. Finally, gaps in the literature were identified and future research implications discussed.

The search engines utilized to gather information concerning competency consisted of OvidPS, CINHAL, PubMed, and Google Scholar. Keywords used for the literature search were "competency," "nursing competencies," "clinical competence," "patient safety" and "patient outcomes." Review articles on clinical competence revealed a follow-up search term: "objective structured clinical examination" or "OSCE". OSCE is a technique for evaluation of clinical performance through use of multiple simulation stations (mannequin-based or standardized patients) and written or oral evaluations. Each of these keywords was utilized to find research pertaining to healthcare students and providers evidence of physical demonstrations of clinical competency. Only research articles written in English were reviewed. In addition, only those articles published on or after 1975 were included; this was the year OSCE technique originally appeared in the literature and it immediately preceded Benner's (1984) dissemination of the Novice to Expert theory. The review of literature was originally limited to nursing competencies; however, it was later expanded to include medicine, aviation and space industries in order to provide relevant historical context of industries that pioneered competency assessments. The search initially revealed 1,080 articles, but articles relating to a specific skill or those with a very narrow healthcare focus were not incorporated. Of the remainder, 25 articles were selected because of their focus on nursing or medical

competency evaluation. Of the 25 articles selected, 14 discussed competency assessment models or curricula, five examined research dealing with various populations and their perceptions of competency and six detailed studies to evaluate instruments used to evaluate competency and performance in simulated healthcare settings.

COMPETENCY ASSESSMENT MODELS

Aviation

A pivotal study of competency evaluation in aviation was included because human error has been shown to be a major factor in both healthcare and aviation accidents (Howard et al., 1992). Helmreich et al. (1990) reported over 2,000 observed crew resource management (CRM) flight simulations of 859 crews and rated 14 separate components using the Helmreich et al. (1987) Line Loft Worksheet (LOFT). The study utilized chi squared statistics to determine that performing CRM increased the probability of excellent performance and decreased the likelihood of poor performance in actual flight. Study strengths included standardized testing and a large sample size. Limitations included a large variation in inter-rater use of the worksheet and quality and timing of testing, as well as a lack of documented theoretical study framework. Finally, the LOFT worksheet used for documentation was not a technologically automated database but a paper based document, so the data could not be easily stored, tracked, mapped, or retrieved.

Nursing

Lenburg (1999b) developed the Competency Outcomes and Performance Assessment (COPA) model, which was constructed around four central questions. Lenburg used these four queries to establish eight core practice competencies; this model defined competency through practice expectations or end-result outcome statements (Lenburg, 1999b). Various U.S. nursing schools have utilized the COPA model. Klein and Fowles (2009) compared schools that implemented Lenburg's COPA model to schools that did not. Statistical analyses consisted of Bartlett's test for sphericity, Kaiser-Meyer-Olkin tests, and the Klein Scale. Six-D scale and Likert structured surveys to

students and faculty were administered. The results revealed that those students trained under the COPA model had slightly lower scores in perceived levels of preparation in all six subscales; however, further review of 361 nursing students in programs utilizing COPA indicated higher overall scores on the National Council Licensure Examination (NCLEX) and higher scores in the areas that were emphasized with COPA. Klein and Fowles' (2009) study strengths included large sample size, evaluation of multiple entry levels of nursing education and close symmetry with nursing curricula conceptual frameworks. Study limitations included use of subjective surveys of students' perceived competency and lack of a database for documentation instrument to facilitate data storage, tracking, mapping and retrieval.

Del Bueno (2005) created a competency evaluation method called Performance-Based Development System (PBDS) for use in acute care settings to assess graduate nurses' job readiness. The PBDS instrument utilized interviews, tests and simulations. Upon completion, data may be compared with scores defined by numeric values. Ratings may range from unsafe to expert and can help to determine whether RNs are prepared to enter practice. Further competency development and reassessment (if needed) can be provided to registered nurse (RN) participants (Del Bueno, 2005). Initial results reported that only "35% of new graduate nurses meet entry level competency expectations" (Del Bueno, 2005, p. 278). The methods used in the PBDS model were limited by several factors. First, the evaluators must be well-trained in PBDS checklist use. Secondly, PBDS assessment use is costly and thus can typically only be used in large centers. Thirdly, PBDS lacks a documented theoretical framework making it more difficult to relate to curricula. Finally, the PBDS checklist is not designed for the data to be easily stored, tracked, mapped or retrieved.

The Structured Observation and Assessment of Practice (SOAP) competency assessment model was developed by Levitt-Jones et al. (2004). SOAP observations include task-related skills, as well as the integration of knowledge, skills and attitudes for nursing practice. This model incorporated observation of clinical events and qualitative interviews instead of checklists. This holistic model was administered over one full day of study, reflection and verification of practice readiness for 1,031 nursing graduates. The

data were then mapped solely to the Australian Nursing and Midwifery Council Competency Standards for the Registered Nurse. Finally students were given a post-course Likert structured evaluation (Levitt-Jones et al., 2004). Study strengths included use of actual clinical situations coupled with extensively trained evaluators and data mapping to core competencies. This study was limited by an absence of a theoretical framework for competency assessment and the need for evaluators to be experienced advanced practice RNs with extensive training on instrument usage. Additionally, the evaluation was lengthy, costly, subjective and lacked sufficient statistical analysis. Finally, SOAP did not utilize software to document, map, store and track data.

Roberts and Brown (1990) tested an Observed Structured Clinical Examination (OSCE) that was used in evaluation of nursing students' clinical competency. This five-year study examined the OSCE's inter-rater reliability, test-retest reliability and interstation consistency. Statistical results were achieved using quadratic Kappa calculations, intra-class coefficients and Cronbach's alpha. Inter-rater reliability and test-retest consistency were both found to be acceptable; however, interstation reliability tested low, indicating that students did not have equal performance in all stations. This OSCE proved to have reasonable content validity due to design and posttest surveys of students, yet scores did not correlate with students' course scores or clinical grades. OSCE design was found to be a reliable and valid instrument for clinical competency and a good instrument for assessment of curricular changes (Roberts & Brown, 1990). Study strengths included its simultaneous evaluation of inter-rater reliability, test-retest and interstation consistency and its large sample size. The study was limited by a lack of detail on rater training, the evaluation documentation instrument and a lack of a description of OSCE stations' structure. Additionally, this study did not state a theoretical framework used in its assessment of competency. Finally, the model did not utilize software to document, map, store, track and retrieve data.

Todd et al. (2008) developed a quantitative simulation evaluation instrument (SEI) for use in undergraduate nursing education. This instrument was aligned with the American Association of Colleges of Nursing (AACN) core competencies and utilized OSCEs. The primary dimensions of evaluation included assessment, communication,

critical thinking and technical skills. Experts evaluated the tool's content validity. Inter-rater reliability was obtained through rater training in SEI usage and pilot testing yielded an 86 % agreement average. Limitations included small sample size, poor generalization and lack of a documented theoretical framework. Again, the SEI did not utilize software to facilitate documentation, mapping, storage, tracking or retrieval of data.

Tai and Chung (2008) evaluated a competency-based teaching and performance model for Bachelors of Science in Nursing (BSN) students in Taiwan. The researchers used action research and quasi-clinical situation models in pilot and final testing phases to determine model reliability and validity. The sample size consisted of 15 nursing students. A Likert structured survey indicated high model validity because of the extensive planning and correlation to the nursing process. In addition, the model's validity was elevated because of the extensive examiner training and standardized patient actors. Finally, students were surveyed on quality of content, content relevance and applicability via post-course Likert structured evaluation. Study strengths included extensive training for both faculty and students prior to the examination. The major study limitation was its small sample size. Additionally, the instrument used by the examiners to document student competency was not explained. Finally, no theoretical framework was offered and the instrument did not use software to document, map, store, track or retrieve data.

Jeffries et al. (2011) conducted a multi-center test of a simulation-based cardiovascular assessment curriculum for advanced practice nurses. This study used a multicenter, prospective, quasi-experimental design. The U.S. study was based in four geographically distinct university nursing schools and included 36 participants. Before and after completing simulations, students executed two tests to measure cardiovascular cognitive ability and physical assessment skills; they also completed a pre-intervention self-confidence questionnaire, a posttest self-efficacy questionnaire and course satisfaction evaluations. Students were divided into learner-led and instructor-led sessions. The learner-led group received an Essential Cardiac Auscultation CD-ROM, PowerPoint slide set and learner's manual; students were encouraged to practice using all materials and to document their time in a log-book. The instructor-led group received

eight hours of combined didactic and hands-on practice in which 12 case-based presentations were used in conjunction with Harvey, a clinical human simulator. After one to two weeks of education interventions, participants completed an OSCE to assess six different clinical scenarios and performances were rated on a 13-item checklist. The students successfully performed accurate cardiovascular assessments following curriculum completion. Pre- to post-test scores improved by 22% and participants reported a significant gain in confidence upon course completion (Jeffries et al., 2011). The study was limited by a small sample size, a potential inability for many institutions to implement curriculum due to limited funds and equipment and few faculty members trained in use of high-fidelity simulation. Additionally, the study did not address the reliability or validity of instruments used in participant evaluations.

Medicine

Cohen et al. (1990) examined the reliability and validity of an OSCE in assessment of surgical residents' clinical competency as compared to recent medical school graduates. Ninety-eight participants were evaluated in 38 stations using observed simulated patient encounters with trained standardized patients, followed by a written exam. Participants were observed and graded by surgeons educated in the use of a structured checklist. The researchers used a compilation of statistical constructs, including Cronbach's alpha and Pearson product moment correlation and confirmed that surgical residents performed significantly better than the newly graduated foreign medical students. Although not examined in this study, a high degree of course standardization was achieved through the use of trained standardized patients, identical scenarios and test questions, surgeons trained as observers, defined observer roles and behaviors and use of a standardized checklist (Cohen et al., 1990). The studies strengths included strong construct validity for differentiation on levels of training while testing across seven surgical specialties in seven domains of performance. Limitations included a lack of statistical information concerning inter-rater reliability (IRR). Additionally, the study lacked evidence of a theoretical framework and the documentation instrument was

not technologically automated, resulting in data that could not be easily stored, tracked, mapped or retrieved.

Gaba et al. (1998) studied competency evaluation of anesthesiologists and certified nurse anesthetists as well as the inter-rater reliability of multiple independent observers of videotaped simulations. The raters scored the learners via a checklist similar to that developed by National Aeronautics and Space Administration (NASA) and the University of Texas Aerospace Crew Performance Project for Crew Resource Management (CRM) (Helmreich et al., 1987). This checklist evaluated the technical and behavioral performance of 14 teams managing two separate anesthesia crises. Gaba et al. (1998) used Kappa statistics, Intra-class Correlation Coefficients and within-group inter-rater reliability coefficients to determine that videotaped simulations and a standardized checklist can be utilized to score both technical and behavioral competency with good inter-rater reliability. The strength of this study included standardized testing and documentation on a checklist previously validated in aviation studies. In addition, the checklist was completed by anesthesiologists trained in the use of the instrument and in observation. Study limitations were that the standardized checklist and observer training did not address fluctuating grading behavior over time and levels of participant experience were not recorded. Additionally, the instrument did not map results to core competencies nor was a theoretical framework provided. Finally, the checklist was not in a database format, so data could not be easily documented, stored, tracked, mapped or retrieved.

Gizardas et al. (2007) examined whether utilization of simulation could determine experience levels when evaluating competency in emergency medicine residents. This prospective study evaluated 44 emergency medicine residents utilizing a high fidelity simulator to demonstrate cases of anaphylactic shock. The residents were rated via checklist on critical performance steps, including epinephrine administration and time to completion of surgical airway. Utilizing a combination of Pearson, chi square, Fisher exact test, and the Shapiro-Wilk test it was concluded that simulation use could evaluate competency as well as determine learners' level of experience (Girzadas et al., 2007). Study strengths included standardized and realistic hands-on simulations. Simulations

were conducted after practice sessions to ensure standardized test conditions. Limitations were that the study was only partially blinded (observers knew participants' training levels), the checklist was not validated and data was collected by several different individuals with various levels of medical training. Finally, no theory was presented and the lack of analytical automation resulted in data that could not be easily stored, tracked, mapped or retrieved.

Kligler et al. (2007) examined family medicine residents through direct observation (DO) scored on a Likert structured checklist and written treatment plans utilized in an OSCE with standardized patients to evaluate their understandings of complementary/alternative medicine (CAM). This quasi-experimental study used scores of 19 fourth year family practice residents' scores in DO and written treatment plans and mapped these scores to the six Accreditation Council for Graduate Medical Education (ACGME) competency domains. The DO instrument was not standardized and was consistently poor in evaluation of behaviors greater than 50 percent of the time, although it was useful in providing learner debriefing. Written treatment plans revealed a curricular deficit in areas of spirituality, history taking and treatment planning in addition to assessment of patient readiness to change and implementation of integrative treatment strategies (Kligler et al., 2007). Study strengths included evaluation of uncommonly tested data in medicine, such as CAM. The limitations included a small sample size, no documented theory, no discussion of statistical instruments utilized in data evaluation and no reference to observer training in neither checklist use nor the ways in which standardized patients were trained. Finally, the checklist was not in a database format resulting in data that could not be easily stored, tracked, mapped or retrieved.

Sloan et al. (1996) evaluated an OSCE for reliability and validity at multiple levels of medical education and the impact of immediate feedback on students' performance. Overall, 53 participants, ranging in levels of experience from medical students to third year chief surgical residents were evaluated using standardized OSCE and half the participants were given instant feedback. All students completed a post-course Likert framed evaluation. As expected, researchers found performance to increase linearly with training. Additionally, it was found that reliability of this OSCE increased to

0.9 per the Spearman-Brown coefficient after approximately 30 stations. Validity was also found to be high as the stations were standardized and correlated with common knowledge required of theses surgical residents. Sloan et al. (1996) also recognized that this OSCE was beneficial for identifying areas in the current curricula that require revision. Finally, students that received immediate feedback gave above average ratings for the evaluation in regard to quality and relevance. Study strengths included standardized training of observers and patient actors and an identical OSCE administered to all participants. Study limitations included an unequal split between senior and junior students, the lack of a documented theory and difficulties in quantifying the checklist data to map, store, track and retrieve data.

Townsend et al.'s (2001) study compared United Arab Emirates medical students' OSCE scores with their final medical examination scores. Twenty-eight medical students took an OSCE pretest, spent 10 weeks in the clinical setting and subsequently repeated the pre-test OSCE. Once completed, students sat for their final medical school examination. The study revealed that students improved upon their pre- and post-OSCE scores, but these scores did not correlate with their final exam scores. OSCE scores were analyzed using SSPS and Microsoft Excel. The strengths of this study included use of a checklist with global rating scores to rate students in the OSCE stations. This study was limited by a small, non-randomized study sample. Rater training was not described nor methods in which stations were conducted and standardized. In addition, no theoretical framework was documented. Finally, this study did not map the stations to a specific set of competencies (e.g., ACGME) and the documentation instrument did not utilize technology to map, store, track and retrieve data.

PERCEPTIONS OF COMPETENCY

Gillispie et al. (2011) examined nurse's perceptions of the components of a competent nurse in the operating theater. This focused group study utilized thematic findings from 27 participants. The study identified three themes: 1) coalescence of theoretical, practical, situational and aesthetic knowledge within a technocratic environment; 2) the importance of highly developed communication skills among teams

of divergent personalities and situations; and 3) managing and coordinating the flow of the list (Gillispie et al., 2011). The study concluded that knowledge, teamwork and the ability to direct patient care were essential components for operating theatre competency standards; these findings could provide instrument development in measurement of nurses' perceived competence (Gillispie et al., 2011).

Hoffman et al. (2004) evaluated healthcare workers' perceptions of APRNs, specifically acute care nurse practitioners (ACNPs). This study utilized a constant comparative method to assess the perceptions of bedside critical care nurses, respiratory therapists, and attending physicians toward the competency and contribution of APRNs. The study revealed four main themes: 1) accessibility, competence/knowledge, care coordination/ communication and system issues; 2) value for their accessibility, expertise in routine daily management of patients and ability to meet patient/family needs, especially for "long-stay" patients; 3) respect for their commitment to providing quality care and for their communication skills, exemplified through teaching of nursing staff, patient/family involvement and fluency in weaning protocols, and 4) continuity of care, patient/family focus and commitment. This study concluded that an overwhelming sense of confidence and respect existed for ACNPs' level of competence (Hoffman et al., 2004).

Wysong & Driver (2009) evaluated competency from the patient perspective. This descriptive qualitative study utilized interview data and content analysis of themes to determine patient perceptions of nurses' skill. Thirty-two patients were asked three questions: 1) what attributes do patients use to determine whether a nurse is skilled rather than unskilled?; 2) to what extent is the observed technical skill of a nurse during procedures a factor that patients use to assess the nurse's skill?, and 3) to what extent do nurses' attributes identified by patients correspond to nurses' characteristics in the AACN Synergy Model For Patient Care? The study concluded that patients focused on nurses' interpersonal skills and caring and placed technical performance as a secondary marker to competency (Wysong & Driver, 2009).

Dr. Ludikhuize and associates (2012) examined the accuracy of 198 doctors and nurses perceptions of their own care through a retrospective review of charts of 47

patients that received cardiopulmonary resuscitation (CPR) or were admitted to the intensive care unit. Medical teams were interviewed upon completion of the chart review. Generally, medical teams rated their abilities to predict impending deterioration, communicate, cooperate and coordinate as "high". The chart review revealed that 38 of 47 patients should have been considered "at risk" during the two days preceding the complications' occurrence. Additionally, delays in recognition of deterioration were found in 28 of patients. Primary study limitations were that the medical team answered from memory whereas the reviewers could refer to charts, and that no rapid response team existed. The overall conclusion from this study was that caregivers could not accurately access their own levels of competency or performance (Ludikhuize et al., 2012).

Byrd et al. (2013) studied whether certified nurse practitioners could correctly self-assess their personal strengths and weaknesses related to cognitive competencies in their specialties. Participants were randomized to three separate samples from National Certification Corporations (NCC)-certified Women's Health Care Nurse Practitioners (WHNP). All sub-stratifications were NCC board certified, had similar years' experience as a WHNP and were equally distributed geographically. Ultimately there were approximately 480 participants in each subgroup. Each group completed a survey of self-assessment in gynecology, obstetrics and primary care. Upon survey completion, one of three iterations of a 100-item multiple choice test was administered. A Pearson product moment correlation was calculated among the three cognitive subgroups (gynecology, obstetrics and primary care) for self-assessment and compared to the four test scores (total, gynecology, obstetrics and primary care). The resulting correlation coefficient did not support use of self-rating as an accurate method of cognitive competency assessment (Byrd et al., 2013).

INSTRUMENTS USED TO EVALUATE COMPETENCY IN SIMULATION

Several instruments have previously been built for use in evaluation of simulation competency. The Clinical Performance Tool (CPT) developed by the EXPRESS Pediatric investigators research, a collaborative established among numerous pediatric centers in

the U.S. and Canada, was used to evaluate residents' cognitive and technical performance of Pediatric Advanced Life Support (PALS) scenarios (Donoghue et al., 2011). Seven raters scored 16 pediatric resuscitation scenarios. The CPT allowed raters to score subjects on the following three point Likert scale: task not performed (0 points); task performed partially, incorrectly or late (1 point); task performed completely, correctly and in correct timeframe (3 points). The CPT inter-rater reliability (IRR) scores were a moderate 0.63 (Donoghue et al., 2011). Study limitations included evaluation of cognitive and technical care aspects alone, scores based on a three point Likert scale, all subjects were novices in resuscitation, all total scores were weighted equally and the instrument did not map the scenarios to a specific set of core competencies. Moreover, the study was not theoretically based and the documentation instrument did not utilize technology to ease mapping, storage, tracking and retrieval of data.

The Clinical Teamwork Scale (CTS) was developed by Dr. Guise and colleagues (2008) to evaluate teamwork in obstetrical crises. The scale contained 15 items in five domains: communication, situational awareness, resource management, decision making, role responsibility and patient-parent friendliness. Each of the 15 items was scored on a 10-point scale ranging from unacceptable (0), poor (1-3), average (4-6), good (7-9) and perfect (10). Raters were trained in crew resource management prior to scoring participants in video-recorded scenarios. The CTS Kappa agreement was 0.78 and IRR was 0.98. Each domain had subtopics to provide clarity to raters. Instrument advantages included its components being based upon aviation and space industries' CRM training program and ease of use. Study limitations included only the behavioral dimension of competency being measured and measurement of the team as a whole rather than individual performance. Finally, core competencies were unmentioned, no theoretical framework was discussed and the documentation instrument did not utilize technology to map, store, track and retrieve data.

McEvoy and associates (2012) developed a detailed checklist to score participants during advanced cardiac life support certification exams. Team leader performance was rated during eight mega code scenarios by four non-expert raters while watching the video-recorded scenarios. The concordance correlation coefficient was 0.96 and intra-

class correlation was 0.96; checklists were integrated in the Laerdal SimMan software interface (McEvoy et al., 2012). Study limitations included little to no rater training and no inter-rater reliability in the statistical analysis. Checklists were based on a yes/no response. The instrument was tasked based and did not evaluate participants' cognitive or behavioral competency. Moreover, core competencies were unmentioned and a theoretical framework was absent.

Locklear and associates (2006) created a neonatal resuscitation performance checklist to evaluate skills during a neonatal "megacode" for the Neonatal Resuscitation Program (NRP) of the American Academy of Pediatrics. The instrument was a 20-item checklist based on a three point Likert scale (Lockler et al., 2006). The study included 468 scenario multidisciplinary participants and 148 experienced NRP instructors rotating through three neonatal delivery scenarios. Study limitations included a lack of standardized scenarios, instrument used in delivery situations only and a low internal consistency of 0.7. Additionally, the instrument was not developed around a theory or mapped to core competencies and the documentation instrument did not utilize technology to map, store, track and retrieve data.

Calhoun et al. (2011) developed the Team Performance During Simulated Crisis Instrument (TPDSCI), which evaluated pediatric code team performance and competency. This global rating instrument was grounded in the ACGME core competencies and CRM. Fifty-four teams participated in a simulated pediatric crisis and were rated by three raters. The Cronbach's alpha was 0.69-0.72 with an overall internal consistency of 0.82, but the professionalism domain's internal consistency was only 0.22. Gap analysis revealed that 98 % of simulated sessions had significant gaps, indicating self-overappraisal by participants. The limitations of this instrument included team assessments rather than individual evaluations and poor multidimensional performance (scoring in the behavioral dimension). Additionally, the documentation instrument did not utilize analytical tools to map, store, track and retrieve data.

Adler and colleagues (2011) compared checklists and global rating instruments for performance in simulated pediatric emergencies. Emergency medicine residents' performance was rated via live closed circuit television using a dichotomous checklist

and the Global Performance Rating Assessment Tool (GPAT) in a fully crossed person-to-rater-to-case generalizability study. The study revealed that IRR was 0.9 for both instruments and that each instrument performed in psychometrically similar manners. The study limitations were that formal cutoff scores were created for the GPAT, and that instruments were not mapped to a set of core competencies and were not theory based. Finally, the GPAT's database analytical compatibility was unknown.

Research Synthesis

The space and aviation industries were pioneers in competency evaluation. Data derived from "black box" recordings as well as examination of in-flight emergencies indicated that nearly 70 % of accidents were caused by human error (Billings & Reynard, 1984). These findings inspired the aviation and space industries to mandate use of annual crew resource management (CRM) training and flight simulations to evaluate pilot competency through demonstration of cognitive, technical and behavioral skills in realistic situations (Helmreich et al., 1987, 1990; Weiner et al., 1993).

The profession of anesthesiology is similar to aviation, as the majority of adverse events in this medical profession result from seemingly small human errors and anesthesia providers must be able to react quickly and clearly in life-threatening situations. Subsequently, Howard and colleagues (1992) in the department of anesthesia at Stanford University developed their own method of CRM known as Anesthesia Crisis Resource Management (ACRM). ACRM now trains and assesses competencies of future and current anesthesia providers in the management of more than 83 anesthesia crises (Gaba et al., 1998; Howard et al., 1992).

Several different models have been utilized for competency evaluation. Tai and Chung (2008) used a Competency-based Teaching Performance Evaluation. Del Bueno (2005) used the PBDS model, Levitt-Jones et al. (2011) used their SOAP model, and Klein & Fowels (2009) examined Lenburg's COPA model. However, the most frequently utilized instrument for physical demonstration of competency has been the OSCE (Cohen et al., 1990; Jeffries et al., 2011; Kligler et al., 2007; Roberts & Brown, 1990; Sloan et al., 1996; Townsend et al., 2001). Each of these studies described OSCE variations. The

OSCE has proven to be more prevalent in testing medical students' and residents' competencies. Three studies examined the use of the OSCE testing in graduate and undergraduate nursing education (Jeffries et al., 2011; Roberts & Brown, 1990; Todd et al., 2008). All of these OSCE studies found it to be a reliable and valid model for competency evaluation; however, OSCE was found to be a poor predictor of clinical performance and written evaluation scores (Roberts & Brown, 1990). None of the studies detailed the actual instrument used to document students' competencies. Additionally, no standardized OSCE administration method has been documented and no software-based instrumentation has been used to document, map, store, track or retrieve data.

Six studies in the reviewed literature described models exclusively used in nursing for competency evaluation (Del Bueno, 2005; Jeffries et al., 2011; Klein & Fowels, 2009; Levitt-Jones et al., 2011; Tai & Chung, 2008; Todd et al., 2008). Two studies evaluated undergraduate nursing competencies (Klein & Fowles, 2009; Tai & Chung, 2008). In contrast, Del Bueno's (2005) PBDS model and Levitt-Jones et al.'s (2011) SOAP model evaluated new graduate RNs and APRNs to assess their readiness for practice. Two studies utilized a qualitative direct observation method followed by a quantitative interview process for competency evaluation (Del Bueno, 2005; Levitt-Jones et al., 2011). Only two studies demonstrated improved outcomes (Jeffries et al., 2011; Klein & Fowles, 2009). Four studies correlated their testing to pre-determined essentials or domains of practice such as ACGME, Australian Nursing and Midwifery Council Competency Standards for the Registered Nurse, or COPA (Cohen et al., 1990; Klein & Fowles, 2009; Kligler et al., 2007; Levitt-Jones et al., 2011).

Many models required competency evaluators to engage in pre-course training for exam structuring, behavioral expectations of the observer and use of the documentation checklist (Cohen et al., 1990; Del Bueno, 2005; Gaba et al., 1998; Girzadas et al., 2007; Helmreich et al., 1990; Sloan et al., 1996; Tai & Chung, 2008). Most models administered simulation through use of high fidelity mannequins with lifelike responses and cues or through the utilization of standardized patient actors (Cohen et al., 1990; Del Bueno, 2005; Gaba et al., 1998; Girzadas et al., 2007; Helmreich et al., 1990; Kligler et al., 2007; Sloan et al., 1996; Tai & Chung, 2008; Townsend et al., 2001). Only one study

focused solely on evaluation of simulation as the instrument for competency evaluation (Girzadas et al., 2007). The aforementioned study helped to validate the use of simulation in OSCE, PBDS, ACRM and CRM studies by demonstrating that simulation was a reliable and valid instrument for assessment of competency. Additionally, several studies revealed curricular improvement resulting from competency evaluation processes (Klein & Fowles, 2009; Kligler et al., 2007; Roberts & Brown, 1990; Sloan et al., 1996; Tai & Chung, 2008).

The implicit theoretical framework used in all studies was principles of adult learning. Simulation was effective in meeting adult learners' needs while simultaneously improving patient safety and outcomes in a virtual environment. Simulation also allowed adult learners to maintain skill proficiencies via hands-on application followed by debriefing (Gaba et al., 1998; Girzadas et al., 2007). Next, Astin's (1991) outcomes model was also utilized focusing on students' talents, attributes and experiences; environments in which students were trained; and students' test scores, clinical performance and competency aggregate.

Only Klein & Fowles' (2009) study explicitly documented the conceptual framework used, but the same framework can be inferred from other studies. The COPA model expanded on theories from two separate nursing and education models. The COPA model used in nursing assumed that learners were actively involved in the learning process (a cognitive view used in debriefing or interviewing) and required nursing programs to specify learning outcomes, strategies and examination processes that demonstrated competencies.

Operational definitions are the instruments used to measure validity and reliability. Validity can be defined as the extent to which instruments measure their intended goals. Three major validity constructs are content validity, construct validity and criterion-related validity. Operational definitions used to assess content validity include groups of clinical experts who meet to delineate and create content taken from course objectives (Cohen et al., 1990; Roberts & Brown, 1990; Sloan et al., 1996; Tai & Chung, 2008; Townsend et al., 2001). Operational definitions used to assess construct validity include score comparisons and time to completion (Cohen et al., 1990; Girzadas et al.,

2007; Townsend et al., 2001). Criterion-related validity examples include surveys administered to students and faculty (Roberts & Brown, 1990; Tai & Chung, 2008).

Reliability is the ability of multiple observers to reach identical conclusions about a given phenomenon. There are several types of reliability scales, including test-retest, split halves, Cronbach's alpha and inter-rater reliability. Townsend et al. (2001) implemented test-retest reliability when they administered an initial test then re-administered same test to the learners after a predetermined time period and compared results. Operational definitions that examined internal consistency reliability have been the Likert scale as evaluated by Cronbach's alpha (Cohen et al., 1990; Del Bueno, 2005; Helmreich et al., 1990; Levitt-Jones et al., 2011; Roberts & Brown, 1990; Sloan et al. 1996). Other operational definitions include measurement of inter-rater reliability by comparison of two separate raters following the viewing of identical videos or live demonstrations using standardized collection instruments (Gaba et al., 1998; Roberts & Brown, 1990). Moreover, the operational definition used to ensure inter-rater reliability has been achieved by holding pre-course training for examiners (Cohen et al., 1990; Del Bueno, 2005; Gaba et al., 1998; Girzadas et al., 2007; Levitt-Jones et al., 2011; Sloan et al., 1996; Tai & Chung, 2008).

