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Improving Neonatal Resuscitation Readiness

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Improving Neonatal Resuscitation Readiness

By

Benay Johnson

DNP Scholarly Project Committee:

Dr. Mary Ellen Roberts-Chair

Dr. Katherine Hinic

Theresa Uva, RN, MSN

Submitted in partial fulfillment of the requirements for the degree of

Doctor of Nursing Practice

Seton Hall University

2018

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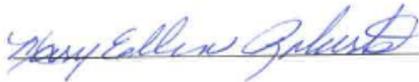
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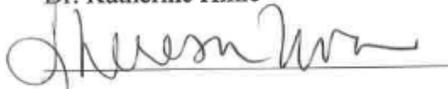
Dr. Mary Ellen Roberts

Date: 3/13/18

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Abstract

According to the AHA and the AAP, approximately 10% of newborns require some assistance to begin breathing at birth; less than 1% need extensive resuscitative measures to survive (2015). There is an abundance of evidence-based literature on the need for neonatal resuscitation readiness. However much of this literature is targeted toward teamwork efforts during the act of resuscitation. This DNP scholarly project is to take a step back to improve the actual set-up component required for neonatal resuscitation. There can be instances in which equipment is not properly set-up or the set-up is not appropriate for the gestational age of the newborn. Based on the PICO format the question for this project: Does initiating a comprehensive pre-resuscitation checklist increase neonatal resuscitation readiness? This can be the foundation for further studies on neonatal outcomes based on neonatal resuscitation and use of a neonatal resuscitation checklist on neonatal outcomes.

Dedication

This project has truly been a labor of love. I dedicate this body of work to my husband Kevin Darnell, who has been my biggest cheerleader. He often refers to me as his hero. He continues to win my heart with his ongoing support to enrich my life. My children, Kevin Daniel and Erin Benay, have been my inspiration. I hope and pray that in observing me pursue my goals, they have learned that persistence is key. I have never discounted that I have a praying mother who has taught me that prayer is the way to communicate to God for guidance and assistance when exhausted, lost, or I am faced with what seems impossible.

I also dedicate this body of work to my NICU colleagues: Meghan, Serena, Mario, Laura, Aruna, and Dr. Marte for the hard work we do. I could not have done this without your support.

To any parent whose newborn has required some aspect of NICU intervention at the start of life, this is dedicated to you and your special newborn.

Acknowledgements

Dr. Roberts, you were there when I wanted to abandon my clinical setting and this project. The time that you took with me when I was facing a difficult and impossible situation was invaluable. You are an excellent role model. Thank you for your encouragement, support, positive thinking and being the best advisor, a student could have.

To Teresa Uva, Director of Nursing for Maternal Child Health you are my champion. Thank you for your advice and suggested revisions to carry my project forward. Ms. Uva, you have been a great listener and advisor. Thank you for making this happen when it seemed impossible. Your availability to me has been priceless.

To the nurses and OB techs on labor and delivery, your enthusiasm was truly inspiring. Your willingness to listen, question, and learn in our ongoing mission to provide the best care not only to women who turn to you during their special time but also to the smallest of patients that come into the world.

To my colleagues. Thank you for your willingness to cooperate in the gathering of information. Most of all, thank you, Serena and Meghan, next to my family, you have been my biggest cheerleaders, listeners, great advisors, and shoulders to cry on when I had enough. I am proud to be your colleague.

Thank you to Dr. Katherine Hinic. I do not discount that you volunteered to be participate in my journey. Thank you for your encouraging words and committed time to see this project to completion. I am truly grateful.

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Improving Neonatal Resuscitation Readiness

Executive Summary

Neonatal Nurse Practitioners (NPs) and house physicians (HPs) as part of the Neonatal Intensive Care Unit (NICU) medical team are required to attend all high-risk deliveries in anticipation that the neonate will require some form of assistance with breathing and/or circulation. All medical personnel working in the NICU and the labor and delivery unit must be certified in the didactic as well as the technical aspect of the Neonatal Resuscitation.

According to the American Heart Association (AHA) and the American Academy of Pediatrics (AAP), approximately 10% of newborns require some assistance to begin breathing at birth; less than 1% need extensive resuscitative measures to survive (2016). There is an abundance of evidence-based literature on the need for neonatal resuscitation readiness. However, much of this literature is targeted toward teamwork efforts during the act of resuscitation. The Neonatal Resuscitation Program (NRP) developed by the AHA and the AAP (2016) provides a checklist in preparing for neonatal resuscitation.

