Comparison of Neonatal Nurse Practitioner Needle Thoracostomy Procedural Competency After Completion of an Online Module Or Standard Textbook Review

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Comparison of Neonatal Nurse Practitioner Needle Thoracostomy Procedural Competency after Completion of an Online Module or Standard Textbook Review

Carol M. Wallman

Submitted as Partial Fulfillment for the Doctor of Nursing Practice Degree

Regis University

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Executive Summary

Comparison of Neonatal Nurse Practitioner Needle Thoracostomy Procedural Competency after Completion of an Online Module or Standard Textbook Review

Problem

This project addresses the ongoing procedural competency assessment of Neonatal Nurse Practitioners (NNPs) practicing within a children’s hospital (CH) system. The initial and ongoing assessment of Advanced Practice Registered Nurses (APRNs) has become a focus of attention for several national organizations.

Currently the NNP department within this CH has a competency committee that annually gathers documentation of high-risk procedures, patient contacts, maintenance of a professional portfolio, and annual participation in a skills day including neonatal resuscitation simulation. However, there is currently no mode for procedural competency assessment. This proposal included the development and implementation of an online review module and application of a standardized format for evaluation of NNP procedural performance. The question addressed was: Is the completion of on online module effective review for NNPs for neonatal thoracostomy by needle aspiration as evaluated by the Leicester Clinical Assessment Tool (LCAT) comparable or better than a standardized textbook review?

Purpose

This project included the development and implementation of an online review module and application of a standardized format for evaluation of NNP procedural performance of neonatal needle thoracostomy.

Goals

The goals of this Capstone Project include developing and implementing evidence based, financially favorable, and sustainable systems for procedural competency review and evaluation of NNPs.

Objectives

The short-term objective was to analyze the effectiveness of an online module for NNP review of needle thoracostomy and assessment of procedural performance utilizing the Leicester Clinical Assessment Tool. A long-term goal was to implement a coordinated, high, and evidence based approach to NNP procedural review and performance assessment.

Plan

The project utilized a two-group descriptive, quantitative, pre-experimental design. Participants were randomized to either online or textbook review. Expert NNPs, blinded to the randomization, evaluated 45 NNPs’ procedural performance on neonatal needle thoracostomy in a simulated setting utilizing the LCAT. Data was analyzed using IBM SPSS version 21.

Outcomes and Results

The online module overall was more effective than textbook review (p < 0.005 at 0.007), equivocal for procedural performance, safety, and infection prevention, yet superior in communication (p=0.05 at 0.008) and teamwork (p<0.005 at 0.024) as scored by the LCAT. This project provides a framework for future NNP procedural assessments.
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This Capstone Project discussed the problem recognition, definition, market risk analysis, project objectives, budgetary needs, resources, and evaluation plan for the project; Comparison of Neonatal Nurse Practitioner Needle Thoracostomy Procedural Competency after Completion of an Online Module or Standard Textbook Review. Additionally the nursing and learning theoretical underpinnings and change model have been presented.

**Problem Recognition and Definition**

The role of the Advanced Practice Registered Nurse (APRN) has evolved in professionalism and expertise over the past several years becoming an integral part of healthcare in the United States. As the profession has matured it has become necessary to align the important aspects of education, accreditation, certification and licensure of APRNs to both increase their access to and safety of their patients. In 2008, the APRN Consensus Work Group and the National Council of State Boards of Nursing (NCSBN) APRN Advisory Committee collaborated to develop the Consensus Model of APRN Regulation: Licensure, Accreditation, Certification, and Education (APRN Consensus Work Group & the National Council of State Boards of Nursing APRN Advisory Panel, 2008). This consensus model provides a detailed outline of criteria required for recognition as a nursing specialty and includes the requirement that individual specialty organizations “define competencies for their area of nursing specialty practice” (APRN Consensus Work Group & NCSBN APRN Advisory Committee, 2008, p.29). Building upon the recommendations from this work group the National Association of Neonatal Nurse Practitioners (NANNP) developed a tool kit addressing orientation, initial competencies, and on-going competencies for the Neonatal Nurse Practitioner (NNP) (NANNP, 2010). This tool kit provides guidelines for the orientation of new NNPs and for the maintenance of competencies for the experienced NNP. Procedures an NNP performs may vary based on
individual practice settings. However, NANNP identified three essential procedural competencies for an NNP required for emergent neonatal resuscitation; including endotracheal intubation, placement of an umbilical line, and needle thoracostomy (NANNP, 2010). The development of standardized, institution specific guidelines utilized for assessing maintenance of procedural competence is also a recommendation of NANNP (NANNP, 2010). The NANNP further states “the development of modules that can be shared across programs and institutions will assist with faculty development and decrease faculty time spent developing new content” (NANNP, 2010 p.12). The NANNP recommendations include the following guidelines for the content of standardized education stating the education should include the

a. Use of universal precautions

b. Use of a time-out

c. Review and discussion of consent issues when securing of informed consent is appropriate

d. Review of the procedure, including summary of indications, contraindications, complications, equipment required, and step-by step technique

e. Assessment and management of the patient’s comfort and pain (NANNP, 2010, p.10).

The need for the development of institution specific guidelines for on-going review of competencies is further supported by the Institute of Medicine’s (IOM) 2011 report (IOM, 2011), as well as their call for practices to encourage life-long learning among health care professionals (IOM, 2009). Furthermore, the Joint Commission (JC), a national hospital accrediting organization, requires hospitals to provide evidence of competency assessment of their
employees (JC, 2009). The need for the development of these institutional specific educational offerings and competency evaluation provided the basis for this project.

**History of Competency Assessments**

The assessment of APRN competency has recently become a focus of many organizations. However, the desire to ensure on-going competency beyond the issue of licensure is not new. Early recommendations from the United States Department of Health, Education and Welfare recommended physician periodic examinations, and in 1971 a similar recommendation stated competency assessments and education should be provided by associations and states (Whittaker, Carson, & Smolenski, 2000). Participation in continuing education was a means of assuming competency for many years, yet in 1994 the state of Colorado removed continuing education as a means of assuring competency due to what they perceived as a lack of evidence that on-going education guarantees competence (Wittaker, Carson, & Smolenski, 2000). National specialty certification is another means of determining competence and is required of all practicing NNPs at this CH. The National Certification Corporation (NCC) has a mandatory continuing competency specialty assessment program, yet this addresses only knowledge content and does not address procedural competency (NCC, 2012). Additionally, the JC requires hospitals to assess the competency of employees when hired and then regularly during their employment (Wittaker, Carson, & Smolenski, 2000). The American Nurses Association (ANA) has historically been active in determining means of assessing nurses’ competency and continues to address this ongoing issue. The ANA supports the ongoing acquisition of knowledge regarding best practices for determining competencies and agrees assessing the impact a combination of continuing education and national certification has on nursing competency is essential (Wittaker, Carson, & Smolenski, 2000). Defining competency has also challenging, yet
having a mechanism in place to assess procedural technique consistent with an evidenced based 
approach to care provides initial information regarding the APRN knowledge base and 
performance.

**Current Neonatal Nurse Practitioner Competency Program at CH**

The NNP department of this CH has an NNP Competency Committee and Educational 
Coordinators who annually track NNPs professional portfolios including completion of advanced 
procedures and patient management. CH also requires all regular staff NNPs to attend an annual 
Skills Day for review of procedural content, an open book exam, and simulated practice for 
neonatal resuscitation and advanced procedures. Simulated practice has recently been shown 
effective as a means for evaluation of NNP acquisition and maintenance of competencies (Cates 
& Wilson, 2011). NNPs at CH have not routinely been evaluated for procedural competence in a 
formal manner. The CH Competency Committee’s review of procedures for 2011 revealed 
needle thoracostomy was the least frequently performed essential procedure as defined by 
NANNP (CH, NNP Competency Committee; 2011, NANNP, 2010). Three annual needle 
thoracostomy procedures were completed by only 14% of CH NNPs, while three umbilical line 
placements were performed by 80% and three endotracheal intubations by 91% of NNPs (CH, 
NNP Competency Committee, 2011). The low frequency in needle thoracostomy attempts 
guided the decision to focus on this essential procedure for competency review and evaluation 
for this Capstone Project.

The NNP department at CH has clinical practice contracts with a variety of hospitals 
along the front range of Colorado, and CH NNPs live in a vast geographic region. Online 
learning has been cited as effective in education of neonatal nurses and the geographic
challenges within the CH NNP department highlight the need to evaluate the effectiveness of an online module for NNP continuing education (Altimier, 2009).

**Problem Statement and Question**

This evidence based practice project utilized a format addressing the Population being addressed, application of an Intervention, a Comparison and the Outcome; represented by the acronym, PICO (Zaccagnini & White, 2011). The PICO for this project was as outlined below:

**Population:** NNPs practicing within the NNP department at CH

**Intervention:** Development, implementation and evaluation of an online module for neonatal thoracostomy by needle aspiration

**Comparison:** NNPs were randomized into two groups. The experimental group completed the online module. The control group completed standardized textbook review. The Leicester Clinical Procedure Assessment Tool (LCAT) was utilized to assess NNPs for procedural competence (McKinley et al., 2008), (Appendix A).

**Outcome:** Results of the LCAT were compared between the experimental and control groups.

**Problem Question:** Is the completion of an online module effective review for NNPs for neonatal thoracostomy by needle aspiration as evaluated by the LCAT comparable or better than a standardized textbook review?

This problem question provided an example of a nurse-sensitive outcome of advanced practice nursing since it addressed knowledge of disease and treatment (Kleinpell, 2009). Identifying nurse-sensitive as opposed to patient sensitive outcomes has provided a link to evaluating specific nursing roles to health outcomes (Kleinpell, 2009). The NNPs who participated in this project were assessed regarding the application of the disease process
necessitating thoracostomy by needle aspiration and the treatment process itself in the performance of thoracostomy by needle aspiration.

**Theoretical Foundations**

Theoretical foundations for this project included nursing and learning theories and the application of a change model. Nursing theories applied included the middle range theories of Rozzano Locsin’s theory of Technological Competency as Caring and practice of knowing persons in nursing states (Locsin, 1999, 2010), and Patricia Benner’s From Novice to Expert (Benner, 1984, 2001). The learning theory effective in online learning and applied in this project was Constructivism (Kala, Isaramalai, & Pohthong, 2010). Rosswurm and Larrabee’s change model was applied to this project to facilitate the change process required for successful implementation.

**Nursing Theory Application**

**Technological Competency as Caring**

Rozzano Locsin’s middle range theory of Technological Competency as Caring and practice of knowing persons in nursing supports viewing of a harmonious coexistence between understanding technological competency and caring and states; “A human being is a person, regardless of bio-physical parts or technological enhancements” (Locsin, 2010, p. 462). Locsin further states: “The ultimate purpose of technological competency in nursing is to acknowledge the person as a focus and that various technological means can and should be used in the practice of knowing persons in nursing” (Locsin, 2010, p. 461).

The use of advanced technologies in the provision of nursing care in clinical settings is a major concept of this theory and is an expectation for nurses, specifically NNPs. Nurses use various technologies to assess and assist patients on a routine basis. A technology may be a
system, a process, an instrument, or a tool. It is expected that nurses be competent in an increasing foray of technologies and procedures on any given day. The theory of Technological Competency as Caring assumes technology is effectively used in the practice of knowing the person in nursing, consistent with caring in practice (Locsin, 2010). The combination of technical competency and caring are integral in this theory and made it applicable to this project. The straightforward concept of combining technological competency and caring nicely blended with promoting a caring and holistic approach to the essential NNP procedural skill of needle thoracostomy.

**From Novice to Expert**

Patricia Benner’s theoretical framework From Novice to Expert was also applied in this project (Benner, 2001). The NANNP supports utilizing Benner’s framework as a basis for developing educational content as well as competency evaluation (NANNP, 2010). In her original work, Benner was one of the first to describe nurses’ skill acquisition as evolving over time and including content knowledge through a sound educational basis combined with clinical experiences (Benner, 1984). Benner further describes effectiveness in management of rapidly changing situations as a competency for expert nurses (Benner, 2001). This competency includes providing rapid and skilled assessment and intervention in life threatening and emergency situations (Benner, 2001). Competencies within Benner’s Novice to Expert theory are congruent with the expected competencies delineated by NANNP (Benner 2001; NANNP 2010). Rapid assessment of a neonatal pneumothorax and appropriate intervention with needle thoracostomy is an essential NNP competency per NANNP (NANNP, 2010). Building on this theory of diverse performance based on novice to expert status, a variable evaluated in this
project was the determination of years of clinical experience and recent practice experience with needle thoracostomy in relation to demonstration of procedural competence.

**Learning Theory Application**

**Constructivism**

Constructivism is a learning theory identified as effective in online learning activities and was utilized in the development of the online module for this project (Kala, Isaramalai, & Pohthong, 2010). Constructivism supports the transformation from teacher centered learning to student engaged learning (Kala, Isaramalai & Pohthong, 2010). Three factors of constructivism identified as effective in online learning modules include enhancing an active learning environment, facilitating social interaction, and creating quality-learning materials (Kala, Isaramalai & Pohthong, 2010). For this project the main aspects of constructivism utilized include an active learning environment and the creation of quality learning materials. Due to technological constraints within the hospital system the online social interaction was limited; however social interaction was present during the objective standardized clinical examination and the skills day activities.

**Change Model**

Introduction of a new model for NNP procedural competency evaluation within the CH NNP Department included change from previous practice. The six steps in shaping the process and product of change outlined by Rosswurm and Larrabee’s model were applied to this project as follows:

1. Assessed the need for change in practice.
   a. Identified by the recommendations for competency assessment by the NANNP (NANNP, 2010), the IOM (IOM 2009, 2011), and the JC (JC, 2009).
2. Linked the need with interventions and outcomes:
   a. Recommendation to develop institution specific learning opportunities tied to competency evaluation supported the development of an online module for procedure review of neonatal needle thoracostomy for evaluation of procedural competence in comparison to NNPs having completed textbook review (NANNP, 2010).

3. Synthesizing best evidence:
   a. Utilization of information obtained from systematic review of the evidence for online learning module effectiveness and performance evaluation utilizing objective structured clinical examination (Altemier, 2009; McKinley, Strand, Gray, Schuwirth, Alun-Jones & Miller, 2008;).

4. Design a new change in practice:
   a. Development of the online learning module

5. Implementation and evaluation of the practice change:
   a. Development of an online module and comparison of NNP procedural competency between NNPs completing the online module versus textbook review as further outlined in the methodology discussion.