Researchers have attempted to create valid and reliable instruments to assess the physical demonstration of competency in simulated environments (Adler et al., 2011; Calhoun et al., 2011; Donoghue et al., 2011; McEvoy et al., 2012). Such instruments have aimed to evaluate resident physicians and were focused on specialty areas such as adult critical care, pediatrics and anesthesia. Additionally, instruments have been developed specifically for the evaluation of behaviors in simulation (Guise et al., 2008). The only existing neonatal-based instrument is the Neonatal Resuscitation Program (NRP) "Mega code Checklist" created explicitly for delivery room settings (Lockler et al., 2006). No instruments have been designed for assessment of physical demonstration of multidimensional competency in simulated environments for NNPs. Additionally, none of the instruments has been proven capable of evaluating competency from a multidimensional approach to simultaneously examine cognitive, technical and behavioral competency.

Studies from operating room and transplant critical care unit nursing specialties have examined nurses' perceptions of their fields' competency components (Gillispie et al., 2011). Studies that have evaluated other healthcare workers' perceptions of acute care nurse practitioners (ACNPs) revealed an overwhelming sense of confidence in ACNPs' competency levels (Hoffman et al., 2004). Wysong & Driver (2009) explored patients' perceptions of nursing competence and found that the nurses' interpersonal and caring skills, along with their ability to think critically, were patients' primary focus; nurses' abilities to perform procedures were not found to be as important in patients' competency perceptions. Ludikhuize et al. (2012) determined that regardless of education, background or expertise, healthcare providers could not accurately self-assess their own competency levels. Finally, Byrd et al. (2013) determined that APRNs were unable to adequately perform self-assessments of cognitive competency levels.

Current Leaders

The Society for Simulation in Healthcare (SSH) has encouraged development of instrumentation used to evaluate subject performance in clinical or simulated healthcare experiences. SSH members Drs. David Murray and James Fehr (Washington University School of Medicine) have developed instruments to assess anesthesiology residents, fellows and Certified Registered Nurse Anesthetists (CRNAs), which include pediatric-based competencies (Boulet & Murray, 2010; Boulet et al., 2008; Fehr et al., 2011). SSH member Dr. Walter Eppich (Harvard University) developed instrumentation for resident evaluation using simulation in emergency room situations (Adler et al., 2011).

Nursing has also produced competency assessment instrumentation. Del Bueno (2005) developed PBDS for post-graduate critical care nursing candidates to measure their readiness for practice. PBDS has been used by many institutions to hire and place new graduates (Del Bueno, 2005). Dr. Kathy Lasater is known for her clinical judgment evaluations and Dr. Carrie Lenberg is a nursing leader in competency evaluation; neither, however, has developed instrumentation specifically for evaluation of physical demonstration of competency for APRNs in clinical or simulated settings (Lasater, 2011; Lenburg, 1999a). Dr. Pamela Jeffries, faculty at Johns Hopkins University, has led the

way for simulation-based training as a staple curriculum modality in undergraduate and graduate nursing education; Dr. Jeffries has served as project director of the National League for Nurses' (NLN) Simulation Innovation Resource Center (SIRC) and was president–elect for SSH (Jefferies, 2008; Boulet et al., 2011; Jeffries et al., 2009, 2011).

To date, the most influential leader in the development of instrumentation for the evaluation and assessment of healthcare competency in a simulated setting has been Dr. John Boulet. Dr. Boulet was appointed as a psychometrician at the Foundation for the Advancement of International Medical Education and Research in Philadelphia, Pennsylvania. He served an advisor to the United States Medical Licensing Examination (USMLE), the Educational Commission for Foreign Medical Graduates (ECFMG) and multiple medical schools and their OSCE teams. He has spoken nationally and internationally on instrument development and validity research. In addition to being well published, Dr. Boulet is a driving force in instrumentation development within the Society for Simulation in Healthcare (Boulet, 2008; Boulet & Murray, 2010; Boulet et al., 2003, 2008, 2009, 2011; Fehr et al., 2011; Henrichs et al., 2009; McKinley et al., 2005).

IMPLICATIONS FOR FUTURE RESEARCH

The literature review revealed several gaps in healthcare's ability to ensure competency. First, no comprehensive and universal multidimensional competency analysis instrument was found that utilized technology to document, map, track and retrieve documentation of providers' physical demonstration of knowledge, skill and professional behaviors through multiple perspectives, educational levels and applications. Additionally, although the OSCE has been proven as a valid and reliable model for the physical demonstration of competency, there was no standardized method of conducting an OSCE. Finally, after competency analysis was completed, there was no measurement of outcomes such as reduced medical error rates, improved patient outcomes or increased formulation of providers' quality decisions.

These literature gaps suggested that considerable research has yet to be done. First, a computational competency analysis tool should be designed to document, map,

track and retrieve documentation of individuals' physical demonstration of knowledge, skill and professional behaviors through multiple perspectives, educational and experience levels and applications. Once assessment of multidimensional competencies is available through such an e-instrument, a standardized method of competency-based evaluation such as the OSCE can be determined. Various evaluation items should be included: number of stations required, absolute inclusion of the core competencies, observer qualifications and training levels. Upon reaching consensus on physical demonstration methodologies, existing curricula can be modified to better prepare graduates for practice. Finally, this testing could be modified for graduation, certification or licensure requirements in multiple healthcare areas.

Mandated competency evaluations may allow for improved outcomes in areas such as response times, patient safety, medical error rates and quality of decisions. The most appropriate evaluation means would be use of aforementioned instruments to document and assess physical demonstrations of competency. Subsequently, an outcome should be chosen for evaluation, e.g., medication error rate for before and after comparisons resulting from competency training and evaluation.

In summary, evaluation, acquisition and maintenance of competency for healthcare providers remain controversial topics because a lack of competency can result in medical errors such as "failure to rescue." This literature review documented research on extant instruments that evaluate competencies in healthcare and other high risk professions. To date, no comprehensive and universal multidimensional competency analysis instruments exist that utilize technology to score, document, map and track learners competencies; adopt standardized methods for physical demonstration of competency; and exhibit proof of improved outcomes through mandated competency testing.

CHAPTER THREE: RESEARCH DESIGN

INTRODUCTION

The Delphi Method is an iterative process used to gather and disseminate quasi-anonymous judgments (Rauch, 1979). This methodology utilizes predesigned items incorporated into a series of surveys amid multiple rounds of questioning during which expert panelists may change their answer based on others' replies with directed feedback following completion of each round (Keeney et al., 2011). The process is deemed complete when expert consensus is reached, ample information has been exchanged or theoretical permeation achieved (Skulmoski et al., 2007). Use of the Delphi Method is extremely useful in cases where there is incomplete extant knowledge on a subject or phenomenon.

The concept of online questionnaires originated with Linstone and Turnoff (1975) in which they described a process of remotely located participants providing anonymous judgments via an online instrument. In any such system, results can be analyzed and reported in real-time, which allows participants to immediately compare their results to results of others. Additionally, any online method allows asynchronous participation, a process by which participants could log in and out independently and as frequently as desired (Linstone & Turoff, 1975). Gordon and Pease (2006) developed an innovative process known as a Real Time Delphi (RTD), which made those capabilities possible through a grant awarded to Articulated Software (San Francisco, CA).

The essential methodological advancements of RTD studies are an absence of repeated rounds and 24-hour, simultaneous computation and delivery of participant responses (Gordon & Pease, 2006). Thus, RTD functions as an uninterrupted, single round process resulting in a condensed time frame required to conduct massive and complex studies. Additionally, experts are not limited by the number of rounds to make additional judgments or change their minds based on additional data. The number and location of experts that can participate in a RTD is limited only by internet access and can be administratively terminated at any time upon satisfaction with existing responses

(Gordon & Pease, 2006). Finally, RTD's anonymous nature allows for increased opportunity for expression while increasing experts' interactions, as well as the implied push for increased cognitive examination, thus, maximizing the overall validity of the study as seen predominately through the narrative comments in this study.

Although RTD software is less than a decade old, several nations, corporations and non-governmental organizations have already taken advantage of its innovative capabilities to collect judgments, assess sensitive policies and produce time series forecasts. RTD was developed under contract to the United States Defense Advanced Research Projects Agency (DARPA, 2004), which was seeking a system to collect judgments on tactical situations in real-time (Gordon & Pease, 2006). Other institutions utilized versions of RTD; for example, the Supply Chain and Management Institute of the European Business School in Germany evaluated the ways in which supply chains evolve over time (Ruske & Kauschke, 2009). The aviation industry was also the subject of an RTD study to evaluate global scenarios for passengers, aviation equipment and cargo (Linz & Rothkopf, 2010). The Millennium Project, an international think tank with over 40 nodes, comprised of over 5,000 futurists and planners from more than 38 countries, used the same type of RTD that was used in this research study to produce global reports on subjects as diverse as elements of the next global economic system, energy networks, future possibilities for education, global ethical issues, future management of science and technology and gender stereotypes (Glenn et al., 2009, 2012). These high profile success stories indicate RTD's readiness for use in the healthcare industry.

The C.A.T.E.S. RTD consisted of four specific aims: 1) identify which dimension (cognitive, technical or behavioral) of NNP competency accurately reflects each of the global statements; 2) map each of the global statements to a National Association of Neonatal Nurse Practitioners (NANNP) core competency domain; 3) define the operational definitions for the novice to expert performance subscales; and 4) determine the essential scenarios to assess multidimensional competency of NNPs.

Expected outcomes from the specific aims were to produce content and face validity of critical elements for C.A.T.E.S., an instrument that will be designed to gather demographic information, assess physical demonstration of competency across diverse

facets of healthcare, determine competency on multiple dimensions, score subjects on a global novice to expert scale, map core competencies for the studied subjects and track performance of high-risk procedures through the use of an online technology-based format.

To accomplish these aims and establish face and content validity for C.A.T.E.S., a RTD study was conducted. Use of conventional methods would have required conducting four separate Delphi forecasts with two to three subsequent rounds, resulting in a multi-phase study with an extremely protracted timeline. Use of RTD allowed for a single large Delphi with each of the specific aims presented in subsequent sections, thus reducing the overall time to completion from numerous months to just a few weeks. Additionally, the researcher decided to use a novel method for specific aim three in which 30- to 60-second video clips of highlights or main points of each scenario were created and made available through hyperlinks for participants to view. This preview was especially important for those experts who were not familiar with neonatal healthcare simulation or crucial concepts of particular scenarios. This use of specially prepared videos was a novel addition to the RTD methodology. Thus, RTD technology provided a means for study aims to be accomplished in a minimal timeframe while maximizing developmental progress on the C.A.T.E.S. multidimensional competency assessment instrument.

SAMPLE

Panelists were chosen based on their ability to contribute to creation of a valid and reliable instrument (C.A.T.E.S.) for assessment of NNP multidimensional competency in clinical simulations. The invited panel was a heterogeneous sample consisting of experts who were seasoned NNPs, neonatal simulation specialists, psychometricians, practiced neonatologists, experienced neonatal nurses and seasoned healthcare educators with a background in competency assessment or creation and individuals with previous experience working on instruments used to assess learners performing simulation. Out of a pool of 84 experts invited to participate based on their specific areas of expertise, 25 individuals contributed to the study. Participant inclusion criteria were: 1) considerable expertise, consisting of at least five or more years of experience in one or more of the

following categories: neonatal care, instrument development, competency assessment or simulation; 2) internet and email access; 3) willingness to participate; 4) sufficient time to participate; and 5) effective English communication skills.

Potential panel members were recruited via email. The email contained a participant email invitation which detailed: 1) study title; 2) invitation to participate; 3) study purpose; 4) reasons/qualifications for choosing the potential panel member; 5) no obligation explanation; 6) study requirements; 7) potential problems and resources; 8) confidentiality; 9) potential uses for the information once the study has ended; 10) organizing and funding bodies; 11) benefits; 12) notice of IRB exemption disclosure; 13) contact information; and 14) URL and study code (Appendix F). Upon entry into the RTD web page, informed consent and confidentiality was explained and accepted before any data were collected. Subsequently, demographic information was collected, including name, job title, place of employment, age, sex, ethnicity, list of qualifications or certifications and years of experience. Upon receipt of this information from all panel members, ID numbers were assigned and a codebook was created.

SETTING

The C.A.T.E.S. RTD required internet connectivity and specialized web-based software accessibility to calculate and visualize results. After the survey was designed, analyzed for errors and PI approved, the PI received administrative access and participants were invited to participate by email. Subsequently, participants could access the study at their convenience.

ETHICAL CONSIDERATIONS

Although adult human raters were utilized in this study, the subject of the study was the instrument and not the raters. Therefore, this research was judged by the UTMB Institutional Review Board as not qualifying as human research and did not require Institutional Review Board approval (Appendix G). Panelists' identities were known only to the PI; this was a necessity to conduct any subsequent follow-up, and resulted in quasi-anonymity (Keeney et al., 2011). Due to the study's nature and relatively small field of

qualified experts available, panelists may have personally known each other or been able to recognize one another's responses. These issues were detailed in the participant information sheet and the informed consent. Participant privacy was protected through the assignment of ID numbers recognized only to the PI and kept in a master codebook. The master codebook and RTD results were uploaded and saved on a password-protected computer, accessible only by the PI. Additionally, any disclosure of panelists' responses did not place them at risk of criminal or civil liability nor would it have been damaging to their financial standing, employability or reputation. No photographs or digital images of participants were collected.

Confidentiality was expected of both researcher and panelists. This study maintained confidentiality by ensuring that panelist' names would never be collected or attributed to any comment used in any resulting report or publication. The panelists were asked to agree to non-disclosure stating that the information discussed in the RTD should not be reproduced or discussed outside of the RTD setting both during the study and upon study completion.

In the future, C.A.T.E.S. could directly affect panelists who were NNPs or experienced nurses seeking to become NNPs. Participation benefits to those panelists included being contributors to the creation of a valid and reliable instrument to assess NNP multidimensional competency evaluation of NNPs performing in simulation. For all participants there was potential for satisfaction of laying the groundwork for a valid and reliable instrument (C.A.T.E.S.) that could utilize technology to gather demographic information, assess physical demonstration of multidimensional competency while scoring subjects on a global novice-to-expert scale, map core competencies for the studied subject and track performance of high-stakes procedures. Because the study topic did not concern panelists' health or personal matters, no complications or risks resulted.

MEASUREMENT METHODS

Specific Aim 1

Creation of a valid and reliable instrument depends on a tool's ability to measure a phenomenon accurately and reliably. The objective of this first aim was to lay a strong foundation for C.A.T.E.S. by creating valid and reliable items. Such items should clearly measure a competency construct reflective of NNPs' clinical practice that is grounded in the cognitive, technical and behavioral competency domains. Attaining the objective of this aim entailed testing the working hypothesis that NNP competency can be accurately assessed using a valid and reliable multidimensional instrument (C.A.T.E.S).

The approach for this initial phase of hypothesis-testing used the RTD Method to determine agreement among experts. RTD participants were asked to indicate whether each of the global statements were correctly categorized into one of the following three categories: 1) Cognitive: based on one's mental knowledge; 2) Technical: based on one's hands-on skill; 3) Behavioral: based on one's professionalism, teamwork, leadership, communication or observable conduct. The global statements were created by the PI after thorough review of current simulation assessment instruments, as well as thousands of personal hours spent designing, facilitating and evaluating simulations. Finally, these global statements were polished and evaluated in GNRS 6352 Survey of Instrumentation course (Appendix H).

If panelists felt the statements were correctly categorized, the experts chose "correct;" if incorrectly categorized, participants chose "incorrect" and described why items were incorrectly categorized. If the experts were unable to decide on a category, they were asked to give reasons explaining their uncertainty. The percentage of the RTD participants in agreement or disagreement was reported by the RTD software. If 80 % or more of participants agreed that an item was correctly classified, then the item was identified as eligible to be forwarded for future studies. If the item received less than 80 % agreement then the item was targeted for reevaluation using the comments and revisions considered for future studies (Landis, et al., 1977). Participants were asked to indicate any missing or unclear items (i.e., suggest improved clarity or additional items

and their categories). Based on participant responses, the suggestions were analyzed by the PI for possible addition to C.A.T.E.S.

Upon completion of the RTD items were classified into the appropriate dimension of competency, which boosted content validity. Items were also deemed clearly written to provide a basis for sound inter-item correlations (ICC). Such items allowed, for the first time, development of portions of the C.A.T.E.S. instrument.

Specific Aim 2

Precisely assessing the multidimensional competency of an NNP requires core domains to be evaluated and mapped to the subjects being evaluated within the instrument used. NNP core domains were first delineated in the Consensus Model for Advanced Practice Registered Nurse (APRN) Regulation (2008), and further extrapolated to the National Association for Neonatal Nurse Practitioners Competency Toolkit (2010a).

The approach for specific aim 2 used the RTD Method to determine percentage agreement among experts. Delphi experts indicated whether the global statements were correctly mapped onto the following NANNP Core Competency domains:

1) Management of Patient Health and Illness Status

2) The Nurse Practitioner–Patient Relationship

3) The Teaching-Coaching Function

4) Professional Role

5) Managing and Negotiating Healthcare Delivery Systems

6) Monitoring and Ensuring the Quality of Healthcare Practice

7) Culturally Sensitive Care

Sub-competencies:

- Pharmacological Competencies
- Skill Competencies

If the panelist felt the statements were correctly categorized, experts indicated "correct"; if incorrectly categorized, experts chose "incorrect" and described why items were incorrectly categorized. In addition, if the experts were unable to decide, they were

asked to give reasons explaining their uncertainty. As in specific aim 1, the percentages of the RTD participants that agreed or disagreed were reported by the RTD software. If 80 % or more of participants agreed that an item was correctly classified, the item was identified as eligible to be included in future studies. If an item received less than 80 % agreement, then the item was targeted for reevaluation using the comments and revisions considered for future studies (Landis et al., 1977).

Upon conclusion, each global statement was expertly mapped to the corresponding NANNP domain. Mapping of these core domains will allow essential NNP core competency domains to be examined, scored and documented via C.A.T.E.S. In turn, employers and educators could provide the needed remediation and training in domains for which students or practitioners were deficient and advancements in domains for which subjects excelled to ensure dependable and maturing practitioners.

Specific Aim 3

An instrument's value lies in its ability to predict levels of performance of evaluated subjects. For C.A.T.E.S., predictors were formulated by developing working definitions for each of levels of the Likert based performance sub-scale. These working definitions should clearly define how a novice, advanced beginner, competent, proficient and expert perform; in turn, raters will be guided in their performance level assessments of students and NNPs. The novice to expert operational definitions were developed initially by the PI from extensive review of literature and refined through qualitative data gathered in a classroom project in GNRS 6361 Qualitative Data Management. These original definitions were then evaluated during a GNRS 6088 The Delphi Method (Research Practicum II) using a traditional Delphi method. Through this process the panelists gave insight as to the needed changes, deletions and modifications required, thus making the definitions more accurate reflections of NNP performance subscales. Consequently, the novice to expert operational definitions were revised and expanded to the current definitions. Finally, to promote excellent inter-rater reliability (IRR) and potential predictive validity, working definitions were required to be clearly articulated, easy to understand and accurately reflect the performance of students or NNPs.

RTD participants answered the following questions for each operational definition: accurate as written, needs minor revisions, needs major revisions or needs complete rewrite. Participants were asked to elaborate when definitions were rated as needs major revisions or needs complete rewrite. The percentage of RTD participants that chose accurate, accurate with minor revisions, accurate with major revisions or not at all accurate was calculated by the RTD software. If 80 % or more participants chose accurate or accurate with minor revisions, those items were identified as eligible to be included for future studies. If items received less than 80 % accurate or accurate with minor revisions, those items were targeted for re-evaluation using comments and revisions considered for future studies (Landis et al., 1977).

Table 1: C.A.T.E.S. Novice to Expert Operational Definitions

	C.A.T.E.S. Novice to Expert Operational Definitions
Novice	A Novice NNP is a provider that typically performs based on strict guidelines or rules, and demonstrates a beginning advanced practice knowledge base specific to neonates. The novice NNP will often seem nervous, anxious, uncomfortable in their role, disorganized, and unsure of themselves (very indecisive). The novice often lacks the confidence to engage in the discussion of care management, and is normally uncomfortable being observed. The novice NNP does not display situational awareness. The staff/team may frequently question the novice NNP prior to implementing their order(s) or plan(s), and could demonstrate a great sense of discomfort or lack of confidence regarding their care/patient management without first verifying the accuracy of their order(s)/plan(s). The staff does not readily recognize the novice NNP as the team leader. Even with help and frequent prompting, the novice will frequently lack the confidence to perform many critical aspects of care/patient management without frequently referring to their preceptors, guidebooks, or reference cards.
Advanced Beginner	An advanced beginner NNP is a provider that performs based on limited experiences, and has sound advanced practice knowledge base including the areas specific to neonates. They will seem calm, organized and comfortable in their role in some areas of care and anxious, nervous, disorganized, and uncomfortable in their role in other areas of their management, and will often be unsure of themselves (indecisive). The advanced beginner occasionally lacks the confidence to engage in the discussion of care management, and may be uncomfortable being observed. The advanced beginner displays limited situational awareness. The staff/team may question the advanced beginner, and demonstrate a slight sense of discomfort or lack of confidence regarding their

	care/patient management without first verifying the accuracy of their order(s)/plan(s). The staff may not readily recognize the advanced beginner as the team leader. With help and frequent prompting, they will have the confidence to perform some critical aspects of care/patient management without referring to their preceptors, guidebooks, or reference cards.
Competent	A competent NNP is a provider that has situational awareness based on experience and is able to begin leading and planning based on this experience; demonstrates an expanding advanced practice knowledge base. While being observed, the competent NNP will know the pertinent information required to care for the patient, or know where to immediately refer. They will seem calm, confident, comfortable with their role, and organized, and will often seem sure of themselves (decisive). The competent NNP is comfortable being observed. The staff/team rarely question or verify the accuracy of their order(s)/plan(s) prior to implementation, and demonstrate their acceptance or confidence regarding their care/patient management. The staff recognizes the competent NNP as the team leader. The competent NNP will have the confidence to perform most critical aspects of care/ patient management without referring to their preceptors, guidebooks, or reference cards.
Proficient	A proficient NNP is a provider that perceives and understands situations as whole parts, and demonstrates an extensive knowledge base with an increasing analytic ability to process and integrate new knowledge. While being observed, the proficient NNP will immediately know the pertinent information required to care for the patient or know where to immediately refer. They will seem very calm, confident, and comfortable with their role, well organized, and will be very sure of themselves (very decisive), and are very comfortable being observed. The proficient NNP displays sound situational awareness. The staff/team very rarely question or verify the accuracy of their order(s)/plan(s) prior to implementation, and demonstrate their acceptance or confidence regarding their care / patient management. The staff readily recognizes the proficient NNP as the team leader. The proficient NNP will have the confidence to perform all critical aspects of care/ patient management.
Expert	An expert NNP is a provider that utilizes a rational knowhow and performs without thinking about rules or sequence from a vast history of experience and theoretical foundations forming an outstanding knowledge base. While being observed, the expert NNP will immediately know the pertinent information required to care for the patient or know where to immediately refer. They will seem calm, confident, and comfortable with their role, well organized, and will be sure of themselves demonstrating no hesitation, and perform in a flawless manner. The expert NNP is relaxed when being observed, and displays impeccable situational awareness. The staff/team embrace the expert subject, and demonstrate their unconditional acceptance or confidence regarding their care/patient management. The staff immediately recognizes the expert NNP as the team leader. The expert NNP will have the confidence to perform all critical aspects of care and exceed by addressing additional aspects of care/ patient management seamlessly.

Upon study conclusion, each sub-scale performance level had working definitions that were clear, concise and reflected real-life experience levels, in turn increasing the probability of future IRR and predictive validity of C.A.T.E.S. Development of such items is predicted to allow raters to accurately rank NNPs' performance in real-time simulated clinical situations. The rankings could be used to guide educators and employers of need for remediation or advancement in neonatal advanced practice nursing.

Specific Aim 4

To create C.A.T.E.S., an instrument to assess subject performance in clinical simulation scenarios, cut scores and key actions must be determined for each scenario (Boulet et al., 2008). As a precursor, essential scenarios for the assessment of NNP multidimensional competency were established.

Based on American Academy of Nurse Practitioners' [AANP] (2010) recommendations, continued competency requires annual review. Such routine review assures the public that NNPs consistently deliver safe, high-quality care. Numerous Boards of Nursing (BON) require NNPs to complete an advanced practice nursing education program from an accredited institution, and pass the National Certification Corporation's (NCC) examination to ensure minimum education and competency requirements are met (NCC, 2012, p. 1). Additionally, the NCC has determined four areas that determine NNP competency: 1) general assessment; 2) general management; 3) disease process; and 4) professional issues (NCC, 2012, p. 18; see Appendix I). Furthermore, the NANNP toolkit has determined domains of core competency (NANNP, 2010). Although the NCC and BONs require a predetermined number of continuing education units to maintain licensure and certification, this does not mean that all healthcare workers practice at the same level. Multiple factors contribute to the challenges of guaranteeing competency of all practitioners: area of practice (newborn nursery, level II NICU or level III NICU), years of service, breadth of experience and

personal motivations (Cates & Wilson, 2011). Finally subject nurses must demonstrate essential understanding in areas of harm prevention for patients.

Establishment of essential scenarios required for assessment of NNP multidimensional competency will allow future studies to determine cut scores and key actions for each scenario. This, in turn, will allow C.A.T.E.S. to accurately score students' or NNPs' levels of competency in real-time mannequin-based simulated clinical situations and determine areas of deficiency or proficiency (Boulet et al., 2008). Scores will provide a means for educators and employers to determine levels of multidimensional competency and an understanding of advanced practice neonatal nursing, which can be used for promotion or remediation purposes.

RTD participants were asked to evaluate a list of scenarios that have been designed and extensively empirically tested by The American Academy of Pediatrics' (AAP) Neonatal Resuscitation Program (NRP), American Heart Association's (AHA) Pediatric Advanced Life Support (PALS) and the S.T.A.B.L.E. Program (Chameides et al., 2011; Karlsen, 2006; Zaichkin et al., 2011). The scenarios were then divided into six subcategories, including respiratory, cardiac, shock, multifaceted, delivery and communication/ethics (Table 2).

The experts were asked to rate each scenario in its subcategory based on a Likert scale of top rated in subcategory, near the top, middle of the pack and not useful as presented on its ability to assess an NNPs' multidimensional competency and the scenarios' reflection of both the National Certification Corporation (2012) as well as the core competency domains delineated by the NANN Competencies Toolkit (NANNP, 2010a). Participants were also asked to suggest future scenarios for development and study. Furthermore, if the panelists felt they were not qualified to complete this section they were asked to give a brief reason in the comments section. Links to short videos, created by the PI to demonstrate the highlights or main points of each scenario as it would appear in simulation, were provided for participants. The number of RTD participants that chose top rated in subcategory, near the top, middle of the pack and not useful as presented in each of the six subcategories (respiratory, cardiac, shock, multifaceted, delivery and communication/ethics) was compiled by RTD software.

Moreover, a point value for each of the previously mentioned choices was assigned in SPSS: 3 points for top rated, 2 points for near the top, 1 point for middle of the pack and 0 points for not useful as presented. Subsequently, an overall score was tabulated for each scenario and compared to the overall scores of the scenarios in its subcategory. Scenarios with the highest points were considered to be essential scenarios and will be forwarded to future studies. Suggestions for future scenarios were also considered. The essential simulation scenarios chosen laid the groundwork required to determine cut scores and key actions for each scenario so that the actual performance level of the NNP being evaluated could be determined.

Table 2: Previously Empirically Tested Neonatal Scenarios

Previously Empirically Tested Neonatal Scenarios	
Category	**Scenario**
Respiratory	• Tension Pneumothorax • Difficult Airway • Lower airway obstruction- RSV/Bronchiolitis • Aspiration Pneumonia • Pulmonary Hemorrhage & obstructed ETT
Cardiac	• Shock & Pulseless Electrical Activity (PEA) • Asystole • Ventricular Tachycardia with Pulses (V-Tach w/ pulses) • Bradycardia • Pulseless Ventricular Tachycardia (Pulseless V-Tach) • Ventricular Fibrillation (V-Fib) • SVT unresponsive to Adenosine and vagal maneuvers
Shock	• Hypovolemic Shock (dehydration- Failure to thrive) • Distributive Shock (Sepsis and pneumonia)
Multifaceted	• Symptomatic Severe Hypoglycemia • Recurrent Hypoglycemia with Respiratory Distress, Pneumonia, Hypotension • Post Home Delivery with displaced ETT, severe hypoglycemia, and hypotension after rapid rewarming • Disordered Control of Breathing (narcotic OD at home- mom gave infant methadone)- ER setting
Delivery	• Resuscitation Involving Meconium- “Non-Vigorous” • Resuscitation with Positive Pressure Ventilation, Chest Compressions, Intubation and Medications (Abruption) • Delivery with Meconium, Gastroschesis, Persistent Cyanosis – CHD
Communication/Ethics	• Necrotizing Enterocolitis and Delivering Bad News • Ethics and Care at the End of Life (no response to resuscitation

efforts at delivery- due to true knot in cord)

DATA COLLECTION PROCESS

By way of an interactive on-screen format, participants were presented with survey questions while viewing statistics from other participants' answers to the same questions (Appendix J). Statistics displayed included number of participants who answered each question and answer rationales for each item (Gordon & Pease, 2006). Participants controlled which questions to access again via a "consensus portal." This control panel allowed participants to access individual questions for re-analysis and potential changed responses based on real-time information. Ultimately the entire study continued for one month as designated by the PI. RTD studies may also be ended when a pre-determined cutoff point is reached—normally when participant feedback has resulted in a steady state (Gordon, 2012). Upon study completion specialized RTD programs condensed the results and provided statistical analysis (Gordon & Pease, 2006).