The use of checklists in healthcare has gained popularity due to its success in other industries such as aviation. This DNP scholarly project took a step back to improve the actual set-up component required for neonatal resuscitation. There can be instances in which equipment was not functional, properly set-up or the set-up was not appropriate for the gestational age of the newborn. The delay in acquiring appropriate and functional equipment at the time it is needed can delay neonatal resuscitation effort leading to a deterioration in clinical status.

Education to 37 nurses and five Obstetric Technicians (OB Techs) including the Nursing Educator for Maternal Child Health working on an inner-city 6-bed labor and delivery unit with

two operating suites were educated at the bedside, in this case, the radiant warmer on the proper preparation of the radiant warmer for neonatal resuscitation based on NRP guidelines using a checklist. An adapted NRP pre-resuscitation checklist (Appendix A) was introduced along with step by step instruction in the preparation of the radiant warmer to serve as a reference for nurses preparing for neonatal resuscitation. Pre-assessment and post-assessment tools were used to assess improvement.

The proposed methodology was discussed with stakeholders prior to the initiation of this quality improvement (QI) project. Following approval, the project was implemented. The goal of this project was to improve the preparation of the radiant warmer using an adapted pre-resuscitation checklist. This can be the foundation for further nursing QI projects on neonatal outcomes based on neonatal resuscitation readiness.

Background

The idea of improving neonatal resuscitation readiness comes from close observations and experiences in performing neonatal resuscitation. It is the responsibility of NPs and the HPs to attend, assess, and provide immediate medical intervention at all high-risk deliveries. Any newborn has the potential to require resuscitation. Neonatal outcomes, in certain instances, are dependent on a newborn's first few minutes of life. Items required for neonatal resuscitation should be appropriate for gestational age, functional, and within reach for the NICU medical team.

The impetus for this DNP project was deliberated for over a year prior to initiation. My colleagues and I would attend deliveries where equipment was not readily available for neonatal resuscitation. There have been instances in which equipment was missing, not properly set-up or the set-up was not appropriate for the gestational age of the newborn. This included items

necessary to clear an airway and items for intubation. There was a lack of readiness. Preparation for neonatal resuscitation is a process. Broken processes contribute to medical errors (Kohn, Corrigan, & Donaldson, 2000). The lack of equipment preparedness at times hindered immediate resuscitation and placed a growing wedge between the working relationship of the NICU team and the nursing staff of labor and delivery.

Radiant warmer preparation in anticipation of neonatal resuscitation begins at the time of admission of the expectant mother. Currently, the OB techs are responsible for supplying each room with items needed for neonatal resuscitation. The bedside nurse has the responsibility to tailor the supplies for the anticipated gestational age of the newborn. There is no required form to provide documentation that supplies were replaced and tailored for the pending delivery. There becomes a lack of accountability when items are not available for use at resuscitation.

Resuscitation guidelines allocate 30-60 second intervals of intervention (AHA & AAP, 2011). A study by McCarthy, Morley, Davis, Kamlin, and O'Donnell (2013) demonstrated that interventions recommended in resuscitation guidelines are commonly not completed within the allocated time. Functionality and availability of equipment may be factors that contribute to a delay in carrying out steps in neonatal resuscitation within the recommended allocated time. Further evidence is needed to conclude that a factor of these delays could possibly be attributed to a lack of readiness in materials needed for neonatal resuscitation. Much has been written on the topic of neonatal resuscitation but with limited information provided on the topic of preparing for neonatal resuscitation.

The first minute of life is crucial to assisting a newborn in the transition to extrauterine life. Hypothermia and the inability to establish a patent airway within 60 seconds of life can lead to labored breathing, persistent cyanosis, oxygen desaturation, apnea, and bradycardia. If

allowed to progress, further deterioration can occur leading to asphyxia or cardiac failure in the newborn. Part of this process is the preparation of equipment.

Newborns lose the most body heat the first 30 minutes of life (Fastman, Howell, Holzman, & Kleinman, 2014). Hypothermia can occur in any newborn. Babies who are born preterm, low birth weight (LBW), small for gestational age (SGA), and babies who exhibit intrauterine growth retardation (IUGR) are at greatest risk due to a high ratio of surface area to body weight, little subcutaneous fat, and reduced glycogen, and reduced brown fat stores (Gomella, 2009).

There are many methods to decrease hypothermia in the newborn such as drying the baby, covering the head with a cap, use of an incubator, and skin-to-skin maternal contact. The goal for all newborns is to provide a neutral thermal environment which promotes body temperature stability (Knobel, 2014). In uncomplicated deliveries, newborns who are not in distress can immediately be placed on the mother for skin-to-skin contact. This method is preferred and has been demonstrated to be effective in warming newborns (Fastman et al., 2014), however this method is inappropriate for the newborn who is in distress. In the case of the baby requiring medical assistance by the NICU team, the simplest method is to place the newborn on a warm surface under radiant heat.