6. Integrating and maintaining the practice change:
Systematic Review of Literature

A systematic review of the literature addressing the major components of this project was conducted (Appendix B). The key words utilized included online learning, neonatal nurse practitioner procedure competency evaluation, and neonatal needle thoracostomy. The search included Google Scholar, CINAHL, and Cochrane Library Reviews. The first concept and keyword researched was ‘competency evaluation’ utilizing CINAHL with full text results between 2006 and 2012 and revealed 1261 results. The search was then narrowed to ‘nursing competency evaluations’ resulting in 530 results, followed by ‘nursing procedure competency evaluation’ resulting in 13 results and finally ‘advanced practice nursing competency evaluation’ resulting in only one article describing evaluation of advanced practice nurses completing sigmoidoscopy.

‘Competency evaluation’ was next searched via Google Scholar and revealed an initial 47,200 results, this was further narrowed to 18,200 results for ‘nursing competency evaluation’, and 14,600 results for ‘nursing procedure competency evaluation’. The Google Scholar search was further narrowed to ‘advanced practice nurse competencies combined with online learning’ and the search results dropped to 8,420. Finally, consistent with the project proposal objectives the search was further narrowed to the use of ‘Objective Structured Clinical Examinations (OSCE) for competency evaluations,’ physician and nursing student articles were deleted. The end result was 11 articles analyzing the use of OSCEs, 11 online learning articles and six competency specific articles. Furthermore, one article addressing the use of simulation for NNP continuing education was kept.

A Google Scholar search for ‘needle thoracostomy’ from 2006-2012 revealed 1,340 results, when narrowed to ‘needle thoracostomy and neonatal’ there were actually more results at
1,540. With the search further narrowed to ‘needle thoracostomy + needle + pneumothorax’ there were 302 references, yet no scholarly articles noted. This resulted in textbook references and articles describing chest tube placement, none specifically addressing needle thoracostomy. A CINAHL search of ‘needle thoracostomy’ from 2006-2012 resulted 31 results, when narrowed to ‘neonatal, newborn or infant needle thoracostomy’ the results decreased to two, one article was deleted since it actually addressed children, one article was retained.

Cochrane reviews revealed few articles related to search key words. The keywords of ‘online learning’, ‘objective structured clinical examinations’, ‘advanced practice registered nurse competency evaluations’, ‘competency reviews’ and ‘procedural competency reviews,’ and ‘needle thoracostomy’ all revealed zero results. One systematic review on the value of continuing education was included; furthermore there were two reviews on newborn and neonatal management of pneumothorax yet both focused on surfactant administration and endotracheal intubation at birth.

**Online Learning**

Online learning has risen over the past decade as a result of a variety of benefits being identified. However, the format of web-based learning varies greatly among educational providers. A recent systematic review of 266 studies identified 89% of courses using written text, 55% multi-media, and 32% on-line communication via e-mail, threaded discussions, chat, or videoconferencing (Cook, Garside, Levinson, Dupras, & Montori, 2010). Additionally, 77% of courses utilized enhanced instructional methods in addition to text and 50% used patient case studies, self-assessment questions, or feedback. (Cook, Garside, Levinson, Dupras, & Montori, 2010). Nurses, followed by physicians, have been identified as the largest group of health care professionals utilizing the Internet in an integrative review on Internet use for continuing
education for health care professionals (Cobb, 2004). This integrative review further identified five studies showing on-line courses effective in imparting new knowledge and three studies showing its effectiveness, yet lack of superiority to traditional classroom teaching (Cobb, 2004). On-line courses have been effective in general undergraduate nursing courses (Dorrian & Wache, 2009), neonatal nursing courses (Fortune, 2007), neonatal nursing orientation courses (Altimier, 2009), as well as graduate courses for advanced practice nurses (Debourgh, 2003; Zukowsky et al., 2011).

Internet learning for clinical skills education has little published support. One integrative review of published research addressing on-line learning for clinical skills in nursing found 12 articles meeting defined search criteria (Bloomfield, While, & Roberts, 2008). The studies that met inclusion criteria had small sample sizes and weaknesses in design, leading the authors to conclude there is limited empirical evidence available addressing the use of online learning techniques for teaching clinical skills in nursing (Bloomfield, Roberts, & White, 2010). However, one study Bloomfield, Roberts, & While, (2010) demonstrated the use of on-line learning as an effective strategy in teaching hand washing theory and skills to entry level nursing students. No articles or research studies specifically addressing the use of on-line educational techniques to teach NNPs procedural skills were identified.

Three main factors have been identified as impacting the overall effectiveness of online learning activities; confidence by the student and instructor in using a computer, the instrument utilized to evaluate the learning, and the quality of the on-line learning materials (Kala, Isaramalai, & Pohthong, 2010). In addition to the overall effectiveness of online learning, other benefits have been identified including reaching students at great geographic distances, significant cost savings, and student satisfaction (Altimier, 2009; Fortune, 2007; Twigg, 2003).
The NNP department at CH employs NNPs living over 200 miles apart from each other and practicing at clinical sites that are over 100 miles apart supporting the use of an online module to address the vast geography the NNP department covers.

**Objective Structured Clinical Exams**

Successful use of OSCE’s (Khattab & Rawlings, 2008), and similar scoring tools such as Objective Structured Assessment of Technical Skills (OSATS), (Bould, Crabtree, & Naik, 2009) and Objective Structured Clinical Assessments (OSCAs), (Ward & Willis, 2006) are well described in the literature in the evaluation clinical skills in staff nursing (Major, 2005), advanced practice nursing, (Walsh, Bailey, & Koren, 2009; Ward & Willis, 2006; Wilbeck, Murphy, Heath, & Thomson-Smith, 2011) and medicine (Bould, Crabtree & Naik, 2009; Newble, 2004; Nothnagle, Reis, Goldman, & Diemers, 2010). Effective assessment of competency in procedural and clinical skills is another focus of nursing and medical literature. For APRNs clinical outcomes are the results of combining clinical judgment, knowledge, technical skills, and previous experience (Kleinpell & Gawlinski, 2005). The outcome measured in this proposal was NNP demonstration of effective thoracostomy by needle aspiration as evaluated by the use of an objective standardized clinical exam (OSCE) tool.

A systematic review of assessment and certification tools by McKinley et al., (2008), identified seven themes that emerged in the checklists utilized for competency evaluations: preparation, infection control, communication and working with the patient, team working, safety, procedural competence, and post procedural care. However, frequent mention of the lack of a holistic approach of OSCEs was mentioned (McKinley et al., 2008). Based on these findings and the goal to have one generic tool for assessment of clinical skills that provided a holistic approach McKinley et al., (2008) created the Leicester Clinical Procedure Assessment Tool
The tool was created after completion of a literature review, focus groups and non-participant observations were conducted, and a modified Delphi study with prior definitions was completed (McKinley et al., 2010). The LCAT is a “generic, multi-professional holistic assessment tool with high content and face validity (70%) and acceptable reliability at 0.79”, with the potential of eliminating the need for multiple procedure specific checklist tools (McKinley et al., 2010, p. 619). The LCAT will be utilized for assessment of NNP performance of neonatal thoracostomy by needle aspiration.

**Needle Thoracostomy**

Thoracostomy by needle aspiration is considered an essential procedure for NNPs competency according to the NANNP (NANNP, 2010). It is performed as an emergency procedure to evacuate air in a pneumothorax causing hemodynamic instability in the patient. A pneumothorax is the extravasation of air into the lung parenchyma and pleura spaces (Zukowsky, 2009). The most common time for the presentation of a pneumothorax is in the neonatal period with 0.08% of all live births and 5% to 7% of infants with a birth weight of less than 1500g experiencing a pneumothorax (Litmanovitz & Carlo, 2008). Pneumothoraces are more common in infants with respiratory distress syndrome, meconium aspiration syndrome, pulmonary hypoplasia, receiving assisted ventilation, and having required resuscitation at birth (Litmanovitz & Carlo, 2008). Emergency evacuation of a pulmonary air leak performed with thoracostomy by needle aspiration is indicated to provide relief to the patient with a hemodynamically significant pneumothorax, often as a temporary measure while the patient is assessed for the potential need for a thoracostomy tube placement (Rais-Bahrami, MacDonald, & Eichelberger, 2012). Contraindications for evacuation of pulmonary leak include small air leaks where the patient has stable vital signs and the air collection is likely to resolve spontaneously without compromise of
the patient (Rais-Bahrami, MacDonald, & Eichelberger, 2012). Potential complications of this procedure are significant and include lung perforation, damage to a major vessel causing hemorrhage, nerve damage, and equipment failure (Rais-Bahrami & MacDonald, 2012). The precarious nature of a neonate with a clinically significant pneumothorax and the risks associated with the performance of a thoracostomy by needle aspiration make it essential for NNPs to have clinical competence in this skill (NANNP, 2010).

**Market Risk Analysis**

A systematic evaluation including strengths, weaknesses, opportunities, and threat (SWOT) analysis was conducted in regards to the proposed Capstone Project. The SWOT Analysis is an effective and convenient method for assessment of internal and external factors associated with projects or products within an organization (Fortenberry, 2010). Strengths within a project are those attributes that enhance the potential success of a project. Strengths identified for this Capstone Project included, project based on national guidelines for development of competency review programs, institutional and department support within CH, peer support and feedback included in development of project, evidence based intervention and, use of existing supplies and classroom space within CH. Furthermore, successful implementation could improve competency evaluation for NNPs within CH, and serve as a model for other institutions’ NNP competency evaluation programs. Additional strengths included a committed and collaborative project team including CH NNP Clinical Coordinator, NNP Educational Coordinator, experienced practicing NNPs within CH, DNP Capstone Chair, DNP faculty mentor, CH Nurse Scientist Mentor, and DNP coursework faculty. Finally, the lack of budgetary impact since the project was conducted within previously budgeted time at an annual NNP Skills Days at CH was a significant strength for implementation and sustainability.
Weaknesses identified included limited population sample size preventing generalizability of outcomes, along with potential resistance by practicing NNPs at CH for change in practice requiring demonstration and evaluation of procedural performance. Strategies identified to overcome weaknesses included NNP department education of national standards and evidence based data for competency evaluations. Additionally, the development of the Capstone Project in a comprehensive and easy to follow manner could potentially increase the replication by other students or NNP departments and therefore increase the generalizability of combined data and outcomes.

Opportunities for this Capstone Project included the potential for being a model for other competency evaluations programs within CH as well as nationally. Presentation of the Capstone Project and outcomes at a national professional organization conference and publication in a professional journal will increase visibility of outcomes and potential becoming a role model for other NNP competency programs.

Potential threats identified included limited NNP agreement for participation, limited stake holder buy-in and lack of institutional or administrative support. Strategies identified and implemented to prevent these potential threats included developing the Capstone Project to be conducted within already established training times at an Annual NNP Skills Day, educating NNP team regarding national standards and evidence based finding regarding competency evaluations. Furthermore the Capstone project was discussed in detail with NNP administration and leadership prior to formal development of the plan to enhance buy-in for the project.

Utilization of the SWOT Analysis modeled after a format provided in Fortenberry (2010, p. 186) is illustrated in Figure 1. The development of the SWOT analysis for this project included identifying institutional strengths, weaknesses, opportunities and threats directly related
to this project. Identified strengths included the project being based on national guidelines for
cOMPETENCY evaluation, evidence based interventions, institutional and departmental support, the
use of existing classrooms and supplies, use of time during existing annual NNP Skills Day for
implementation, lack of budgetary impact, a committed and collaborative team, and finally the
potential to serve as model for other unit and institutional competency evaluation projects.
Limitations identified for this project included a limited available sample size, inability to
generalize the findings, and the potential resistance to a change from current NNPs.
Opportunities identified included potential presentation of project and outcomes at a national
professional organizational meeting, publication in a professional journal and becoming a role
model for other NNP programs regionally and nationally. Potential threats identified included
limited NNPs consenting for the study, and limited stakeholder and administrative buy-in.
Figure 1. SWOT Analysis of Capstone Project

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• National guidelines for competency evaluation</td>
<td>• Limited available sample size</td>
</tr>
<tr>
<td>• Evidence based interventions</td>
<td>• Inability to generalize findings</td>
</tr>
<tr>
<td>• Institutional and departmental support</td>
<td>• Potential resistance for change by CHCO NNPs</td>
</tr>
<tr>
<td>• Use of existing classrooms and supplies</td>
<td></td>
</tr>
<tr>
<td>• Use of time during existing annual NNP Skills Day for implementation</td>
<td></td>
</tr>
<tr>
<td>• Lack of budgetary impact</td>
<td></td>
</tr>
<tr>
<td>• Committed and collaborative team</td>
<td></td>
</tr>
<tr>
<td>• Potential to serve as model for other unit and institutional competency evaluation projects</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Potential presentation of project and outcomes at a national professional organizational meeting</td>
<td>• Potential limited NNP consenting to participate</td>
</tr>
<tr>
<td>• Potential publication in a professional journal</td>
<td>• Potential limited stake-holder buy-in</td>
</tr>
<tr>
<td>• Potential role model for other NNP programs regionally and nationally</td>
<td>• Potential limited administrative buy-in</td>
</tr>
</tbody>
</table>

**Stakeholders and Project Team**

Stakeholders for this project were individuals affected by the project. Direct stakeholders included CH staff, including, nursing, medical, administration, team members, APRN Advanced Practice Council members, and project leader. Ancillary stakeholders included patients, insurance providers, regulatory agencies, and community members.

Project team members included the DNP student as team leader, advisors to the team leader, administration, and fellow NNPs. The team leader was responsible for project development including completion of a systematic review, development of the online module, education of potential NNP participants regarding project content and aims, Institutional Review
Board submission, development of implementation design, data analysis, and dissemination of findings. Advisors to the team leader included the Capstone Chair, a CH Nurse Scientist, and Director of the Regis University NNP Program. The combination of these experts’ advice and counsel guided the team leader at all facets of project development, implementation and analysis. Fellow NNP team members participated by completing Collaborative Institutional Training Initiative (CITI), obtaining consent from participants, and one particular member managed the organization of all consents, completed the randomization process the team leader was blinded to, and managed the website holding the online module. NNP administrative support was provided by the NNP Coordinator and consisted of ongoing encouragement and support for project development and completion as well as budgetary support for the online module development and purchasing of textbooks and agreement for inclusion of project implementation at annual skills day review.

Cost-Benefit Analysis

Incorporating the use of an online module for the review presentation regarding the essential NNP procedure was based on several factors including, wide geographic variability of NNPs living and practicing within the CH system, flexible availability for ongoing use, effectiveness of online learning and cost benefits. CH NNPs live and practice in a varied geographic range. The availability of an online module to be accessed from home or a clinical practice site was appealing. While empirical data is limited on the use of online learning for clinical skills an integrative review did find support for its effectiveness (Bloomfield, While, & Roberts, 2008).