DATA ANALYSIS PROCEDURES

Data was analyzed using both RTD software (version 10.17.13) and SPSS (version 20). Descriptive data were obtained from all respondents including email address, primary area of expertise, list of qualifications or certifications, gender, age, ethnicity, years of experience and sign-in date and time. Quantitative results provided by RTD software included the question ID number, section number, total count of responses for each question, sign in time, and participant's actual responses received corresponded to their RTD email ID. Furthermore, a complete listing of all qualitative responses was provided corresponding to the section number, question and participants' RTD email ID.

A master codebook was created linking participants' RTD email IDs with random ID numbers associated with the data in order to provide clarification requests or elaborations if necessary. Qualitative and quantitative data were then separated; the quantitative data was subsequently imported into SPSS for analysis. Initial analyses included descriptive statistics such as count, mean, median, mode, SD and percentages.

Specific analyses for specific aims 1 and 2 included running frequencies to determine the percentage of the RTD participants that agreed or disagreed (chose correct and incorrect) for each of the global statements; those that were found to have percent agreement of 80% or better were considered valid items (Landis et al., 1977) and will be forwarded to future studies. Specific aim 3 required that frequencies be examined for each possible choice including accurate, accurate with minor revisions, accurate with major revisions or not at all accurate for each of the operational definitions. Those that had 80 % or better agreement for accurate or accurate with minor revisions will be forwarded to future studies. Finally, specific aim 4 analysis included frequencies to determine the number of the RTD participants that chose top rated in subcategory, near the top, middle of the pack or not useful as presented for each scenario in each of the six subcategories (respiratory, cardiac, shock, multifaceted, delivery and communication/ethics). Furthermore, a point value for each of the previously mentioned choices was assigned in SPSS: 3 points for top rated, 2 points for near the top, 1 point for middle of the pack and 0 points for not useful as presented. Subsequently, an overall score was tabulated for each scenario and compared to the overall scores of the scenarios in its subcategory. Scenarios with the highest points were considered to be essential scenarios and will be forwarded to future studies. Additionally, in cases where the scenarios scores were close or equivocal, quantitative data were further analyzed for number of respondents that felt it were top rated compared to those that felt it were not useful as presented. Qualitative data were then examined to break a tie or determine if both scenarios should move forward. Finally, the qualitative data was divided by specific aim and study question, and examined for common themes. Once themes found within each question the data was transferred to a table and examined for possible use in future studies.

CHAPTER FOUR: RESULTS

The Real Time Delphi (RTD) process was vetted and tested through a pilot study containing the same questions and processes as the formal study. Pilot participants were recruited through email invitations identical to those sent to formal study experts. The invited sample for the pilot study consisted of 30 experts such as seasoned NNPs, physicians, experienced nurses and academic faculty, many with simulation backgrounds. The number of actual pilot participants was 16: nine NNPs, three physicians (one neonatologist, one OB-GYN, one pediatric emergency medicine), two neonatal nurses and two academic faculty that were Masters-trained nurse educators enrolled in doctoral programs. Ten of the 16 pilot participants were also trained in the pedagogy of healthcare simulation (four NNPs, three physicians [one associate director for simulation center], one RN and one academic faculty member/director of simulation center).

The pilot process ran with few errors. All data saved correctly, and all video links were functional. Only minor revisions were made, such as correction of misspelled words and increasing the potential study time in the email invitation to participate from 15-30 minutes to 30-45 minutes. Pilot participants were very complementary of the study contents and the RTD process.

In this chapter the results of the formal RTD were reported by sample characteristics as well as psychometric details of both quantitative and qualitative data. The information was also described by separating each specific aim. Finally, the data was analyzed and reported using figures, tables and narrative descriptions.

SAMPLE CHARACTERISTICS

The invited sample consisted of 84 experts: seasoned NNPs, physicians, psychometricians, simulation specialists, experienced nurses and academic faculty each with simulation or competency development backgrounds (Figure 1). Two potential participants entered the study, completed the demographic section and then opted out of the study due to personal time limitations. The number of participants that answered at

least one section of the RTD was 25: 19 NNPs, three neonatal clinical nurse specialists, one registered nurse (simulation specialist) and one baccalaureate nursing faculty member. Of the 19 NNPs, four were also directors of NNP services, four were assistant professors, two were associate professors, four were NNP program directors and two were deans in their schools of nursing. All 25 experts had a minimum of a Master's degree, seven had Doctor of Philosophy degrees (PhD), six had Doctor of Nursing Practice degrees (DNP), and two had Doctor of Education degrees (EdD). Eleven of the 25 participants were also trained in the pedagogy of healthcare simulation. Although males and individuals of multiple ethnic backgrounds were invited to participate, the makeup of this RTD consisted entirely of Caucasian females.

Age of the experts ranged from 39 to 66 years (n= 25; Mean= 54.4; SD 7.042) with a skew, reflective of the typical nursing expert population (Figure 2). Experts' years of experience ranged from 11-43 years (n= 25; Mean=29.08; SD 7.643) (Figure 3). Furthermore, the number of years of experience represented in the experts suggested an extensive amount of knowledge, skill and familiarity with advanced practice nursing competency.

Due to the time required and amount of data collected, each specific aim had varying degrees of participation. Section one, *Global Statements*, contained specific aims 1 and 2 and had 24 of the 25 participants answer all but seven of the items (four in SA1 and three in SA2), and these items had 23 of the 25 participants answer. Section two, *Operational Definitions*, included specific aim 3 and had 22 of the 25 experts complete four of the five items, and 21 of 25 participants completing the remainder. Section three, *Essential Scenarios*, comprised specific aim 4 and had 17 of the initial 25 experts complete the quantitative portion of the 23 items, and 16 of the 25 experts completed the remainder of the quantitative items.

Figure 1: Participants Primary Areas of Expertise

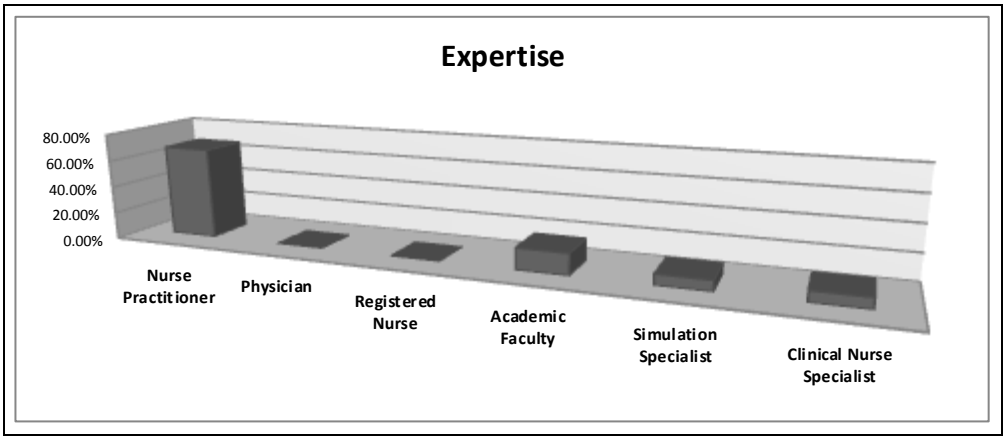


Figure 2: Age of the Participants

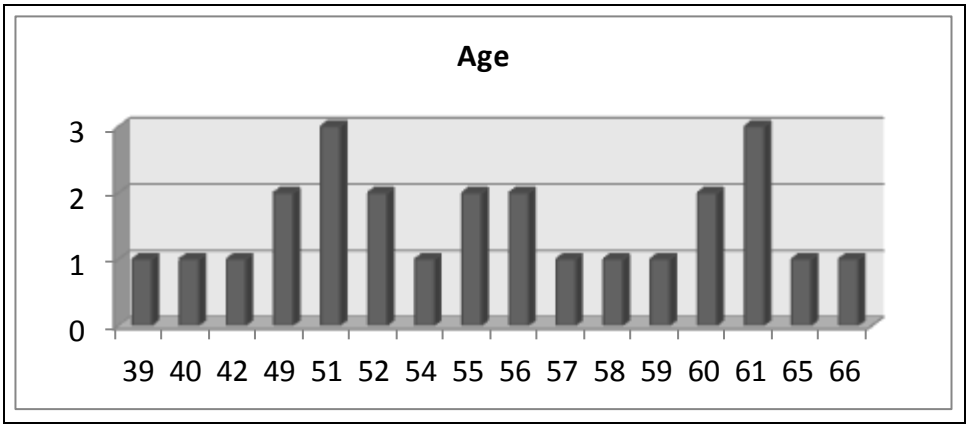
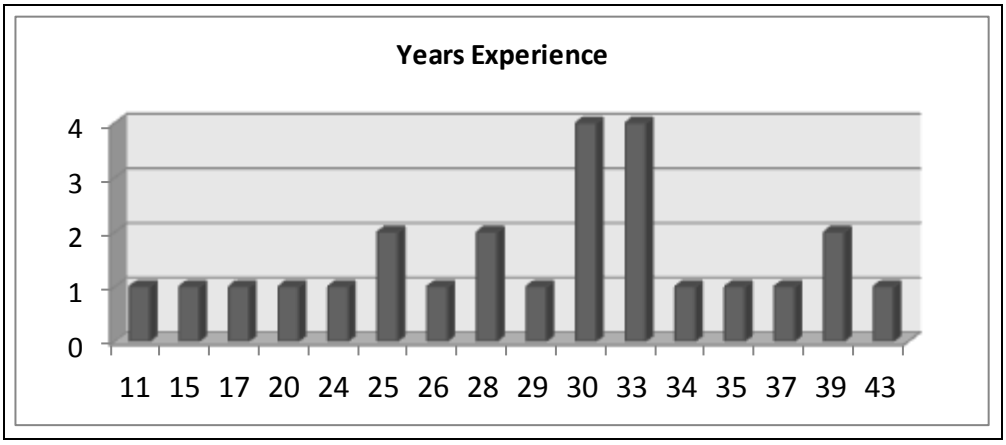


Figure 3: Years of Experience



PSYCHOMETRIC ESTIMATES

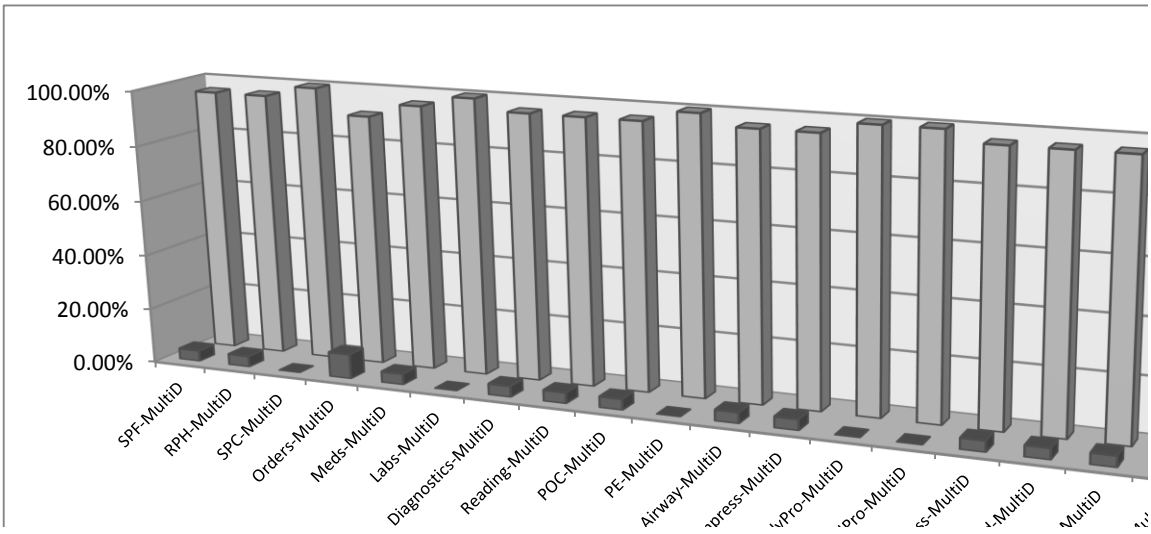
Specific Aim 1

Specific aim 1 was to identify which cognitive, technical or behavioral dimensional of competency accurately reflected each global statement. The participants were asked to indicate whether the global statements were correctly categorized into one of the following three categories: cognitive—based on one's mental knowledge; technical—based on one's hands-on skill; or behavioral—based on one's professionalism, teamwork, leadership, communication or observable conduct. Each of the 22 global statements were determined to be at least 91% (n=24) correctly categorized on multidimensionality (Figure 4). Thus, all global statements in SA1 achieved inter-rater agreement of 80% or better. A number of those that received an incorrect rating had comments addressing their potential multidimensionality. Others were marked incorrect with no rationale given as to why; the majority of these were provided by a single expert and focused on communication and the placement of particular items in the behavioral category.

Respondents were asked to make narrative comments if they were unsure of the answer or if they found it incorrect. The comments were sorted by item, themes were identified and initial responses or potential implications for future item revisions were recorded. Common thematic clusters noted were: 1) Competence continuum; 2) Multi-categorical; 3) Rationale; and 4) General statements. Competence continuum included statements that reinforced the novice to expert operational definitions portion of C.A.T.E.S. An expert stated that "Knowledge about reading of diagnostic exams is dependent on expertise and depth of knowledge." Multi-categorical statements were made when an expert felt that although the current dimension was correct, the global statement may have multiple dimensions. A panelist explained that "While this can fit in cognitive in that they need to know what to do, it can also fit in behavioral—they may know what needs to be done, but they may be unable to direct others." Rationale statements were made when an expert felt that the dimension could be incorrectly categorized, such as "I think this could be cognitive—knowing what is happening with the patient in order to manage a particular clinical situation." Finally, general statements

were made referring to the use of brand names in the example of products used to stabilize the airway. An expert commented that "May not want to use brands, but use generic terms per Neonatal Resuscitation Program." A complete table of comments referring to the multidimensional categorization of the global statements including item, themes and potential revision implications can be found in Appendix K. Furthermore, **the bolded statements** located in this table were items that have revisions explained for future studies.

Figure 4: Global Statements—Multidimensional



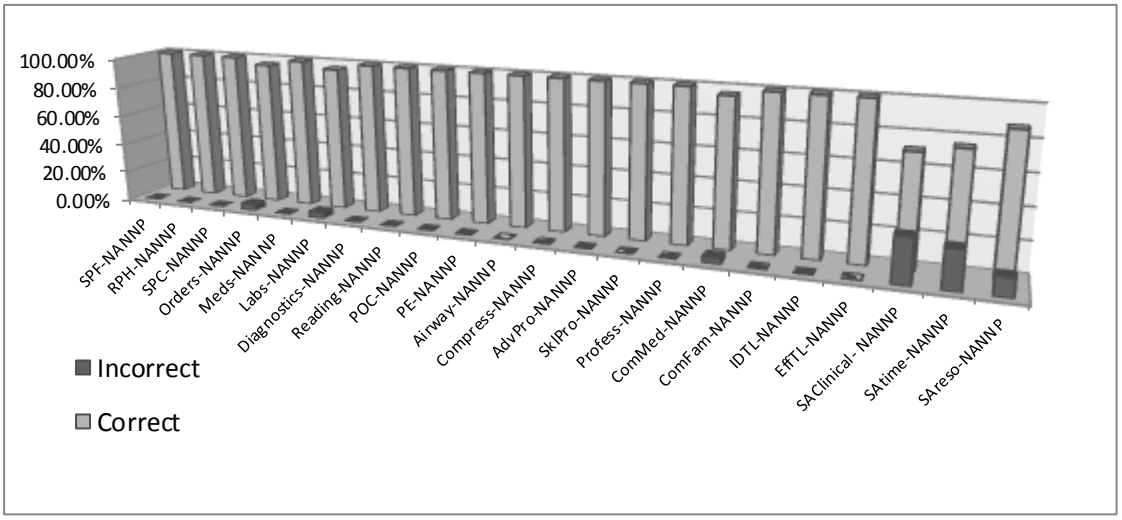
Specific Aim 2

Specific aim 2 was to indicate whether each of the global statements was correctly mapped into one of the National Association of Neonatal Nurse Practitioners (NANNP) core competency domains (Figure 5). Of the 22 global statements mapped to NANNP core competency domains, 19 were determined to have an inter-rater agreement of 96 % correct or better (n=21); one (uses situational awareness to manage resources) was 87 % correct (n=1). Two had an inter-rater agreement of less than 80 %, including "uses situational awareness to manage clinical situation," with an agreement of 71 % correct (n=1), and "uses situational awareness to manage time," with an agreement of 75 % correct (n=1). Thus, 20 of the 22 global statements mapped to NANNP core competency

domains achieved inter-rater agreement of 80 % or better. Moreover, all of those that were considered incorrect were in the subcategory of situational awareness.

The experts were asked to make narrative comments if they were unsure of the answer of if they rated an item as incorrectly categorized. The comments were collected by item, themes were identified and initial responses or potential implications for future item revisions were documented. Frequent themes observed were: 1) Competence continuum; 2) Multi-categorical; 3) Rationale; 4) General statements; and 5) Editing.

Figure 5: Global Statements—NANNP



An illustration of a competence continuum comment concerning NANNP competency domains was "Think of the emotional intelligence of the team leader." Multi-categorical statements were made when an expert felt a global statement could belong to two or more NANNP domains. An expert stated that "Almost want to place this global statement in the NANNP domain of management of patient health and illness status as for most people it is an integral skill in effective care management." Rationale statements were made when panelists felt the NANNP domain was incorrectly categorized. One expert commented on the global statement *Communicates to medical personnel appropriately* mapped to *Professional Role* that "the NANNP domain would be nurse practitioner-patient relationship as the domain talks about relaying information to the healthcare team." Other comments concerning *Uses situational awareness to*

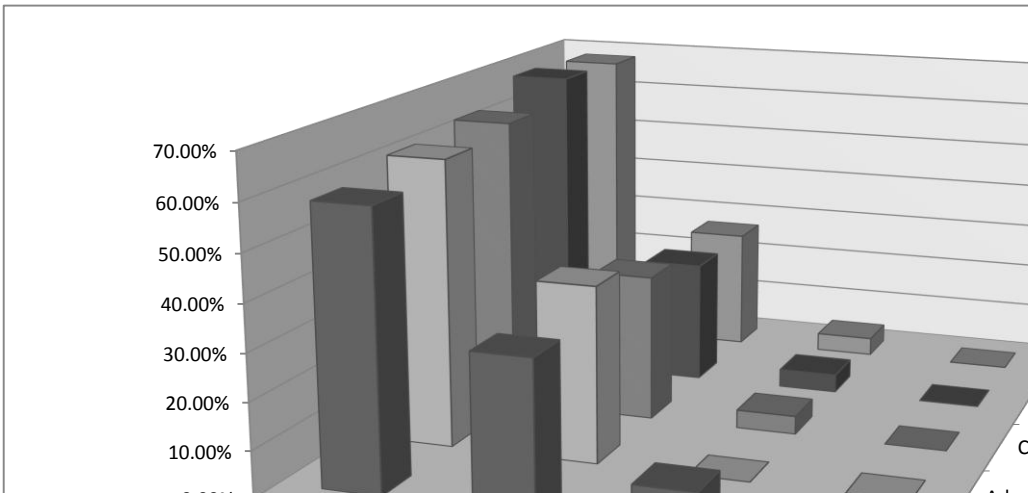
manage clinical situation mapped to *Managing and negotiating healthcare delivery systems* were "Maintaining situational awareness is a behavioral skill that can be enhanced with task delegation or close communication with the recorder in resuscitation or training yourself to be aware of surroundings; I would put this under professional behavior." Moreover, several experts commented on the global statement *Uses situational awareness to allocate time wisely* mapped to *Managing and negotiating healthcare delivery systems* by saying that "This NANNP domain is off the mark," and "Using time wisely will fall into professional role." General statements were made concerning the type of communication that was being referred to when speaking to medical staff. One expert wondered "Medical personnel communication is it SBAR for immediate or other fashion?" Finally, panelists made editing comments to make the global statements read more clearly, such as "It might be better to say, easily identified as team leader." A comprehensive table containing all the comments referring to the mapping of the NANNP core competency domains to the global statements as well as items, themes and potential study responses or revision implications is included in Appendix L. In addition, **the bolded statements** found in this table are items that have revisions explained for future studies.

Specific Aim 3

Specific aim 3 was to determine if the operational definitions were accurate reflections of NNP performance while being observed in simulation (Figure 6). The participants were given five novice-to-expert operational definitions that a person observing candidates would use in making an overall assessment of a participant being observed in simulation. Participants were asked to examine the definition and determine if it was accurate as written, needed minor revisions, need major revisions, or needed complete re-write. The inter-rater agreement for the definition of novice was 59 % accurate (n=13), 32 % needs minor revisions (n=7) and 9 % needs major revisions (n=2). Agreement on the definition of advanced beginner was 62 % accurate (n=13) and 38 % needs minor revisions (n=8). Agreement with the definition of competent was 64 % accurate (n=14), 32 % needs minor revisions (n=7) and 4 % needs major revisions (n=1).

The proficient and expert operational definitions each received an inter-rater agreement 68 % accurate (n=15), 28 % needs minor revisions (n=6), and 4 % needs major revisions (n=1). Thus, all operational definitions received an inter-rater agreement of 80 % or better in the categories of accurate or accurate with minor revisions.

Figure 6: Novice to Expert Operational Definitions



The participants were asked to elaborate if they were unsure of their answer or if they felt revisions were needed. The comments were assembled by item, common themes were identified and initial responses or potential implications for future item revisions were detailed. Recurrent themes observed were: 1) Competence continuum concerns, and 2) Editing. Panelists felt that there were competence continuum concerns with the operational definitions of novice and advanced beginner, i.e., those descriptions read like a person that would be potentially unsafe in practice. One NNP stated that "When I read this statement I come away with a feeling of lack of confidence in the education that we are providing. In my opinion novice NNPs should be minimally competent." Additionally, there were concerns with the lack of questioning the orders or rationale of a competent through expert practitioner. The expert explained that "At this point an NNP should be able to engage in effective communication techniques and incorporate feedback and suggestions as appropriate; would be key in team building." Finally, for each level of operational definition, experts commented that the descriptions should be edited to read "skills statement should be included," and "the word 'may' should be used

rather than declarative statements." A detailed table containing all the comments referring to the mapping of the NANNP core competency domains to the global statements as well as items, themes and potential study responses or revision implications is included in Appendix M. Moreover, **the bolded statements** in this table are items that have revisions explained for future studies.

Specific Aim 4

Choose essential scenarios to evaluate multidimensional NNP competency. The experts were given 23 previously vetted neonatal scenarios (including video links) to observe very brief demonstrations of the highlights or main points of each scenario. The panelists were asked to choose the best scenario in each subcategory (respiratory, cardiac, shock, multifaceted, delivery, communication/ethics) for its ability to assess a NNPs multidimensional competency and its reflection of both the National Certification Corporation (NCC) essential evaluation areas and the National Association of Neonatal Nurse Practitioners (NANNP) core competency domains. Participants were asked to make this decision by rating scenarios as top in category, near top, middle of the pack or not useful as presented. Additionally, the participants were asked to give suggestions for future scenarios that would greatly reflect both the NCCs' essential evaluation areas and the NANNP core competency domains. To determine the essential scenario for each subcategory, each rater choice was given a corresponding set of points (top rated: 3 points; near top: 2 points; middle of the pack: 1 point; and not useful as presented: 0 points) and the total score was calculated by multiplying the frequency of each choice by the corresponding points value. The scenarios with the highest scores were deemed eligible for future studies. Moreover, if the participants did not feel they could competently answer this section they could submit a narrative reason for their opt-out.

Essential Respiratory Scenarios

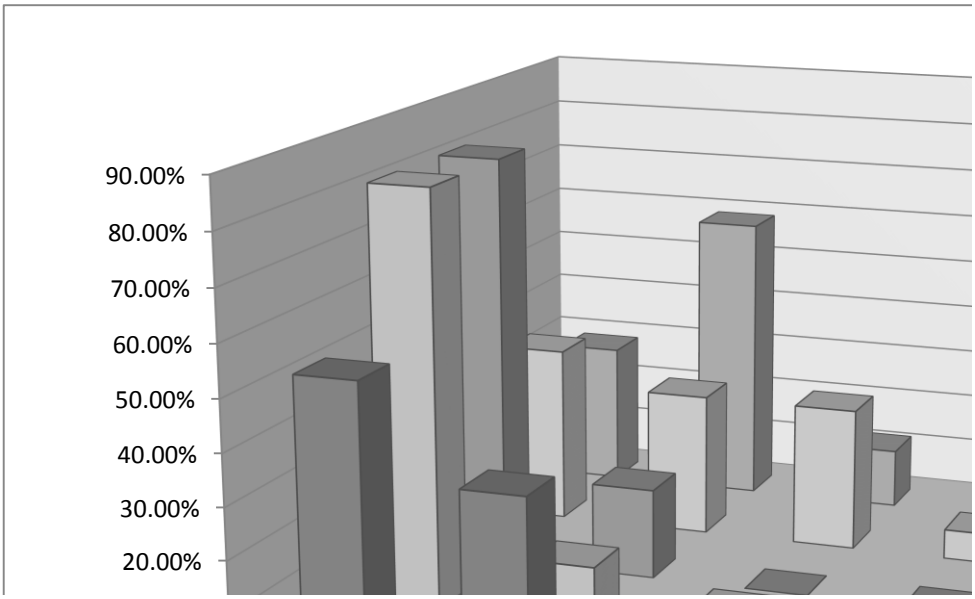
There were a total of five respiratory scenarios; the overall scores ranged from 33-48 points (n=17; mean=41; SD=6.42), with the lowest being Lower Airway (bronchiolitis) followed by Aspiration Pneumonia, and Pulmonary Hemorrhage. The top

two scenarios were Tension Pneumothorax, which received 82 % top rated (n=14), 12 % near top (n=2), and 6 % middle of the pack (n=1), and Difficult Airway, which received 82 % top rated (n=14) and 18 % near top (n=3). This resulted in an equivalent inter-rater agreement for both scenarios, with an overall score of 48 points for Difficult Airway and 47 points for Tension Pneumothorax (Figure 7).

Each of these essential scenarios were determined to be reflective of common respiratory issues and skills that a NNP would need to know, including bag-valve-mask ventilation, endotracheal intubation, use of an laryngeal mask airway, as well as recognition and treatment of a pneumothorax via chest needle aspiration and subsequent placement of a chest tube. Thus, both the Difficult Airway and Tension Pneumothorax scenarios will be forwarded to future studies for the determination of essential objectives, key actions and cut scores.

Participants were asked again to elaborate if they were unsure of their answer or if they felt an item was not useful as presented. The comments were grouped by subcategory (respiratory, cardiac, shock, multifaceted, delivery, communication/ethics) and further divided by scenarios. Although the instructions concerning the videos explained that they were only meant to provide a very brief demonstration of the main points of each scenario, i.e., they were not comprehensive or described as flawless, there was substantial qualitative critique of the content of several of the scenarios. Subsequently, common themes were identified and initial responses or potential implications for future item revisions were detailed. Recurrent themes observed were: 1) Rationale, and 2) Video content.

Figure 7: Essential Respiratory Scenarios



One expert explained their rationale for rating lower airway as only middle of the pack by saying "bronchiolitis is unlikely to be seen in the NICU, this content is more relevant to the primary care of the NICU graduate". Other experts agreed: "Bronchiolitis is not usually seen in NICU but PICU." This line of reasoning explained why the Lower Airway scenario was voted as the least essential respiratory scenario. Several experts commented on the content of the videos. When referring to the Tension Pneumothorax scenario, a panelist explained that "In scenario, because of rapid decompensation and length of time to get CXR, we recommend transillumination and needle aspiration." To clarify, this too is the practice of the PI; the chest X-ray was displayed in the video only to serve as a rapid visual depiction of patients' primary condition. When discussing the video content of Aspiration Pneumonia, experts desired that the practitioner in the video should "ask about NG/OG tube location to begin assessment." The video content comments, although not requested, will go forward in the development of exemplar videos used to train future raters. A detailed table containing all the comments that refer to the essential respiratory scenarios are displayed by items, themes and potential study

responses or revision implications is included in Appendix N. Moreover, **the bolded statements** are guidance for revisions in future studies.