According to Fastman et al., “hypothermia appears manageable with careful and focused attention that recognizes each instance as a patient safety failure, rather than an expected if undesirable, outcome” (2014). Survival of a neonate is increased with successful prevention of hypothermia (Gomella, 2009). There is recognition that some babies may be more prone to hypothermia than others, however, the goal is to anticipate the needs of the newborn to prevent deterioration in status in an already stressed newborn and prevent admissions to the NICU for

respiratory distress related to hypothermia thus separating the newborn from the mother. Nursing must understand the implications of not completing the simple step of setting up the neonatal radiant warmer. Education backed by evidence promotes evidence-based practice. This is the key to promote safety in preparing for neonatal resuscitation.

Part of this process is the preparation of equipment. Even with NRP guidelines available errors in preparation for neonatal resuscitation continue to plague many neonatal units. There were inconsistencies in the set-up of each delivery room. This problem must be corrected and a culture of willingness for sustained change established for the good of all newborns, all staff involved in neonatal resuscitation, the unit, and the organization. NICU staff is called to all high-risk deliveries to provide medical intervention if needed. Newborns requiring immediate medical intervention are placed on a warming bed to facilitate resuscitative efforts. There are cases where the warming beds were not turned on or found to be nonfunctional. This tends to be a neglected step in preparing for neonatal resuscitation. The implications of such can further distress a newborn that is predisposed to stress. To turn on a warming bed is a simple but neglected step. In nursing practice, the safety of LBW babies depends upon pre-warming surfaces that will encounter the newborn (Fastman et al., 2014).

Conduction and radiation are the major causes of heat loss. In most of the delivery rooms, the radiant warmer is situated next to a large window. This positioning of the radiant warmer can be considered a source of neonatal heat loss lending support to the importance in preparing the radiant warmer for delivery or more importantly, neonatal resuscitation. This piece of equipment is essential to allow resuscitative measures to occur while providing heat to the newborn. Surfaces should be warmed to prevent heat loss through conduction and radiant warmer can increase the heat by radiation (Knobel, 2014). This simple step in preparing for all deliveries

could potentially prevent admissions to the NICU in those who lack fetal and maternal risk factors.

At times, the NPs or HPs may be required to attend high-risk deliveries without a second person due to staffing and flow of the NICU. There may not be time for the NICU team member to check the appropriateness, availability, or functionality of the equipment needed for neonatal resuscitation. It is imperative that the radiant warmer is prepared appropriately to prevent delays in resuscitation due to equipment issues. The NICU team had noticed a trend in the lack of appropriate set-up for neonatal resuscitation. The lack of appropriate neonatal resuscitation readiness can lead to a delay in neonatal resuscitation and can change the course of a good to a poor outcome which may require the transfer of the infant for more advanced neonatal care. This type of scenario separates the mother-baby unit leading to unhappy parents and loss of income to the unit and organization.

Persistent symptoms of distress after delivery are causes for admission to the NICU. Any newborn can require resuscitation efforts whether the expectant mother is high-risk or not. The key is to be prepared always for the expectant and the unexpected. Each delivery room should be set up with a radiant warmer bed in addition to equipment for suction, bag-and-mask, intubation, medications, and umbilical vessel catheterization (AHA/AAP, 2016).

The suggestion has been made to use a bulb syringe if the suction is not available. There are problems with the use of bulb syringes. Alur, Liss, Ferrentino, & Super (2012) determined that many brands of bulb syringes do not generate the amount of pressure recommended by NRP guidelines and depending on the size of the bulb syringe can occlude the nasal passages of preterm neonate and produce a pneumothorax. Endotracheal intubation can be one of the most difficult procedures during neonatal resuscitation (Nadler, McLanders, Sanderson, & Liley,

2016). Intubation can be stressful for a neonate; therefore, timeliness and precision are critical (Nadler et al., 2016).

Project Description

This project was created as a quality improvement (QI) project to increase the safety of the newborn in the delivery room based on the PICOT question: Does initiating a comprehensive pre-resuscitation checklist increase neonatal resuscitation readiness? To this author's awareness, no QI projects have been initiated on this topic. For optimal patient outcomes, healthcare professions are required to work as a team to interpret observations and documentation to respond appropriately to acute time pressures (Yamada, Yaeger, & Halamek, 2015). According to Drucker (as cited by Warren, 2014) "you can't manage what you don't measure".