Providing a model for didactic content to be readily available for staff to review during slow periods at work and or at home reduces the cost of needed educational in class time paid.
With 70 NNPs and four hours the average time spent doing power point in class presentations at previous skills sessions the cost was substantial. An average NNP hourly wage is $55 so when multiplied by four hours time for 70 NNPs the cost was $15,400.00 annually solely for presentation time. This did not include time for development of the presentations. The other format trialed included the provision of textbooks for review. The standard textbook utilized was *Atlas of Procedures in Neonatology*, (Rais-Bahrami, MacDonald, & Eichelberger, 2012) and sold for $129.00 book. To meet the same availability standards as online learning 70 books purchased for staff would cost $9,030.00. This is less expensive than in class time yet still significantly more costly than the free availability of online modules. The only cost for online modules would be the development and periodic update costs of the modules which would be rolled into the salary of the NNP Education Coordinators, approximately 20 hours at $55 per hours totaling approximately $1,100. Altimier (2009) describes significant cost savings when implementing online learning modules as compared to direct teaching for neonatal nursing orientation. Furthermore, implementation of the Capstone project within already established annual NNP Skills Days limited any additional costs realized by the CHCO NNP department.

**Mission, Vision and Goals**

CH was established in 1908 and has defined their mission as “To improve the health of children through the provision of high-quality, coordinated programs of patient care, education, research and advocacy” (Children’s Hospital Colorado, n.d.). The CH mission is carried out through their vision stated as being “the driving force, in partnership with others, in providing children and their families with an integrated pediatric healthcare delivery system” (Children’s Hospital Colorado, n.d.) Development of a program providing a mechanism for assessment of NNP procedural competency aligns with the mission and vision of CH improving children’s
health and high-quality care. The vision for this project was that by the end of 2013 CHCO NNPs would have a high quality and coordinated approach to evaluation of essential NNP procedure competencies. Additionally, CH is a Magnet designated hospital, and embraces the concepts of transformational leadership and change. Embracing a policy that provides evidence based approaches to change and competency assessment was in alignment with Magnet designation philosophy of excellence in practice and engagement of nursing staff (Steinbinder, 2009). The goals of this Capstone Project included developing and implementing evidence based, financially favorable, and sustainable systems for procedural competency review and evaluation of NNPs aligned with the CH mission and vision.

**Conceptual Model**

Identifying outcomes for APRNs includes evaluating the results of APRN interventions based on the utilization of clinical judgment, scientific knowledge, and past clinical experiences (Kleinpell & Gawlinski, 2005). The benchmark outcome for this proposal was related to the effectiveness of the online learning module as a review for NNPs in essential procedure of thoracostomy by needle aspiration. The formal benchmark was NNPs completing the online module being able to demonstrate competence in performance of thoracostomy by needle aspiration on the neonate as evaluated by the LCAT. An additional benchmark was that the online module was an effective learning tool to review thoracostomy by needle aspiration for the neonate.

The conceptual model for this proposal first defined the project as the development, implementation and evaluation of an online module for thoracostomy by needle aspiration on the neonate; an essential procedure as defined by NANNP for utilization with NNPs practicing at CH (Figure 2). The problem identification was based on the NANNP definition of NNP
essential procedural competencies and call for systematic review of competencies and the
development of institutional modules to guide teaching and analysis of procedural competencies
(NANNP, 2010). The inputs for a proposal include the factors and resources utilized to enhance
the program effectiveness (Kellogg Foundation, 2004). The inputs for this proposal included the
NNPs practicing at CH, NNP Education Coordinator collaborators, technical and administrative
support provided through CH, NNP scheduling cooperation, NNP Department budget support for
NNPs participating in Skills Day, NANNP Competency Guidelines (NANNP, 2010), the LCAT
standardized procedure evaluation tool, Clinical Mentor support, IRB approval through both
Regis University and Colorado Multiple Institutional Review Board (COMIRB). Additionally,
the use of Locsin’s Technological Competency as Caring and Benner’s from Novice to Expert,
as nursing theories guided proposal development. The learning theory utilized throughout was
Constructivism.

The activities within a conceptual model include the processes, techniques, tools, and
planned actions within a proposal (Kellogg Foundation, 2004). The activities in this proposal
included the development of the online module for thoracostomy by needle aspiration to be
completed by NNPs within CH, the development and implementation of three days of skills
training, and evaluation which were utilized for the standardized evaluation of NNP competency
in demonstrating thoracostomy by needle aspiration. The evaluations were completed by
assessment with the LCAT. The CH NNPs were provided education regarding the program
proposal and participants provided informed consent. These activities were completed with the
collaboration of other NNP Education Coordinators.

The outputs in a conceptual model reflect the direct result of the programs activities
(Kellogg Foundation, 2004). The outputs in this project included the development of an online
module to teach NNPs needle thoracostomy by needle aspiration and the opportunity for NNPs to demonstrate competency of this procedure at the skills day session.

Logic Models also present short and long term goals that address the specific changes in attitudes, behaviors, skills, knowledge, or level of functioning that result from the program implementation (Kellogg Foundation, 2004). The short-term goals for this proposal included CH NNPs demonstrating adequate knowledge and procedural technique for thoracostomy by needle aspiration on the neonate. Additional short-term goals included having the online module serve as a model for future online module development for other essential and nonessential NNP procedures, as well as the use of the LCAT as a standardized clinical assessment tool will serve as a model for evaluating procedural competence in other essential and nonessential NNP procedures. A long-term outcome goal was that CH would have an effective program for provision of didactic information and evaluation of NNP procedural competence.
Figure 2. Logic Model format depicting conceptual model for project

### Conceptual Model

**Project**

Development, implementation and evaluation of an on-line module for thoracostomy by needle aspiration for Neonatal Nurse Practitioner (NNP) essential procedure as defined by the National Association of Neonatal Nurse Practitioners (NANNP) for utilization with NNPs within the Children’s Hospital of Colorado (CHCO).

### Problem Identification

NANNP has defined thoracostomy by needle aspiration as an NNP essential procedural competency and called for systematic review of competencies and for the development of institutional modules to guide teaching and analysis of procedural competencies.

### Inputs

- CHCO NNPs
- NNP Education Collaborators
- Technical support
- Education time for NNP participation
- Administrative support
- NNP Department budget support
- Scheduling support
- NANNP Competency Guidelines
- Standardized procedure evaluation tool
- Clinical Mentor support
- IRB Approval
- Nursing and learning theory

### Activities

- Implementation of three NNP Skills Days
- Development of on-line module teaching essential NNP technical procedure
- Working with collaborators and coordinating training day
- Notifications and consent of participants
- Standardized evaluation of NNP knowledge base
- Standardized evaluation of NNP procedure demonstration using LCAT

### Outputs

- Provision of standardized content of NNP essential procedure to CHCO NNPs via on-line format
- Opportunity for NNP demonstration of appropriate knowledge content of NNP essential procedure at NNP Skills Day
- Standardized evaluation of NNP procedural technique at NNP Skills Day

### Outcomes Short Term

- CHCO NNPs will demonstrate adequate knowledge for essential NNP procedure
- Opportunity for NNP demonstration of appropriate procedural technique at NNP Skills Day
- Evaluation of procedural technique will serve as basis for future evaluation of NNP essential and non-essential procedures

### Outcomes Long Term

- CHCO will have an effective program for provision of didactic information and evaluation of NNP procedural competencies.
- Final program development, implementation, evaluation will be presented in a poster presentation at a national professional conference and published in a peer reviewed professional journal
- CHCO will serve as a model for other NNP systems for providing an effective approach for provision of didactic information and evaluation of NNP procedural competencies
Finally, the Logic Model presents the long term impact goal of the project which address the organization, community, and or system level changes expected to result from the program implementation (Kellogg, Foundation, 2004). The impact goal for this proposal included presentation of the program development, implementation, evaluation, and outcomes presented at a national professional conference and published in a peer reviewed professional journal. Furthermore, the goal was that with the dissemination of the information CH would serve as a model for other NNP programs in providing an example of an effective approach for provision of didactic information via an online format and evaluation of NNP procedural competency utilizing a standardized clinical assessment tool. Figure 2 depicts the Conceptual Model based on the Kellogg Foundation’s Logic Model.

**Methodology**

This project was an evidence-based practice (EBP) project in which a program evaluation or standard of care intervention was conducted. The project was internal to CH with a goal of informing CH of issues in healthcare quality, cost, and satisfaction. Specifically, this study compared the effectiveness of completion of an on-line review module to text book review on Neonatal Nurse Practitioners (NNPs) needle thoracostomy procedural performance in a simulated environment using a mannequin. The NNPs within the CH system live within a vast geography and determination of effectiveness of an online module for procedural performance would potentially aide in determining best practice strategies for continuing education of NNPs. This was also in allignment with the previously mentioned national organizations calling for initial and ongoing competency performance evaluations of health care providers. This Capstone Project is outlined below.

1. The project utilized a two-group descriptive, quantitative, pre-experimental design.
2. All NNPs practicing within the CH system were invited to participate in this study. Education regarding the study was provided at a regularly scheduled NNP meeting utilizing a Power Point presentation. (Appendix C)

3. Follow-up information was provided via e-mail to include NNPs not in attendance at NNP meeting. (Appendix D)

4. CITI, (Appendix E) trained project team members participated in project development and implementation, and Institutional Review Board Approval from Regis University (Appendix F) and Colorado Multiple Institutional Review Board (Appendix G).

5. Once participants were consented to partake in the project they were randomized into one of two tracks, either standard textbook review or online module review.

6. Participants were asked to review the assigned textbook or online module (Appendix H) within one week of the annually scheduled skills day.

7. At the regularly assigned annual skills day, the participant was asked to complete a demographic questionnaire (Appendix I). These variables questioned in this demographic questionnaire included years practicing as a registered nurse (RN), years practicing as an NNP, clinical practice site characteristics, and recent experience with neonatal needle thoracostomy.

8. The participants were then observed and evaluated by one of two expert NNPs, each with over 20 years of clinical experience along with experience teaching and performance evaluation of both student and experienced NNPs, in the performance of needle thoracostomy utilizing the LCAT. The performance was evaluated in a simulated environment utilizing a neonatal mannequin. The expert NNP completing the performance
evaluation was blinded to the participants’ randomization assignment, i.e., textbook or online module review.

9. Data obtained from the demographic questionnaire was summarized using descriptive statistics. Scores from the LCAT observations were compared between the two randomized groups using an independent t-test. The data was also analyzed to determine possible relationships between the outcome variables and the demographics of the study population using correlational statistics. All data was de-identified and entered into the Statistical Package for the Social Sciences (SPSS) for analysis.

10. No additional funding was requested. Research was conducted within PI primary job responsibilities and educational time, and as part of completion requirements for Doctorate of Nursing Practice degree from Regis University. All staff participated voluntarily in the study and were paid for their time within the annual budgeted time for skills day reviews. The NNP budget annually includes eight hours paid for skills day review.

Risks and Benefits

Minimal risks were anticipated for project subjects; NNPs are very familiar with participating in online education for a number of requirements at CH as well as for academic educational courses. A potential minimal risk was mild anxiety related to being evaluated on procedural performance. The principal investigator was a Coordinator of NNP Education for CH and worked with participants clinically and on various projects, yet was not responsible for any formal evaluations of participants and did not work in a supervisory role. NNPs individual decision to participate or not and the results of individual assessments were not known to any managers or be used in any way for performance evaluations and did not impact employment in any manner. Assessments were conducted in a private and supportive environment by CITI.
trained expert NNPs and participants were assured results would not be made known to any
supervisors and would not impact their employment in any way.

This project involved the comparison of textbook review and online module review to
determine if online review is equal to or better than previous practice of textbook review. Both
are generally accepted modes of education. The goal was to provide a consistent and up to date
process for addressing essential neonatal procedures to establish best practice at various CH NNP
practice sites. Potential identification of best practice strategy for evaluation of NNP procedural
competency in needle thoracostomy and potentially improving safety and quality of care
provided to vulnerable and at risk neonates.

Consent Process

Recruitment occurred within normally established patterns of communication within the
CH NNP program including introduction of project at a quarterly NNP meeting and e-mails
describing the project. The principal investigator made initial contact within the quarterly NNP
meeting and presented a short Power Point presentation. Follow-up contact was made via e-mail
by principal investigator, the short Power Point presentation used at the NNP meeting was sent
via e-mail to those not in attendance at the quarterly meeting. No more than three attempted
contacts were made.

Only the primary investigator and team members who completed CITI training obtained
consents. The need to avoid any coercion or undue influence was discussed with team members
participating in obtaining consent. Also, the need for confidentiality was discussed, and the
consent form was reviewed. The project was explained to NNPs and they were asked to
voluntarily participate. It was not revealed to their supervisor whether or not they choose to
participate, and the results of their competency evaluation were not revealed to their supervisor.
Consents were obtained in a private manner. Participants were allowed to ask questions regarding the study as they request. Total consented NNPs were 46; with a final sample size of 45, one did not participate due to a medical leave at the time of study implementation.

**Privacy Protection**

All data collected was managed on a password-protected, restricted access computer. A secure password protected server was utilized. Only the principal investigator, primary team members, facility mentor and Capstone Chair had access to the collected data. There was no identifiable data collected. All hard copy paperwork was kept and transported in a locked portable file; these documents included the consents, demographic questionnaire, and LCAT evaluation tool. Paperwork was transferred to PI private office and transported via the locked and secured file. Data will be secured for a minimum of three years. After the three years all paper information will be shredded.

**Timeframe**

Project development began in August 2011 and included PICO selection, followed by a systematic literature review, proposal development, online module development, and IRB approval completed December 2012. Obtaining participant consent occurred between January and February 2013. All project data was collected at three prescheduled annual NNP Skills Days in April 2013. Data was analyzed between April and July of 2013 with and formal project write-up completed by the end of August 2013. Additional dissemination of findings is anticipated in 2013 and 2014 through professional presentations and publication. Figure 3 depicts the project timeline.
Figure 3. Project Timeline

![Project Timeline Diagram]

**Budget**

The budget for this project included time for project development, module development, and purchase of textbooks for each NICU staffed by CH NNPs. The bulk of the budget went to module development, was estimated at approximately $1,100. This consisted of approximately 20 hours of development time calculated by an average NNP rate of $55 per hour. Additional cost was the purchase of nine textbooks, *Atlas of Procedures in Neonatology* (Rais-Bahrami, MacDonald, & Eichelberger, 2012). One textbook was purchased for each NICU site staffed by CHCO NNPs. The textbooks cost $129.00 each for a total of $1,161.00. Fortunately, NNP time for participated was included in previously scheduled annual skills day reviews so did not impact this project budget. Total cost for project was $2,261.00.