Essential Cardiac Scenarios

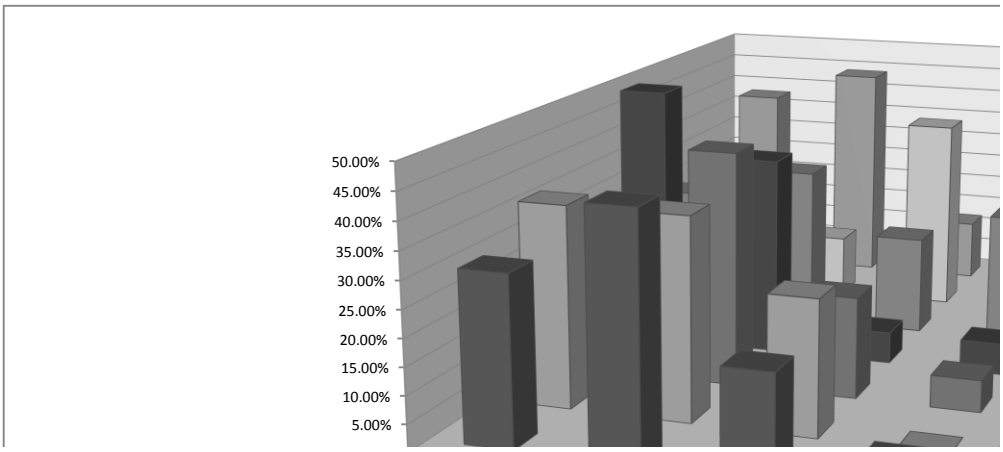
There were a total of seven cardiac scenarios; the overall scores ranged from 22-37 points (n=16; mean=29.6; SD=5.5) with the lowest score awarded to Ventricular Fibrillation (V-Fib) followed by Pulseless Ventricular Tachycardia (PV-Tach), Pulseless Electrical Activity (PEA), Ventricular Tachycardia (V-Tach), Supraventricular Tachycardia (SVT) and Asystole (Figure 8). The top scenario as rated by the RTD experts was Bradycardia, which received 50 % top rated (n=8), 38 % near top (n= 6), and 6 % middle of the pack (n=1), and 6 % not useful as presented (n=1). Bradycardia was determined to be reflective of an extremely common neonatal cardiac occurrence, and requires skills that a NNP would need to know including rhythm recognition, bag-valve-mask ventilation, endotracheal intubation, chest compressions, administration of epinephrine and normal saline. Thus, the Bradycardia scenario will be forwarded to future studies that will initially include the determination of essential objectives, key actions and cut scores.

In addition to quantitative responses, the panelists were asked to explain their rationale if they were unsure of their answer or if they felt the item was not useful as presented. The data were reviewed and categorized by scenario and further sorted for themes. Throughout the Cardiac sub-category, two primary themes prevailed: rationale and video content. For Pulseless Electrical Activity, rationale comments included "Not a neonatal scenario but more a PICU type," and "Not sure all the possible problems/diagnoses the NNP was identifying are necessarily what I would expect." The content in several of the cardiac scenarios was from the American Heart Association's Pediatric Advanced Life Support (PALS) program (Chameides et al., 2011), as detailed in the introduction to this section of the RTD. This particular scenario was included because all of the causes of PEA can be found in the NICU, especially in academic centers with readmissions to NICU and high patient acuity. It has also been included in Karlsen's S.T.A.B.L.E. scenarios after discovering that this situation was being

frequently overlooked until patients' heart rate dropped below 60 BPM (Karlsen, 2006). The video content comments included "Seemed a bit rehearsed and not very natural"; "Resuscitation technique not paid attention by NNP"; "No hands around and under infant for compressions"; "Not the preferred method by ILCOR or NRP. NNP should be correcting their technique"; and "Closed loop communication not used." The videos, as explained in the introduction of this portion of the RTD, were only approximately one minute in length to ensure experts' time spent in viewing was not misused. Subsequently, the videos of each scenario were rehearsed compressed versions of the main points or highlights and not meant to be viewed as exemplars. The two-finger compression technique is a method that is globally accepted and utilized when multiple providers are needed to allow for greater access to a neonatal patient during cardio-respiratory resuscitation. Each of the comments will be examined prior to creating exemplar video for training raters in the use of C.A.T.E.S. in future studies.

Expert narrative remarks concerning Asystole contained only the video content theme. Comments included "Terrible compressions and breathing techniques"; "this video is not a good example of technique"; and "Need to look for causes of asystole [such as] what preceded this event: feedings, medication infusion, etcetera." As previously mentioned, the videos of each scenario were designed to demonstrate only the main points or highlights rather than be exemplars. Consequently, these comments will also be sent forward when designing sample videos for training raters in the use of C.A.T.E.S.

Figure 8: Essential Cardiac Scenarios



Panelists also commented on their rationale and video content of Ventricular Tachcycardia with a Pulse. Rationale statements included “Not sure this is very useful as a NICU scenario—more likely to see SVT”; “It is good, however, to have some experience with a defib/cardioverter”; “More of a PICU scenario than a neonatal”; and “Have never done cardioversion without Neo at bedside.” As stated in introduction, some of the scenarios are from American Heart Association’s PALS program and were included because NNPs are certified to care for patients aged zero to two; resuscitations involving treatment with electricity are not covered in the Neonatal Resuscitation Program’s content. Moreover, this condition can occur more frequently on neonatal transports with purely bedside RNs present and in academic centers’ NICUs. The author agrees that SVT is more prevalent in neonatal population than ventricular tachycardia. Video content critique included “I would call the neo prior to calling Cardiology (because) a lot of centers do not have Pediatric Cardiology readily available.” The author also agrees—when future exemplar videos are created, the neonatologist will be contacted first.

The experts’ comments on bradycardia fell exclusively under the theme of video content. Sample comments included “I thought that the administration of epinephrine was a little quick after the bag mask ventilation was started,” and “Does not follow NRP algorithm.” The setting for this demonstration video was in the NICU and based on PALS, whereas NRP is designed primarily for the delivery room setting. Furthermore, due to the extremely compressed timeframe for the video, real-time actions were accelerated to ensure all desired content was included.

Rationales concerning Pulseless Ventricular Tachycardia were focused on the scenario not being neonatal in origin: “This is a better fit for PICU,” and “Not commonly seen in NICU.” Again, the author agrees that although uncommon, arrhythmia does occur in neonatal population and thus must be treated with a precise and rapid response. Video content commentaries included “the chest compressions appeared to be what you would do on pediatric patients, not neonatal,” and “NRP guidelines for chest compressions not followed.” Indeed, the chest compressions were PALS and not NRP because of the size (age) of the mannequin required for this scenario. NRP is designed for the neonatal

period, which is over at 28 days of age; this patient was older, and still fell under NICU and NNP purviews.

Rationales for Ventricular Fibrillation focused on the pervasive feeling that this was primarily a pediatric or PALS scenario. One expert commented that "Not sure I have ever seen this in the NICU, seems like it is better suited to the PICU, and not something I would expect NNPs to recognize and respond to in this way." Another expert commented, "V-fib is rare in the newborn and therefore its recognition and treatment is not a major focus for the NNP." Although Ventricular Fibrillation (V-Fib) is rare in the newborn, an NNP is certified to care for patients up to two years of age. Moreover, the scenario was included primarily because the recognition and treatment for this rhythm is included on the NCC examination for certification of an NNP. Finally, because it is a rare occurrence, every member of the NICU team, including the bedside RN, should be able to rapidly recognize and understand the required treatment modalities including but not limited to the use of the defibrillator.

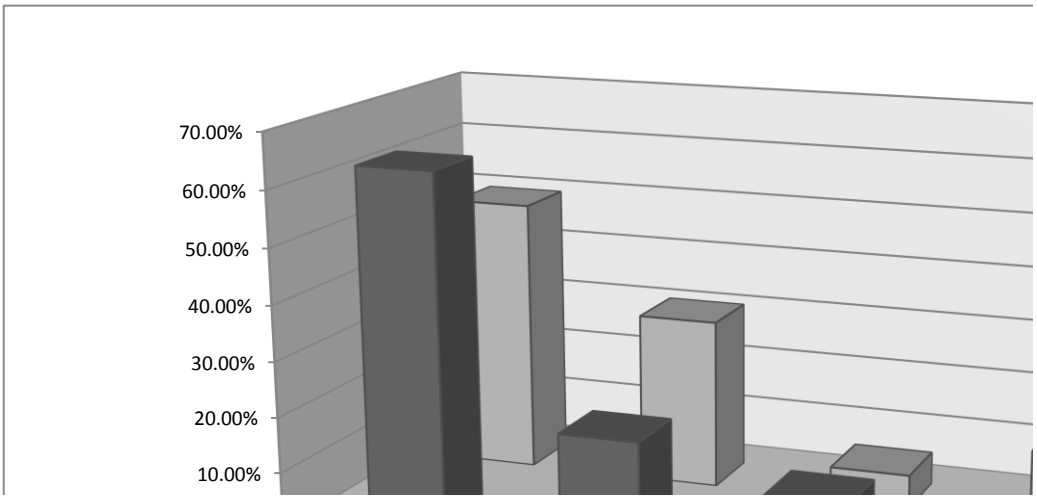
Finally, experts expressed video content commentary concerning the footage of Supraventricular Tachycardia (SVT). Such comments included "Not sure I would expect an NNP to manage this whole scenario on her own," and "Going way too fast for communication." The management of SVT could be handled by a bedside RN trained in PALS, especially if on transport; thus an NNP managing the situation as sole team leader is not out of the question. This video had an extensive amount of material to include in a one minute clip, and thus exemplar communication could not be attained throughout, but will be a primary focus of future model recordings. A thorough table containing all the comments that refer to the essential cardiac scenarios are displayed by items, themes and potential study responses or revision implications is included in Appendix O. Furthermore, **the bolded statements** are helpful items to direct modifications in future studies.

Essential Shock Scenarios

There were only two shock scenarios and overall scores ranged from 36-38 points (n=16; mean=37; SD=1.4); Hypovolemic Shock received 63 % top rated (n=10), 19 %

near top (n=3), and 12 % middle of the pack (n=2) and 6 % not useful as presented (n=1). Distributive Shock received 50 % top rated (n=8), 31 % near top (n=5), 6 % middle of the pack (n=1) and 13 % not useful as presented (n=2) (Figure 9). Each scenario is common in the neonatal setting, although in the NICU distributive shock is more reflective of infectious processes than anaphylactic or neurogenic processes, and may be labeled as septic shock. Additionally, both shock scenarios require skills that a NNP would need to know including recognition of shock, bag-valve-mask ventilation, endotracheal intubation, administration of normal saline or blood products and treatment of the initial causes that lead to shock. While scores are equivocal, with further analysis one can see that Hypovolemic Shock received 13 % higher in the top rated category and 7 % lower in the not useful as presented category. Thus, the Hypovolemic Shock scenario will be forwarded to future studies that will initially include the determination of essential objectives, key actions and cut scores.

Figure 9: Essential Shock Scenarios



Furthermore, the participants were asked to explain their justification if they were unsure of their answer or if they felt the item was not useful as presented. The data were reviewed and categorized by scenario and further examined for themes. Throughout the shock sub-category, rationales and video content were the two primary themes. The only theme concerning the Hypovolemic Shock scenario was video content; selected

comments included “I think more information is needed before jumping to a volume bolus—blood pressure, capillary refill, weight, number of wet diapers, etcetera,” and “The NP made an assessment of hypovolemic shock yet there was no mention of a blood pressure by the RN staff.” This information will be used in the creation of exemplar videos to train raters.

Experts’ logic concerning Distributive Shock was documented through description of rationale and video content items. Rationale comments included “This happens in the NICU but the terminology is PALS again.” As described in the introduction, some scenarios are from the PALS program but also apply in the NICU setting. Experts also critiqued the video content with comments such as “go a little slower; let team members contribute”; “Add weight and doses of antibiotics”, and ”More closed loop communication.” Once again, the abbreviated time frame for each clip prevented perfect execution to allow for all major aspects of the scenario to be included. A comprehensive table containing all the comments referring to the essential shock scenarios are displayed by items, themes and potential study responses or revision implications is included in Appendix P. Furthermore, **the bolded statements** will serve as advice for adjustments desired in future studies.

Essential Multifaceted Scenarios

There were four multifaceted scenarios; the overall scores ranged from 22-41 points (n=16; mean=34; SD=8.5). The lowest score went to Disordered Control of Breathing (DisCont) followed by Post Home Delivery (PostHome), and Recurrent Hypoglycemia. The top rated scenario was Severe Symptomatic Hypoglycemia, which received 69 % top rated (n=11), 19 % near top (n=3) and 12 % not useful as presented (n=2) (Figure 10). While the scores are essentially equivocal for Severe Symptomatic Hypoglycemia (41 points) and Recurrent Hypoglycemia (39 points), further evaluation yielded Severe Symptomatic Hypoglycemia receiving 13 % higher in the top rated category, and the overall content of each scenario is very similar. Severe Symptomatic Hypoglycemia is a scenario that is common in the neonatal setting, and requires skills that a NNP would need to know including recognition of hypoglycemia, obtaining IV

access and administration of dextrose as need to correct blood glucose levels as well as treatment of any subsequent respiratory or neurological sequelae. Thus, the Severe Symptomatic Hypoglycemia scenario will be forwarded to future studies that will initially include the determination of essential objectives, key actions and cut scores.

Likewise, participants were asked to explain their justification if they were unsure of their answer or if they felt the item was not useful as presented. The data were reviewed and categorized by scenario and further examined for themes. Throughout the Multifaceted sub-category, rationales and video content prevailed as the two primary themes.

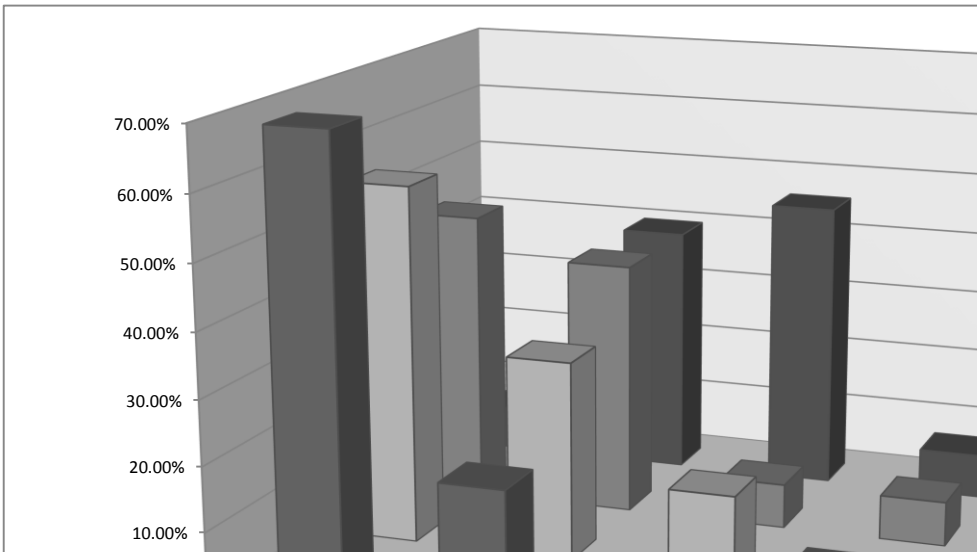
Experts limited their narrative responses to Severe Symptomatic Hypoglycemia to video content analysis. Experts stated "[Include] more information about hypoglycemia, Accucheck results using unit of measure (mg/dL)," and "Include how many mg/kg/minute of D10W is being delivered with the IV drip." These items should have been detailed in the exemplar videos, but were not due to time restraint. Other experts wanted to know "why the 10 minute wait for the next Accucheck glucose?" One must give the dextrose bolus adequate time to take effect, and typically the glucose level is checked between 10– 30 minutes after the initial bolus; this occurrence will be examined for potential modification in the exemplar video.

Panelists also voiced suggestions concerning the video content of Recurrent Hypoglycemia with Respiratory Distress, Pneumonia, and Hypotension. Some ideas presented were: "Need to give the staff more time to convey pertinent information to NNP," and "Rather than state breath sounds are good, state that they are audible on the right and left and equal." These recommendations will be forwarded to any future development of model video for this scenario.

Moreover, participants voiced comments concerning the video content of the scenario entitled Post Home Delivery with displaced ETT, severe hypoglycemia and hypotension after rapid rewarming. Advice offered included "With the new NRP guidelines I would have them place the pulse ox on the right hand ASAP," and "I would recommend extending the scenario to include the volume and glucose boluses needed to

treat all facets of this scenario." These suggestions will be forwarded to any future development of a model video for this scenario.

Figure 10: Essential Multifaceted Scenarios



The experts had both rationale and video content comments on the final multifaceted scenario, Disordered Control of Breathing (narcotic OD at home—mom gave infant methadone)-emergency room setting. Rationales included "I do not believe this scenario is appropriate for assessment of NNP competence (due to the area of service and the clinical problem)." While the author is in general agreement with this observation, this scenario was included because it covered the 0-2 age range and is appropriate for those NNPs involved with neonatal readmits or transports from area emergency rooms. Another expert stated that "I do not think many NNPs would be the lead in the ER setting; they may, however, be there to assist the ER physician in any way they can and offer suggestions on care." The author generally agrees with this comment, but the NNP can be the lead provider in the ER settings in which the physician on-service is not comfortable with infants or small children. Video content counsel offered by panelists consisted of statements such as "Not sure I would worry about social services in the middle of the resuscitation—although they do need to be called." The author agrees on timing of the call, but due to video time restraints, it was included as the closing line.

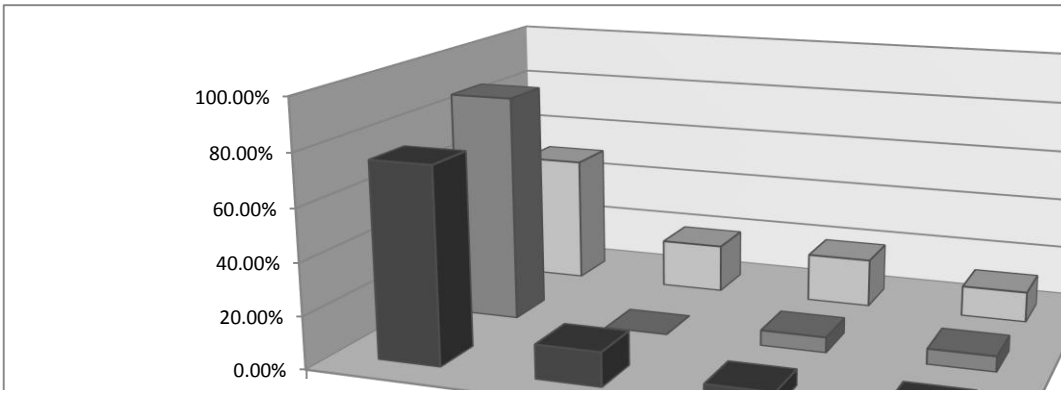
Another expert stated that "NNP should recognize that Narcan might be contraindicated if the mother has been on methadone." The author also agrees with this statement, yet the lead NNP in the video simply stated it would be considered; this facet will be removed if future exemplars are created. An all-inclusive table containing all the comments referring to the essential shock scenarios are displayed by items, themes and potential study responses or revision implications is included in Appendix Q. Additionally, **the bolded statements** will serve as direction for modifications toward future studies.

Essential Delivery Scenarios

There were a total of three delivery room scenarios: the overall scores ranged from 33-43 points (n=16; mean=39; SD=5.3); the lowest score was awarded to Meconium with Gastroschesis and CHD (MecGastro), followed by Meconium Non-Vigorous (Mecon NonV) (Figure 11). The top scenario as rated by the RTD experts was Abruption, which received 88 % top rated (n=14), 6 % middle of the pack (n=1), and 6 % not useful as presented (n=1).Each of these delivery scenarios are different in their focus, but reflective of common neonatal delivery occurrences, and require skills that a NNP would need to know: intubating before stimulation for meconium, bag-valve-mask ventilation, endotracheal intubation, chest compressions, administration of epinephrine and normal saline as well as umbilical line placement. Yet the scores for Abruption (41 points) and Meconium Non-Vigorous (39 points) were equivocal. Thus, both the Abruption and Meconium Non-Vigorous scenarios will be forwarded to future studies that will initially include the determination of essential objectives, key actions and cut scores.

Subsequently, experts were asked to explain if they were unsure of their answer or if they felt the item was not useful as presented. The data were reviewed and categorized by scenario and further examined for themes. Video content was the exclusive theme throughout the Delivery sub-category.

Figure 11: Essential Delivery Scenarios



Experts comments on the Meconium Non-vigorous scenario included "Good representation of skill set but would recommend having someone call out neonate response to intubations as another decision point for how many times to intubate"; "No discussion or obvious checking of HR/VS"; and "NNP needs to tell the plan of care to team." All responses will be forwarded to the creation of exemplar video to train raters.

Conversely, where the Abruption scenario was concerned, a panelist wrote:

> Even in an emergent situation such as this the practitioner should don sterile gloves prior to touching the sterile field. As the others are continuing the compressions and ventilation, the NNP can step away and take the few seconds involved in donning sterile gloves, then touch the sterile catheter for the UVC.

The author is in agreement with this statement, yet time and budget constraints for the video clips made for this study did not allow for the donning of sterile gloves; it is also not a requirement in an emergency. Another expert commented that "Would have placed a pulse ox the right wrist soon after delivery." Each of these suggestions will be addressed when future exemplar videos are made.

Finally, participants expressed several points about the video content of the video containing an excerpt from the Delivery with Meconium, Gastroschesis, Persistent Cyanosis, and Congenital Heart Disease (CHD) scenario. Comments included "Not sure why he needed CPAP when he was crying—it was not clear that he was having breathing difficulty"; "Would be careful with CPAP with a gastroschesis, needs OG tube"; and

"Not listening to team input with stethoscope in ears." The author agrees with these comments, yet notes that this was a very difficult scenario to get all main points portrayed in abbreviated time frame. Each of these comments can be carried forward if a model video needs to be created for this scenario. A complete table containing all the comments referring to the delivery scenarios are displayed by items, themes, and potential study responses or revision implications is included in Appendix R. Additionally, **the bolded statements** will utilized as direction for revisions for future studies.

Essential Communication/Ethics Scenario

The final sub-category, Communication/Ethics, had only two scenarios and overall scores ranged from 35-38 points (n=16; mean=36.5; SD=2.1) (Figure 12). Necrotizing Enterocolitis (NEC) received 60 % top rated (n=10), 20 % near top (n=3), and 13 % middle of the pack (n=2), and 7 % not useful as presented (n=1). End of Life - true knot in cord (EOL) received 56 % top rated (n=9), 32 % near top (n=5), and 6 % middle of the pack (n=1), and 6 % not useful as presented (n=1). Each scenario is found in the neonatal setting, yet discussion of removal from life support as seen in Necrotizing Enterocolitis is often a team approach and the entire responsibility is rarely placed solely on the NNP.

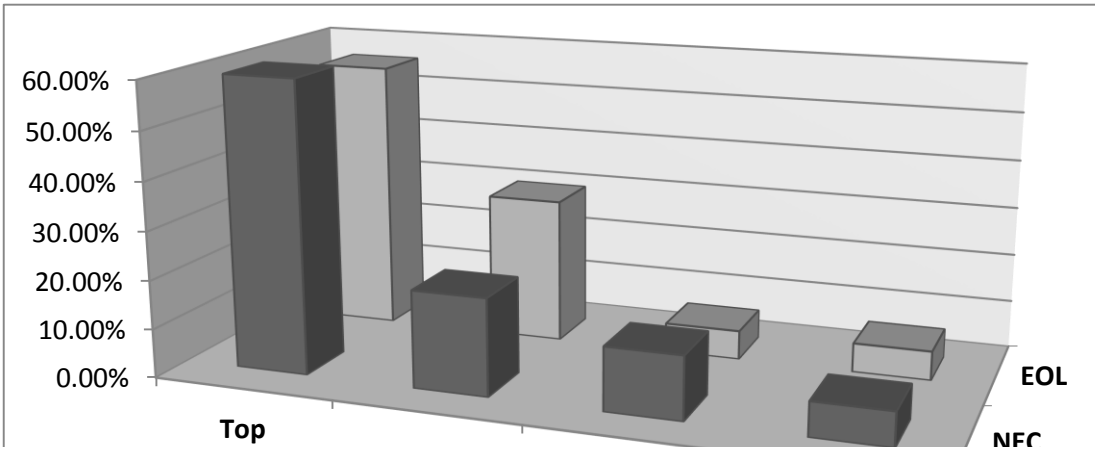
Additionally, although, both ethics and communication scenarios require expertise in competent and compassionate communication, the End of Life scenario also encompasses a full resuscitation attempt including bag-valve-mask ventilation, endotracheal intubation, administration of epinephrine and normal saline or blood products and emergent placement of umbilical lines. Thus, the End of Life scenario will be forwarded to future studies that will initially include the determination of essential objectives, key actions and cut scores.

Moreover, experts were asked to explain their reasons if they were unsure of their answer or if they felt the item was not useful as presented. The data were reviewed and categorized by scenario and further examined for themes. Throughout the Communication/Ethics sub-category, rationales and video content predominated were the only themes.

Experts focused solely on video content of the Necrotizing Enterocolotis and Delivering Bad News scenario, commenting that "Neo should be present as well." The author agrees that this is normally a team conversation, and an NNP would rarely have to have this conversation alone. Another expert asked "Where are other family members or support for mother?" Due to budget constraints, family members were omitted from the video clip for this study. Additionally experts suggested that "It would be more effective with a little more time, less nurses, putting baby on ventilator, and face-to-face communication with Mother." The author also agrees and had time permitted, this would have been optimal. Finally, a participant suggested "Use less medicalease (viable is too technical for most lay people) and call the baby by her name (he was used instead of she at one point)." These comments can be applied to any future exemplar videos.

Rationales expressed by experts concerning the End of Life (True Knot in Cord) scenario included such factual statements as "Depending on the state where you practice, an NNP cannot make this decision—rather an MD has to be the one to stop the resuscitation," and "Some states may allow NNPs to do this in their scope of practice, but it is quite variable." The author agrees that that although advanced practice nursing has an excellent understanding of what constitutes valid reasons to stop resuscitation, many states have not granted that authority beyond the physician. Another expert explained ways in which to legally manage such scenarios by stating, "[Can utilize] the OB for example, an ER physician, or others who can come help with the decision making." Video content comments included "Make longer scenario to be more effective." This input will be forwarded to the creation of a model video used to train raters. A detailed table that contains all the comments referring to the communication/ethics scenarios are displayed by items, themes, and potential study responses or revision implications is included in Appendix S. Additionally, **the bolded statements** are items that will provide guidance for adjustments in future studies.

Figure 12: Essential Communication/Ethics Scenarios



The RTD experts also had the opportunity to submit general qualitative comments. Many experts submitted analysis of the video viewing and creation process. The data was reviewed, categorized by content and further examined for themes. Four primary themes were found while examining the data including access, logistics, future scenario suggestions and educational uses. Where access was concerned, one expert stated that "I could not access videos so my answers were based on the title of the topic and perception of content that would be included." This was deemed to be totally acceptable as the videos were only meant as adjunct information for those that were experts in neonatal care but not familiar with simulation, or those familiar with competency assessment or simulation but not familiar with neonates. Other participants stated they had "Difficulty submitting answers"; "Some videos hard to view"; or that experts were unable to access the videos at work due to the facility's firewall. Still another expert stated that "Fortunately, I was able to access everything."

Global scenario logistics suggestions from experts included "To make the scenarios more realistic, there needs to be a little more interaction between the person at the head of the bed with the rest of the staff," and "[Use] closed loop communication, no thin air commands, and input from the team." Another expert stated,

> I agree with the break in infection control techniques, particularly the hair needs to be tied back, and verbal orders with no repeat back. Also, I believe that a neonatologist should be contacted and available to appear.

Other participants focused on behind the scenes logistics: “Camera angles were good, but wonder if a few birds’ eye shots would offer expanded views of teamwork and position during resuscitation.” Another individual gave kudos by stating that “Overall, the scenarios are well done,” and “Thought narration of care by NNP added to fidelity of manikin based scenarios.” When making exemplar videos for training the raters these suggestions will be used to guide the scenario participants and director.

The third theme, future scenario suggestions, included expert opinions such as “Consider adding scenarios with pleural or pericardial effusions,” and “Need a different scenario for IO and UAC.” Although the vetted scenarios that were chosen in this RTD will be studied first, these suggestions will be utilized in creation of additional neonatal simulation scenarios to assess multidimensional competency.

The final theme, educational uses, had a single respondent who stated:

> You may be able to use this first set of videos to compare practice by an expert NNP before she went through sim and debriefed. You could set it up that the NNP students could watch the vids, and then do a debrief on the performance that is evaluating both excellence and areas of challenge (a model like + delta would be a good debriefing frame to keep it simple and brief). [This] offers a chance to look not only for error, but also areas of strength as they advance through the novice to expert path.

This suggestion would be a wonderful addition to the additional simulation activities in the NNP program at UTMB. A detailed table containing all the comments referring to the global assessment of the essential scenario videos are displayed by items, themes and potential study responses or revision implications is included in Appendix T. Additionally, **the bolded statements** are items that will provide guidance for adjustments in future studies.

Finally, experts submitted general comments directly related to the RTD process. The data was reviewed and categorized by theme including: 1) user friendless, 2) usefulness, and 3) study attachments. In reference to user friendliness panelists stated that “I thought the system was very easy to use”; “I like the RTD process”; and “I had no difficulty in using this tool.”

Participants also commented on the usefulness of the RTD process. They wrote statements including “Delphi process interesting”; “For me this tool was extremely helpful”; and “This type of Delphi study is fun!” Moreover, experts reviewed the attachments included within the study to aid in expert decision. Some comments regarding the global statements attachment included “Add Pericardial and Pleural effusions, Pneumo-thorax, pericardium, and peritoneum.” These will be added for future reference. Other experts added that “If you have drop-downs for some categories, include them for all categories.” It has been anticipated from conception that C.A.T.E.S. would include drop-downs for all global statements that align to the scenario design and objectives. The experts also agreed that the drop downs should “add closed loop, eye to eye, knee to knee communication” to the current drop down choices. This suggestion will also be implemented within C.A.T.E.S. to match the scenario design and objectives.

CHAPTER FIVE: CONCLUSIONS, DISSCUSSION, AND RECCOMENDATIONS

INTRODUCTION

Preceding chapters discussed the background and significance of competency in healthcare and, specifically, NNPs. Subsequently, the literature was reviewed and supporting theoretical frameworks examined. The RTD method was explained and the study design was presented. Results of the RTD were detailed. This final chapter will detail major results, divided by specific aim, as they relate to current literature and theoretical frameworks. A discussion of study limitations, as well as implications for nursing and healthcare, will be included. Finally, recommendations for future research will be explored.