Stakeholders of the Project

Stakeholders to include neonates, parents, NNPs, HPs, labor and delivery nursing staff, and hospital administration. The overall aim of this DNP scholarly project was to improve neonatal readiness. Although most of the interventions were geared toward the labor and delivery nursing staff, there are other stakeholders involved which include indirectly, the neonate and parental unit.

Anticipated Project Outcomes

Outcomes were determined based on inputs as well as project outputs. Short-term outcomes were to obtain hospital as well as divisional approval to conduct the project. In addition to obtaining approval, another short-term outcome was that the organization would incur the cost of all materials past initiation of the project. The ongoing materials were paper and ink for printing in black and white as well as color, lamination of bedside and lanyard reference

cards, as well as the small chains required to connect the bedside reference card to the radiant warmer.

Medium-term outcomes included the use of the adapted NRP pre-resuscitation checklist when admitting an expectant mother to labor and delivery. The use of the checklist was anticipated to increase some accountability in the preparation of the radiant warmer for resuscitation. Looking at long-term outcomes, the labor and delivery room staff will continue to strive toward 100% compliance in preparing for neonatal resuscitation with the continued use of the adapted NRP pre-resuscitation checklist as part of the maternal electronic medical record.

Phases of Initiation

Pre-assessment began in September 2017 with the project concluding in February 2018. It was my belief that there was a lack of knowledge on preparing the radiant warmer for neonatal resuscitation. The adapted NRP pre-resuscitation checklist was used to formulate the Neonatal Resuscitation Equipment Assessment form (NREA). The NREA (Appendix B) was used to evaluate the preparation of the radiant warmer by the NICU team. Education on the steps in preparing the radiant warmer for neonatal resuscitation was provided focusing on the rationale for each step. The adapted pre-resuscitation checklist was added as a reference tool to assist in guiding the nursing staff in preparing the radiant warmer. There has been an overall improvement in preparing the radiant warmer for neonatal resuscitation as demonstrated in pre and post evaluations.

Project Significance

There is an abundance of evidence-based literature on the need for neonatal resuscitation readiness. However much of this literature is targeted toward teamwork efforts during the act of resuscitation. This DNP scholarly project took a step back to the beginning of the process to

improve the actual set-up component required for neonatal resuscitation. The goal was to have 90% to 100% compliance in preparing the radiant warmer at the end of the project. This project was the foundation for further studies on neonatal outcomes based on neonatal resuscitation and use of a neonatal resuscitation checklist on neonatal outcomes.

As the target audience for this project, it is expected that all labor and delivery room nursing staff who are responsible for preparing equipment for neonatal resuscitation will participate. This QI project will benefit all stakeholders, specifically, the neonate. Stakeholders to include neonates, parents, NNPs, HPs, labor and delivery nursing staff, and hospital administration.

NRP has identified 10 key behavioral skills important in neonatal resuscitation one of which is anticipation and planning (AHA & AAP, 2011). Sawyer, Leonard, Sierocka-Castaneda, Chan, and Thompson (2014) found a correlation between technical and behavioral skills. Constant mindfulness of the inherent risks to safety and how these can be prevented is a framework present in all highly reliable complex systems (Lachman, Jayadev, & Rahi, 2014) which would improve anticipation of what may happen in real time. The development of a culture that fosters and enhances safety is the first step on the QI journey and may require examination of what care should look like (Lachman et al., 2014). We need to ask if this is the best we can do (Lachman et al., 2014). Real outcome measures in health care are not what immediately happens but what the survival means for the neonate (Lachman et al., 2014). This, I propose, starts at birth.

Halamek (2013) defined elements that define human performance. These elements, intrinsic and extrinsic, influence human performance. Halamek noted in an earlier article that to deliver safe, effective and efficient care to neonates one must possess cognitive, technical, and

behavioral skills (Halamek, 2007). This article provided the basis for the rationale in conducting this DNP project. The thought was to address cognitive issues (knowledge) along with technical (staff handling equipment and using checklist) to alter behavioral skills.

Fragmented health processes are noted by Berntsen (2006) as a barrier to reaching the Institute of Medicine's (IOMs) dimensions of quality. Human error can be viewed as the person approach or the system approach (Reason, 2000). I choose to focus on the system approach, a lack of education. This was an initial attempt to alleviate the focus on blaming individuals on inappropriate neonatal resuscitation set-ups. Reason (2000) pointed out that the person approach has serious shortcomings and is ill-suited to the medical domain.