**Findings and Results**

The SPSS was utilized to analyze population demographics, LCAT aggregate summary and individual scores, and potential correlations between LCAT scores and individual variables. These variables included NNP age, years of experience, needle thoracostomy experience, level of clinical practice site, and randomization to online on textbook review.
Demographics

Final enrollment included 46 NNPs, with a final N of 45. One consented participant did not participate due to a medical leave. All participants had a Master’s Degree in nursing and were certified by the National Certification Corporation (NCC) as an NNP. The percentage of participant age less than 30 years old was 2.2%, greater than 30 but less than 40, 28.3%, greater than 40 but less than 50, 23.9%, and greater to or equal to 50, 45.7% (Table 1).

Table 1

<table>
<thead>
<tr>
<th>Age of subject</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 30 years old</td>
<td>1</td>
<td>2.2</td>
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<tr>
<td>greater than or equal to 30 years but less than 40 years old</td>
<td>12</td>
<td>28.3</td>
<td>28.3</td>
<td>30.4</td>
</tr>
<tr>
<td>greater than or equal to 40 but less than 50 years old</td>
<td>11</td>
<td>23.9</td>
<td>23.9</td>
<td>54.3</td>
</tr>
<tr>
<td>greater than or equal to 50 years old</td>
<td>21</td>
<td>45.7</td>
<td>45.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

The participants’ years practicing as an RN had a mean of 22.3 years, median of 20 years, mode of 13, with a range from 6 to 45 years. The mean for years practicing as an NNP was 14.5 years, median 11 years, and mode 8 years, with a range from 1.5 to 35 years. The demographic data for age, years of experience as an RN, and NNP were comparable between the textbook and online groups suggesting a homogenous group. Years employed by CH were a mean of 9.1, median 7, mode 4, with a range from 0.5 to 37 years. This represents a large percentage of NNPs over 50 years of age with over 10 years of experience. This demographic is representative
of findings from a recent NANNP workforce survey that reported the majority of practicing NNP
NPs have greater than 10 years of experience (Timoney & Sansoucie, 2012).

The majority of NNPs worked greater than or equal to 36 hours per week of clinical time, 76%,
with 17.4% between 24 and 36 hours per week, and 6.5% between 12 and 24 hours per week. This data was also consistent with the recent NANNP publication which reported the majority of NNPs practiced full time at greater than 35 hours per week (Timoney & Sansoucie, 2012).

Neonatal Nurse Practitioners employed by CH practice at a variety of clinical sites. The various practice sites CH employs reflected 43.5% of participants had their primary practice in a level II NICU, 27% in a Level III, and 17.4% in a level IV NICU. Secondary practice sites were 45% in level II, 37% in level III, and 15.2% in a level IV. These demographics are also consistent with the national survey results having reported the vast majority of NNPs practice in a level III NICU (Timoney & Sansoucie, 2012).

Participants reported limited recent experience with neonatal needle thoracostomy. Only 13% had three or more experiences in the past year, 39% had one or two, and 22% had zero. (Table 2) This is consistent with CH 2011 internal competency data where only 14% of NNPs had three or more needle thoracostomy procedures in the past year (CHCO NNP Competency Committee, 2011). Observation of needle thoracostomies was also limited by participants with 19.6% having observed three or greater in the past year, 26% one or two, and 52.2% zero (Table 3). The most commonly reported perceived barrier for obtaining three or more needle thoracostomy procedures in the past year was lack of patients in clinical setting needing needle thoracostomy reported by 78.3%, followed by competition for procedure by other NNPs, students, residents, fellows, or attending physicians 10.9%. (Table 4). This limited clinical
experience is consistent with the recommendations by NANNP to require annual procedure review of needle thoracostomy rather than actual live experiences due to limited availability of patients requiring this emergent, lifesaving procedure in the clinical setting (NANNP, 2010).

Table 2

| Number of needle thoracostomies performed in past year on live neonatal patient |
|---------------------------------|-----------------|-----------------|-----------------|
|                                 | Frequency | Percent | Valid Percent | Cumulative Percent |
| 0                               | 22        | 47.8    | 47.8           | 47.8               |
| 1 or 2                          | 18        | 39.1    | 39.1           | 87.0               |
| 3 or greater                    | 6         | 13.0    | 13.0           | 100.0              |
| Total                           | 46        | 100.0   | 100.0          |                    |

Table 3

| Number of needle thoracostomies observed in past year |
|---------------------------------|-----------------|-----------------|-----------------|
|                                 | Frequency | Percent | Valid Percent | Cumulative Percent |
| 0                               | 24        | 52.2    | 53.3           | 53.3               |
| 1 or 2                          | 12        | 26.1    | 26.7           | 80.0               |
| 3 or greater                    | 9         | 19.6    | 20.0           | 100.0              |
| Total                           | 45        | 97.8    | 100.0          |                    |
| Missing                         | System    | 1       | 2.2            |                    |
| Total                           | 46        | 100.0   |                |                    |
Table 4

Perceived barriers to obtaining three or more needle thoracostomy procedures on a live neonatal patient in the past year

<table>
<thead>
<tr>
<th>Valid</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of patients in clinical setting needing needle thoracostomy</td>
<td>36</td>
<td>78.3</td>
<td>80.0</td>
<td>80.0</td>
</tr>
<tr>
<td>Competition for procedure, i.e. other NNPs, NNP students, residents, fellows, attending physicians</td>
<td>5</td>
<td>10.9</td>
<td>11.1</td>
<td>91.1</td>
</tr>
<tr>
<td>No barriers, have performed 3 or more procedures in past year</td>
<td>3</td>
<td>6.5</td>
<td>6.7</td>
<td>97.8</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>97.8</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Missing System</td>
<td>1</td>
<td>2.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All participants were asked to rate their preference for learning; 52.2% preferred online review, 37% preferred live didactic presentations, 6.5% preferred textbook review, and 2.2% preferred a combination of online and didactic review. Responses regarding the online module experience were obtained only from participants randomized to the online review; 92% had previous experience with online module reviews (Figure 4).
Figure 4. Previous experience with online experience

![Bar chart depicting the frequency distribution of participant’s randomized to online review previous experience with online modules.](image)

The length of the online module was rated as ‘just right’ by 100% of participants and a 52% found the written content most helpful while 48% reported the picture content as most helpful (Figure 5).

Figure 5. Participant rating of helpful components of online module

![Pie chart depicting online participants rating of most helpful component of online module](image)
LCAT Results

The LCAT is a holistic objective structured exam that includes five areas of performance assessment; communication and working with the patient and/or family, infection prevention, safety, procedural competence, and team working. (Appendix A) Scores are assigned from zero to three. A score of zero indicates unsafe practice in one or more components with errors or omissions likely to result in harm to the patient. A score of one reflects safe practice with one or more errors or omissions unlikely to result in harm to the patient. A score of two is reflective of competent practice, and three reflective of expert practice. Individual scores are specified for each category and an accumulative score is calculated from the combination of the five individual scores with the highest possible score being 15. The overall mean summary score from both the online module and textbook review participants was 9.91, with a standard deviation of 2.6. When plotted on a histogram the overall mean scores created a near perfect bell curve (Figure 5).

Figure 5. LCAT Summary Scores

![Histogram of LCAT mean summary scores depicting near perfect bell curve](image)

The participants completing the textbook review had an overall mean score of 8.8 with a standard deviation of 2.5 while the online review participants had an overall mean score of 10.88
with a standard deviation of 2.369. This represents a statistically significant difference \( (p < 0.05, \) at 0.007) between the summary scores of the two groups with the online review module having improved summary scores per the Independent Samples T Test calculations (Table 5).

Table 5

**T Test Comparing LCAT Summary Scores between Online and Textbook Review Participants**

<table>
<thead>
<tr>
<th>Group Statistics</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCAT Summary - total score</td>
<td>20</td>
<td>8.80</td>
<td>2.505</td>
<td>.560</td>
</tr>
<tr>
<td>online review</td>
<td>25</td>
<td>10.88</td>
<td>2.369</td>
<td>.474</td>
</tr>
</tbody>
</table>

**Independent Samples Test**

<table>
<thead>
<tr>
<th>Levene's Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Sig.</td>
</tr>
<tr>
<td>Equal variances assumed</td>
<td>.125</td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>-2.836</td>
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**Independent Samples Test**

<table>
<thead>
<tr>
<th>t-test for Equality of Means</th>
<th>Mean Difference</th>
<th>Std. Error Difference</th>
<th>95% Confidence Interval of the Difference</th>
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</thead>
<tbody>
<tr>
<td>Equal variances assumed</td>
<td>-2.080</td>
<td>.729</td>
<td>-3.550</td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>-2.080</td>
<td>.734</td>
<td>-3.563</td>
</tr>
</tbody>
</table>

The individual LCAT category scores reveal no statistical difference between the two groups for infection prevention, safety, or procedural competence. Those scores were as follows: textbook/online infection prevention mean scores respectively 2.2 and 2.56, safety 2.05 and 2.36, procedural competence 2.45 and 2.44. However there were statistically significant differences
noted in both communication and team working. Those scores were as follows: textbook/online respectively for communication .55 and 1.4, with p < 0.05 at 0.008; (Table 6) teamwork 1.55 and 2.16 with p < 0.05 at 0.024 (Table 7).

Table 6

*T Tests comparing LCAT Communication Scores Between textbook and online review participants*

<table>
<thead>
<tr>
<th>Group Statistics</th>
<th>1 = textbook 2 = online</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCAT Scoring on communication and working with the patient and/or family</td>
<td>textbook review</td>
<td>20</td>
<td>.55</td>
<td>.887</td>
<td>.198</td>
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<tr>
<td></td>
<td>online review</td>
<td>25</td>
<td>1.40</td>
<td>1.155</td>
<td>.231</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Independent Samples Test</th>
<th>Levene’s Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
</tr>
<tr>
<td>LCAT Scoring on communication and working with the patient and/or family</td>
<td>Equal variances assumed</td>
<td>4.340</td>
</tr>
<tr>
<td></td>
<td>Equal variances not assumed</td>
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</table>

<table>
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<tr>
<th>Independent Samples Test</th>
<th>t-test for Equality of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean Difference</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>LCAT Scoring on communication and working with the patient and/or family</td>
<td>Equal variances assumed</td>
</tr>
<tr>
<td></td>
<td>Equal variances not assumed</td>
</tr>
</tbody>
</table>
Table 7

T Tests comparing LCAT scores between textbook and online review for Teamwork

<table>
<thead>
<tr>
<th>Group Statistics</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCAT Scoring on Team working</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>textbook review</td>
<td>20</td>
<td>1.55</td>
<td>.826</td>
<td>.185</td>
</tr>
<tr>
<td>online review</td>
<td>25</td>
<td>2.16</td>
<td>.988</td>
<td>.180</td>
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Independent Samples Test

<table>
<thead>
<tr>
<th>t-test for Equality of Means</th>
<th>Mean Difference</th>
<th>Std. Error Difference</th>
<th>95% Confidence Interval of the Difference</th>
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</thead>
<tbody>
<tr>
<td>LCAT Scoring on Team working</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal variances assumed</td>
<td>-.610</td>
<td>.260</td>
<td>-1.134</td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>-.610</td>
<td>.258</td>
<td>-1.130</td>
</tr>
</tbody>
</table>

Instrumentation

The LCAT was utilized to analyze the problem question: Is the completion of an online module effective review for NNPs for neonatal thoracostomy by needle aspiration as evaluated...
by the LCAT comparable or better than a standardized textbook review? This APRN sensitive
outcome addressed the knowledge and subsequent treatment for neonatal pneumothorax
requiring needle thoracostomy. The LCAT was chosen since it is a holistic tool measuring five
key components: communication and working with the patient and/or family, safety, infection
prevention, procedural competence, and team working. The LCAT tool has a high content and
face validity at 70% utilizing a Delphi study; and acceptable reliability of 0.79 as a generic,
multi-professional holistic assessment tool (McKinley et al., 2010). The tool was created after
completion of a systematic review of the literature, focus groups, and non-participation
observations were conducted, and a modified Delphi study completed (McKinley et al., 2010).

The online module was developed utilizing basic components of Constructivism learning
theory and Benner’s From Novice to Expert (Benner, 2010). Furthermore, the module was
developed following standardized guidelines for education and evaluation of procedural
competence developed by NANNP (NANNP, 2010). In addition the components of teamwork
and communication recommended by McKinley (2010) were added to the online module. The
module consisted of 24 slides including both text and pictures demonstrating appropriate
equipment selection and procedural technique. The goal was for the module to take
approximately 15 minutes for completion.

For this study two expert NNPs administered the LCAT, both with over 20 years of NNP
clinical, teaching, and evaluation experience, who were blinded to participant randomization.
The NNP evaluators agreed upon consistent expectations for scoring participants by the LCAT.
Each participant was prompted with a scripted statement prior to initiation of the evaluation. The
evaluations occurred in a private simulated setting using a neonatal mannequin and real
equipment. Evaluations were completed immediately upon completion of each NNP procedural
performance. Evaluations were coded by number only so analyzed data was not traceable to individual participants, thus protecting the participants’ identity.

Data were entered and analyzed utilizing SPSS version 21. Demographic data was analyzed for descriptive statistics including mean, median, mode, and range. Independent t-tests were performed for comparison of mean data between groups.

**Discussion**

**Evidence Based Practice Question**

Analysis was conducted of the APRN sensitive problem question: Is the completion of an online module effective review for NNPs for neonatal thoracostomy by needle aspiration as evaluated by the LCAT comparable or better than a standardized textbook review? Study participant group demographics were consistent with recent national benchmark data from a NANNP work force survey (Timoney & Sansoucie, 2012) for NNP age, years of experience, and clinical practice sites, and consistent with NANNP Competency Toolkit assumptions regarding limited NNP experience with neonatal thoracostomy (NANNP, 2010). The online module length was rated as ‘just right’ by 100% of participants with a nearly equal split between participants rating either the written content or pictures as most effective. Participants overwhelmingly had previous experience with online modules (92%). This supports literature that has identified main components to effective online learning activities include; confidence by the student and instructor in using a computer and quality of online learning material created (Kala, Isaramalai, & Pohthong, 2010).