SYNTHESIS OF MAJOR FINDINGS

Specific Aim 1

Specific aim 1 was designed to identify which dimension (cognitive, technical or behavioral) of NNP competency accurately reflects each of the global statements. Specific aim 1 was investigated by asking the RTD experts: Are the global statements accurate reflections of a competency dimension? The panelists agreed that 100 % of the global statements accurately reflected a cognitive, technical or behavioral dimension of NNP competency. This finding correlated with the foundational theoretical frameworks that specific aim 1 was based on, including the Iceberg Theory of Competency developed by Spencer and Spencer (1993) through the unanimous determination of the cognitive, technical and behavioral dimensions of competency, and Miller's Prism of Competency (2009) through its use of the respective terms of knowledge, skills and attitudes (Appendices B & D). Thus, the foundation for C.A.T.E.S. to accurately measure each of the cognitive, technical and behavioral competency dimensions reflective of NNPs'

clinical practice is properly constructed and increases the possibility of ensuring that C.A.T.E.S. will become a valid and reliable multidimensional instrument.

Specific Aim 2

Specific aim 2 was developed to indicate whether each of the global statements is correctly mapped into one the following NANNP Core Competency domains. To determine the accuracy of the NANNP domain to each global statement, experts were asked: Are the global statements accurate reflections of a NANNP competency domain? The panelists agreed that all but two global statements were correctly mapped to a corresponding NANNP competency domain. Moreover, each of the global statements in question fell into the behavioral dimension of situational awareness, which indicated that this category is more difficult to distinguish between NANNP competency domains. Moreover, NANNP is currently revising their domains to mirror the National Organization of Nurse Practitioner Faculty Domains (NONPF). The PI for this study is on that NANNP competencies task force, and will use that information to map the global statements to the NONPF domains. Subsequently, all statements will be revisited by an additional panel of experts to determine their accuracy to the NONPF domains when published by NANNP. Ensuring all the global statements are accurately mapped to the latest NANNP competency domains will assist in forming C.A.T.E.S. into a comprehensive instrument to evaluate the core portions of NNP clinical competence as delineated in the Consensus Model for Advanced Practice Registered Nurse (APRN) Regulation (2008) and further extrapolated to the National Association for Neonatal Nurse Practitioners Competency Toolkit (2010a).

Specific Aim 3

Specific aim 3 was created to determine if the operational definitions are accurate reflections of NNP performance while being observed in simulation. Subsequently, experts were asked: Are the novice to expert operational definitions accurate reflections of NNP performance subscales? It was determined that all novice-to-expert operational definitions were accurate reflections of the operational definitions of NNP performance

while being observed in simulation, and worthy of progression to future studies. Thus, experts found that operational definitions strongly correlated with Benner's Novice to Expert theoretical model (1984) of competency, as also depicted in Miller's Prism of Competency (2009) (Appendices C & D). Of note, some experts suggested minor revisions; although these suggestions did not affect the definition's overall accuracy, they will be analyzed and implemented as needed to increase the comprehensiveness and clarity of each novice to expert operational definition. Thus, the subsequent value of C.A.T.E.S. will be improved because of its strong ability to clearly define how a novice, advanced beginner, competent, proficient and expert NNP will appear while performing in a simulated clinical situation. Development of such items is predicted to permit raters to accurately define NNPs' performance in real-time simulated clinical situations, which will in turn increase the probability of future IRR and predictive validity of C.A.T.E.S. and guide educators and employers in the need for remediation or advancement in neonatal advanced practice nursing.

Specific Aim 4

Specific aim 4 was constructed to have experts choose the essential scenarios to evaluate multidimensional NNP competency. Thus, the question posed to experts was: What are the essential scenarios to evaluate multidimensional NNP competency? The scenarios from which panelists could choose from consisted of previously vetted neonatal and pediatric scenarios developed by certifying organizations, including The American Academy of Pediatrics' (AAP) Neonatal Resuscitation Program (NRP), The American Heart Association's (AHA) Pediatric Advanced Life Support (PALS) program, and the S.T.A.B.L.E. Program (Chameides et al., 2011; Karlsen, 2006; Zaichkin et al., 2011). Moreover, the scenarios divided into six subcategories: respiratory, cardiac, shock, multifaceted, delivery and communication/ethics. The experts determined subsequent essential scenarios by category: 1) Respiratory – *Tension Pneumothorax & Difficult Airway;* 2) Cardiac – *Bradycardia;* 3) Shock – *Hypovolemic Shock;* 4) Multifaceted – *Severe Symptomatic Hypoglycemia;* 5) Delivery – *Meconium " Non-vigorous" & Abruption;* 6) Communication/Ethics – *End of Life (true knot in cord).* Thus, essential

portions of the NANNP toolkit and the NNC core domains are represented in these initial simulation scenarios. These scenarios will be analyzed so that cut scores and key actions can be determined. Finally, Miller's Prism of Competency (Mehey & Burns, 2009) is encompassed at the "Shows" level in addition to the previously mentioned three dimensions of competency and novice to expert operation definitions depicted therein (Appendix D).

Furthermore, experts gave numerous suggestions to improve the content and video recordings for each scenario (Appendices N-T). The comments primarily cover core content items, communication expectations and simulator logistics such as camera angles. These comments will be utilized to precisely guide the future creation of exemplar videos that will subsequently be used to train raters in the use of C.A.T.E.S.

LIMITATIONS

Prior to initiation of the RTD, multiple limitation scenarios had to be examined to prevent failure or poor results including the inability to recruit, compromised anonymity, overall poor expert quality or poor response rate. If a heterogeneous panel of least 10 experts meeting previously defined inclusion criteria had not been obtained, the search would have been expanded or modified until a qualified panel was obtained with additional recruiting rounds conducted. In addition, in the improbable event that a participant's anonymity was compromised, the option to remove that member would be weighed against the likelihood that other members would be pressured to conform to their opinion. If the likelihood of conformity was high, due to position of authority or increased recognition of the expert, the compromised member would have been removed as a panelist. In the extremely unlikely event, due to the quality and expertise of the participants, the Delphi was unable to create valid and reliable items to assess multidimensional competency for NNPs, a new Delphi would have been chosen and the process repeated. Finally, there was an initial poor response rate to the initial invitation email as well as subsequent decreases in participation of those responding with a promise to participate. Thus, subsequent reminder emails were sent to all potential participants

each week of the study. These emails were successful in obtaining a sufficient number and quality of experts while maintaining anonymity.

The RTD study conducted to construct the cornerstones for C.A.T.E.S. had additional limitations to consider. The initial limitation, although minimal considering current high levels of internet connectivity and technology accessibility, was that only those experts with internet and email access could participate. Furthermore, due to increased programming costs, this RTD was designed such that participants were not required nor prompted to answer every question. Thus, as the participants progressed through the study, several participants omitted whole sections or multiple questions without being notified questions were missed or being prompted to explain their reasons for omission. Although an extensive amount of information was gleaned in an extremely short period of time, which reduced the overall study time from numerous months to a single month, experts still noted that they spent close to an hour of their valuable time to complete the entire survey. Moreover, comments were also made concerning the overall RTD process; these comments can be used to make essential changes to any future RTD studies (Appendix T). Some of the critiques detailed additional limitations such as various hospital or educational facilities having firewalls in place that blocked the access to the video links or the entire RTD altogether. Thus, if subjects were unwilling or without sufficient time to complete the RTD at home or on a different network, then that expert's participation was lost. In addition, the experts needed for this study were extremely knowledgeable yet busy individuals. Thus, many wanted to participate, but were unable to engage due to prior commitments or time restraints.

Finally, use of web-based software to conduct a conventional Delphi function is not new. Web-based survey providers such as Survey Monkey provide small Delphi assessments (10 questions or fewer) for free. Larger question sets, increased participants and deeper statistical analyses result in increased costs. The Platinum package on Survey Monkey cost $65.00 per month or $750.00 per year and allowed for unlimited questions and responses; however, it would have required the PI to design and input the information (Survey Monkey, 2012). Additionally, a conventional web-based Delphi function requires information between rounds to be analyzed and disseminated by the PI.

Professional survey services can help design, input and administer web-based surveys by providing customer support during development and data collection processes. In addition to providing web-based service and software, PI-requested demographic or respondent characteristics such as sex, age and experience can be collected, analyzed and placed into a summary report upon study completion (Group Quality, 2013). Typical turn-key costs of professional survey services range from $200-$2,000 depending on the extent of customization, the number of questions required, and need for subsequent rounds (Galloway Research Service, 2013). One aim may require several months of time due to initial and subsequent rounds required for a conventional Delphi.

In contrast, after initial survey questions were created by the PI, the RTD was designed by RTD principal consultants to function in an artfully designed and seamless manner (Global Opinion Studies, 2012). This consultant was not only computer- and web-savvy, but also an expert in the programming, coding and development of quality surveys using unambiguous question design and answer choices. All professional survey provider options mentioned above were available in addition to expanded RTD research capabilities. These capabilities included PI and participant real-time visualization of responses and rationales. The RTD allowed for vast amount of data to be collected in a single round rather than multiple rounds (Gordon, 2012). Thus, time and analysis burdens on participants were exponentially reduced. Additionally, RTDs eliminate PIs' requirement for multiple rounds of data collection. A typical custom RTD costs at least $5,000. This arrangement includes up to 40 primary questions, a maximum of three sub-questions for each primary question, and an unlimited number of participants (Global Opinion Studies, 2012). Although the overall cost of the study was significant, especially when compared to free or minimal cost survey sites, this cost was offset by a significantly reduced amount of time that would have been required of a traditional Delphi and the resulting multiple semesters of tuition payments.

IMPLICATIONS FOR NURSING

Based on American Academy of Nurse Practitioners [AANP] (2010) recommendations, continued competency requires annual review. Such routine review assures the public that NNPs consistently deliver safe, high-quality care. Numerous Boards of Nursing (BON) require NNPs to complete an advanced practice nursing education program from an accredited institution, and pass the National Certification Corporation's (NCC) examination to ensure minimum education and competency requirements are met (NCC, 2012, p. 1). Although the NCC and BONs require a predetermined number of continuing education units to maintain licensure and certification, this does not mean that all healthcare workers practice at the same level. Multiple factors contribute to the challenges of guaranteeing competency of all practitioners: area of practice (newborn nursery, level II NICU or level III NICU), years of service, breadth of experience and personal motivations (Cates & Wilson, 2011). This RTD has enhanced the face and content validity of the global statements by ensuring they accurately correspond to three dimensions of competency depicted in both Spencer and Spencer's Iceberg Model (1993) and Miller's Prism of Competency (2009). Moreover, this RTD has determined that a majority of the global statements were correctly mapped to the NANNP domains, but those statements encompassing situational awareness are more complex and must be revisited in the near future. Once the mapping the most current NANNP domains to the global statements are complete, C.A.T.E.S. will be able to evaluate the core competency domains required of NNPs to be safe and reliable practitioners. Furthermore, this RTD study allowed for well-written and accurate operational definitions to be constructed atop Benner's gold standard Novice to Expert model (1984). Finally, the initial essential scenarios were chosen to complete Miller's Prism of Competency (2009) and allow for NNPs to demonstrate their cognitive, technical and behavioral competencies that were representative of the NCC domains (2012) and NANNP toolkit (2010a) at their respective levels (novice to expert). Each of these achievements results in critical components of C.A.T.E.S., and could propel competency assessment for NNPs and nursing as a whole to a level of excellence and greater accountability.

RECOMMENDATIONS FOR FUTURE RESEARCH

Beyond the aforementioned revision and subsequent expert evaluation of the accuracy of the NANNP domains mapped to the global statements, there are numerous studies required to develop C.A.T.E.S. into a technologically based comprehensive and universal multidimensional competency analysis instrument. Initially, and as previously mentioned, very minor revisions will be made to the operational definitions (e.g., addition of a skills statement to each level) that will be reviewed by similar panelists. Moreover, expert determination of key actions and cut scores for each of the chosen scenarios must be performed. Once each of these foundational pieces is established, C.A.T.E.S. must be technologically programmed into a web-based format and beta tested for errors. Filming exemplar demonstration videos will be required to use to train potential raters in the use of C.A.T.E.S. In addition to the videos, a complete training program must be developed and implemented. Once raters are trained, studies must be designed to psychometrically test C.A.T.E.S.'s validity, reliability and standardization, including but not limited to construct validity, criterion validity, inter-rater reliability and internal consistency. Once C.A.T.E.S. has been revised as needed and determined to have excellent validity and reliability, further scenarios can be developed and standardized, key actions and cut scores determined and programmed into C.A.T.E.S., raters trained and subsequent tests run for reliability and validity. At the point in which C.A.T.E.S. demonstrates high validity and reliability in pilot studies, future studies could be conducted to include additional scenarios, larger samples and use of certified NNPs and NNP students from across the United States. The information gained from C.A.T.E.S. could guide educators and employers in decisions to advance or remediate subjects based on their demonstrations of competency or lack thereof. The ultimate goal of C.A.T.E.S. is to join forces with NANNP and the National Certification Corporation (NCC). In this joint effort, research would be conducted utilizing C.A.T.E.S. and multiple scenarios that represent the content NANNP and the NCC has mandated as a requirement to assess readiness for entry into practice. This joint research could lead to the use of simulation based assessments scored with C.A.T.E.S. as an additional step for the acquisition and maintenance of certification for all NNPs. Finally, after competency analysis is completed, studies can be developed to measure outcomes such as medical error rates,

and patient outcomes in those subjects C.A.T.E.S. scored as minimally competent or better.

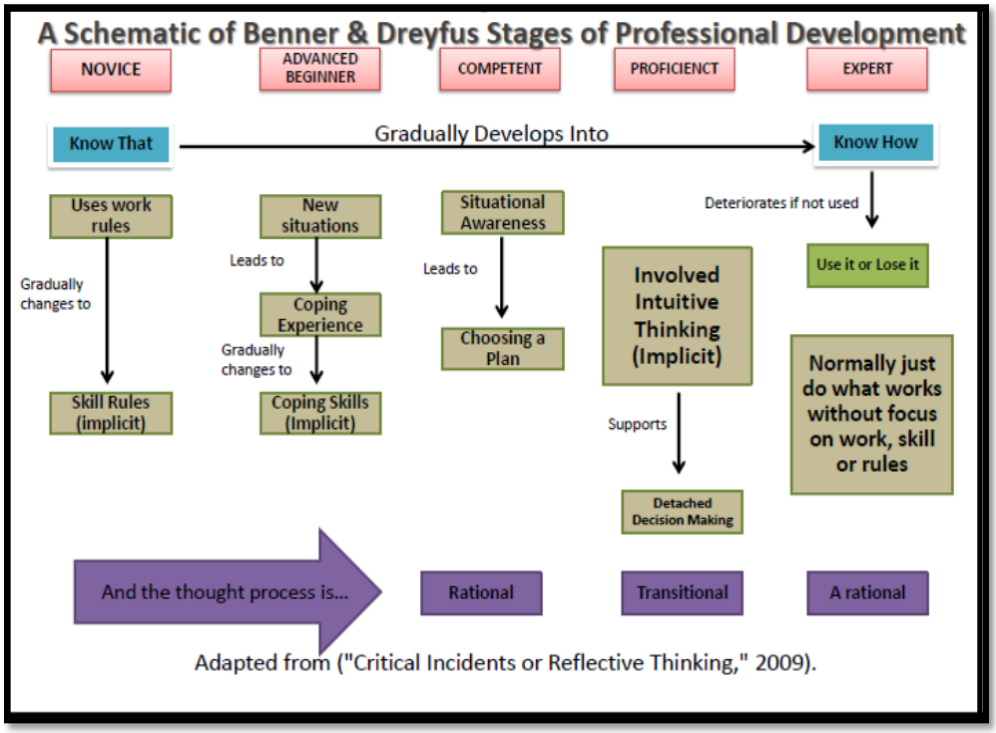
CONCLUSION

In summary, this RTD assembled a solid foundation for the face and content validity for C.A.T.E.S. It is the desire that quality construction of C.A.T.E.S. will continue for years to come. Thus, once C.A.T.E.S. is determined to be an extremely valid and reliable instrument, it will be the first instrument of its kind that can simultaneously 1) utilize technology to gather demographic information; 2) assess physical demonstration of multidimensional competency; 3) score subjects on a global novice to expert scale; 4) map core competencies for the studied subject; and 5) track performance of high-stakes procedures. Long-term, a national database might then be formed as a repository for this information. Such a database could be used for meeting course or graduation requirements for students, medical staff credentialing, acquisition and/or maintenance of certification, future employment and quality and safety research. Thus, bringing about a means to assess, document and track the multidimensional competency demonstration of all healthcare providers can be depicted as a multidimensional prism incorporating Miller's Prism, NANNP Competency Domains and NCC core testing areas. It seems likely that there could be annual assessments of NNPs multidimensional competency using C.A.T.E.S. Therefore, in the near future, C.A.T.E.S. could advance greater accountability and transparency of student and practitioner competency assessments. Additionally, C.A.T.E.S. could add a critical multidimensional quality control piece to NNPs' certification acquisition and maintenance process, which may provide healthcare institutions and society with a valid measure of assurance regarding the practitioner's initial and ongoing competency.

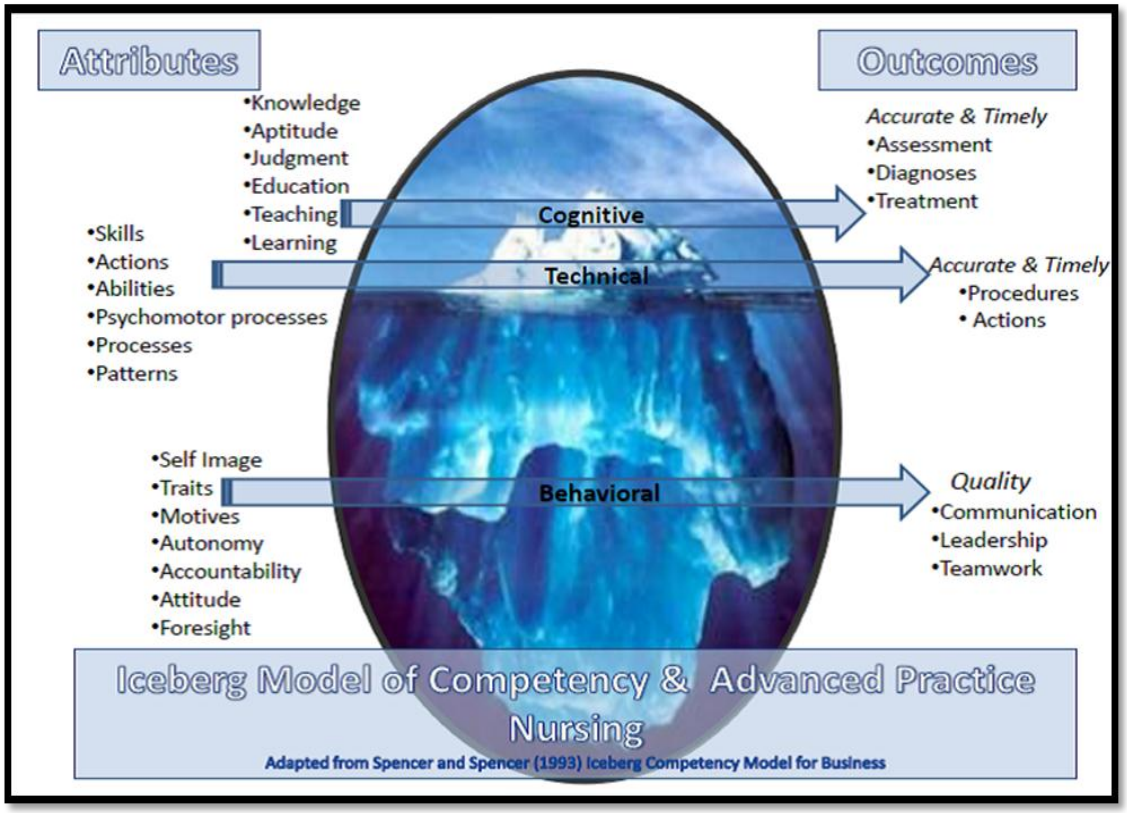
APPENDIX A: CORE COMPETENCIES IN HEALTHCARE & HEALTHCARE EDUCATION

CORE COMPETENCIES IN HEALTHCARE & HEALTHCARE EDUCATION					
ACGME Core Competencies (2013)	**AACN Essentials of Master's Education (2011)**	**AACN Essentials of Doctoral Education (2006)**	**QSEN Competencies (2012)**	**NANNP Toolkit Core Competencies (2010a)**	**NONPF Competencies (2013)**
1. Patient care 2. Medical knowledge 3. Practice based learning & Improvement 4. Systems Based Practice 5. Professionalism 6. Interpersonal Skills & Communication	1. Background for Practice from Sciences & Humanities 2. Organizational & Systems Leadership 3. Quality Improvement & Safety 4.Translating & Integrating Scholarship into Practice 5. Informatics & Healthcare Technologies 6. Health Policy & Advocacy 7. Inter-professional Collaboration for Improving Patient & Population Health Outcomes 8. Clinical Prevention & Population Health for Improving Health 9. Master's-Level Nursing Practice	1.Scientific Underpinnings for Practice 2. Organizational & Systems Leadership for Quality Improvement & Safety 3. Clinical Scholarship & Analytical Methods for Evidence Based Practice 4. Information Systems/Technology & Patient Care Technology for the Improvement & Transformation of Healthcare 5. Healthcare Policy for Advocacy in Healthcare 6. Inter-professional Collaboration for Improving Patient & Population Health Outcomes 7. Clinical Prevention & Population Health for Improving Health 8. Advanced Nursing Practice	1. Patient- Centered Care 2. Teamwork & Collaboration 3. Evidence Based Practice 4. Quality Improvement 5. Safety 6. Informatics	1. Management of Patient Health & Illness Status 2. NNP-Patient Relationship 3. The Teaching-Coaching Function 4. Professional Role 5. Managing & Negotiating Healthcare Delivery Systems 6. Monitoring & Ensuring the Quality of Healthcare Practice 7. Culturally Sensitive Care Sub-competencies *Pharmacological Competencies *Skill Competencies	1. Scientific Foundation 2. Leadership 3.Quality 4.Practice Inquiry 5.Technology & Information Literacy 6. Policy 7. Health Delivery Systems 8. Ethics 9. Independent Practice
*A vast majority of these core competencies can be evaluated through simulation					

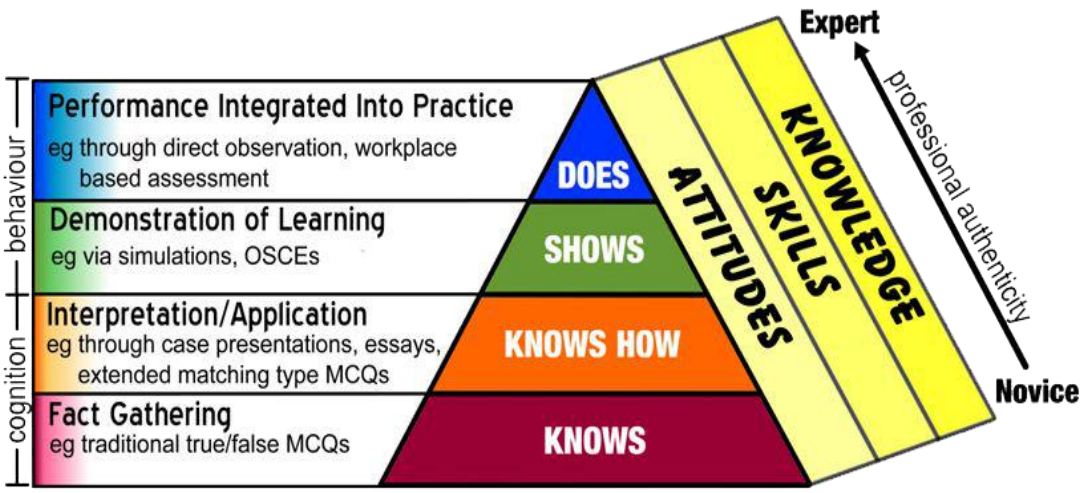
APPENDIX B: BENNER'S NOVICE TO EXPERT MODEL OF COMPETENCY



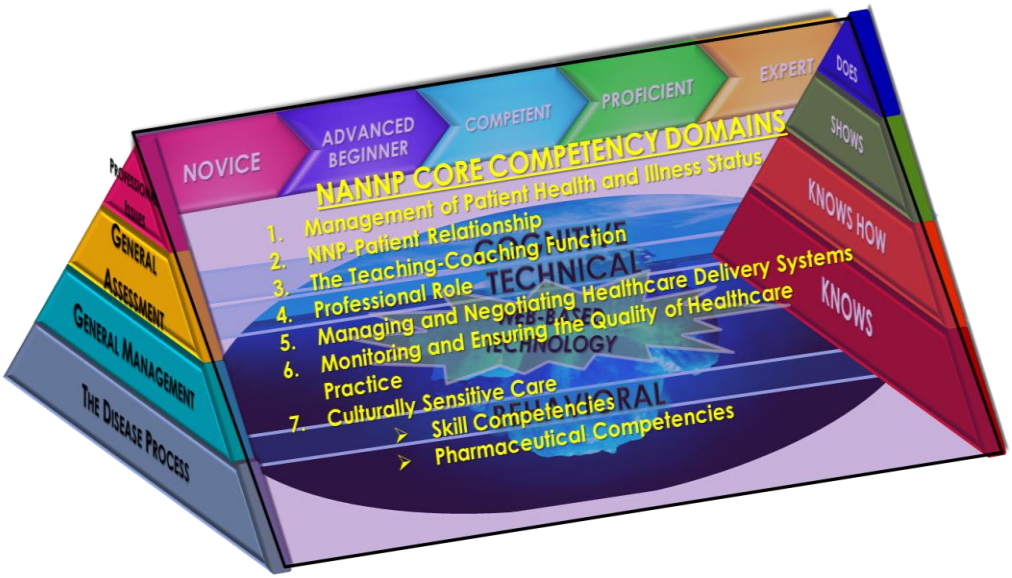
APPENDIX C: ICEBERG MODEL OF COMPETENCY



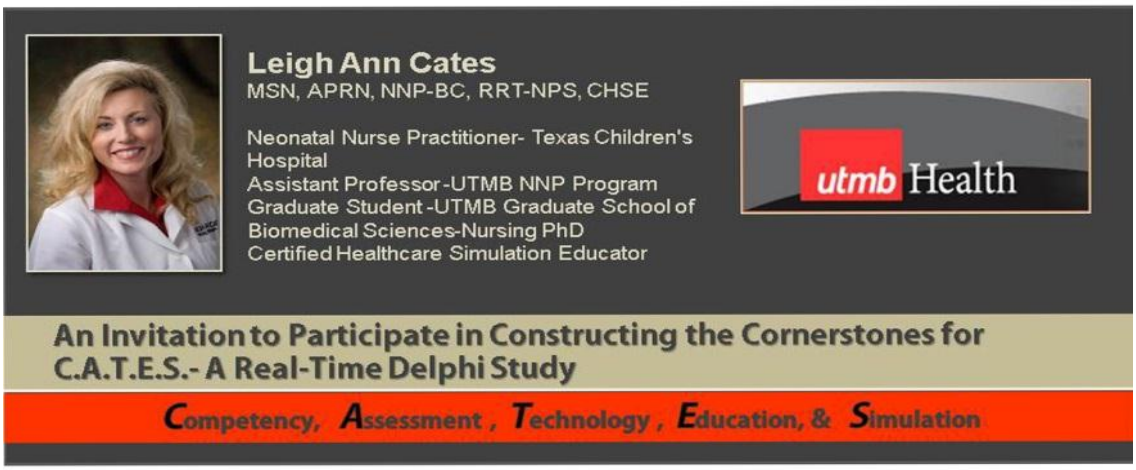
APPENDIX D: MILLER'S PRISM OF COMPETENCY



APPENDIX E: C.A.T.E.S. MULTIDIMENSIONAL DEPICTION



APPENDIX F: SAMPLE PARTICIPANT EMAIL INVITE



Hello,

My name is Leigh Ann Cates, and I am conducting a study to build the foundations for an instrument (C. A.T. E. S.) to assess multidimensional competency of Neonatal Nurse Practitioners (NNPs) performing in simulation. You were chosen based on your expertise as a neonatal nurse practitioner, and simulation specialist. This study would not be complete without your input and invaluable comments.

This study will utilize a Real-Time Delphi (RTD), an extremely innovative process, recently developed by Gordon and Pease (2006). The typical Delphi Method is an iterative process requiring repeated rounds across a long period of time and communication. However, the RTD approach uses a 24 hour a day simultaneous computation and delivery of the participant's responses (Gordon & Pease, 2006). Thus, RTD is an uninterrupted round-less process resulting in a condensed time frame required to conduct massive and complex studies. In addition, the RTD methodology guarantees anonymity which increases the freedom to respond individually, increases the degree of interaction between experts, as well as encourages thoughtful and examined responses by contributors. All of these benefits will maximize the overall validity of the study while minimizing your time and effort. Therefore, in a relatively short amount of time, this RTD study can accomplish the examination of four specific aims including:

1. Identify which dimension (cognitive, technical, or behavioral) of NNP competency accurately reflects each of the global statements.

Based on The Iceberg Theory of Competency developed by Spencer and Spencer (1993). And Miller's Prism of Competency (1990).

2. Indicate whether each of the global statements is correctly mapped into one the following NANNP Core Competency domains.

Based on the NANNP Competency Toolkit (2010a).

3. Determine if the operational definitions are accurate reflections of NNP performance while being observed in simulation.

Based on Patricia Benner's Novice to Expert Model (1984).

4. Choose the essential scenarios to evaluate multidimensional NNP competency.

Based on the National Certification Corporation's Core Testing Domains (National Certification Corporation [NCC], 2012), and NANNP Competency Domains (2010a).