Improving neonatal resuscitation readiness fits the SMART criteria by being specific, measurable, attainable, relevant, and timely (Campbell, 2015) addressing safety and effectiveness as the dimensions of quality to improve. The foundation for this project lies in the lack of preparedness. To improve and promote quality in this area of neonatal care, the objectives of this project were:

- Formulation of a clinical question based on the PICOT model
- Formulation of a questionnaire, Neonatal Resuscitation Equipment Assessment (NREA) to be administered to stakeholders responsible for performing neonatal resuscitation to assess equipment readiness in the preparation of neonatal resuscitation
- Prepare a questionnaire to be administered to labor and delivery nursing staff to assess knowledge of supplies and equipment required for neonatal resuscitation.
- Compare the results of the NREA questionnaire before and after applying an educational review of the NRP guidelines in preparing for neonatal resuscitation.

- Design a laminated reference card that can be attached to employee badge/lanyard stating the items needed for setting up a radiant warmer for neonatal resuscitation on one side with an adapted NRP neonatal pre-resuscitation checklist based on the NRP Pre-Resuscitation checklist. This checklist was based on items recommended by American Heart Association and the American Academy of Pediatrics' Neonatal Resuscitation Program (NRP) for neonatal resuscitation preparation.
- Draw conclusions based on the synthesis of the evidence determining evidence-based processes and follow-up.
- Monthly self-evaluation to assess the progression of the scholarly project.
- Propose change to nursing and medical assessment and treatment based on evidence.
- Apply empiric evidence to the benefits of using a checklist in NRR.
- Share finding of QI project with nursing and medical staff.
- Formulate a plan to further academic study in topic based on the evidence.
- Submit findings for peer-reviewed publication.

The AAP has operationalized the IOMs definition and framework of six dimensions of health care as the right care for every child every time (McInermy & Sachdeva, 2013). The model for quality at the AAP utilizes a 3-step process: first developing quality guidelines for practice, second implementing strategies for education, and measuring quality to allow continuing quality improvement, creating a culture of transparency and shared learning (McInermy & Sachdeva, 2013). The key to QI in the NICU is to develop the structures for good care and to ensure the processes are reliable (Lachman et al., 2014). One of these processes is to have every delivery room within our organization to be 100% prepared for neonatal resuscitation. Evidence-based improvements in patient safety and reduction in patient care errors

also directly contribute to improved patient outcomes (Kilday, Spiva, Barnett, Parker, & Hart, 2013).

Literature Review

Theoretical Review

It was difficult to place this project under one nursing theory. Guidance was obtained by researching nursing theories associated with the field of pediatrics. Petiprim (2016a) listed a website dedicated to categorizing nursing theory within a specialty of nursing. First, I had to assess to whom this project was directed toward. Although the primary and major stakeholder was the neonate, the actions of the project were directed toward the nursing staff. In thinking about this project in a comprehensive manner, I chose two theories to be the basis of improving neonatal resuscitation readiness. Florence Nightingale's theory is credited with establishing nursing based on theoretical principles. Nightingale's environment theory was housed in the category of neonatal intensive care nursing (Petiprin, 2016b).

The environmental theory considers the environment as an important aspect of patient care. Using this theory as a base for my project was justified in that improving neonatal resuscitation readiness occurs in the patient environment after deliver on the radiant warmer (Petiprin, 2016c). Nightingale considered the environment of the patient in terms of fresh air, cleanliness, and pure water. I would venture that the environment can extend, in modern times, to the neonatal radiant warmer.

In addition to attaching Nightingale's environment theory to this project, the theory of nursing as caring seemed appropriate. Formulated by Boykin and Schoenhofer, according to Shearer (2015), this theory uses minimal concepts and involves lived experiences. Shearer states, "A shared lived experience in which the caring between nurse and nursed enhances personhood;

the locus of all that is known and done in nursing. The place where nurse responds to the professional call and commitment, communicated through presence” (2015, p.2).

Much of nursing theories are known to be somewhat abstract. The nursing as caring theory is personal (Boykin & Schoenhofer, 2001). There are six assumptions presented by Boykin and Schoenhofer (2001): persons are caring by their humanness, persons are caring, moment to moment, persons are whole or complete in the moment, personhood is a process of living grounded in caring, personhood is enhanced through participating in nurturing relationships with caring others, and nursing is both a discipline and a profession. Nursing is a profession that vastly depends on teamwork. In working as a team to accomplish a common goal, we bond or should bond in the satisfaction of saving a new life. I was touched by the statement by Boykin and Schoenhofer, “The nature of relationships is transformed through caring. All relations between and among persons carry with them mutual expectations. Caring is living in the context of relational responsibilities” (2001, p. 4).

I have no doubt that each person working with a new life desires to provide the best care. It is my desire that through helping the labor and delivery room staff improve in the preparation of the radiant warmer for resuscitation, this will improve the working relationship between the two units.