LCAT summary scoring for both the online and textbook group revealed a near perfect bell curve when illustrated on a histogram (Figure 5). While a bell curve is a well-accepted expectation in evaluations (Polit, 2010), it is concerning that a few practicing NNPs
demonstrated the procedure in a manner evaluated as unsafe with the likelihood of causing harm. LCAT scoring for both the control and intervention group revealed competent scoring on infection prevention, safety, and procedural competence. This supports use of either a textbook or online review was effective for these categories of evaluation. However, the online group had statistically significant increased scores on teamwork and communication.

Most concerning was the textbook groups’ mean score of 0.55, for communication. A score of less than one is consistent with an observed performance of unsafe practice in one or more components, with errors or omissions likely to result in harm to the patient (McKinley et al., 2010). The decreased scores on teamwork and communication from the textbook group are additionally concerning when considering the evolving body of literature citing communication and teamwork deficiencies as key components to hospital errors (Baker, Salas, King, Battles, & Barach, 2005; Manser, 2009; Salas et al., 2009). Furthermore, supporting the need for effective communication and teamwork, CH has recently joined, a multi-hospital collaborative effort with the mission to eliminate serious harm across all children’s hospitals in the United States. Key components to this program training include being accountable for clear, complete and respectful communication, and promoting a questioning attitude (Schwartz, 2013).

**Theoretical Support**

The data presented 100% agreement for the length of the learning module being ‘just right’ and an even divide between the most effective components of the module being either the written content or pictures. This supported the learning theory Constructivism that proposes the inclusion of an active learning environment and quality-learning materials enhance effective learning (Kala, Isaramali & Pohthong, 2010). Furthermore, inclusion of both quality written
material and photographs or diagrams in nursing education to enhance learning is supported in the literature as effective (Riley & Manias, 2004).

Limitations

Even though the participation group demographics were reflective of the national benchmark established by NANNP for years of experience as an NNP, working fulltime clinical, and a primary practice site being in a level III unit, it was still a small and homogenous sample size within one health care system. This limitation decreases the ability of findings to be generalized. Furthermore, the study addressed only one of the three essential NNP procedures identified by NANNP (NANNP, 2010). Finally, methodology lacked any before and after testing.

Contributions to Advanced Practice Nursing

This study supports the NANNP Competencies and Orientation Toolkit statement, “Evaluation of competencies is ongoing. Thus all NNPs must have a mechanism in place to verify their ongoing competence in knowledge, patient management and procedural skill” (NANNP, 2010, p.1). This also supports the NANNP recommendation of needed annual neonatal needle thoracostomy review secondary to limited clinical exposure to this procedure. Utilization of the LCAT demonstrated either competent or expert practice for safety, infection prevention, and procedural competence in NNPs utilizing either the textbook or online module. However, deficiencies were noted in communication and teamwork in the textbook participants. This highlights the need for directed education regarding teamwork and communication when teaching procedures. These were included in the online module, yet not specifically in the textbook review. The online module included components of communication and teamwork, based on a holistic approach advocated by McKinley (2010), which is not a part of the NANNP
The increased scores from the online module review in addition to evolving literature regarding the importance of communication and teamwork in reduction of medical errors lend support for NANNP to consider including teamwork and communication specifically to their recommendations for standardized education content of review modules.

This study also supports the use of the LCAT as an effective module for evaluation of procedural performance for NNPs. This standardized, holistic objective structured clinical evaluation tool has the potential to decrease time needed for the development of a specific tool for each procedural performance evaluation. This was the first documented study utilizing the LCAT for NNP procedural competence assessment making it a landmark.

**Recommendations for Further Study**

This study lays the foundation for future studies addressing NNP procedural competency and development of online educational modules. Additional studies analyzing the use of the LCAT for NNP procedural competency evaluation are recommended. Additionally, studies directly analyzing techniques for improved scores on communication and teamwork are indicated. Studies addressing online modules as both initial learning activities and as review modules would be beneficial. Finally, studies utilizing an online module for review or teaching of a procedural technique that included a pre and posttest evaluation using the LCAT could be beneficial.

**Conclusion**

This Capstone Project addressed the empirical and theoretical basis, methodology, conceptual framework, and statistical analysis for the problem statement; Is the completion of an on-line module effective review for NNPs for neonatal thoracostomy by needle aspiration as
evaluated by the LCAT comparable or better than a standardized textbook review? The project was developed as a response to national organizational calls for the development of models for review and evaluation of practitioner competency. Locsin’s middle range theory, Competency in Technology as Caring, and Benner’s middle range theory, From Novice to Expert, provided the nursing theory framework while Constructivism was utilized as the learning theory for development of the online module. Rosswurm and Larrabee’s model for change was applied to this project.

In summary, the participants’ demographics in this study were representative of the national benchmark established by NANNP for mean years of NNP experience being greater than 10, the majority of NNPs with a fulltime clinical practice at greater than 35 hours per week, and a Level III or greater unit as a primary practice site. Overall LCAT summary scores showed a statistically significant higher score for the online review group when compared to the textbook review group. Both the textbook and online review were associated with competent LCAT scores for safety, infection prevention, and procedural competence. However, statistically improved scores for communication and teamwork were identified for participants having completed the online review when compared to the textbook review. The online module included information specifically addressed towards communication and teamwork, while the textbook did not. This supports the importance of including specific teamwork and communication information in educational materials. Finally, participants rated the online module length of 24 slides, including both pictures and text as ‘just the right length’, and there was an equal division among participants regarding the most effective components being either written text or pictures.

Overall, this study answers the problem statement of: Is the completion of an online module effective review for NNPs for neonatal thoracostomy by needle aspiration as evaluated
by the LCAT comparable or better than a standardized textbook review? The answer is: this
online module was comparable to a standardized textbook review for procedural performance,
safety, and infection prevention yet superior for communication and teamwork as scored by the
LCAT.
References

APRN Consensus Work Group & the National Council of State Boards of Nursing APRN


Appendix A

LCAT Scoring Tool

Criteria for allocation of scores for assessment of clinical procedural skills using LCAT

Categories of consultation competence:

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>DESCRIPTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Unsafe practice in 1 or more components: Errors or omissions are <strong>likely</strong> to result in harm to the patient</td>
</tr>
<tr>
<td>1</td>
<td>Safe practice but one or more errors or omissions Errors or omissions are <strong>unlikely</strong> to result in harm the patient</td>
</tr>
<tr>
<td>2</td>
<td>Competent practice</td>
</tr>
<tr>
<td>3</td>
<td>Expert practice</td>
</tr>
</tbody>
</table>

Notes:

- The levels and associated score are used to describe the observed performance on a single clinical procedure and not to make a judgment of competence or lack of competence compared to an arbitrary ‘pass’ score.
- Each assessor uses his/her professional awareness to decide whether an error or omission is likely or not likely to harm the patient. Not everyone will agree whether harm is likely or not likely.

LCAT questions to probe thinking:

Pre-procedure

- What patient factors have you considered in planning the procedure and why?
  - How do you propose to carry out this procedure and why?

Post-procedure

- Did anything happen during the procedure which caused you modify your plan for the procedure?
  - What and why?
  - What patient factors did you consider and why?
<table>
<thead>
<tr>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

**LCAT Assessor’s Recording Form**

<table>
<thead>
<tr>
<th>Name of procedure:</th>
<th>Brief clinical details (as appropriate)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>COMPETENCE CATEGORY</th>
<th>POSITIVE FEATURES</th>
<th>OPPORTUNITIES FOR IMPROVEMENT (OMISSIONS)</th>
<th>PERFORMANCE LEVEL or SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication and working with the patient and/or family</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infection prevention</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procedural competence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team working</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES ON OVERALL PERFORMANCE**

**SPECIFIC STRATEGIES FOR IMPROVEMENT**

Assessor’s name __________________________ Signature __________ Date _________
# Appendix B

## Review of Literature

<table>
<thead>
<tr>
<th>Key Search Word &amp; Data Base &amp; Funding</th>
<th>Level of Evidence</th>
<th>Research Design: Systematic Review</th>
<th>Purpose/Question</th>
<th>Study Population Sample Size, inclusion/exclusion Criteria</th>
<th>Instruments</th>
<th>Results</th>
<th>Strengths/Weakness</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>McKinley, R., Strand, J., Ward, L., Gray, T., Alun-Jones, T., Miller, H. (2008). Checklists for assessment and certification of clinical procedural skills omit essential competencies: a systematic review. <em>Medical Education, 338-349</em> doi: 10.1111/j.1365-2923.2007.02970.</td>
<td>Googlr Scholar Key Words: Objective structured clinical assessments &amp; examinations No stated funding source</td>
<td>Systematic Review and qualitative analysis of literature addressing clinical procedural skills assessment tools from 1995 to 2005 Included all English language papers</td>
<td>It is possible to develop generic criteria for the global assessment of clinical procedural skills. Identified 7 themes and 37 sub themes in checklists reviewed.</td>
<td>Systematic review and qualitative analysis of published clinical procedural skills assessment checklists and enumerated the contents of each, used 18 data bases. Performed 2 phase data extraction, first coding framework and second checking framework against the remaining checklists.</td>
<td>Power analysis not cited</td>
<td>Strengths: Well done systematic review looking at need for and approach to develop a ‘holistic’ objective structured clinical examination (OSCE). Weakness: No studies past 2005 included in review.</td>
<td>Excellent application to PICO since it addresses the literature addressing OSCE tools which I will be using in my evaluation of clinical performance skills of Neonatal Nurse Practitioners (NNPs), the LCAT.</td>
<td></td>
</tr>
</tbody>
</table>