The amount of time necessary for completion of each aim will vary for each panelist, but completion of the total study should range from approximately 30-45 minutes. There are no right and wrong answers to the questions. This study is seeking your expert opinion. I think that you will find the information and process interesting, and the results will be made available to you at the conclusion of this study.

It is imperative that you understand that participation in this study is entirely voluntary. A review by the UTMB Institutional Review Board has determined that this instrument development study does not constitute human subject research requiring IRB approval or review. Any information provided will be confidential and will be kept in a locked office on a password protected computer available only to myself (Leigh Ann Cates) the principal investigator (PI). When results are reported, you will not be identifiable in the findings. You will remain anonymous to the other experts throughout this RTD study and only the PI will be able to identify your specific answers.

Upon entry to the study through **www.realtimedelphi.com** you will be asked to confirm consent and confidentiality through electronic agreement. Your electronic agreement will imply your consent to participate as well as your understanding that confidentiality of the items contained within the study *MUST* be maintained. You will find that the study is divided into three sections: please make sure you answer all three sections. Please return to the questionnaire often. The questionnaire is best accessed with the following browsers: Internet Explorer 8+, all recent versions of Google Chrome, Safari 3+, Firefox 3+, or Opera 9+. When you initially enter this study and as a returning participant, use this email address: _____ and this study code: **NNP**. This study is scheduled to close on*11-16-2013*. Please remember to press **SUBMIT** at end of questionnaire.

Leigh Ann Cates MSN, RN, NNP-BC, RRT-NPS, CHSE
Neonatal Nurse Practitioner- Texas Children's Hospital
Assistant Professor UTMB NNP Program
Graduate Student -UTMB Graduate School of Biomedical Sciences-Nursing PhD
Certified Healthcare Simulation Educator
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Portfolio: http://leighanncates.myefolio.com

APPENDIX G: IRB DISCLOSURE LETTER

utmb Health

Anne Clark, BA, CIP
Dir, Human Research Protection Program

301 University Blvd.
Galveston, TX 77555-0158
O 409.266.9434
E akclark@utmb.edu

TO: Leigh Cates, MSN, RN, NNP-BC, RRT-NPS, CHSE
Assistant Professor NNP Program

FROM: Anne Clark, CIP
Director, Human Subject Protection Program

DATE: October 9, 2013

RE: IRB Acknowledgement of Project Not Human Subject Research
IRB Number: N/A
Title: Constructing the Cornerstones for C.A.T.E.S.

We have reviewed the above referenced project and have determined that the project described below does not meet the definition of research at 45 CFR 46.102 and is a quality assessment/quality improvement project. Therefore, does not require IRB approval or oversight.

Project Description

Establish content and face validity for C.A.T.E.S. through four specific aims: 1) Identify which cognitive, technical, and behavioral dimension of NNP competency accurately reflects each of the global items; 2) Map the global items to the National Association of Neonatal Nurse Practitioners (NANNP) core competency domains; 3) Define the operational definitions for the novice to expert performance subscales, and 4) Determine the essential scenarios to assess multidimensional competency of NNPs

If you have any questions related to this project or the IRB, you may telephone me, at 409-266-9434.

APPENDIX H: C.A.T.E.S. GLOBAL STATEMENTS WITH OPTIONAL CHECKLISTS

The following are examples of C.A.T.E.S. global statements followed by optional 'dropdown' key action(s) checklist- All will be scenario specific, and must align to the primary objectives of the scenario. The lists are not all inclusive.

COGNITIVE- *global rating statement* w/ key actions subscale checklist(s)

- *States pertinent findings or observations*(depends on scenario)
    - Vital signs
        - HR
        - RR
        - Temp
        - Blood pressure
        - Saturations
    - Infants color
        - Pale
        - Ruddy
        - Cyanotic
        - Plethoric
    - Cardiac Rhythm
    - Infant's tone
        - Limp (Non-Vigorous)
        - Active
        - Jittery
        - Seizure like
    - Work of breathing
    - Presence of lesions
        - Rash
        - Petechia
        - Abrasions
        - Lacerations
        - Open wounds
        - Scars
        - Crepitus
        - Fremitus
    - Color of amniotic fluid
    - Scaphoid abdomen

- Presence of anomaly
  - Gastroschesis
  - Oomphalocele
  - Myelomeninigocele
  - Cleft lip
  - Presence of a mass
  - Hydrops

- ***Requests pertinent history***(depends on scenario)
  - Gestation
  - Maternal labs
  - Gestational diabetes
    - Type of control
  - PIH
  - HELLP
  - Amount of amniotic fluid
  - Color of amniotic Fluid
  - Number of fetuses
  - Reason for visit/ call
  - Last meal
  - Type of fluids running
  - Medications
  - Medical/birth history
  - Type of feeds
  - Intake
  - Output
  - Weight

- ***States Possible causes or diagnoses*** (depends on scenario)
  - Respiratory distress syndrome (RDS)
  - Pulseless electrical activity (PEA)
  - Necrotizing Entercolitis (NEC)
  - Hyperkalemia
  - Hypovolemic shock
  - Sepsis
  - Transient Tachypnea of the Newborn (TTN)
  - Pneumonia
  - Congenital Diaphragmatic hernia (CDH)
  - Congenital Heart Disease (CHD)
  - Ventricular Tachycardia (V-Tach)

- Supraventricular Tachycardia (SVT)
- Hypoxic Ischemic Encephalopathy (HIE)
- Gastroschesis

- *Requests /orders team actions*(depends on scenario)
  - Turn on warmer
  - Start APGAR Timer
  - Calls for help
  - (Do/Do not) Warm -dry –stimulate
  - Remove wet blankets
  - (Do/Do not) Provide BVM
  - Place Cardio pulmonary monitoring leads
  - Place pulse oximeter
  - (Do/Do not) Give Chest Compressions
  - Prepare to intubate
    - ETT (size)
    - Laryngoscope (blade size)
    - Suction
    - BVM
    - Pedi cap
    - Tape ETT (appropriate depth)
  - (Do/Do not) Suction
  - Obtain Meconium Aspirator
  - Provide Oxygen
    - Blow by (FIO2)
    - NCPAP
      - FIO2
      - Pressure
    - BVM/Neo Puff (FIO2)
      - FIO2
      - Pressure
      - PEEP
      - Rate
    - Hood (FIO2)
    - NC LPM flow
    - Ventilator settings
  - Prepare to place umbilical lines
  - Start PIV
  - Bring defibrillator to bedside

- Placement of type of OG/NG
- Transilluminate
- Prepare to needle aspirate
- Prepare to place chest tube/pigtail catheter
- NS soaked gauze (Kerlex)
- Bowel bag
- Position of baby
    - Prone
    - Supine
    - Side lying

- *States appropriate medication dose(s) (depends on scenario & route)*
    - Ampicillin
    - Gentamicin
    - Vancomycin
    - Acyclovir
    - Phenobarbital
    - Morphine
    - Fentanyl
    - Ativan
    - Epinephrine
    - Amniordorone
    - Adenosine
    - Calcium Chloride
    - Potassium Chloride
    - Lasix
    - Insulin
    - Percent Dextrose
    - Normal Saline
    - Sodium Bicarbonate
    - Oxygen
    - Surfactant
    - Albuterol
    - Dopamine
    - Dobutamine
    - Millrinone
    - Digoxin
    - PRBCs
    - FFP

    - Platelets
    - IV Fluids (depends on scenario)
        - D__W @
        - D___W with _____ @
        -
    - Feeds
        - Route
        - Type
        - Amount

- *States appropriate lab work(s) (depends on scenario)*
    - CBC d/p
    - Blood culture
    - Glucose (Accu-check)
    - BMP (electrolytes)
    - Blood gas
    - Lactate
    - LFTs
    - Total serum bilirubin
    - Conjugated bilirubin
    - Direct bilirubin
    - T3
    - T4
    - TSH
    - PT
    - PTT
    - Fibrinogen
    - INR
    - DIC panel
    - iCa
    - H/H
    - CRP
    - BNP
    - PCR
    - Genetic
        - Chromosomes
        - FISH
        - Microarray
        - Specific test

    - Urinalysis
    - Urine for ..
        - CMV
        - Drug screen
        - Culture
    - Stool for…
        - O &P
        - Drug screen
    - CSF
        - Culture
        - Protein & glucose
        - Cell count
        - PCR
    - Drug levels
        - Phenobarbital
        - Gentamicin
        - Vancomycin
- *States appropriate diagnostic exam(s) (depends on scenario)*
    - ABER
    - X-ray
        - Chest
        - KUB
        - Chest & KUB
        - Lateral decubitus
        - Cross table lateral
        - Skeletal series
    - EKG
    - EEG
    - CT (specify area)
    - MRI (specify area)
    - Contrast study
        - BE
        - UGI
        - UGI w/ small bowel follow through
    - ECHO
    - VCUG
    - Ultrasound
        - Head
        - Renal

        - Abdominal
        - Spinal

- *States accurate reading of diagnostic test(s) (depends on scenario)*
    - ETT placement
    - Gastric tube placement
    - Vascular line placement
    - RDS
    - Pneumonia
    - TTN
    - Pneumothorax
    - CDH
    - Type of Congenital heart disease
    - NEC
    - Perforation (free air)
    - Fracture(s)
    - Vertebral anomaly

- *States appropriate plan of care (depends on scenario)*
    - Admit to (place)
    - Admit to (service)
    - NPO
    - Phototherapy
    - Special protocols
        - GBS
        - Cooling
        - Hypoglycemia
        - CDH
    - Consulting services
        - Cardiology
        - Neurology
        - Genetics
        - Surgery
        - Renal
        - Pulmonary
        - Infectious disease
        - Hematology/oncology
        - Etc…
    - See medications

- See lab work
- See diagnostic tests

TECHNICAL- *global rating statement* w/ key actions subscale checklist(s)

- Performs a Physical Assessment
  - Listens
    - Breath sounds
    - Heart sounds
    - Bowel sounds
    - Fontanel
  - Palpates
    - Pulses
    - Abdomen
    - Areas of swelling

- Stabilizes airway/ breathing (I.E. through use of Neopuff, Bag and Mask, CPAP via mask, or simple suctioning and/or head position) (depends on scenario)
  - BVM
    - Good chest rise
    - Tight mask seal
    - Appropriate rate
    - Appropriate pressure
    - Appropriate FIO2
  - Suction
    - Bulb
    - Suction catheter
    - Meconium aspirator
  - Provide CPAP
    - Neo-puff
    - Anesthesia bag
    - Nasal prongs
    - ETT

- Performs or ensures performance of chest compressions (depends on scenario)
  - Correct ventilation rate
  - Correct ventilation to compression ratio
  - Correct compression technique
  - Correct compression depth
  - Correct compression rate

- Performs advanced procedure (s) (scenario dependent)*Specific steps will be delineated for each procedure)
    - Intubation
    - LMA
    - Umbilical Line Placement
    - Chest needle thoracentesis
    - Chest tube/ pigtail catheter placement
    - Interosseous placement
    - Defibrillation
    - Cardioversion
    - Mechanical pacing
    - Lumbar puncture

- Performs or ensures performance of skilled procedure (s) (scenario dependent)*Specific steps will be delineated for each procedure) – or ensures procedure is done correctly-
    - Warm –dry –stimulate
    - Removes wet blankets
    - Places cardiac leads
    - Places pulse oximeter
    - Places Quik-Combo pads or paddles
    - PIV
    - Arterial stick
    - Surfactant Administration
    - OG/ NG placement
    - Taping ETT
    - Umbilical line securement
    - Placement of NS soaked gauze
    - Placement of bowel bag
    - Administers IV/IO medication(s)
    - Administers ETT medication(s)

BEHAVIORAL- *global rating statement* w/ key actions subscale checklist(s)

- *Exhibits Professionalism*
    - Clean (Well Kept)
    - Dressed appropriately
        - Scrubs
        - Lab coat
    - Introduces self
        - Name
        - Title
    - No foul language

- No in appropriate comments or gestures

- *Communicates to medical personnel appropriately*
  - Easily heard
  - Complete thoughts
  - Courteous/respectful
  - Uses transparent thinking
    - Paints mental picture
    - Thoughts
    - Concerns
    - Plan
  - Uses SBAR to report situation
    - A subject explains first the **S**ituation (I.E. What is happening with the patient).
    - Next, describes the **B**ackground (I.E. What is the clinical background).
    - Subsequently, depicts the **A**ssessment (I.E. What do I think the problem is).
    - Finally, provides a **R**ecommendation (I.E. What would I recommend).

- *Communicates with family appropriately*
  - Makes eye contact
  - Sits when possible (appropriate- to get at eye level)
  - Chooses a space with privacy
  - Provides honest information
  - Asks what the family knows and understands
  - Asks what is important now to the family
  - Speaks frankly
  - Avoids jargon
  - Slows the rate of speaking
  - Allows silence and tears
- *Can be easily identified as team leader*
  - Displays confidence
  - Takes position at ‘ head of bead’
- *Effective as team leader*
  - Staff readily follow direction
  - Staff look to subject for guidance
- *Uses proper situational awareness to manage clinical situation*
  - Asks probing questions
  - Connects pieces of puzzle to diagnose and treat

        - History
        - Observable Signs and symptoms (moulage/ monitor/ vitals)
        - Assessment findings
        - Lab work
        - Diagnostic tests
- *Uses proper situational awareness to allocate time wisely*
    - Uses good decision making to prioritize care
        - Treats patient in proper order (scenario dependent)

- *Demonstrates proper situational awareness to allocate resources*
    - Equipment
        - Asks for the equipment needed
        - Uses equipment available
    - Personnel
        - Asks for the personnel needed
        - Uses personnel available

APPENDIX I: NATIONAL CERTIFICATION CORPORATION (NCC) ESSENTIAL TESTING AREAS & NANNP COMPETENCY DOMAINS WITH SUBCATEGORIES

NCC Essential testing Areas

1) **General Assessment (15-20 percent) – Perinatal, Neonatal, Family**
    - Demonstrate the knowledge inherent in the role and function of the NNP in the NICU
    - Apply the knowledge of basic sciences in the provision of neonatal care
    - Obtain and interpret a comprehensive perinatal history and a systemic assessment of all body systems
    - Obtain clinical laboratory information and interpret the resultant data
    - Institute appropriate diagnostic procedures and techniques and interpret the resultant data
    - Formulate a diagnosis and a plan of care in collaboration with physicians and other healthcare professionals
    - Initiate appropriate therapeutic and educational interventions including consultations and referrals
    - Evaluate and document responses to interventions and modify the plan of care indicated
    - Use adult learning principals when teaching about the care, growth, and development of the high risk infant
2) **General Management (20-30 percent) – Thermoregulation, Resuscitation and Stabilization, Nutrition, Fluids and Electrolytes, Pharmacology**
    - Demonstrate the knowledge inherent in the role and function of the NNP in the NICU
    - Apply the knowledge of basic sciences in the provision of neonatal care
    - Formulate a diagnosis and a plan of care in collaboration with physicians and other healthcare professionals
    - Initiate appropriate therapeutic and educational interventions including consultations and referrals
    - Evaluate and document responses to interventions and modify the plan of care indicated
    - Maintain current knowledge regarding advances in neonatal health care
3) **The Disease Process (45-55 percent) – Embryology, physiology, and Pathophysiology by Body Systems**

- Demonstrate the knowledge inherent in the role and function of the NNP in the NICU
- Apply the knowledge of basic sciences in the provision of neonatal care
- Obtain and interpret a comprehensive perinatal history and a systemic assessment of all body systems
- Obtain clinical laboratory information and interpret the resultant data
- Institute appropriate diagnostic procedures and techniques and interpret the resultant data
- Evaluate the benefits and risks of diagnostic and therapeutic intervention
- Formulate a diagnosis and a plan of care in collaboration with physicians and other healthcare professionals
- Initiate appropriate therapeutic and educational interventions including consultations and referrals
- Evaluate and document responses to interventions and modify the plan of care indicated
- Maintain current knowledge regarding advances in neonatal health care

4) **Professional issues (<5 percent) – Legal and Ethical Issues, Principles of Nursing Research**
    - Apply knowledge of basic research principles to practice
    - Maintain current knowledge regarding advances in neonatal health care
    - Integrate legal and ethical principles into neonatal health care

Adapted from National Certification Corporation (2012) Candidate Guide: Neonatal Nurse Practitioner

NANNP Competency Domains with Subcategories

1) **Management of Patient Health and Illness Status**
    - Scientific knowledge for improvement of care in clinical practice
    - Knowledge of epidemiology and demography in clinical practice
    - Acquisition of health history (maternal and newborn)
    - Performance of physical (PE), developmental and behavioral assessments
    - Distinguishing variations of normal and abnormal findings
    - Employs screening and diagnostics
    - Use of critical thinking in clinical practice
    - Developing and prioritizing differential diagnoses
    - Establishing a final diagnosis
    - Prioritizing Care
    - Developing a plan of care
    - Prescribing medications
    - Initiation of therapeutic interventions
    - Stabilization and resuscitation in compromised patients
    - Incorporates family centered and developmental care
    - Management of pain
    - Palliative and end of life care

- Evaluation of outcomes in clinical practice
- Documentation of assessment , plan , and outcomes
- Identification of community needs, strengths, and resources
- Effective and professional communication
- Performance of technical skills
- Interdisciplinary continuity of care

2) <u>NNP-Patient Relationship</u>

- Communication with family and staff RE: diagnosis , prognosis, diagnostic results
- Communication with family and staff RE: plan of care
- Compassionate and ethical communication with families
- Development of crisis management to assist families in coping
- Advocating for patient and families
- Demonstration of respect and dignity for patients and families
- Use of self-reflection to enhance therapeutic relationship with families
- Maintenance of professional boundaries

3) <u>The Teaching-Coaching Function</u>

- Identification and relating coping strategies of families
- Developing plan for discharge teaching
- Develops multidisciplinary discharge plan
- Develops plan and anticipates teaching and questions for family teaching
- Facilitates teaching of other healthcare professionals as well as precepting NNP students
- Development of plan to evaluate educational outcomes of staff and families

4) <u>Professional Role</u>

- Participation in formal education in clinical practice
- Utilization of evidence based practice to support plan of care
- Research participation
- Participation in professional organization
- Participates in improving practice and quality
- Participates in hospital or unit based committee
- Collaborates with the interdisciplinary team to develop the plan of care
- Offers expertise to other healthcare team members regarding a case, topic, or product
- Evaluation and implications of current policies and procedures related to care, and families
- Contacts local, state, and national legislators
- Evaluation of new technologies in clinical practice
- Professional development
- Current regulations of NP practice
- Maintains knowledge regarding code of ethics

5) <u>Managing and Negotiating Healthcare Delivery Systems</u>

- Assessment of cost related to benefit and quality of care
- Unit or hospital based discussions regarding finances relating to NNP practice
- Unit or hospital based discussions regarding systems, function, resources, and their application
- Development of business /economics to improve patient care
- Develops/participates in organizational processes to improve care
- Promotion of mutually respectful environment to promote individual contributions to care

6) <u>Monitoring and Ensuring the Quality of Healthcare Practice</u>

- Review application and summary of published research
- Self-evaluation of education needs to maintain competence
- Application of continuous quality improvement in clinical practice
- Application of technology to improve patient safety

7) <u>Culturally Sensitive Care</u>

- Awareness of cultural backgrounds and beliefs that affect delivery of care
- Incorporation of family's cultural beliefs into the plan of care
- Incorporation of family's spiritual beliefs/behaviors into the plan of care

SUB-COMPETENCIES

- Pharmacology
- Skills

Note. Adapted from the Competencies and Orientation Tool Kit for Neonatal Nurse Practitioners (Appendix A), 2010 Glenview IL: National Association of Neonatal Nurses, Copyright 2010 by The National Association of Neonatal Nurses with permission by Paula Timoney from "Neonatal Nurse Practitioner Evaluation Instrument (DARTNPEI II) by M.E. Buus-Frank. Copyright 1998 by Madge Buus-Frank. Reprinted with permission.

APPENDIX J: C.A.T.E.S. REAL-TIME DELPHI AS IT APPEARS ONLINE

Global Opinion Studies

Polls, Surveys, Crowdsourcing, and Real Time Delphi's

WELCOME

The studies on this web site rely on judgments and opinions in polls, surveys and Real Time Delphis. In classical Delphi, the judgments collected in one round are fed back to the participants in subsequent rounds. By contrast, Real Time Delphi is roundless and answers generated are fed back to participants in real time. As in classical Delphi, participants are anonymous to one another. Anonymity is preserved and none of your answers will be attributed to you.

Please enter your email address

expertNNP@123.com

Submit

To learn how to design your own Global Opinion Study click here

Global Opinion Studies

Sign On Page for New Participants

This data is intended for use in statistical studies that will review the group's responses in terms of the factors requested here. The data will never be sold. It will be resident on secure servers for a limited time after the study is completed. Your email address serves as your password.

* Study Code (if you do not know the code for your study, contact realtimedelphi@att.net)	NNP
* Email Address	expertNNP@123.com
* Confirm Email	expertNNP@123.com
* Principle Area of Expertise	Nurse Practitioner;
* Job Title/ Certifications (Please include, particularly, participation in competency based projects and research to create instruments for evaluating simulation participants.)	NNP-BC, CHSE, publications in simualtion, presentatic
* Gender	female
* Ethnicity	Caucasion;
* Years of Experience	20
* Age	39

By submitting this form, you indicate your acceptance of the release and conditions statement (click here to review the release and conditions statement), your intent to participate, and your agreement to maintain confidentiality of all materials furnished or derived from this study.

Submit

Date: 2013-10-17 20:31:05

Global Opinion Studies

Polls, Surveys, Crowdsourcing, and Real Time Delphis

Constructing the Cornerstones for C.A.T.E.S

Competency, Assessment, Technology, Education, & Simulation

GENERAL STUDY BACKGROUND AND INFORMATION

This study is designed to collect judgments from a set of experts, which can be used in the design of an instrument for assessing multidimensional competency of neonatal nurse practitioners.

The role of human error is prominent in healthcare; thus, competence is required to protect and promote the health of our most vulnerable population, preterm and critically ill neonates. Lack of instrumentation for documenting, mapping, tracking, and retrieving a Neonatal Nurse Practitioner's (NNP's) cognitive, technical, and behavioral competency impedes the advancement toward competency-based assessment for the profession. The ***long-term goal*** is to design a valid and reliable competency-based assessment instrument (C.A.T.E.S.) that utilizes technology to document, map, track, and retrieve documentation of a NNPs' multidimensional competency while being observed in simulation. The ***objective here*** is to produce the first draft of C.A.T.E.S. The ***central hypothesis*** is that with C.A.T.E.S., multidimensional competency can be accurately assessed; thus increasing quality improvement and patient safety while ensuring competency. The ***rationale*** is that the medical error rates of NNPs, as well as patient safety and outcomes for those patients managed by NNPs, will be improved through the utilization of C.A.T.E.S. The proposed study will test the central hypothesis by pursing the following four ***specific aims***:

1. **Identify which dimension (cognitive, technical, or behavioral) of NNP competency accurately reflects each of the global items.**
2. **Indicate whether each of the global statements is correctly mapped into one the following NANNP Core Competency domains.**
3. **Determine if the operational definitions are accurate reflections of NNP performance while being observed in simulation.**
4. **Choose the essential scenarios to evaluate multidimensional NNP competency**.

The approach utilized is a Real Time Delphi (RTD) Method, created by Gordon and Pease (2006), a technologically based uninterrupted round-less process with 24 hour a day simultaneous computation and delivery of the participant's responses through which content validity can be ascertained. C.A.T.E.S. will be a ***significant contribution*** because it will enable NNPs to be evaluated in simulated clinical situations reflective of the multidimensional competencies required to be reliable and safe providers. Furthermore, C.A.T.E.S. can then be applied to other nursing specialties, paramedical and medical disciplines.

This proposed research is ***innovative on numerous levels*** because C.A.T.E.S. will be the first instrument designed to assess NNP cognitive, technical, and behavioral competency during simulation that will simultaneously utilize technology to: 1) Gather demographic information; 2) Assess physical demonstration of multidimensional competency; 3) Score subjects on a global novice to expert scale; 4) Map core competencies for the studied subject, and 5) Document performance of high-stakes procedures. Over the long-term, a national database might then be formed as a repository for this information that could be used for student evaluations, medical staff credentialing, acquisition and/or maintenance of certification, as well as quality and safety research. Finally, C.A.T.E.S. will create greater accountability and transparency to the competency assessment process of NNPs while providing facilities and the public a valid measurement of NNPs ongoing competency.

The questionnaire is divided into three sections:

SECTION 1 The questions in this section are designed to collect judgments about Global Statements that a rater would use to assess a neonatal nurse practitioner (NNP) while performing in simulation. Your judgments are requested about whether these statements have been assigned to an appropriate "competency category" and whether the NANNP "competency domain" is correct.
For Section 1, click here

SECTION 2. In this section we ask for your judgments about the definitions that could be applied to five novice-to-expert operational definitions for NNP performance subscales.
For Section 2, click here

SECTION 3 This section presents several neonatal scenarios in the form of short video clips that demonstrate essential points of each scenario. Please assess the relative importance of each scenario in the evaluation of multidimensional competency for NNPs.
For Section 3, click here

You will find there is space to elaborate on any answer you provide, by clicking on the REASONS button in each cell of the questionnaire.

Please make sure you participate in all sections. If you leave before completing the questionnaire, your previous answer will appear when you return and you will see the new group averages. When you return, use this email address: expertNNP@123.com and this study code: NNP. This study is scheduled to close on 2013-11-15. Please remember to press SUBMIT in each row or at end of questionnaire.

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Date: 17 October, 2013

Global Opinion Studies

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Section 1: Global Statements

The following global statements are actions that a person who rates candidates would look for when evaluating a participant's performance in simulation (Not all will apply to every simulation).

To see the global statements paired with optional key actions, click here
To see the definitions of some of the key terms used within the global statements, click here

Please review each of the global statements

1. Indicate whether the global statements are correctly categorized into one of the following three categories:
To see the theoretical frameworks that support and explain the categories of competency click here

- Cognitive- based on one's mental knowledge
- Technical- based on ones hands on skill
- Behavioral- based on one's professionalism, teamwork, leadership, communication, or observable conduct.

2. Indicate whether each of the global statements is correctly mapped into one of the following National Association of Neonatal Nurse Practitioners (NANNP) Core Competency domains:
To see the NANNP domains and corresponding subdomains, click here

1)Management of Patient Health and Illness Status
2) The Nurse Practitioner–Patient Relationship
3) The Teaching-Coaching Function
4) Professional Role
5) Managing and Negotiating Healthcare Delivery Systems
6) Monitoring and Ensuring the Quality of Healthcare Practice
7) Culturally Sensitive Care
8) Pharmacological Competencies
9) Skill Competencies

Please provide your suggested additions, revisions, or reassignment by clicking on the REASONS button.

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Questionnaire: Section 1
Judgments about Global Statements

	Questions	*Question 1*	*Question 2*
1	*Global Statement: States pertinent findings* *Competency Category: Cognitive* *NANNP Domain: Management of Patient Health and Illness Status* *(Categories and Domains)* Submit this page	**Is the Global Statement in the correct category?** *Correct* *Incorrect* **If incorrect or unable to determine, please provide reasons and suggested changes click here**	**Is the Global Statement in the correct NANNP domain?** *Correct* *Incorrect* **If incorrect or unable to determine, please provide reasons and suggested changes click here**
2	*Global Statement: Requests pertinent history* *Competency Category: Cognitive* *NANNP Domain: Management of Patient Health and Illness Status* *(Categories and Domains)* Submit this page	**Is the Global Statement in the correct category?** *Correct* *Incorrect* **If incorrect or unable to determine, please provide reasons and suggested changes click here**	**Is the Global Statement in the correct NANNP domain?** *Correct* *Incorrect* **If incorrect or unable to determine, please provide reasons and suggested changes click here**
3	*Global Statement: States possible causes or diagnosis*	**Is the Global Statement in the correct category?**	**Is the Global Statement in the correct NANNP**

	Competency Category: Cognitive *NANNP Domain: Management of Patient Health and Illness Status* *(Categories and Domains)* Submit this page	Correct Incorrect If incorrect or unable to determine, please provide reasons and suggested changes click here	domain? Correct Incorrect If incorrect or unable to determine, please provide reasons and suggested changes click here
4	*Global Statement: Requests /orders team action* *Competency Category: Cognitive* *NANNP Domain: Management of Patient Health and Illness Status* *(Categories and Domains)* Submit this page	Is the Global Statement in the correct category? Correct Incorrect If incorrect or unable to determine, please provide reasons and suggested changes click here	Is the Global Statement in the correct NANNP domain? Correct Incorrect If incorrect or unable to determine, please provide reasons and suggested changes click here
5	*Global Statement: States appropriate medication doses* *Competency Category: Cognitive* *NANNP Domain: Pharmaceutical Competencies* *(Categories and Domains)* Submit this page	Is the Global Statement in the correct category? Correct Incorrect If incorrect or unable to determine, please provide reasons and suggested changes click here	Is the Global Statement in the correct NANNP domain? Correct Incorrect If incorrect or unable to determine, please provide reasons and suggested changes click here
6	*Global Statement: States appropriate lab work*	Is the Global Statement in the correct category?	Is the Global Statement in the correct NANNP domain?