Examination of the Literature

Checklists have been used in many industries to promote preparation and guidance in activities. Use of checklists in the workplace has foundations in the aviation industry, now healthcare has begun to demonstrate its usefulness. Although there is growing popularity of its use in healthcare, checklists are only useful if diligently used by the individuals for which they are intended.

Data Sources from The Cumulative Index to Nursing and Allied Health Literature (CINHAL) and ProQuest Dissertations and Theses Global were used to search databases. Using the keywords of neonatal resuscitation from 1954 to 2018, produced 237 full-text articles were produced from CINHAL. The quantity was reduced to 17 when keywords of resuscitation and checklist were combined with the word neonatal. From ProQuest Dissertations and Theses Global, 779 articles were produced using the time span of 2005 to present, decreasing to 14 when the keyword of nursing was added to the search.

After the review of literature, it was determined that most of the articles reviewed the checklist in terms of evaluating skills during resuscitation with and independent of teamwork. There were several articles that use the checklist to evaluation resuscitation performance during the review of skills of teams using videotaping of performances. Some materials addressed the use of a checklist in adults and neonatology as a method to evaluate technical as well as communication skills among practitioners however the use of the checklist was not addressed. These articles were eliminated along with articles which used video as a method to evaluate staff performance in performing neonatal resuscitation.

Background on the use of checklist

The use of a checklist was taken from the aviation industry in which pilots use a checklist for every aspect of flight (Verdaasdonk, Stassen, Widhiasmara, & Dankelman, 2009). The checklist has a history in aviation to reduce human errors and improve safety (Katheria, Rich, & Finer, 2016). This helped in the consistency in training and responding to any situation in a logical sequence. Bosk, Dixon-Woods, Goeschel, and Pronovost pointed out in a 2009 article that checklists are a good way of making certain that tasks get done by reducing ambiguity. A summation of the various use of checklists is provided by Hales and Pronovost (2006).

Checklists, according to Hales and Pronovost (2006) can assist with recall of memory, regulate processes, standardization of care, and provide a framework for evaluation of care.

Thongprayoon et al. (2016) noted the need for use of a checklist in the intensive care setting to reduce provider workload and errors.

The use of checklist in healthcare

The literature supports the use of checklists in medicine. In an article by Maxwell, various checklist was shown to assist in asthma care as well as care associated with seizures, post-arrest, and syncope (2014). Verdaasdonk et al. (2009) noted that the most important use of a checklist in health care is to ensure that procedures are done correctly. The World Health Organization (WHO) devised the surgical safety checklist which has proven to improve patient outcomes before, during and after surgery (Bergs et al., 2014). The WHO checklist presents a logical sequence of steps to benefit the patient (2009). Berg and colleagues (2014) noted a solid correlation between a decrease in postoperative complications and adherence to the elements in the checklist. In a qualitative research study, Dharampal, Cameron, Dixon, Ghaili, & Quan (2016) found the surgical checklist to be helpful if it was simple but disruptive to workflow. This was considered a barrier and a possible negative effect on the current workflow of the labor and delivery unit.

Barriers to the surgical checklist have been identified in the literature. Fourcade, Blache, Grenier, Bourgain, and Minvielle (2012) identified 11 barriers to implementing a checklist. This group studied 1440 surgical procedures, 1299 checklists, and 28578 items with a mean completion rate of 61%. Important to this project are items that were thought about and eliminated. This included duplication of items within the checklist, time spent completing the

checklist, lack of understanding, and ambiguity. Thongprayoon and colleagues (2016) noted that to be effective, the checklist must easily integrate into daily practice and routines.

Hart and Owens (2005) took their cues from the aviation industry to examine the use of checklists as a method to eliminate or decrease many errors in Cesarean deliveries under general anesthesia. Voice prompts were given to 20 anesthesiologists through an electronic device. With a checklist, a median of 13 items out of 40 items was omitted. The omission rate was thought to occur because the participants assumed items had been checked by others. A checklist was felt to be useful by 95% of the anesthesiologist. It surprised me that 60% preferred a written checklist and 40% preferred verbal. This article was written in 2005. There have been advances in technology so perhaps more anesthesiologist would now prefer an electronic checklist.

Regarding resuscitation in adults, DePriest, Fee-Mulhearn, and Teleron (2013) used a checklist designed for their response team as a Read-Do Checklist in addition to the ACLS card. Their team used the Read-Do Checklist to complement ACLS recommendations.