<p>| McKinley, R., Strand, J., Gray, T., Schuwirth, L., Alun-Jones, T., Miller, H. (2008). Development of a tool to support holistic generic assessment of clinical medicine | Googlr Scholar Key Words: Objective structured clinical assessment &amp; examination | Systematic Review and qualitative analysis of literature addressing clinical procedural skills assessment tools from 1995 to 2005 Included all English language papers | It is possible to develop generic criteria for the global assessment of clinical procedural skills. Identified 7 themes and 37 sub themes in checklists reviewed. | Systematic review and qualitative analysis of published clinical procedural skills assessment checklists and enumerated the contents of each, used 18 data bases. Performed 2 phase data extraction, first coding framework and second checking framework against the remaining checklists. | Power analysis not cited | Strengths: Well done systematic review looking at need for and approach to develop a ‘holistic’ objective structured clinical examination (OSCE). Weakness: No studies past 2005 included in review. | Excellent reference as the public is interested in the development of a generic and holistic tool. |
| Wilbeck, J., Murphy, M., Heath, J., &amp; Thomson-Smith, C. (2011). Evaluation methods for the assessment of acute care nurse practitioner inserted central lines: evidence based strategies for practice. <em>Journal for Advanced Vascular Access.</em> 16, 226-233. DOI: 10.2309/ja | Google Scholar Key Words: | Two-part literature review: | Literature review: | Power analysis not cited | Two-part literature review | Seven studies and on expert consensus were identified related to use of standardized forms and templates/checklists to improve national guideline compliance. All studies indicated the use of standardized documentation significantly increased compliance with national guidelines. Consensus exists that written exams and patient outcomes are | Strengths: GOOD reference to use; APRN competency evaluation focused. Supports model for OSCE. Defines written exams as outdated for evaluation of procedure competency. Weakness: Low level. | Good application to study as it provides support for use of OSCE for evaluation of procedural competency in APRNs. |</p>
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Year</th>
<th>Title</th>
<th>Key Words</th>
<th>Level of Evidence</th>
<th>Type of Key Words</th>
<th>Description</th>
<th>Power Analysis</th>
<th>Strength</th>
<th>Weakness</th>
<th>Helpfulness</th>
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<tr>
<td>Khattab, A., &amp; Rawlings, B. (2008).</td>
<td>Osce</td>
<td>Use of a modified Osce to assess nurse practitioner students. Nurse Education Today, 17, 754-759</td>
<td>googlescholar</td>
<td>V</td>
<td>Descriptive study describing use of Osce for Nurse Practitioner (NP) students</td>
<td>Outdated and undesirable for use as evaluation tools in competency assessment</td>
<td>Not cited</td>
<td>Detailed description of program implementation utilizing Osce for NP student assessment</td>
<td>Provides helpful hints for implementation</td>
<td>Useful for Capstone project as it provides helpful tips for successful use of Osce with NPs, yet not used in student population</td>
</tr>
<tr>
<td>Newble, D. (2004).</td>
<td>Osce</td>
<td>Techniques for measuring clinical competence: objective structured clinical</td>
<td>googlescholar</td>
<td>V</td>
<td>Level of Evidence: VII</td>
<td>How can high levels of reliability and content validity for Osce be obtained?</td>
<td>Integration of evidence and supportive literature</td>
<td>Step by step approach to effectively using Osce with supportive literature</td>
<td>Provides strategies for effective utilization of Osce</td>
<td>Practical and applicable information provided to guide use of Osce</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Article Title</td>
<td>Journal</td>
<td>Volume</td>
<td>Issue</td>
<td>Page Numbers</td>
<td>DOI</td>
<td>Keywords</td>
<td>Strengths</td>
<td>Weaknesses</td>
<td>Application</td>
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<td>Source</td>
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<tr>
<td>CINAHL, Cochrane Database, Academic Search Premier, Medline from 1960 to 2008</td>
<td>NNP states</td>
<td>Power analysis</td>
<td>41 papers met criteria of search and supported use of OSCE to address the complexities of evaluating clinical competence.</td>
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<tr>
<td>Strengths:</td>
<td></td>
<td></td>
<td>Addresses gaps in literature psychometric properties of some OSCEs.</td>
<td></td>
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<tr>
<td>Weaknesses:</td>
<td></td>
<td></td>
<td>Now 3-4 years old. Does not address newer publications since 2008.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Applicable to Capstone as it provides support for the use of OSCE in the evaluation of clinical competence for nurses since most previous studies looked at the use of OSCE in medical education.</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Committee</td>
<td>Key word: Competency evaluation Funding: Robert Wood Johnson Foundation Initiative on the Future of Nursing, at the Institute of Medicine, Institute of Medicine. (2010). The future of nursing: Leading change, advancing health. Retrieved from The national Academies Press: <a href="http://www.nap.edu/catalog.php?record_id=12956">http://www.nap.edu/catalog.php?record_id=12956</a></td>
<td>Level of Evidence: VII Design: Expert Consensus based on literature review</td>
<td>Addresses the need for lifelong learning for all nurses and ongoing competencies and interprofessional learning</td>
<td>Not a study, professional recommendations based on literature review and expert consensus</td>
<td>Literature review and interprofessional expert consensus opinion</td>
<td>Literature: Evidence: the need for professional review and opinion competencies, and continual review of competency programs</td>
<td>Summary of recommendations of IOM supports my PICO with interdisciplinary expert consensus for lifelong learning and competency evaluation</td>
<td>Support Capstone project as it provides recommendation from a respected national organization for lifelong learning and competency evaluation</td>
<td></td>
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<tr>
<td>---------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
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</tbody>
</table>
| National Association of Neonatal Nurses. (2010). Competencies and orientation tool kit. Glenville, IL: National Association of Neonatal Nurses. | Keyword: NNP competencies Funding: National Association of Neonatal Nurses website | Level of Evidence: VII Design: Expert Consensus based on literature review | Detailed explanations of all NNP competencies including procedural competencies | Not a study, professional recommendations developed by literature review and expert consensus | Literature review and expert consensus development from a nation-wide task force of NNP experts and reviewed by board of directors | Important reference as it is the NNP professional organizing and outlines specifically which procedures are considered essential and what type of evaluation for review is needed. This reference is a basis for my entire PICO | NANNP recommendations are basis for my PICO- important reference supports evaluation of essential procedures as developed by NNP national professional organization | Excellent reference for Capstone project as PICO question is directly drawn from NANNP recommendations for institut
<table>
<thead>
<tr>
<th>Authors</th>
<th>Focuses on nursing students, yet descriptive opinion not a study</th>
<th>More research is needed for best practice of competency measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. Lenburg</td>
<td>Review of literature and concept development, discusses four aspects of competency evaluation including, defining the competencies to be evaluated, defining outcome statements to describe the competencies, identifying effective learning strategies, and performance assessment methods.</td>
<td>Strength: Nursing based, outlines competency assessment strategies nicely. Weakness: More of program description and supporting literature than research.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Authors</th>
<th>Literature review of nursing, medical, public health, and education literature from 2001-2005 was conducted using CINAHL, and Ovid</th>
<th>Literature review of nursing, medical, public health, and education literature from 2001-2005 was conducted using CINAHL, and Ovid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tilley, D. (2006)</td>
<td>Literature reviews- not systematic</td>
<td>Key Points summarized: Competence is focused on the description of the action or behavior, whereas competency is focused on the individual’s behavior underpinning the competent performance.</td>
</tr>
<tr>
<td></td>
<td>Power analysis not cited</td>
<td>Weakness: Not a systematic review</td>
</tr>
<tr>
<td></td>
<td>Comments: Applicable to Capstone project since it highlights a concept analysis supporting the need for competency evaluation in nursing.</td>
<td></td>
</tr>
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<table>
<thead>
<tr>
<th>Authors</th>
<th>Level of Evidence: VII Author opinion</th>
<th>Describes approach to competency training in nursing in response to national and state regulations. Provides eight core practice competency categories and examples of skills and assessment approaches, literature supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Googler Scholar Key Words: Nursing Competencies</td>
<td>Review of literature and concept development, discusses four aspects of competency evaluation including, defining the competencies to be evaluated, defining outcome statements to describe the competencies, identifying effective learning strategies, and performance assessment methods.</td>
<td>Power analysis not cited</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Authors</th>
<th>Can a concept analysis of competency in nursing be helpful</th>
<th>Literature review of nursing, medical, public health, and education literature from 2001-2005 was conducted using CINAHL, and Ovid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Googler Scholar Key Words: Nursing Competencies</td>
<td>Literature reviews- not systematic</td>
<td>Key Points summarized: Competence is focused on the description of the action or behavior, whereas competency is focused on the individual’s behavior underpinning the competent performance.</td>
</tr>
<tr>
<td></td>
<td>Power analysis not cited</td>
<td>Weakness: Not a systematic review</td>
</tr>
<tr>
<td></td>
<td>Comments: Applicable to Capstone project since it highlights a concept analysis supporting the need for competency evaluation in nursing.</td>
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<tr>
<td>Author(s)</td>
<td>Googled Scholar Key Words</td>
<td>Level of Evidence: Research design</td>
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<tr>
<td>Weakness: Already older literature (2004) and addresses only physician outcomes Does not address nursing practice</td>
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<td>---------------------------------------------------------------</td>
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<tr>
<td>Findings suggest an inverse relationship between years of practice and quality of practice provided with physicians. One of my demographic collection tool questions addresses years of experience as an NNP.</td>
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<tbody>
<tr>
<td>CINAHL Key Words: APRN Competencies No funding source cited</td>
</tr>
<tr>
<td>Level of evidence: VI Design: exemplar of case history and application to traditional classroom and online learning model</td>
</tr>
<tr>
<td>Exemplars, summary information, asks; can case histories be effective for teaching APRN procedures and intervention(s)</td>
</tr>
<tr>
<td>APRN students, number of students not provided Power analysis not cited</td>
</tr>
<tr>
<td>Exemplars, definitions of Case Studies Case histories can be effective as a teaching tool for APRNs in identifying need for certain procedures and interventions</td>
</tr>
<tr>
<td>Strength/Provides support adding a case study to online module that I develop regarding the essential procedure of thoracostomy by needle aspiration Weakness: low level of evidence</td>
</tr>
<tr>
<td>Applicable to Capstone project as it provides support for the use of case histories as an effective learning strategy for APRNs, plan to incorporate a case history into the online</td>
</tr>
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</tr>
<tr>
<td>CINAHL Key Words: APRN Competencies No funding source was cited</td>
</tr>
<tr>
<td>Level of Evidence: VI Single quantitative descriptive study</td>
</tr>
<tr>
<td>Can the procedures that ER nurses perform and their associated competencies be identified and evaluated?</td>
</tr>
<tr>
<td>Convenience, non-random sample of practicing Emergency Nurses in 11 Emergency rooms in Ireland Power analysis not cited</td>
</tr>
<tr>
<td>403 researcher developed questionnaires distributed to 11 ERs in Ireland, measured 119 procedures and competencies were evaluated</td>
</tr>
<tr>
<td>Findings: Most competent feelings related to diagnostic reasoning, statistically significant relationship (p &lt; 0.01) between APRNs perceived level of competency and frequency of practice Also, highest perceived mean competency was in nurses with 6-10 years experience</td>
</tr>
<tr>
<td>Strengths: Descriptive study Supports increased perceived competencies with increased frequency of practice Weakness: Not NNP specific</td>
</tr>
</tbody>
</table>
| Applicable to Capstone study addresses nurses procedural competence related frequency of procedure performance. My data will be analyzed to determine if an association between frequency of exposure to and performance of procedure and the assessment of procedural competency Supports, concept of choosing thoracentesis for PICO since it has the least...
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<tbody>
<tr>
<td>CINAHL Key word Competency + procedures</td>
<td>Level of evidence: VI Quantitative descriptive study</td>
<td>Questionnaire to physicians and paramedics, regarding experience and self-confidence for performing life-saving procedures including endotracheal intubation, cricothyroidotomy, and needle chest decompression, tube thoracostomy and intravenous infusion. 299 questionnaires sent, 183 total respondents, 98 Physicians and 85 paramedics practicing as first responders in the Israel Defense Forces. Used a p value of less than 0.5 as statistically significant. Power analysis not cited.</td>
<td>Anonymous, structured Questionnaire Self-confidence in procedures was positively associated with experience gained from manikins, and supervised or unsupervised patient contacts/procedures. No benefit was demonstrated by animal model use. Most confidence building was unsupervised experience, next supervised experience and 3rd simulated experience.</td>
<td>Strengths: Recent descriptive quantitative study (2012) Addresses life-saving procedures including needle thoracostomy for chest decompression. Shows benefit of simulated experience with manikin. Weakness, Level VI evidence, not APRNs or NNP specifically.</td>
<td>Applicable to Caphstone project since it addresses trainings approaches to life-saving procedures. My Caphstone project addresses needle thoracostomy which can be life-saving in the neonates. Addresses the value of a simulated training experience in confidence in procedural performance, consistent with plans for my project application.</td>
</tr>
<tr>
<td>The practical use of technology in nursing education. National Association of Neonatal Nursing (NANN) Preconference workshop. (Lecture notes). (hard copy)</td>
<td>office folders</td>
<td>VII</td>
<td>learning techniques</td>
<td>Power analysis not cited</td>
<td>presentation developed from personal expert experience and literature review</td>
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<tr>
<td>Altimier, L. (2009). Benefits of a flexible neonatal online nursing orientation program. Newborn and Infant Nursing Reviews, 2, 83-87. Retrieved from <a href="http://www.nainr.com">www.nainr.com</a> (Hard copy)</td>
<td>Googl</td>
<td>Level of evidence: VII</td>
<td>Can an online program be effective for a neonatal nursing orientation program</td>
<td>No specific sample size cited</td>
<td>No specific instruments used. Provides brief description of format of online modules developed</td>
</tr>
<tr>
<td>Philips, J. (2005). Strategies for active learning in online continuing education.</td>
<td>Googl</td>
<td>Level of Evidence: VII Not a study</td>
<td>Discusses strategies for successful online learning, looks at constructivism briefly</td>
<td>A review presentation - not a study</td>
<td>Not a study, or systematic review</td>
</tr>
<tr>
<td>Journal of Continuing Education in Nursing, 36, 77-83. (Hard copy)</td>
<td>learning &amp; nursing funding not cited</td>
<td>and also seven principles of good practice in education as a foundation for active learning, Power not cited as not a study</td>
<td>theory in the development of the online learning</td>
<td>developing online learning</td>
<td>Weakness: Expert opinion, not a study</td>
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<tr>
<td>Copley Cobb, S. (2004) Internet continuing education for health care professionals: An integrative review, The Journal of Continuing Education in Health Professions, 24, 1171-180. (Hard copy)</td>
<td>Googlescholar key words: Online learning, health care professional No funding source was cited</td>
<td>Review of key articles research on practices, preferences, and evaluation of online continuing education used by health care professionals MEDLINE, CINAHL, and ERIC databases 1990 to 2004 and manual searches of Journal of Cont. Education in Health Professions and Journal of Continuing Education in Nursing Power analysis not cited</td>
<td>Integrative review used categorization according to intervention, subjects, study designs and findings</td>
<td>Determined online learning is effective and satisfactory to health care professionals, yet in-person learning still preferred method for continuing education</td>
<td>Strengths: One of first integrative reviews on online learning in continuing education for health care workers Weakness: Older data as articles reviewed were from 1990-2004 Despite being an older article it is applicable to Capstone since it is one of the first integrative review of the literature addressing online learning as means of continuing education for health care worker s</td>
</tr>
<tr>
<td>Fortune, J. (2007) The virtual learning environment: An alternative, flexible and</td>
<td>Googlescholar key words: Online learning, expert nurse educator opinion and description of practice</td>
<td>How can a virtual learning environment (VLE) be used for neonatal nursing continuing Description of single program implementation in Scotland/UK Power analysis not cited</td>
<td>Description of hospital program, no specific instruments mentioned Describes anecdotal positive responses from use of VLE for teaching newborn assessment</td>
<td>Strengths: nice summary of a single successful program and addresses neonatal</td>
<td>Applicable to Capstone as it includes expert opinion of</td>
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<td>Neonatal nursing No funding source was cited</td>
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<tr>
<td>Within her hospital setting</td>
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<tr>
<td>Education in Scotland? Highlights benefits of VLE when financial resources are limited</td>
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<td>Journal of Neonatal Nursing.</td>
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<tr>
<th>Weakness: single descriptive experience described</th>
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<tr>
<td>Online learning effectiveness in the neonatal nursing population consistent with my Capstone population</td>
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<tr>
<td>Googlescholar Key words: Online learning, nursing Funding: Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions grant money for “Promoting Health Access: Online Graduate”</td>
</tr>
<tr>
<td>Level of Evidence: VI Description of program development</td>
</tr>
<tr>
<td>Can implementing and an online MSN program for rural students provide high quality and rigorous distance education for NNP students? Also, can an online program be a cost effective solution to providing qualified NNPs in rural underserved areas?</td>
</tr>
<tr>
<td>Description of program development, implementation and evaluation in rural Pennsylvania Power analysis not cited</td>
</tr>
<tr>
<td>No specific instruments were described</td>
</tr>
<tr>
<td>Describes positive response from on-line distance program, yet addresses the challenges in recruiting rural nurses interested in pursuing the NNP education and role</td>
</tr>
<tr>
<td>Strengths: Nice description of on-line program success and application of grant and working with DHHS</td>
</tr>
<tr>
<td>Weakness: single descriptive experience</td>
</tr>
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| NIH and online grants could be utilized to Capstone project since this program was specifically designed toward NNP education utilizing an online format. Yet transferable information is limited since this is mainly focused on rural NNP students, however the geography and effectiveness of online teaching with NNPs |

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<th>Weakness: single descriptive experience described</th>
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<tr>
<td>Online learning effectiveness in the neonatal nursing population consistent with my Capstone population</td>
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<th>Weakness: single descriptive experience described</th>
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<tr>
<td>Online learning effectiveness in the neonatal nursing population consistent with my Capstone population</td>
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<tr>
<td>Forsellund et al. (2009)</td>
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</table>
| Bloomfield et al. (2010) | The effect of computer–assisted learning versus conventional teaching methods on nursing students | Googl e scholar t Key Words : Online learning, nursin g | Level of Evidence: IV Research design: randomized controlled experimenta l design | Could nursing students learn and retain theory and skill of hand washing more effectively when taught using computer | First year nursing students in a 3 year nursing program in London (n=420) Inclusion criteria: ability to use a computer Total N 245 students | Two groups randomized controlled design. Intervention group used interactive, multimedia, self-directed computer assisted learning module. | Knowledge scores increased significantly p <05 from baseline in both groups, immediate, week 1 and with 8 week follow-up demonstrating significant | Strength: Randomize d controlled trial sample size: control 113, intervention 118 Showing effectivenes | Applicable to Capstone project since it shows effectiveness of teaching a nursing

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<tr>
<td>Googled Scholar Key Words:</td>
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<td>Level of evidence: V</td>
</tr>
<tr>
<td>Integrative review</td>
</tr>
<tr>
<td>Power analysis not cited</td>
</tr>
<tr>
<td>Strength: Integrative review, specificity addresses acquisition of clinical skills - Weakness: Data already 6 yrs. old.</td>
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<tr>
<td>Level of evidence: V</td>
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<tr>
<td>Provides ways to look at online learning without increasing</td>
</tr>
<tr>
<td>General review</td>
</tr>
<tr>
<td>Strengths: Multi-site study, large sample size</td>
</tr>
</tbody>
</table>
### Reducing Costs: New Models for Online Learning

**Educausereview.** 28-38.

#### Online Learning

**Funding:** PEW Charitable Trust

**Review of descriptive and qualitative studies**

**Costs:** looked at entire course redesign, not just a single class. Looks at a variety of models, supplemental, replacement, Emporium and fully online institutions in course redesign required institutions to complete comprehensive evaluations of findings.