	Competency Category: Cognitive *NANNP Domain: Management of Patient Health and Illness Status* *(Categories and Domains)* Submit this page	*Correct* *Incorrect* **If incorrect or unable to determine, please provide reasons and suggested changes click here**	*Correct* *Incorrect* **If incorrect or unable to determine, please provide reasons and suggested changes click here**
7	*Global Statement: States appropriate diagnostic exam(s)* *Competency Category: Cognitive* *NANNP Domain: Management of Patient Health and Illness Status* *(Categories and Domains)* Submit this page	**Is the Global Statement in the correct category?** *Correct* *Incorrect* **If incorrect or unable to determine, please provide reasons and suggested changes click here**	**Is the Global Statement in the correct NANNP domain?** *Correct* *Incorrect* **If incorrect or unable to determine, please provide reasons and suggested changes click here**
8	*Global Statement: States accurate reading of diagnostic exams* *Competency Category: Cognitive* *Global Statement: NANNP Domain: Management of Patient Health and Illness Status* *(Categories and Domains)* Submit this page	**Is the Global Statement in the correct category?** *Correct* *Incorrect* **If incorrect or unable to determine, please provide reasons and suggested changes click here**	**Is the Global Statement in the correct NANNP domain?** *Correct* *Incorrect* **If incorrect or unable to determine, please provide reasons and suggested changes click here**
9	*Global Statement: States appropriate plan of care* *Competency Category:*	**Is the Global Statement in the correct category?**	**Is the Global Statement in the correct NANNP domain?**

	Cognitive ***NANNP Domain: Management of Patient Health and Illness Status*** ***(Categories and Domains)*** Submit this page	***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**	***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**
10	***Global Statement: Performs physical assessment*** ***Competency Category: Technical*** ***NANNP Domain: Skill Competencies*** ***(Categories and Domains)*** Submit this page	**Is the Global Statement in the correct category?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**	**Is the Global Statement in the correct NANNP domain?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**
11	***Global Statement: Stabilizes airway/breathing (i.e. through the use of Neopuff, Bag and Mask, CPAP via mask, or simple suctioning and/or head position)*** ***Competency Category: Technical*** ***NANNP Domain: Skill Competencies*** ***(Categories and Domains)*** Submit this page	**Is the Global Statement in the correct category?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**	**Is the Global Statement in the correct NANNP domain?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**
12	***Global Statement: Performs or ensures performance of chest compressions***	**Is the Global Statement in the correct category?**	**Is the Global Statement in the correct NANNP domain?**

	Competency Category: Technical ***NANNP Domain: Skill Competencies*** ***(Categories and Domains)*** Submit this page	***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**	***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**
13	***Global Statement: Performs advanced procedure(s) (such as endotracheal intubation)*** ***Competency Category: Technical*** ***NANNP Domain: Skill Competencies*** ***(Categories and Domains)*** Submit this page	**Is the Global Statement in the correct category?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**	**Is the Global Statement in the correct NANNP domain?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**
14	***Global Statement: Performs or ensures performance of skilled procedure(s) (such as peripheral IV start)*** ***Competency Category: Technical*** ***NANNP Domain: Skill Competencies*** ***(Categories and Domains)*** Submit this page	**Is the Global Statement in the correct category?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**	**Is the Global Statement in the correct NANNP domain?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**
15	***Global Statement: Exhibits professionalism*** ***Competency Category:***	**Is the Global Statement in the correct category?**	**Is the Global Statement in the correct NANNP domain?**

	Behavioral ***NANNP Domain: Professional Role*** ***(Categories and Domains)*** Submit this page	***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**	***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**
16	***Global Statement: Communicates to medical personnel appropriately*** ***Competency Category: Behavioral*** ***NANNP Domain: Professional Role*** ***(Categories and Domains)*** Submit this page	**Is the Global Statement in the correct category?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**	**Is the Global Statement in the correct NANNP domain?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**
17	***Global Statement: Communicates with family appropriately*** ***Competency Category: Behavioral*** ***NANNP Domain: The Nurse Practitioner- Patient Relationship*** ***(Categories and Domains)*** Submit this page	**Is the Global Statement in the correct category?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**	**Is the Global Statement in the correct NANNP domain?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**
18	***Global Statement: Can easily be identified as a team leader*** ***Competency Category:***	**Is the Global Statement in the correct category?**	**Is the Global Statement in the correct NANNP domain?**

	Behavioral ***NANNP Domain: Professional Role*** ***(Categories and Domains)*** Submit this page	***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**	***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**
19	***Global Statement: Effective as a team leader*** ***Competency Category: Behavioral*** ***NANNP Domain: Professional Role*** ***(Categories and Domains)*** Submit this page	**Is the Global Statement in the correct category?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**	**Is the Global Statement in the correct NANNP domain?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**
20	***Global Statement: Uses situational awareness to manage clinical situation*** ***Competency Category: Behavioral*** ***NANNP Domain: Managing and Negotiating Healthcare Delivery System*** ***(Categories and Domains)*** Submit this page	**Is the Global Statement in the correct category?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**	**Is the Global Statement in the correct NANNP domain?** ***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**
21	***Global Statement: Uses situational awareness to allocate time wisely***	**Is the Global Statement in the correct category?**	**Is the Global Statement in the correct NANNP domain?**

	Competency Category: Behavioral ***NANNP Domain: Managing and Negotiating Healthcare Delivery System*** ***(Categories and Domains)*** Submit this page	***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**	***Correct*** ***Incorrect*** **If incorrect or unable to determine, please provide reasons and suggested changes click here**

Submit this page

The questionnaire is divided into three sections:
SECTION 1 YOU ARE HERE. The questions in this section are designed to collect judgments about Global Statements that a rater would use to assess a neonatal nurse practitioner (NNP) while performing in simulation. Your judgments are requested about whether these statements have been assigned to an appropriate "competency category" and whether the NANNP "competency domain" is correct.
For Section 1, click here

SECTION 2. In this section we ask for your judgments about the definitions that could be applied to five novice-to-expert operational definitions for NNP performance subscales.
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ADDITIONAL SUGGESTIONS

To submit comments and suggestions click here

Please remember to return to the questionnaire often. When you come back, you will see how the group's answers have evolved and can edit your comments in response. If you have difficulties please send your questions to lacates@UTMB.EDU .

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Section 2: Operational Definitions

Below are operational definitions that a person who rates candidates will use in making an overall assessment of a participant being observed in simulation. To see the theoretical framework that supports and explains the novice to expert operational definitions, click here

1. Determine if the operational definitions listed below are accurate reflections of the performance subscale for participants being observed in simulation.

2. If revisions are required please elaborate by clicking REASONS.

Please make sure you participate in all sections. If you leave before completing the questionnaire, your previous answer will appear when you return and you will see the new group averages. When you return, use this email address: expertNNP@123.com and this study code: NNP. This study is scheduled to close on 2013-11-15. Please remember to press SUBMIT in each row or at end of questionnaire.

Questionnaire: Section 2
Operational Definitions

	Definitions	*Question*
23	***NOVICE - A Novice NNP is a provider that typically performs based on strict guidelines or rules, and demonstrates a beginning advanced practice knowledge base specific to neonates. The novice NNP will often seem nervous, anxious, uncomfortable in their role, disorganized, and unsure of themselves (very indecisive). The novice often lacks the confidence to engage in the discussion of care management, and is normally uncomfortable being observed. The novice NNP does not display situational awareness. The staff/ team may frequently question the novice NNP prior to implementing their order(s) or plan(s), and could demonstrate a great sense of discomfort or lack of confidence regarding their care / patient***	**How accurate is this description?** ○ *Accurate as written* ○ *Needs minor revision*

	management without first verifying the accuracy of their order(s)/plan(s). The staff does not readily recognize the novice NNP as the team leader. Even with help and frequent prompting, the novice will frequently lack the confidence to perform many critical aspects of care/ patient management without frequently referring to their preceptors, guidebooks, or reference cards. Submit this page	***Needs major revision*** ***Needs complete rewrite*** **To provide reasons and suggested changes click here**
24	***ADVANCED BEGINNER – An advanced beginner NNP is a provider that performs based on limited experiences, and has sound advanced practice knowledge base including the areas specific to neonates. They will seem calm, organized and comfortable in their role in some areas of care and anxious, nervous, disorganized, and uncomfortable in their role in other areas of their management, and will often be unsure of themselves (indecisive). The advanced beginner occasionally lacks the confidence to engage in the discussion of care management, and may be uncomfortable being observed. The advanced beginner displays limited situational awareness. The staff/ team may question the advanced beginner, and demonstrate a slight sense of discomfort or lack of confidence regarding their care / patient management without first verifying the accuracy of their order(s)/plan(s). The staff may not readily recognize the advanced beginner as the team leader. With help and frequent prompting, they will have the confidence to perform some critical aspects of care/patient management without referring to their preceptors, guidebooks, or reference cards.*** Submit this page	**How accurate is this description?** ***Accurate as written*** ***Needs minor revision*** ***Needs major revision*** ***Needs complete rewrite*** **To provide reasons and suggested changes click here**
25	***COMPETENT – A competent NNP is a provider that has situational awareness based on experience and is able to begin leading and planning based on this experience; demonstrates an expanding advanced practice knowledge base. While being observed, the competent NNP will know the pertinent information required to care for the patient, or know where to immediately refer. They will seem calm, confident, comfortable with their role, and organized, and will often seem sure of themselves (decisive). The competent NNP is comfortable being observed. The staff/ team rarely question or verify the accuracy of their order(s)/plan(s) prior to implementation, and demonstrate their acceptance or confidence regarding their care / patient management. The staff recognizes the competent NNP as the team leader. The competent NNP will have the confidence to perform most critical aspects of care/ patient management without referring to their preceptors, guidebooks, or reference cards.*** Submit this page	**How accurate is this description?** ***Accurate as written*** ***Needs minor revision*** ***Needs major revision*** ***Needs complete rewrite*** **To provide reasons and suggested changes click here**
26	***PROFICIENT -A proficient NNP is a provider that perceives and understands situations as whole parts, and demonstrates an extensive knowledge base with an increasing analytic ability to process and integrate new knowledge. While being observed, the proficient NNP will immediately know the pertinent information required to care for the patient or know where to immediately refer. They will seem very calm, confident, and comfortable with their role, well organized, and will be very sure of themselves (very decisive), and are very comfortable being observed. The proficient NNP displays sound situational awareness. The staff/ team very rarely***	**How accurate is this description?** ***Accurate as written*** ***Needs minor revision***

	question or verify the accuracy of their order(s)/plan(s) prior to implementation, and demonstrate their acceptance or confidence regarding their care / patient management. The staff readily recognizes the proficient NNP as the team leader. The proficient NNP will have the confidence to perform all critical aspects of care/ patient management Submit this page	○ *Needs major revision* ○ *Needs complete rewrite* **To provide reasons and suggested changes** click here
27	***EXPERT - An expert NNP is a provider that utilizes a rational knowhow and performs without thinking about rules or sequence from a vast history of experience and theoretical foundations forming an outstanding knowledge base. While being observed, the expert NNP will immediately know the pertinent information required to care for the patient or know where to immediately refer. They will seem calm, confident, and comfortable with their role, well organized, and will be sure of themselves demonstrating no hesitation, and perform in a flawless manner. The expert NNP is relaxed when being observed, and displays impeccable situational awareness. The staff/ team embrace the expert subject, and demonstrate their unconditional acceptance or confidence regarding their care / patient management. The staff immediately recognizes the expert NNP as the team leader. The expert NNP will have the confidence to perform all critical aspects of care and exceed by addressing additional aspects of care/ patient management seamlessly.*** Submit this page	**How accurate is this description?** ○ *Accurate as written* ○ *Needs minor revision* ○ *Needs major revision* ○ *Needs complete rewrite* **To provide reasons and suggested changes** click here

Submit this page

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ADDITIONAL SUGGESTIONS

To submit comments and suggestions *click here*

Please remember to return to the questionnaire often. When you come back, you will see how the group's answers have evolved and can edit your comments in response. If you have difficulties please send your questions to lacates@UTMB.EDU .

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3: Essential Scenarios

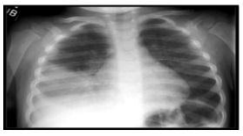
Below are neonatal scenarios that have been previously tested for validity and reliability. CLICK on the links provided to see very brief demonstrations, created by the PI, detailing the highlights or main point(s) of each scenario.

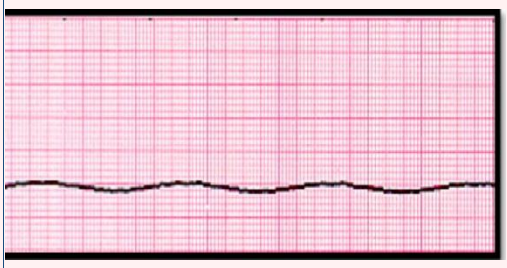
1. Choose the best scenario in each subcategory on its ability to assess a NNPs multidimensional competency, and their reflection of both the National Certification Corporation (NCC) essential evaluation areas and the National Association of Neonatal Nurse Practitioners (NANNP) core competency domains. To see the NCC & NANNP domains and corresponding subdomains, click here
2. Give suggestions for future scenarios that would greatly reflect both the NCCs essential evaluation areas and the NANNP core competency domains; your inputs can be entered by clicking on REASONS
3. If you do not feel qualified to complete this section, please give a brief reason by going to the bottom of the page and clicking on reasons.

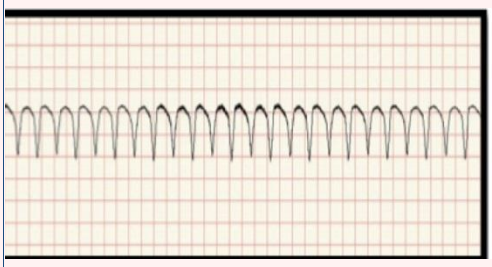
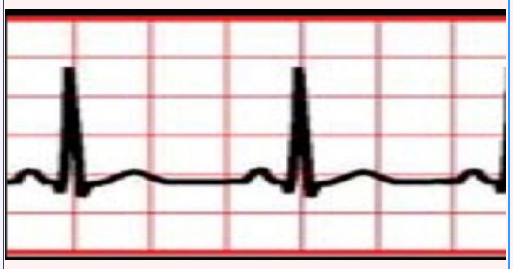
Please make sure you participate in all sections. If you leave before completing the questionnaire, your previous answer will appear when you return and you will see the new group averages. When you return, use this email address: expertNNP@123.com and this study code: NNP. This study is scheduled to close on 2013-11-15. Please remember to press SUBMIT in each row or at end of questionnaire.

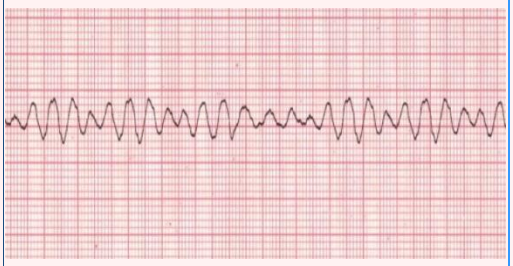
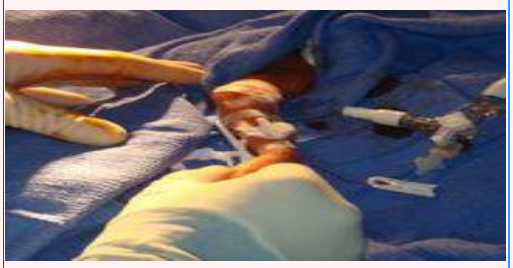
Questionnaire: Section 3
Scenarios

	Videos	*Question*
28	***Scenario 1: Tension Pneumothorax*** ***Sub Category: Respiratory***  ***click here for video*** Submit this page	IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM? ○ ***Top rated in sub category*** ○ ***Near the top*** ○ ***Middle of the pack*** ○ ***Not useful as presented*** **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
29	***Scenario 2: Difficult Airway*** ***Sub Category: Respiratory*** 	IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM? ○ ***Top rated in sub category*** ○ ***Near the top*** ○ ***Middle of the pack*** ○ ***Not useful as presented***

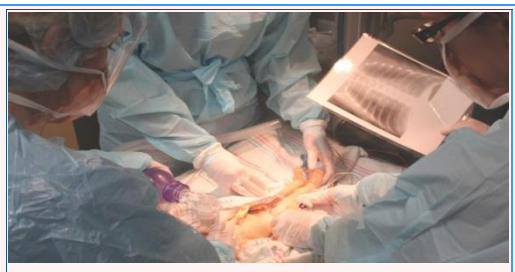
	click here for video Submit this page	**If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
30	***Scenario 3: Lower Airway Obstruction- RSV/Bronchiolitis Aspiration Pneumonia*** ***Sub Category: Respiratory***  *click here for video* Submit this page	**IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM?** ○ *Top rated in sub category* ○ *Near the top* ○ *Middle of the pack* ○ *Not useful as presented* **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
31	***Scenario 4: Aspiration Pneumonia*** ***Sub Category: Respiratory***  *click here for video* Submit this page	**IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM?** ○ *Top rated in sub category* ○ *Near the top* ○ *Middle of the pack* ○ *Not useful as presented* **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
32	***Scenario 5: Pulmonary Hemorrhage & Obstructed ETT*** ***Sub Category: Respiratory***	**In considering all of the functions that must be performed by an NNP, how important is this item?** ○ *Top rated in sub category* ○ *Near the top* ○ *Middle of the pack*

	 *click here for video* Submit this page	○ *Not useful as presented* **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
33	*Scenario 6: Pulseless Electrical Activity (PEA)* *Sub Category: Cardiac*  *click here for video* Submit this page	**IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM?** ○ *Top rated in sub category* ○ *Near the top* ○ *Middle of the pack* ○ *Not useful as presented* **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
34	*Scenario 7: Asystole* *Sub Category: Cardiac*  *click here for video* Submit this page	**IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM?** ○ *Top rated in sub category* ○ *Near the top* ○ *Middle of the pack* ○ *Not useful as presented* **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
35	*Scenario 8: Ventricular Tachycardia with a Pulse*	**IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM?**

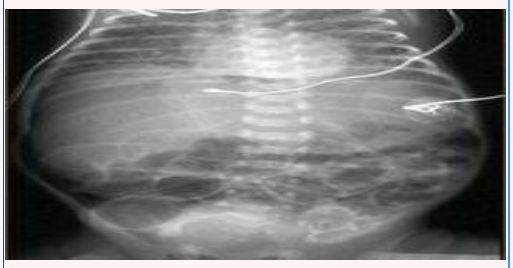
	Sub Category= Cardiac  *click here for video* Submit this page	○ *Top rated in sub category* ○ *Near the top* ○ *Middle of the pack* ○ *Not useful as presented* **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
36	*Scenario 9: Bradycardia* *Sub Category: Cardiac*  *click here for video* Submit this page	**IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM?** ○ *Top rated in sub category* ○ *Near the top* ○ *Middle of the pack* ○ *Not useful as presented* **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
37	*Scenario 10: Pulseless Ventricular Tachycardia (Pulseless V-Tach)* *Sub Category: Cardiac*  *click here for video* Submit this page	**IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM?** ○ *Top rated in sub category* ○ *Near the top* ○ *Middle of the pack* ○ *Not useful as presented* **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**

38	***Scenario 11: Ventricular Fibrillation (V-Fib)*** ***Sub Category: Cardiac***  ***click here for video*** Submit this page	**IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM?** ○ ***Top rated in sub category*** ○ ***Near the top*** ○ ***Middle of the pack*** ○ ***Not useful as presented*** **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
39	***Scenario 12: SVT unresponsive to Adenosine and vagal maneuvers*** ***Sub Category: Cardiac***  ***click here for video*** Submit this page	**IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM?** ○ ***Top rated in sub category*** ○ ***Near the top*** ○ ***Middle of the pack*** ○ ***Not useful as presented*** **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
40	***Scenario 13: Hypovolemic Shock (dehydration- Failure to thrive)*** ***Sub Category: Shock***  ***click here for video***	**IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM?** ○ ***Top rated in sub category*** ○ ***Near the top*** ○ ***Middle of the pack*** ○ ***Not useful as presented***

	Submit this page	**If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
41	***Scenario 14: Distributive Shock*** ***Sub Category: Shock***  ***click here for video*** Submit this page	**IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM?** ○ ***Top rated in sub category*** ○ ***Near the top*** ○ ***Middle of the pack*** ○ ***Not useful as presented*** **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
42	***Scenario 15: Symptomatic Severe Hypoglycemia*** ***Sub Category: Multifaceted***  ***click here for video*** Submit this page	**IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM?** ○ ***Top rated in sub category*** ○ ***Near the top*** ○ ***Middle of the pack*** ○ ***Not useful as presented*** **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
43	***Scenario 16: Recurrent Hypoglycemia with Respiratory Distress, Pneumonia, Hypotension*** ***Sub Category: Multifaceted***	**IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM?** ○ ***Top rated in sub category*** ○ ***Near the top*** ○ ***Middle of the pack*** ○ ***Not useful as presented***

	 *click here for video* Submit this page	**If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
44	***Scenario 17: Post Home Delivery with displaced ETT, severe hypoglycemia, and hypotension after rapid rewarming*** ***Sub Category: Multifaceted***  *click here for video* Submit this page	**IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM?** ○ ***Top rated in sub category*** ○ ***Near the top*** ○ ***Middle of the pack*** ○ ***Not useful as presented*** **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
45	***Scenario 18: Disordered Control of Breathing (narcotic OD at home- mom gave infant methadone)- ER setting*** ***Sub Category: Multifaceted***  *click here for video* Submit this page	**IN CONSIDERING ALL OF THE FUNCTIONS THAT MUST BE PERFORMED BY AN NNP, HOW IMPORTANT IS THIS ITEM?** ○ ***Top rated in sub category*** ○ ***Near the top*** ○ ***Middle of the pack*** ○ ***Not useful as presented*** **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
46		**HOW ACCURATE IS THIS DESCRIPTION?**

	Scenario 19: Resuscitation Involving Meconium- "Non-Vigorous" *Sub Category: Delivery*  *click here for video* Submit this page	○ *Top rated in sub category* ○ *Near the top* ○ *Middle of the pack* ○ *Not useful as presented* **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
47	*Scenario 20: Full Resuscitation Abruption* *Sub Category: Delivery*  *click here for video* Submit this page	**HOW ACCURATE IS THIS DESCRIPTION?** ○ *Top rated in sub category* ○ *Near the top* ○ *Middle of the pack* ○ *Not useful as presented* **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
48	*Scenario 21: Delivery with meconium, gastroschesis, persistent cyanosis –CHD* *Sub Category: Delivery*  *click here for video*	**HOW ACCURATE IS THIS DESCRIPTION?** ○ *Top rated in sub category* ○ *Near the top* ○ *Middle of the pack* ○ *Not useful as presented* **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**

	Submit this page	
49	***Scenario 22: Necrotizing Enterocolitis and Delivering Bad News*** ***Sub Category: Ethics/ Communications***  ***click here for video*** Submit this page	**HOW ACCURATE IS THIS DESCRIPTION?** ○ ***Top rated in sub category*** ○ ***Near the top*** ○ ***Middle of the pack*** ○ ***Not useful as presented*** **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**
50	***Scenario 23: Ethics and Care at the End of Life (no response to resuscitation efforts at delivery- due to true knot in cord)*** ***Sub Category: Ethics/ Communications***  ***click here for video*** Submit this page	**HOW ACCURATE IS THIS DESCRIPTION?** ○ ***Top rated in sub category*** ○ ***Near the top*** ○ ***Middle of the pack*** ○ ***Not useful as presented*** **If middle of the pack or not useful as presented, please provide reasons and suggested changes click here**

Submit this page

The questionnaire is divided into three sections:
SECTION 1 The questions in this section are designed to collect judgments about Global Statements that a rater would use to assess a neonatal nurse practitioner (NNP) while performing in simulation. Your judgments are requested about whether these statements have been assigned to an appropriate "competency category" and whether the NANNP "competency domain" is correct.
For Section 1, click here

SECTION 2. In this section we ask for your judgments about the definitions that could be applied to five novice-to-expert operational definitions for NNP performance subscales.
For Section 2, click here

SECTION 3 YOU ARE HERE. This section presents several neonatal scenarios in the form of short video clips that demonstrate essential points of each scenario. Please assess the relative importance of each scenario in the evaluation of multidimensional competency for NNPs.
For Section 3, click here

ADDITIONAL SUGGESTIONS

To submit comments and suggestions click here

Please remember to return to the questionnaire often. When you come back, you will see how the group's answers have evolved and can edit your comments in response. If you have difficulties please send your questions to lacates@UTMB.EDU .

To go to the top of this form click here

To sign out click here

Date: 17 October, 2013

APPENDIX K: QUALITATIVE RESPONSE TABLE SPECIFIC AIM 1

Qualitative Responses to Specific Aim 1 (Global Statements-Multidimensional)			
Item	**Qualitative Response**	**Theme**	**Initial Response or Revision Implication**
States Pertinent Findings- ***Cognitive***	• Knowledge according to Benner can be expressed in certain ways according to expertise from novice to expert. Novices will be task driven whereas experts do not even think any more about what to do. Experts will do actions without thinking about them. They have internalized the decision making. Sometimes, they use old knowledge and have a real hard time with accepting changes.	Competence continuum	• Utilize as needed for Novice to expert operational definitions
States accurate reading of diagnostic exam(s)- ***Cognitive***	• Knowledge about reading of diagnostic exams is dependent on expertise and depth of knowledge. Not all institutions will have similar experiences.	Competence continuum	• How well they do this will be graded on a novice to expert subscale; there essential sets of diagnostic exams that an NNP is expected to interpret
States appropriat e plan of care- ***Cognitive***	• Dependence on their emotional intelligence maturity and depth of knowledge. Different training programs emphasize various things.	Competence continuum	• The NCC expects essential areas of knowledge; all training programs must cover these areas. Regardless of the emotional maturity of the person they must be able to meet the minimum requirements to practice in order to be safe.
Stabilizes airway/bre athing- ***Technical***	• May not want to use brands but use generic terms per Neonatal Resuscitation Program. There are alternative devices being advocated such as LMA and others.	General statement	• These were stated only as examples of stabilizing the airway. The pertinent information was in the actual global statement not what was in parenthesis.
Performs or ensures performan ce of chest compressio ns- ***Technical***	• Use statements on chest compressions from ILCOR and NRP.	General statement	• The guidelines to be used will be scenario dependent (I.E. if it is a neonate then NRP will used; if 1 year old then PALS guidelines will be followed)
Requests /orders team action- ***Cognitive***	• While this can fit in cognitive in that they need to know what to do, it can also fit in behavioral - they may know what needs to be done, but they may be unable to direct others. • This one was tough in that I thought there was a split in how the global statement could be categorized. The verbs requests/orders feel more appropriately placed in the behavioral domain, but the subject matter is definitely more appropriately placed in the cognitive competency category. Since the global statement refers to specific tasks that reference cognitive skill to implement, the argument could be made that the cognitive competency category is correct placement. Would it be workable to include this global statement in both competency categories?	Multi-categorical	• How well they do this will be graded on a novice to expert subscale

Effective as a team leader- ***Behavioral***	• Could overlap into cognitive - if the leader is unsure of information or what to do will not be effective.	Multi-categorical	• According to Spencer and Spencer team work and leadership is a behavior, the information portion could affect their behavior, but will be assessed in other items and on a novice to expert subscale
Uses situational awareness to manage clinical situation- ***Behavioral***	• I think this could be cognitive - knowing what is happening with the patient in order to manage a particular clinical situation.	Rationale	• Situational awareness is to thoroughly evaluate ones surroundings to be conscious of all resources available (human, technological, equipment), and how to access them quickly; thus this is a practiced behavior (pilots train to this behavior)

***BOLDED statements are intended to be utilized for revisions in future studies**

APPENDIX L: QUALITATIVE RESPONSE TABLE SPECIFIC AIM 2

Qualitative Responses to Specific Aim 2 (Global Statements-NANNP)			
Item	**Qualitative Response**	**Theme**	**Initial Response or Revision Implication**
Requests /orders team action- ***Management of patient health and illness status***	• Could fit in cognitive, but might also fit in teaching/coaching others	Multi-categorical	• There may be specific scenarios that this is the primary objective, but generally to order an action is to manage the patient's health and/or illness
States appropriate lab work- ***Management of patient health and illness status***	• Although it is implied in the NANNP Domain, it is not explicit.	Rationale	• Employs screening and diagnostics is listed under this NANNP domain; thus a screening test could be lab work
Communicates to medical personnel appropriately-Professional Role	• Medical personnel communication is it SBAR for immediate or other fashion? • Almost want to place this global statement in the NANNP domain of management of patient health and illness status as for most people it is an integral skill in effective care management. Might be taken more seriously by practicing and potential NNPs undergoing competency testing if this communication is conceptualized as part of patient management. • I believe the NANNP domain would be nurse practitioner- patient relationship as this domain talks about relaying information to the healthcare team	General statement Multi-categorical Rationale	• The appropriate communication will depend on the scenario and its objectives. May be more than one type of communication used; thus two or more drop-down choices will appear for this global statement. • Although this could be the means for the management of patient health and illness status, the method chosen is a demonstration of the NNPs professional role. • **Valid point made RE: nurse practitioner-patient relationship- Domain clearly reads:** • **Communication with family and staff RE: diagnosis , prognosis, diagnostic results** • **Communication with family and staff RE: plan of care**
Communicates with family appropriately-Nurse practitioner-patient relationship	• Competencies have taken out "appropriately" as is not an easily define term.	Editing	• **Would consider changing to correctly or another suitable pseudonym**
Can be easily identified as team leader-Professional Role	• It might be better to say, "Easily identified as team leader."	Editing	• **Will make edits to this global statement in the future**
Effective as a team leader-Professional	• A team leader is part of the professional role, but in the NANNP domain, a team leader is an integral component of the	Multi-categorical	• Teaching and coaching is focused on education and not on the