Albolino, Dagliana, Meda, Ranzani, and Tanzini (2015) evaluated a pilot study using a childbirth checklist. The checklist was used in theory to reduce the number of neonatal deaths. The checklist was not neonatal specific but supported the use of a checklist outside the surgical area. Bennett et al. (2016) implemented the use of a checklist in the delivery room to improve the reliability of delivering known best practices and to reduce errors through standardization of care. This group initiated the *Readiness Bundle*. Not every aspect of the study was in tune with the project environment. In this project, rapid response teams contain respiratory therapist who has the responsibility to help in the equipment for intubation. This is an unrealistic scenario in my current practice, but the checklist used provided a base for the adapted NRP pre-resuscitation checklist.

The use of checklist to improve team communication

Gillespie, Withers, Lavin, Gardiner, and Marshall (2016) performed a prospective study examining team communication with the use of a checklist. The article noted that the use of a checklist is not formally taught in the medical or nursing schools and is not an indication of task compliance. The authors warned that “ticking” of a checklist can lead to unintentional complacency. The article cites from the Institute of Medicine’s report “To err is human” (Kohn, Corrigan, & Donaldson, 2000). This report is groundbreaking in noting several errors that occur in medicine. Noting that errors can be due to ineffective team communication. Lingard et al. (2005) noted that the use of checklist assists with promoting interprofessional communication in the operating arena. Although team participation is an important component of preparing for neonatal resuscitation, the use of preparing for neonatal resuscitation was not highlighted. Interprofessional collaboration is important for improving the effectiveness of healthcare services (Solberg, Hansen, & Bjørk, 2014). Nurses can provide ideas for interventions and advocate constructively for patients (Streton et al., 2016). Collaboration may be improved by improving communication (Solberg et al., 2014).

The use of checklist in pediatrics

Levy et al. (2012) evaluated the use of checklist for pediatric surgeries. The prospective study was completed to evaluate the completion of checklist components. The process involved direct observations. Out of 142 surgeries, 100% compliance was demonstrated in the pre-incision phase of surgery. There was 99% in the identification of the patient, 97% with the timeout phase of surgery, and the remainder of the checklist was completed less than 60%. The authors felt that ambiguity or misconceptions related to the checklist may be related to a lack of re-education. The idea of the need for continuing education is an important point. Norton and Rangel (2010)

performed a pilot study to test a pediatric surgical safety checklist. The pediatric surgical safety checklist was shown to promote shared responsibility in conduction time out. There was improvement in teamwork, communication, and adherence to procedures (Norton & Rangel, 2010). The authors predict that as the checklist before more widespread, that its use could deter thousands of disabilities and deaths (Norton & Rangel, 2010).

The use of checklist in neonatal resuscitation

Katheria, Rich, and Finer (2013) address the use of the checklist to facilitate preparation and communication during neonatal resuscitation. Video footage where 445 checklists were used were reviewed. The authors noted problems in communication ($n = 58$), equipment preparation ($n = 56$), inappropriate decision making ($n = 87$), leadership ($n = 56$), and procedures ($n = 25$). This study caught my attention as it noted equipment preparation. The checklist used was part of a quality assurance record and not the medical record. This was beneficial to the DNP project.

A clinical paper by Katheria et al. (2016) provided strategies to assist the preterm newborn in transition. One of the discussed strategies is made use of checklists. According to the authors, the use of the checklist ensures that required equipment is available for immediate use if neonatal resuscitation is required (Katheria et al., 2016). Although the article focused on the preterm newborn, its principles can be used in both the term and preterm newborn.

Pre-resuscitation checklists are used for briefing the care team to the equipment that they will need to prepare in the delivery room (Wyckoff, 2014). The neonatal resuscitation performance checklist was found to be a reliable and valid tool for neonatal resuscitation (Lockyer, Singhal, Fidler, Weiner, Aziz, and Curran (2006) documented checklist usage as a feasible assessment tool in evaluating neonatal resuscitation skills. The article reaffirms the need to conduct this QI however it does not specifically address preparing for neonatal resuscitation in

terms of equipment use. Brown, Tu, Profit, Gupta, and Lee (2016) evaluated checklist as an optimal tool to serve as a reminder. The study obtained web-based surveys on checklists. Out of the 15 hospitals and 299 responses, clinicians professed use of the checklist for equipment preparation as the most important use of the tool (Brown et al., 2016).

In the design of the checklist, there was one article providing background of the checklist in aviation and the design of the checklist. Verdaasdonk et al. (2009) discussed the design in terms of approach. There are two approaches to design, engineering approach and the human performance approach (Verdaasdonk et al., 2009). This DNP project took the human approach in which only critical items, performances, were checked. Practitioners are warned that the use of a checklist could lead to checklist fatigue (Hales & Pronovost, 2006) warn of checklist fatigue.