**Citation of power N/A**

**Showed no change in online versus traditional learning.** Each institution showed 40% cost savings on average with range from 20 to 80% savings, overall include increased course-completion rates, improved retention, better student attitudes toward subject matter, and increased student satisfaction with the mode of instruction. The thirty redesigned courses represent 50,000 students nationwide and produce a savings of 3.6 million per year.

**Strengths:**
- Significant findings for learning, student satisfaction, retention attitudes and large cost savings.
- Not randomized or controlled study and older (2003)

**Weakness:**
- Older articles and provides a nice reference for a conceptual framework addressing online and blended learning

---


**Googlescholar**

**Key Words:** Online learning

**Level of Evidence:** VII

**Design:** Expert opinion based on experience and supporting literature

**To look at the transformative potential of blended learning in higher education**

**Discussion about the concept of blended learning combining traditional learning with online learning.**

**Citation of power N/A**

**Provides a framework of issues to be addressed to transition to blended learning approach**

**Strengths:**
- Nice conceptual model p 97 on e-learning and enhanced, blended and online variables

**Weakness:**
- Older article and low level of evidence

---

**Applies to Capstone as it addresses online and blended learning strategies and provides a nice reference for a conceptual framework addressing online and blended learning.**
<p>| Rovai, A.P. (2003). A practical framework for evaluating online distance education programs. Internet and Higher Education (6) 109-124. (Hardcopy) | Googl_ Scholar | Key Words | Level of Evidence: V | Provides support for the need for specific evaluations to be conducted regarding the experience of online learning, also to include technology and support services, course design, and instruction | Review of program evaluation guidelines along with author experience | Power analysis not provided | Strength: Provides effective framework for evaluation of online learning activities | Weakness: Low level of evidence and older article (2003) | Applicable to Capstone project as it addresses a variety of online learning activities and provides a framework that could be utilized to evaluate effective on learning activity |
| DeBourgh, G.A. (2003) Predictors of student satisfaction in distance-delivered graduate nursing courses: What matters most? Journal of Professional Nursing, (19) 149-163. | Googl_ Scholar | Key Words | Online learning and nursing | No funding source cited | Convenience sample of registered nurses enrolled in first semester masters program in mandatory theory course | Power analysis not provided | Strength: Four main predictors to student satisfaction with online learning 1. Clarity of communication and course expectations 2. Selection, quality and instructional use of visuals 3. Timeliness of feedback on course work 4. Use of instructional strategies that aid students in understanding course content | Weakness: Emphasizes the need for clarity in instructions for online learning to be valued and successful | Applicable to Capstone project since provides original research basis to student satisfaction with online learning experiences, Emphasizes the need for clarity in instructions for online learning to be valued and successful |</p>
<table>
<thead>
<tr>
<th>Grunemann, B., J. (2007). Distance learning and perioperative nursing. Association of Operating Room Nursing Journal. (85) 574-586.</th>
<th>CINA HL</th>
<th>Level of Evidence: VII</th>
<th>Question: What are the strengths of online distance learning based on literature review</th>
<th>Expert author opinion supported by literature</th>
<th>N/A</th>
<th>Outcomes of literature summarized the strengths/weaknesses of online learning.</th>
<th>Strengths of article: Identified: flexibility of timing, enhanced job skills and professional practice, improved recruitment and retention. Weakness: Based on student/faculty role so limited transferability to continuing education situation with practicing NNPs.</th>
<th>Applicable to Capstone as this article highlights potential strengths of online learning consistent with goals described in my Capstone including enhanced job skills, flexibility and availability of education.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smith, A. (2010). Learning styles of registered nurses enrolled in an online nursing program. Journal of Professional Nursing (26) 49-53.</td>
<td>CINA HL Keyword: Online learning - Advanced practice nursing No funding source cited</td>
<td>Level of Evidence: VI Research design: Descriptive cross-sectional study</td>
<td>What are the learning styles of graduate nurses enrolled in an online nursing program?</td>
<td>Master’s nursing students, Sample size: 217 students enrolled in online courses at study site’s university, students were enrolled in either RN-BSN or master’s program. No power analysis cited; yet authors did state that follow-up studies with larger sample size suggested</td>
<td>Kolb’s Learning Style Inventory version 3.1 given to nursing students</td>
<td>Results: Predominant style was ‘accommodator’, the “feeling, hands on person who likes new experiences and can adapt to changing circumstances, yet all four learning styles were represented</td>
<td>Strengths / weaknesses: Addresses learning of advanced practice nurses, yet looks at students and not experience APRNs, the APRN aspect is most closely related to PICO. Weakness: Low level of evidence and study with students, not practicing APRNs so limited transferability.</td>
<td>Applicable to Capstone project since this discusses the learning styles of online learners in nursing education programs. Information gained can be assimilated into online module development.</td>
</tr>
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</table>

<p>| Litmanovitz, I., &amp; Carlo, W.A. (2008) | CINA HL Keyword: Needle thorac Level of Evidence: IV Research | What is the incidence and outcome of managing a 136 NICU ventilated infants with pneumothorax while on the | Retrospective chart review and analysis of expectant management | Of 136 ventilated infants with pneumothorax, 74% were | Strengths: Good evidence for indicating | Excellent source for clinical practice. |</p>
<table>
<thead>
<tr>
<th>Expectant management of pneumothorax in ventilated neonates. <em>Pediatrics.</em> (122) e975-e980.</th>
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<tr>
<td><strong>ostomy and neonate</strong></td>
<td>No finding source cited</td>
<td>design: Retrospective analysis</td>
<td>pneumothorax without tube thoracostomy and to determine the clinical and laboratory characteristics that distinguish infants with a pneumothorax who can be treated without chest-tube insertion?</td>
<td>ventilator Power analysis not provided</td>
<td>of pneumothorax treated with CT, 26% without chest aspiration and 21 expectant management</td>
<td>need for minimal intervention for neonatal pneumothorax Weakness, does not address procedural technique or teaching methods relatively small sample size</td>
</tr>
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Appendix C

Capstone Project Educational Presentation

Comparison of Neonatal Nurse Practitioner Needle Thoracentesis Procedural Competency After Completion of an Online Module or Textbook review

Carol Wallman RN, MS, NNP-BC

Presentation

- Presentation to:
  - Children’s Hospital Colorado (CHCO) Neonatal Nurse Practitioners:
- Obtain departmental support for proposal

Problem Statement

- Is the completion of an online module on neonatal needle thoracostomy effective review for Neonatal Nurse Practitioners (NNPs)?
- Format:
  - Utilize online format or textbook review for didactic content
  - Utilize standardized clinical assessment tool

PICO Statement

- Population: NNPs practicing within CHCO
- Intervention: Development, implementation and evaluation of online module for review of neonatal needle thoracostomy
- Comparison: Standard teaching method (textbook)
- Outcome: Results of standardized observation tool compared between experimental and control group

Background

- Competency evaluation is a national focus
- AFRN Consensus Work Group (AFRN Consensus Work Group, 2008)
- National Association of Neonatal Nurse Practitioners (NANNP, 2010)
- Institute of Medicine (IOM, 2011), (IOM, 2009)
- The Joint Commission (2011)

Current Practice

- CHCO NNP Competency Committee
- Track NNP Portfolios and Procedures
- Annual Skills Day: Mandatory
- Power point presentations or textbook review
- Open-book written exam
- Simulated procedure practice
- No formal evaluation of procedure performance
NANNP Recommendations

- Develop standardized institutional specific procedure guidelines
- Assessment of initial and ongoing competencies
- Recommended content of assessments:
  - Universal precautions and time-outs
  - Review and discussion of informed consent
  - Review of procedure's indications, contraindications, complications
  - Assessment and management of pain (NANNP, 2010)

Benefits of Online Format

- Demonstrated effectiveness for nurses (Cobb, 2004)
- Ability to reach vast geographic distance
- CHCO NNPs reside and practice > 200 miles apart
- Cost effectiveness (Akshier, 2009)

Choice of Thoracentesis

- NANNP defined 3 essential NNP procedures
  - Endotracheal intubation
  - Emergent umbilical line placement
  - Needle thoracostomy (Thoracentesis)
- Recommended 3 procedures per year:
  - For ETT and emergent umbilical line
  - Review for needle thoracostomy

Choice of Thoracentesis

- Procedure tracking: 90% CHCO NNP participation
- NNPs NOT having 3 yearly procedures
  - ETT placement 9%
  - UVC placement 20%
  - UAC placement 34%
  - Thoracentesis 86%
  - (CHCO, unpublished data, 2011)

Choice of Thoracentesis

- Essential NNP procedure per NANNP
- Lowest frequency of NNP performance
- Emergency procedure for pneumothorax
- Neonatal period most common for pneumothorax (Limanovitz & Carlo, 2008)

Use of Structured Assessment Tool

- Variations of structured assessment tools exist:
  - Well supported APRN use in literature (Ward & Willis, 2006)
  - Objective standardized clinical exam (OSCE)
  - Objective structured assessment of technical skills (OSATS)
  - Objective structured clinical assessments (OSCA)
Choice of Tool

- Leicester Clinical Procedure Assessment Tool (LCAT)
- Holistic approach to procedure assessment
- Generic, multi-professional assessment tool
- High content validity
- Acceptable reliability
- Eliminates need for multiple checklists (McKinley et al., 2010)

Methodology

- Research question:
  - Is the completion of an online module effective in teaching NNP thoracentesis as evaluated by the LCAT?
- Research benchmarks:
  - Competent NNP performance after review module completion
  - Effective use of LCAT for performance assessment

- Independent variable: online module
- Dependent variable: LCAT performance measurements
- Extraneous variables
  - Years of clinical practice as RN and NNP
  - Recent experience with thoracentesis
  - Any self learning completed by NNP

Methodology

- Descriptive, quantitative, pre-experimental design
- IRB approval
- Voluntary CHCO NNP participation
- Convenience sample of CHCO NNPs
- Informed consent (Cullen, 2012)

- Randomization of participants
- Experimental group completes online module review
- Control group completes textbook review
- Individual blinded assessments by NNP expert
- Assessment per LCAT
- Outcomes evaluated as aggregate data (Cullen, 2012)

Impact

- Present program at national professional conference
- Publish findings in professional journal
- Serves as model for competency assessment
Impact

- Present program at national professional conference
- Publish findings in professional journal
- Serves as model for competency assessment

References

Appendix D

E-Mail Consent Script

Date: 12-4-12

This e-mail is being sent to you to request your participation in a research study. If you have already consented for this research study, please disregard this e-mail.

Study Title: **Comparison of Neonatal Nurse Practitioner needle thoracostomy procedural competency after completion of an online module or standard textbook review**

This e-mail provides you with information about the study. A member of the research team will discuss this study with you and answer all of your questions. Please read the information below and ask questions about anything you do not understand before deciding whether or not to take part.

Principal Investigator: Carol Wallman RN, MS, NNP-BC

Why is this study being done?

This study plans to learn more about Neonatal Nurse Practitioner (NNP) neonatal needle thoracostomy procedural performance after completing an online module or textbook review. This study is part of the course work for Carol Wallman’s doctorate of nursing program course requirements.

If you agree to join the study you will be blindly randomized to either complete standard textbook review or an online module review within one week of your scheduled skills day. You will be able to complete either the module or the textbook review on your own time. During your regularly scheduled skills day an NNP expert will evaluate your neonatal needle thoracostomy procedure performance. The review will take approximately 15 minutes and the evaluation will take approximately 15 minutes.

Your decision to participate or not participate will in no way impact your employment at Children’s Hospital Colorado. All data collected will be kept confidential and shared only with team members.

You may have questions about your rights as someone in this study. You can call Carol Wallman at (970) 581-7462 with questions or Dr. Cris Finn, (Capstone Chair, at Regis University at 719-661-6750). You can also call the Multiple Institutional Review Board (IRB). You can call them at 303-724-1055.

Please review the attached consent form and contact Carol Wallman at (970) 581-7462 at your convenience with any questions and to provide phone consent should you decide to participate.
If you do not contact Carol Wallman (Principal Investigator) within three days you will receive a phone call from Carol Wallman to answer any questions you may have and to invite you to participate in this study.

Thank you for your consideration,

Carol Wallman

Attachment: Consent Form
Appendix E

Collaborative Institutional Training Initiative Completion Certificate

CITI Collaborative Institutional Training Initiative

Human Research Curriculum Completion Report
Printed on 8/2/2012

Learner: Carol Wallman (username: cwallman@regis.edu)
Institution: Regis University
Contact Information Department: Nursing
Email: cwallman@regis.edu

Social Behavioral Research Investigators and Key Personnel:

Stage 1. Basic Course Passed on 08/02/12 (Ref # 8379361)

<table>
<thead>
<tr>
<th>Required Modules</th>
<th>Date Completed</th>
<th>Completed</th>
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<tr>
<td>Introduction</td>
<td>07/31/12</td>
<td>no quiz</td>
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<tr>
<td>History and Ethical Principles - SBR</td>
<td>07/31/12</td>
<td>4/5 (80%)</td>
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<tr>
<td>The Regulations and The Social and Behavioral Sciences - SBR</td>
<td>08/01/12</td>
<td>5/5 (100%)</td>
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<tr>
<td>Assessing Risk in Social and Behavioral Sciences - SBR</td>
<td>08/01/12</td>
<td>4/5 (80%)</td>
</tr>
<tr>
<td>Informed Consent - SBR</td>
<td>08/02/12</td>
<td>5/5 (100%)</td>
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<td>Privacy and Confidentiality - SBR</td>
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<tr>
<td>Regis University</td>
<td>08/02/12</td>
<td>no quiz</td>
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</table>

For this Completion Report to be valid, the learner listed above must be affiliated with a CITI participating institution. Falsified information and unauthorized use of the CITI course site is unethical, and may be considered scientific misconduct by your institution.

Paul Braunschweiger Ph.D.
Professor, University of Miami
Director Office of Research Education
CITI Course Coordinator

Return
Appendix F

Regis Institutional Review Board Approval

February 4, 2013

Carol Wallman
8059 Timberwolf Circle
Wellington, CO 80549

RE: IRB #: 13-029

Dear Ms. Wallman:

Your application to the Regis IRB for your project “Comparison of NNP Needle Thoracostomy Procedural Competency after Completion of an Online Module or Standard Textbook Review” was approved as an expedited study on February 4, 2013. It is approved under research category #7.