Role		teacher-coaching role. • Again, think of the emotional intelligence of the team leader. The leader is the bedside nurse until the provider arrives. There is the concept of floating leadership.	Competence continuum	leadership functions of the professional • All global statements will be assessed on the novice to expert continuum and thus adapts for multiple levels of performance and ability. The scenarios will be geared toward evaluation of the NNP, and thus will not allow for long periods of time in which the bedside nurse will need to be the team leader.
Uses situational awareness to manage clinical situation- ***Managing and negotiating healthcare delivery systems***	•	I think this has more to do with *managing patient disease and illness*. When I think of managing a clinical situation, I think of the patient illness and looking at the big picture of what is happening with the patient. • I would place this as *professional role*. To me managing healthcare delivery systems is a much broader category. • Managing and Negotiating Healthcare Delivery System seems to be more of how a NNP might manage the business of healthcare or the business plan of the hospital where that impacts their role as a care provider. Maintaining situational awareness is a behavioral skill that can be enhanced with task delegation or close communication with the recorder in resuscitation or training yourself to be aware of surroundings. I would put this under professional behavior.	Rationale	• This is focused on situational awareness of resources; although resources are a part of managing patient disease and illness, it is not the focus. • Can see the possibility of it falling more under professional role • **This is a behavior, and is found in those that are well trained in their roles. This will be modified for future revisions to professional roles**
Uses situational awareness to allocate time wisely- ***Managing and negotiating healthcare delivery systems***	•	The NANNP domain is off the mark with situational awareness. Allocation of time is directly related to case load and patient management. • I would categorize this as professional role. NNPs learn to use time wisely and efficiently as they mature in the role. • Using time wisely will fall into professional role • Managing and Negotiating Healthcare Delivery System seems to be more of how a NNP might manage the business of healthcare or the business plan of the hospital where that impacts their role as a care provider. Maintaining situational awareness is a behavioral skill that can be enhanced with task delegation or close communication with the recorder in resuscitation or training yourself to be aware of surroundings. I would put this under professional behavior.	Rationale	• **The NANNP domain is incorrect** • **Categorize this as professional role** • **This is a behavior, and is found in those that are well trained in their roles. This will be modified for future revisions to professional roles**
Uses situational awareness to allocate resources- ***Managing***	•	A case could be made for managing health care delivery but it would depend on what resources you were referring to.....I think personnel (human resources) is more a function of professional role - How many	Multi-categorical	• **This is a behavior, and is found in those that are well trained in their roles. This will be modified for future**

and negotiating healthcare delivery systems	NNPs needed to care for census in NICU. However, how the dollars are spent to provide the necessary equipment needs, eg., computers for NNPs to chart may be a part of negotiating health care delivery. • Managing and Negotiating Healthcare Delivery System seems to be more of how a NNP might manage the business of healthcare or the business plan of the hospital where that impacts their role as a care provider. Maintaining situational awareness is a behavioral skill that can be enhanced with task delegation or close communication with the recorder in resuscitation or training yourself to be aware of surroundings. I would put this under professional behavior.	Rationale	**revisions to professional roles**
***BOLDED statements are intended to be utilized for revisions in future studies**			

APPENDIX M: QUALITATIVE RESPONSE TABLE SPECIFIC AIM 3

Qualitative Responses to Specific Aim 3 (Novice to Expert Operational Definitions)			
Item	**Qualitative Response**	**Theme**	**Initial Response or Revision Implication**
NOVICE	• A novice skills statement might be helpful. For example novice requires support and is learning new technical skills • Agree that skills statement should be included. Agree word "may" should be used rather than declarative statements. Would not use the word "normally" but rather may be uncomfortable being observed. • Consider saying "may" instead of "will" (e.g. the novice NNP may seem nervous, anxious...) • When I read this statement I come away with a feeling of lack of confidence in the education that we are providing. I my opinion novice NNPs should be minimally competent. Their education and certification should prepare them for minimal competence (safety). • The general feeling reading this description was not of novice practice but seriously challenged function of someone who perhaps should take advantage of more schooling. Agree that adjusting some of the wording to include "may" will help, as well as the idea of a novice skills statement.	Editing Competence continuum concerns	• **A skill statement such as this will be added to future operational definitions** • **Will change normally to may** • Yes but the operative word here is competent, if the NNP being assessed is NOT competent they will perform poorly and be labeled novice • See statement above; this is the point of the instrument to pick out those that perform at sub competent levels. These do need more schooling or remediation to be safe and competent providers
ADVANCED BEGINNER	• Needs less support and is more comfortable with technical skills • Would use less declarative statements using "is" "will". Include statement regarding technical skills. Agree some sentences could be restructured. Example for first sentence: An advanced beginner NNP has a sound advanced practice knowledge base including areas specific to neonates, but performs is based on limited experiences. • Restructure sentences to flow better. "has sound advanced practice knowledge base specific to neonates." • The same issues exist with this level of practice description in that it reads more of a judgment of poor practice vs. positively evolving development of NNP skill/practice on the novice to expert continuum. Agree with editions suggestions of the other responders.	Editing Competence continuum concerns	• **A skill statement such as this will be added to future operational definitions** • **Like sentence restructuring** • **Like this restructuring as well** • Again want the unsafe provider to be recognized and given the appropriate level of remediation
COMPETENT	• Run on or overly long sentences can be broken down into separate statements. Include skills statement. • Overly long sentences. • Rewrite: A competent NNP is a provider that has a beginning situational awareness based on limited experience...	Editing	• **A skill statement will be added to future operational definitions** • **Will break down sentences into shorter versions** • **Like sentence**

	• Try not to use run on sentences. Break up into clear compact sentences. • A good start. I would rethink the statement that a competent NNP rarely experiences questioning or verification of orders and plan of care. In many models of teamwork and communication, an example of which is TeamStepps, ongoing order verification and check back is actually encouraged. I think the intent was to describe a greater confidence by the other team members and the NNP him/herself in autonomous decisions.	Competence continuum concerns	**restructuring** • Yes intent was to describe a greater confidence by the other team members and the NNP him/herself in autonomous decisions- **will consider better means of description.**
PROFICIENT	• The proficient NNP understands the pertinent information required to care for the patient or know where to immediately refer. Try to minimize use of very, and immediately. Use clear concepts. • Understands situations as whole parts" is unclear. Would minimize the use of the word "very" in favor of more descriptive terms. • Agree with edit suggestions of other respondents. Also have the same concern as stated with the competent level re: verification of orders and check back. At this point an NNP should be able to engage in effective communication techniques and incorporate feedback and suggestions as appropriate. Also would be key in team building.	Editing Competence continuum concerns	• **A skill statement will be added to future operational definitions** • **Will remove very as descriptors where at all possible** • Whole parts= big picture- **will consider better means of description.** • Intent was to describe a greater confidence by the other team members and the NNP him/herself in autonomous decisions- **will consider better means of description.**
EXPERT	• Knowhow is not a word. First sentence overly long. Add skill statement. • very intuitive; may or may not be able to give rationales for actions • Use knowledge-base instead of know how. Try to use clear concepts. • Expert practitioners can struggle to explain what expert practice is and why the clinical judgments that they make are correct and in best interests of patients. I believe that it is thought that patient care management experience has solidified into a fluid and finely honed intuitive sense that supports excellent practice. Would not use "flawless" to describe excellent care management and delivery or to infer that NNPs practice successfully in a vacuum. On the flip side, NNPs can and do reach near-flawless capability and that status should be described in strong terms.	Editing Competence continuum concerns	• Knowhow is defined as the knowledge and skill required to do something; practical knowledge for a specific task. **A skill statement will be added to future operational definitions** • **Like this sentence** • **Will consider changing knowhow to knowledge-base** • **Will remove flawless and create a description of this type of performance**
GENERAL COMMENTS	• For section two you may consider providing average number of years for each category.	Editing	• Considered this is initial composition, did not include in order to prevent putting people in a box based on years of experience as some may perform beyond their years and some less than. Also if want to make subjects anonymous to observers in all ways to assess validity than should

	not have as a means of assessment.

***BOLDED statements are intended to be utilized for revisions in future studies**

APPENDIX N: QUALITATIVE RESPONSE TABLE SPECIFIC AIM 4 (RESPIRATORY)

Qualitative Responses to Specific Aim 4 (Essential Scenarios- Respiratory)			
Item	**Qualitative Response**	**Theme**	**Initial Response or Revision Implication**
Tension Pneumo	• **Would not wait for a chest x-rays if clinically have decreased breath sounds on one side and have ability to transilluminate. If plan on showing videos in the future would take out reference to brand names....use chest tube set up as opposed to "pigtail."** • **Transillumination would be quicker followed by needle aspiration** • **In scenario, because of rapid decompensation and length of time to get CXR, we recommend transillumination and needle aspiration.**	Video content	• Must use what can be done on the mannequin , will allow "pigtail" • Transillumination not possible on mannequin, and was attempting to get all main points in under 1 min. • Agree, but CXR was a better visual of what was occurring to patient for a rapid demonstration • **Will use when comprehensive demonstration video is created**
Lower Airway Obstruction- RSV/Bronchiolitis	• Similar to other scenario for intubation. Bronchiolitis is not usually seen in NICU but PICU. • Because bronchiolitis is unlikely to be seen in the NICU, this content is more relevant to the primary care of the NICU graduate. • However, the NNP would be unlikely to be the provider who intubates this baby in the ED • The hair is not pulled back or under a hat as a side note.	Rationale Video content	• Agreed not all NICUs allow RSV in their unit, but some NICUs such as large academic centers have RSV; • Depends on ED and comfort of MD/provider with infants- have personally been on a number of transports for infants that ED provider is not at all comfortable with the management of infants • Agreed **will have had hair pulled back in future videos**
Aspiration Pneumonia	• I think making the diagnosis of aspiration pneumonia on a patient that has just aspirated is premature. It seems to me the dx would be potential or rule out aspiration. • No reference to where the NG/OG tube was located. The NNP should ask about tube location to begin assessment.	Video content	• Agreed, but was attempting to get all main points in less than 1 min. • Agreed can do if comprehensive demonstration of this scenario is created
***BOLDED statements are intended to be utilized for revisions in future studies**			

APPENDIX O: QUALITATIVE RESPONSE TABLE SPECIFIC AIM 4 (CARDIAC)

Qualitative Responses to Specific Aim 4 (Essential Scenarios- Cardiac)			
Item	Qualitative Response	Theme	Initial Response or Revision Implication
Pulseless Electrical Activity (PEA)	• Not sure all the possible problems/diagnoses the NNP was identifying are necessarily what I would expect of an advanced beginner or at that stage in the scenario. I would expect attention to airway, breathing, circulation - checking vitals, turning up oxygen, giving epinephrine - and to begin thinking about things like hyperkalemia, etc, but this seemed a bit rehearsed and not very natural. • Not a neonatal scenario but more a PICU type. Resuscitation technique not paid attention by NNP. No hands around and under infant for compressions. Not the preferred method by ILCOR or NRP. NNP should be correcting their technique. Closed loop communication not used. • Agree with other responses.	Video content Rationale	• This is a demonstration of a competent or better NNP; It was rehearsed to ensure all main points were demonstrated in less than 1 min. • Every cause of PEA can occur in the NICU, S.T.A.B.L.E .has PEA as one of its scenarios due to the fact of PEA being missed in the NICU until HR got below 60; Can use 2 fingers or encircled thumbs; Can do a better demonstration of closed loop communication if comprehensive demonstration of this scenario is created.
Asystole	• Terrible compressions and breathing techniques. They should be acting as a team together. The preferred method by ILCOR and NRP is to encircle the chest. Going the wrong way for the other method and no hand under the chest. Please refer to NRP book for proper methods. Need more closed loop communication. Looks like thin air commands. • Agree with comments of others. This may need to be near the top of the pack but this video is not a good example of technique. • Need to look for causes of asystole--what preceded this event: feedings, medication infusion, etc.	Video content	• Can do a better demonstration of compressions and closed loop communication if comprehensive demonstration of this scenario is created.
Ventricular Tachycardia with a Pulse	• Not sure this is very useful as a NICU scenario - more likely to see SVT and then use adenosine rather than cardioversion • Have never done cardioversion without Neo at bedside. This is information that NNP would need to have some "awareness" of but to make the decision to perform seems outside their role in the NICU. Even giving adenosine would require a call to the Neo in most units. • More of a PICU scenario than a neonatal. This is straight out of PALS • Agree with other responses. Also, I would call the neo prior to calling Cardiology. A lot of centers do not have Peds Cardiology readily	Rationale Video content Rationale Video	• Depends on what type of NICU you practice in, academic centers see this as well • Disagree, an NNP would perform cardioversion alone on transport, in fact so would a paramedic or transport bedside RN, I have also instructed cardiology fellows and attending MDs on use of a defibrillator in which

		available. It is good, however, to have some experience with a defib/cardioverter.	content	they are not familiar • The instructions clearly state the source of the scenarios and yes PALS is a source. NNPs must be able to care for ages 0-2 years of age – NRP does not cover after 28 days of age or 35 weeks PCA. NRP was also designed specifically for the delivery room. • Can use if comprehensive demonstration of this scenario is created.
Bradycardia	• It seems that there is not enough information here to support immediate need for information. Is this a premie that was apneic? If so, face mask ventilation should be effective - **not sure I would go to intubation so quickly without more information.** • **I thought that the administration of epinephrine was a little quick after the bag mask ventilation was started, in other words, it really did not follow NRP guidelines** • **No coordination of bagging and compressions. Does not follow NRP algorithm. Again, really bad compression technique. Better closed loop communication.**	Video content	• Agreed-was attempting to get all main points in less than 1 min. • **Will use when comprehensive demonstration video is created**
Pulseless Ventricular Tachycardia (Pulseless V-Tach)	• This is a better fit for PICU - not even sure I could identify pulseless V-tach – • Not a good NICU scenario, not commonly seen in NICU. • This more for PICU than NICU. More of a PALS scenario. • the chest compressions appeared to be what you would do on pediatric patients, not neonatal • NRP guidelines for chest compressions not followed even though patient is 5KG	Rationale Video content	• An NNP should be able to identify all common neo/pediatric rhythms. • Yes compressions were fit to the larger mannequin AND NNPs must care for ages 0-2. • Have seen this more than once, and patient is not an NRP candidate • Yes it is PALS as stated in intro; can be seen in NICU as well.
Ventricular Fibrillation (V-Fib)	• Not sure I have ever seen this in the NICU - seems like it is better suited to the PICU, and not something I would expect NNPs to recognize and respond to in this way. • Does not seem like a common NICU scenario, • This is a PALS scenario not neonatal. • V-fib is rare in the newborn and therefore its recognition and treatment is not a major focus for the NNP. • Does not follow NRP at all. • Terrible compression and breathing techniques. • CPR was more for a peds patient	Rationale Video content	• This is basic treatment for V-fib AND this rhythm is seen on NCC exam • Yes compressions were fit to the larger mannequin AND NNPs must care for ages 0-2. • NRP does not cover electrical disturbances , so YES it is PALS and is a needed skill (see above comments on compressions and age) • Agreed rare, but an NNP should know how to recognize and treat
SVT unresponsive to	• Would be more helpful to define what is meant by "symptomatic." It seems by the time you have given adenosine and a vagal maneuver the	Video content	• Symptomatic is a VERY common PALS term. Again needed to

Adenosine and vagal maneuvers	cardiologist would at least have called back. Not sure I would expect an NNP to manage this whole scenario on her own. • Would an NNP in a NICU be in a position to make a decision regarding cardioversion after 3 doses of adenosine without additional expert input? • This would happen in the NICU but this seems right out of PALS again. • Little input from team members from the NNP. NNP is not using closed loop communication. Going way too fast for communication.		complete all main points in less than 1 min. An RN or paramedic could manage on her own. Why not an NNP? • See above response • NRP does not cover electrical disturbances, so YES it is PALS -NNPs must care for ages 0-2. • Again needed to complete all main points in less than 1 min.
***BOLDED statements are intended to be utilized for revisions in future studies**			

APPENDIX P: QUALITATIVE RESPONSE TABLE SPECIFIC AIM 4 (SHOCK)

Qualitative Responses to Specific Aim 4 (Essential Scenarios- Shock)			
Item	**Qualitative Response**	**Theme**	**Initial Response or l Revision Implication**
Hypovolemic Shock (dehydration-Failure to thrive)	• Not sure I would call a one week old who was dehydrated failure to thrive - maybe. **I think more information is needed before jumping to a volume bolus - blood pressure, capillary refill, weight, number of wet diapers, etc.** • fluid and electrolytes • The NP made an assessment of **hypovolemic shock yet there was no mention of a blood pressure by the RN staff.** How do we know by first glance that the infant is failure to thrive? • I must agree with the calling the baby FTT, may IUGR would be more appropriate.	Video content	• Agreed-was attempting to get all main points in less than 1 min. • IUGR? No mention was made as to where the baby should be on graph etc… • **Will use when comprehensive demonstration video is created**
Distributive Shock (Sepsis)	• How would you know by the fact that the baby is blue that he is in septic shock? I have never heard distributive shock used in the neonate. • Go a little slower. Let team members contribute. Add weight and doses of antibiotics. More closed loop communication. NNP is not looking at any one for interactions to close the loop. • Provide weight of baby and the doses of ampicillin and gentamicin • This happens in the NICU but the terminology is PALS again.	Video content Rationale	• Agreed-was attempting to get all main points in less than 1 min.; Distributive shock can be caused by sepsis (frequent in NICU), anaphylaxis (rare but happens), and neurogenic causes (also happens in NICU • See previous comments on PALS and condensed time frame to get all main points across to viewers • Can use if comprehensive demonstration of this scenario is created.
***BOLDED statements are intended to be utilized for revisions in future studies**			

APPENDIX Q: QUALITATIVE RESPONSE TABLE SPECIFIC AIM 4 (MULTIFACETED)

Qualitative Responses to Specific Aim 4 (Essential Scenarios-Multifaceted)			
Item	**Qualitative Response**	**Theme**	**Initial Response or Revision Implication**
Symptomatic Severe Hypoglycemia	• **I did not hear a weight discussed in the scenario for the dose of D10w, and no mention of vital signs or sats, did he just need oxygen or CPAP?** • **A little better pacing. A little better closed loop communication. Thin air commands confuse team members.** • **more information about hypoglycemia, accucheck results using unit of measure (mg/dL) and why the 10 minute wait for the next accucheck glucose. Include how many mg/kg/minute of D10W is being delivered with the IV drip.**	Video content	• Agreed-was attempting to get all main points in less than 1 min • **Will use when comprehensive demonstration video is created**
Recurrent Hypoglycemia with Respiratory Distress, Pneumonia, Hypotension	• How do we know he has pneumonia?...nothing was mentioned in the scenario. Need to give the staff more time to convey pertinent information to NNP. Not sure this scenario is needed since it is essentially hypoglycemia with respiratory distress. • No time for team members to answer. A little better closed loop communication with use of their names.. Bagging is too fast and not paced per NRP. Slow the scenario down a little to give the full impact of the situation. • Rather than state breath sounds are good, state that they are audible on the right and left and equal.	Video content	• Agreed was attempting to get all main points in less than 1 min • Can use if comprehensive demonstration of this scenario is created.
Post Home Delivery with displaced ETT, severe hypoglycemia, and hypotension	• I would recommend extending the scenario to include the volume and glucose boluses needed to treat all facets of this scenario. • With the new NRP guidelines I would have them place the pulse ox on the right hand ASAP. This will reinforce the practice.	Video content	• Can use if comprehensive demonstration of this scenario is created. • Not sure it matters as he was delivered at home
Disordered Control of Breathing (narcotic OD at home- mom gave infant methadone)- ER setting	• Not sure I would worry about social services in the middle of the resuscitation -although they do need to be called. NNP should recognize that narcan might be contraindicated if the mother has been on methadone - she sort of indicated that in the video - she said to consider it but needed more history. Might be more of an ER scenario than an NICU • Agree w previous comments-take the narcan out. • You would never give narcan for methadone. One doctor did that and the baby seized for hours. • I do not believe this scenario is appropriate for assessment of NNP competence (due to the	Video content ‘ Rationale	• Can use if comprehensive demonstration of this scenario is created; Agreed more ED, but could happen in some academic NICUs • Agreed no Narcan if use in future • Narcan was only mentioned as consideration- not given • Agreed-See above ED comment • Depends on ED and provider

area of service and the clinical problem).

- **I do not think many NNPs would be the lead in the ER setting. They may however, be there to assist the ER physician in any way they can and offer suggestions on care.**

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APPENDIX R: QUALITATIVE RESPONSE TABLE SPECIFIC AIM 4 (DELIVERY)

Qualitative Responses to Specific Aim 4 (Essential Scenarios- Delivery)			
Item	**Qualitative Response**	**Theme**	**Initial Response or Revision Implication**
Resuscitation Involving Meconium- "Non-Vigorous"	• respiratory category as well • **No discussion or obvious checking of HR/VS** • **Good representation of skill set but would recommend having someone call out neonate response to intubations as another decision point for how many times to intubate** • **This is a neonatal scenario. No one is monitoring the vital signs. NNP needs to tell the plan of care to team.**	Video content	• Correct treatment of a non-vigorous infant delivered with meconium and is a skill an NNP must be able to perform well. It is more than just airway. • **Will use when comprehensive demonstration video is created**
Full Resuscitation Abruption	• **Need to use sterile technique for line placement.** • **Where is the hat, gown, and sterile gloves? NNP needs to follow guidelines for HACs.** • **Even in an emergent situation such as this the practitioner should don sterile gloves prior to touching the sterile field. As the others are continuing the compressions and ventilation, the NNP can step away and take the few seconds involved in donning sterile gloves, then touch the sterile catheter for the UVC.** • **Would have placed a pulse ox the right wrist soon after delivery.**	Video content	• Not in an emergency • This is emergent, Can use if comprehensive demonstration of this scenario is created • Was attempting to get all main points in less than 1 min, placing sterile gloves is time consuming and not needed in this case • **Will use for comprehensive demonstration video is created**
Delivery with meconium, gastroschesis, persistent cyanosis – CHD	• Not sure why he needed CPAP when he was crying - it was not clear that he was having breathing difficulty - would be careful with CPAP with a gastroschesis, needs OG tube. • OG tube or replogyle to LIS...3-4 weeks early can have RDS as well as a normally open PDA...need to focus on airway 1st and communicate this to team members. • Not sure why a Neo is not the first person to be called. Agree with the comments of others related to CPAP in a crying infant and OG tube needs to be place before CPAP initiated. • Not sure if I missed it or not but it sounded like a vigorous crying baby that was ?direct suctioned for meconium. While a murmur is a possible link to CHD, there also might be additional reasons for persistent cyanosis, like prematurity, MAS, etc. • No closed loop communication. Not listening to team input with stethoscope in ears. Need less thin air commands. • Place an orogastric tube before providing CPAP	Video content	• Was attempting to get all main points in less than 1 min. • Can use if comprehensive demonstration of this scenario is created • Not crying initially
***BOLDED statements are intended to be utilized for revisions in future studies**			

APPENDIX S: QUALITATIVE RESPONSE TABLE SPECIFIC AIM 4 (COMMUNICATION/ETHICS)

Qualitative Responses to Specific Aim 4 (Essential Scenarios- Communication/Ethics)			
Item	**Qualitative Response**	**Theme**	**Initial Response or Revision Implication**
Necrotizing Enterocolitis and Delivering Bad News	• Not sure I would expect an NNP to do this on her own without a physician present. • NNP would not be doing this alone, Neo should be present as well. Where are other family members or support for mother? This is difficult scenario to make realistic. • Personally, did not seem like a lot of time to introduce mom to the concept of non-survivability. Where are the physician collaborators, and other supportive family members be? Emphasis was on holding baby and not allowing mom to process information. • It would be more effective with a little more time, less nurses, putting baby on ventilator, and face-to-face communication with Mother. • Use less medicalease (viable is too technical for most lay people) and call the baby by her name (he was used instead of she at one point). Were all of the nurses at the bedside necessary? It looked like too many people and the mother could barely squeeze in.	Video Content	• Agreed this is a team conversation • Was attempting to get all main points in less than 1 min. • Can use if comprehensive demonstration of this scenario is created
Ethics and Care at the End of life No response to resuscitation efforts at delivery- due to true knot in cord	• **Depending on the state where you practice, an NNP cannot make this decision - rather an MD has to be the one to stop the resuscitation. If there is no neo/peds present I would expect the NNP to know what the other resources are - the OB for example, an ER physician, or others who can come help with the decision making. Some states may allow NNPs to do this in their scope of practice, but it is quite variable.** • **Agree that OB should be in room to offer assistance to NNP. Father or other support person should be present as well.** • **I would also hope that the OB has stayed close to offer support to the family and reassurance that everything possible was done.** • **Make longer scenario to be more effective. NNP is talking so fast. Much better syncing of compressions and breathing. Finally the correct NRP technique.**	Rationale Video content	• Agreed varies by state • NRP technique used with NRP scenario, not used when did not apply • **Will use when comprehensive demonstration video is created**

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APPENDIX T: QUALITATIVE RESPONSE TABLE VIDEOS

Qualitative Responses to Specific Aim 4 (Essential Scenarios)		
Item/Theme	**Qualitative Response**	**Initial Response or Revision Implication**
ACCESS	• I could not access videos so my answers were based on the title of the topic and perception of content that would be included. • I was unable to access videos and was unable to submit any revisions to the levels of competency • Difficulty submitting answers. • Some videos hard to view. • Fortunately, I was able to access everything.	• This is totally acceptable as videos were not meant to be a perfect demonstration, only as an adjunct to those that may not know what the content would look like in simulation. • Access to videos and readmission to the study on computer networks at hospital based facilities was found to restricted by some IT departments
CONTENT	• Need a different scenario for IO or UAC • To make the scenarios more realistic, there needs to be a little more interaction between the person at the head of the bed with the rest of the staff. Directions by NP while direct appeared sometimes exclusive of staff input • Scenarios are too fast. More attention to detail of simulation: closed loop communication, no thin air commands, and input from the team. Look at ILCOR recommendations for resuscitation. Need more neonatal scenarios and less PALS ones. Refer to STABLE program also. • Overall, the scenarios are well done. I agree with the break in infection control techniques, particularly the hair needs to be tied back, and verbal orders with no repeat back. Also, I believe that a neonatologist should be contacted and available to appear. • Generally the scenarios are well done. That said, there are breaks in technique that are troublesome. The hair not being tied back and flipping long hair is problematic. The use of a stethoscope around the neck is problematic. These are breaks in infection control practices that if corrected, would improve the scenarios • Better infection control measures role modeling, better communication- closed loop and mental mode, more frequent neonatal situations versus those of older kids, more display of emotion, more technique and explanation sharing for drawing up meds, placing LMA, defibrillator.... • Suggestions: Consider adding scenarios with pleural and pericardial effusion from PICC erosion or any other unexpected scenarios that have happened in your unit. • Had a thought that you may be able to use this first set of videos to compare practice by an expert NNP before she went through sim and debriefed. You could set it up that the NNP students could watch the vids, and then do a debrief on the performance that is evaluating both	• **Agreed, as scenarios are developed these skill should be included** • Agreed , but the budget and time was very thin as well as the fact that these were made as brief demos and not comprehensive examples • See above comments, and keep in mind that NNPs must treat ages 0-2, NRP does not cover electrical disturbances or focus on NICU resuscitations. There are multiple STABLE scenarios in these choices. • **Agreed- can correct in future comprehensive demonstration videos** • **Like PICC erosion idea** • **Like learner use of videos idea**

	excellence and areas of challenge (a model like + delta would be a good debriefing frame to keep it simple and brief). offers a chance to look not only for error, but also areas of strength as they advance through the novice to expert path. • Liked the short clips although were slightly too rushed with resolution of issue quickly obtained each time. Acknowledge that these are training videos. Noticed same issues with hair and contamination of gloves, stethoscopes around neck, etc, but those are challenges that can be addressed with next revision of videos. Also suggest more closed loop communication be demonstrated and increased dialog between team members and NNP. • Camera angles were good, but wonder if a few birds eye shots would offer expanded views of teamwork and position during resuscitation. • Thought narration of care by NNP added to fidelity of manikin based scenarios. • Is there a role for RTs and or MDs in these videos for some kind of interdisciplinary practice competency? • Did appreciate the SP/actor roles in the bad news and end-of-life scenarios.	

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VITA

Mrs. Cates was born in Odessa, Texas, daughter of Allen and Jackie Cason. She has been married to Rick Cates for over 20 years. She has two sons: Magnum and Maveric Cates. Her academic qualifications include a Master of Science in Nursing (Medical University of South Carolina) - with preparation to function as an NNP, an Associates in Applied Science - Nursing (Odessa College) and an Associates in Applied Science - Respiratory Care (Odessa College). She maintains national certification as a Neonatal Nurse Practitioner (NNP) and is recognized by the Texas Board of Nurse Examiners as an Advanced Practice Nurse (APRN). In addition, she maintains certification as a registered respiratory therapist (RRT), and is recognized by the Texas Department of Health to practice respiratory care in the state of Texas. Additionally, she holds a sub specialty certification in pediatric and neonatal respiratory care (NPS). She was trained as a simulation specialist at Stanford University's Center for Advanced Pediatric Education (CAPE) in 2009. In addition, Mrs. Cates is certified as a healthcare simulation educator (CHSE). She has over 20 years of total bedside experience as an RN and respiratory therapist in home health, general and adult, pediatric, and neonatal critical care nursing. Of those, over 8 years have been as a NNP at Texas Children's Hospital in Houston, TX. She also serves as Assistant Professor University of Texas Medical Branch in the NNP Program. Moreover, she is faculty in both the TCH and UTMB simulation centers where she designs and coordinates of neonatal simulation courses. Furthermore, Mrs. Cates specializes in presentations, workshops, and courses using simulation as well as advanced neonatal procedure labs. Mrs. Cates' research interests include healthcare competency evaluation, high fidelity simulation training, and respiratory techniques. She is recently published and serves as reviewer for multiple healthcare journals. Mrs. Cates has also presented on multiple levels from local to international. For more information please visit http://leighanncates.myefolio.com

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