If changes are made in the research plan that significantly alter the involvement of human subjects from that which was approved in the named application, the new research plan must be resubmitted to the Regis IRB for approval. Projects which continue beyond one year from their starting date require IRB continuation review. The continuation should be requested 30 days prior to the one year anniversary date of the approved project’s start date. A completion report of the findings of this study should be sent to the IRB.

In addition, it is the responsibility of the principal investigator to promptly report to the IRB any injuries to human subjects and/or any unanticipated problems within the scope of the approved research which may pose risks to human subjects. Lastly, a final report should be submitted at completion of the project and it is the responsibility of the investigator to maintain signed consent documents for a period of three years after the conclusion of the research.

Sincerely,

Patsy McGuire Cullen, PhD, CPNP
Chair, Institutional Review Board
Associate Professor and Director
Department of Accelerated Nursing
Loretto Heights School of Nursing
Rueckert-Hartman College for Health Professions
Regis University

cc: Dr. Cris Finn

A JESUIT UNIVERSITY
Appendix G

Colorado Multiple Institutional Review Board Approval

Certificate of Approval

10-Jan-2013

Investigator: Carol Wallman

Sponsor(s):

Subject: COMIRB Protocol 12-1592 Initial Application

Effective Date: 08-Jan-2013

Expiration Date: 07-Jan-2014

Expedited Category: 7

Title: Comparison of Neonatal Nurse Practitioner needle thoracentesis procedural competency after completion of an online module or standard textbook review

All COMIRB Approved Investigators must comply with the following:

- For the duration of your protocol, any change in the experimental design/consent and/or assent form must be approved by the COMIRB before implementation of the changes.
- Use only a copy of the COMIRB signed and dated Consent and/or Assent Form. The investigator bears the responsibility for obtaining from all subjects “Informed Consent” as approved by the COMIRB. The COMIRB REQUIRES that the subject be given a copy of the consent and/or assent form. Consent and/or assent forms must include the name and telephone number of the investigator.
- Provide non-English speaking subjects with a certified translation of the approved Consent and/or Assent Form in the subject’s first language. The investigator also bears the responsibility for informing the COMIRB immediately of any Unanticipated Problems that are unexpected and related to the study in accordance with COMIRB Policy and Procedures.
- Obtain COMIRB approval for all advertisements, questionnaires and surveys before use.
- Federal regulations require a Continuing Review to renew approval of this project within a 12-month period from the last approval date unless otherwise indicated in the review cycle listed below. If you have a restricted/high risk protocol, specific details will be outlined in this letter. Non-compliance with Continuing Review will result in the termination of this study.

You will be sent a Continuing Review reminder 75 days prior to the expiration date. Any questions regarding this COMIRB action can be referred to the Coordinator at 303-724-1056 or UCHSC Box F-460.

Review Comments:

This expedited approval includes:
- Application, v12/1/12 and attachment F
- Protocol
- Consent/authorization form
- LCAT evaluation
- Demographic questionnaire
- Needle Thoracentosy
- Email script
Appendix H

Neonatal Needle Thoracostomy On-line Module

Objectives

Upon completion of this module the participant will be able to competently demonstrate neonatal needle thoracostomy upon evaluation by an expert neonatal nurse practitioner (NNP) utilizing the Leicester Clinical Assessment Tool which includes the following components:

- Effective communication
- Safety
- Infection prevention
- Procedural competency
- Team work (McKinley, 2008)

Neonatal Needle Thoracostomy

An online module for procedure review

Objectives

- Needle thoracostomy is defined as the use of a needle to create an opening in the chest wall to remove fluid or air
- Needle thoracostomy is also referred to as 'simple aspiration' or needle thoracentesis (Reynards, Ulberg, Vitek, Chun, & Harrigan, and NANNP 2010)

Objectives

- Upon completion of this module the participant will be able to competently demonstrate neonatal needle thoracostomy upon evaluation by an expert neonatal nurse practitioner (NNP) utilizing the Leicester Clinical Assessment Tool which includes the following components:
  - Effective communication
  - Safety
  - Infection prevention
  - Procedural competency
  - Team work (McKinley, 2008)
Pulmonary Air Leak

A pulmonary leak in the neonatal population may be a life-threatening situation. The neonatal period is the most common period for presentation of a pulmonary air leak. The presence of a pulmonary air leak requires rapid diagnosis and management (Limanovitz & Carlo, 2008).

Neonatal Risk Factors for Pulmonary Air Leak

- Neonates have many risk factors increasing their incidence of a pulmonary air leak.
- Some of these risk factors include:
  - Respiratory distress syndrome
  - Meconium aspiration syndrome
  - Aspiration of blood or amniotic fluid
  - Pneumonia and sepsis
  - Need for mechanical ventilation (Limanovitz & Carlo, 2008)

Clinical Presentation of Pneumothorax

- Clinical signs and symptoms of a pneumothorax include:
  - Respiratory distress
  - Diminished breath sounds on the affected side
  - Diminished heart sounds (AHA/AAP, 2011)

Clinical Presentation of a Tension Pneumothorax

- When the pneumothorax is under tension, or placing increased pressure within the pleural space and preventing lung expansion, signs and symptoms may include:
  - Tachypnea and/or tachycardia
  - Hypotension
  - Cyanosis
  - Poor peripheral pulse (AHA/AAP, 2011)

Clinical Confirmation of a Pneumothorax

- When an infant's clinical presentation is concerning for a possible pneumothorax, the next step is to confirm the diagnosis.
  - Transillumination with a flashlight of the suspected side of the pneumothorax will illuminate nicely on the affected side if a pneumothorax is present (AHA/AAP, 2011)
Clinical Confirmation of a Pneumothorax

- Definitive diagnosis of a pneumothorax is obtained by evaluation of a chest x-ray (CXR).

Right tension pneumothorax on CXR

Indications for Needle Thoracostomy

- Indications for needle thoracostomy include the presence of a pneumothorax that is:
  - Under tension
  - Causing significant respiratory distress
  - Causing lung collapse with ventilation and perfusion abnormalities
  - In the presence of a bronchopleural fistula

  The needle thoracostomy may be a temporary measure while preparing for thoracostomy tube placement (MacDonald, Ramasethu, & Rais-Bahrami, 2012)

Indications for Needle Thoracostomy

- Large pleural fluid collections can also be an indication for needle thoracostomy

Examples of pleural fluid include:
  - Pleural effusion
  - Empyema (pus in the pleural space)
  - Chylothorax (lymphatic fluid in pleural space (MacDonald, Ramasethu, & Rais-Bahrami, 2012)

A pneumothorax causing significant clinical compromise usually requires evacuation of the air

However, a small and asymptomatic pneumothorax may not require intervention and may resolve spontaneously (AHA/AAP, 2011 and MacDonald, Ramasethu, & Rais-Bahrami, 2012)

Contraindications for Needle Thoracostomy

- Small pulmonary air or pleural fluid collections without significant hemodynamic symptoms

- Spontaneous pneumothorax that is likely to resolve without intervention (AHA/AAP, 2011 and MacDonald, Ramasethu, & Rais-Bahrami, 2012)

Potential Complications of Needle Thoracostomy

- Pain
- Lung perforation
- Vessel perforation
- Accidental reinjection of air or fluid into chest cavity (AHA/AAP, 2011 and MacDonald, Ramasethu, & Rais-Bahrami, 2012)
Preparation for Procedure

- Review indications for needle thoracostomy
- Discuss plans with family if patient condition allows
- Discuss plans with team members
- Complete time out according to institution guidelines
- Anticipate and prepare for pain management
- Prepare needed equipment

Pain Management

- Acute clinical presentation may not allow time for additional pain management prior to performance of procedure
- Recognize potential need for pain management beyond procedure completion
- IV opioid treatment may be indicated (Batton & Wallman and AAP Committee on Fetus and Newborn 2007)

Equipment

- Drapes
- Antiseptic prep
- Large syringe
- Tourniquet
- Stopcock
- Butterfly needle or angiography set-up

Procedural Technique for Needle Thoracostomy

- Use antiseptic to cleanse the appropriate hemithorax
- Use of universal precautions, including gloves

Procedural Technique

Initial needle insertion at 45 degrees then gently decrease angle to 15 degrees
- Use one hand to secure needle at insertion site, while aspirating with syringe with other hand.
Needle Thoracostomy

• Additional Tips for success:
  - Avoid excessive aspiration since it increases the risk for lung perforation
  - Use of an angio-catheter rather than needle has been shown to decrease the risk for lung perforation (MacDonald, Ramasethu, & Rais-Bahrami, 2012)

References


Children's Hospital of Colorado (2011). Neonatal nurse practitioner competency program. Raw unpublished data


Post-procedure Care

• Remove any remaining disinfectant with normal saline wipe
• Insertion site may be covered with an op-site or petroleum jelly and gauze dressing
• Administer infant’s pain and intervene appropriately
• Discuss follow-up care plans with team members
• Update family members

References


Appendix I

Demographic Questionnaire

Neonatal Nurse Practitioner Needle Thoracostomy Competency Evaluation

Please respond to the following questions based on your experience as an NNP.

1. How long have you been practicing as an RN? __________

2. How long have you been practicing as an NNP? __________

3. How long have you worked for the Children’s Hospital Colorado (CHCO) system as an NNP? __________

4. What is your age?
   a. < 30 years old
   b. ≥30 years old but <40
   c. ≥40 years old but <50
   d. ≥50 years

5. On average, how many clinical hours do you work per week?
   a. 12 hours or less
   b. ≥12 hours but <24 hours
   c. ≥24 hours but < 36 hours
   d. ≥36 hours

6. What is the Level of nursery for your primary clinical site as defined by AAP Levels of Care 2012?
   a. Level I
   b. Level II
c. Level III
d. Level IV

7. What is the Level of nursery for your secondary clinical site as defined by AAP levels of Care 2012?
   a. Level I
   b. Level II
   c. Level III
   d. Level IV
   e. N/A (do not have a secondary site)

8. How many needle thoracostomies (thoracentesis) have you performed in the past year on a live neonatal patient?
   a. 0
   b. 1 or 2
   c. 3 or greater

9. How many needle thoracostomies (thoracentesis) have you observed in the past year on a live neonatal patient?
   a. 0
   b. 1 or 2
   c. 3 or greater

10. What do you perceive as barriers to obtaining 3 or more needle thoracostomy (thoracentesis) procedures on a live neonatal patient in the past year? Please choose ALL that apply.
    a. Lack of patients in my setting needing needle thoracostomy (thoracentesis)
    b. Competition for procedure, i.e. other NNPs, NNP students, residents, fellows, attending physicians
    c. Discomfort with the procedure so allow others to complete
    d. No barriers; I perform 3 or more procedures/year
    e. Other (please be specific):____________________________________________________

11. What is your preferred method of procedure review?
    a. Live didactic presentation
    b. Online review module
    c. Text book review
    d. Other (please specify):____________________________________________________

12. Were you able to complete the online module or textbook review within 1 week prior to participating in the procedure evaluation?
    a. Yes
b. No

IF you completed the **online module** please complete questions 13,14, and 15. If you completed the **textbook review** please do NOT answer questions 13,14,15.

13. What do you think was the most helpful part of this online module?
   a. Written content
   b. Pictures
   c. Case studies
   d. Other (please specify): ______________________________________

14. Have you completed other online educational modules in the past?
   a. Yes
   b. No

15. How would you rate the length of this module?
   a. Too short
   b. Too long
   c. Just right
Appendix J

Participant Consent

Date: 12/4/12 Valid for Use Through: 9/30/13

Study Title: Comparison of Neonatal Nurse Practitioner neonatal needle thoracostomy procedural competency after completion of an online module or standard textbook review

Principal Investigator: Carol Wallman RN, MS, NNP-BC
COMIRB No: 12-1592
Version Date:
Version No:

You are being asked to be in a research study. This form provides you with information about the study. A member of the research team will describe this study to you and answer all of your questions. Please read the information below and ask questions about anything you do not understand before deciding whether or not to take part.

Why is this study being done?

This study will investigate Neonatal Nurse Practitioner (NNP) neonatal needle thoracostomy procedural performance after completing an online module versus a textbook review.

You are being asked to be in this research study because you are an NNP employed by Children’s Hospital Colorado and performing neonatal needle thoracostomy is within your job description. Up to 75 people will participate in the study.
What happens if I join this study?

If you join the study, you will be randomized to either complete standard textbook review or an online module review within one week of your scheduled skills day. During skills day an expert NNP will evaluate your neonatal needle thoracostomy procedure performance for competence per standard practice. The review will take approximately 15 minutes and the evaluation will last approximately 15 minutes.

What are the possible discomforts or risks?

Discomforts you may experience while in this study include mild anxiety related to being evaluated on skill performance.

______Initials

What are the possible benefits of the study?

This study is designed to learn more about best practice strategies related to content review for essential NNP procedures and evaluation for NNP procedure competence.

You will not be paid to be in the study.

It will not cost you anything to be in the study.

Is my participation voluntary?

Taking part in this study is voluntary. You have the right to choose not to take part in this study. If you choose to take part, you have the right to stop at any time. If you refuse or decide to withdraw later, you will not lose any benefits or rights to which you are entitled. This will in no way affect your employment at CHCO.

Who do I call if I have questions?

The researcher carrying out this study is Carol Wallman. You may ask any questions you have now. If you have questions later, you may call Carol Wallman at (970) 581-7462

You may also have questions about your rights as someone in this study. You can call Carol Wallman at (970) 581-7462 with questions or Dr. Cris Finn, (Capstone Chair, at Regis University at 719-661-6750). You can also call the Multiple Institutional Review Board (IRB) at 303-724-1055.

Who will see my research information?

All data from this study will be de-identified and cannot be linked with any individual participant. We will do everything we can to keep your records confidential. All data will be kept on a password-protected computer, and any papers will be kept in a locked file cabinet in the investigator’s personal office. Confidentiality cannot be guaranteed.
Both the records that identify you and the consent form signed by you may be looked at by others such as:

- Federal agencies that monitor human subject research
- Human Subject Research Committee
- The group doing the study
- Regulatory officials from the institution where the research is being conducted who want to make sure the research is safe

The results from the research may be shared at a meeting in aggregate only and no individual names or locations will be used. The results from the research may be in published articles. Your name will be kept private when information is presented.

_____ Initials
Agreement to be in this study

I have read this paper about the study or it was read to me. I understand the possible risks and benefits of this study. I know that being in this study is voluntary. I choose to be in this study: I will get a copy of this consent form.

Signature:__________________________________________ Date:_______

Print Name:__________________________________________

Consent form explained by:____________________________ Date:________

Print Name: _________________________________

Investigator:______________________________________ Date:________