Project Methodology

A team approach was needed to improve neonatal resuscitation readiness. Initial proposal to this improvement project was met by rejection from the Director of Education due to a lack of association with the academic institution of the student. This led to rejection from the Director of the NICU. I was able to meet with the Vice President of Nursing, the Director of Nursing for MedSurg and Maternal Child Health, along with the Director of Nursing Education. Once it was agreed upon that no patient information would be used for this project, approval was given (Appendix C). Initiation of the project followed a meeting with the Clinical Manager of Labor and Delivery along with the labor and delivery room staff to discuss the purpose, activities, goals, and flow of the project.

Once a project is planned, it must be implemented to evaluate its success. A logic model was designed to implement this project. This began with a problem statement: Despite NRP training, labor and delivery room staff continue to prepare the radiant warmer inappropriately for

neonatal resuscitation. The logic model consists of inputs, outputs, along with short-term, medium-term, and long-term goals.

Inputs included the NRP checklist, six delivery rooms with two operating suites, each equipped with a radiant warmer, limited funding for supplies to produce tools for the project, labor and delivery nursing staff trained in NRP by an outside facilitator, NPs, and HPs receive NRP training through an in-house neonatologist. Outputs included activities needed to complete this project and the level of participation needed from stakeholders. Short, medium and long-term goals were determined by what could realistically be accomplished during the targeted time frame.

The adapted NRP pre-resuscitation checklist was based on the NRP pre-resuscitation checklist. The design of the checklist is dependent on the purpose and desired use (Verdaasdonk et al., 2009). As one of the important tools of the project, the adapted checklist was adapted based on the flow of the NICU and provided the foundation in the formulation of additional tools, namely the NREA form, the 10-item questionnaire assessing labor and deliver nursing knowledge regarding neonatal resuscitation (Appendix D), the laminated lanyard reference card (Appendix E), and an enlarge version of the lanyard card to be placed on each radiant warmer. Mock-ups were done for the laminated 8 X 11-inch card along with the lanyard reference card in multiple colors. The staff was given a week-long examination of the reference materials and suggestions were taken for the final color scheme.

To initiate this DNP project, materials were obtained to facilitate the formation of needed documents. To improve equipment readiness, colorful enclosed bins were purchased to label and organize supplies needed for neonatal resuscitation. Two bins were initially purchased to present to the administration as a proposed method to organize materials for neonatal resuscitation. It

became evident that each delivery room and operating suite would require at least three bins to enable all materials to be separated. The short-term goal was to have all supplies available on the unit increasing availability to stock the radiant warmer. The idea of the colorful enclosed bins was unsuccessful due to the bulky structure of the bins and cost. It was agreed upon by the NICU team and labor and delivery that supplies will continue to be housed in the drawers of the radiant warmer. The medium-term outcome was that the labor and delivery room nurses will use the adapted NRP pre-resuscitation checklist when admitting an expectant mother to the unit and to increase accountability regarding preparation for neonatal resuscitation with a long-term goal to incorporate the checklist into the maternal electronic medical record.

Limited funding had the potential to hinder carrying out a QI project. Initially, supplies were provided by the student with the expectations that with the approval of the QI project, the cost could be provided through resources that already exist in the organization. This DNP project was expected to run over a period of five to six months with the anticipated long-term for the continual use of the adapted NRP pre-resuscitation checklist at the bedside and use of the lanyard reference card. This timeline was somewhat fluid. The project began in September 2017.

The primary stakeholder in this project is the neonate. Every action, delay, or lack of action has the potential to alter neonatal status. As a quality improvement project, no direct intervention occurred to the neonate. Working with nursing to ensure perfection in the preparation of neonatal resuscitation was the method to indirectly affect the neonate. Each nurse working in the labor and delivery unit received one on one or small group discussion on how to prepare the radiant warmer for neonatal resuscitation. The adapted checklist was added as a reference tool. Initially, the staff was supplied with paper copies of the checklist to facilitate

familiarity with the reference material. This was also a time to assess the desired color of the bedside document along with the lanyard reference card prior to final print.

The NPs and HPs are the primary personnel called to attend all high-risk deliveries. There was a desire to improve the process and participation were needed from these stakeholders as well as the labor and delivery nurses. For the month of September, NPs and HPs completed the NREA for upon return from a delivery. The provider checked off which piece of equipment was missing from the delivery that affected neonatal resuscitation, was nonfunctional, or if the equipment was inappropriate for the gestational age of the newborn. This provided documentation as to the areas of preparing the radiant warmer for resuscitation that required strengthening.

During October, the Labor and Delivery Neonatal Resuscitation Knowledge Assessment was administered to nursing. This tool allowed for a baseline assessment of knowledge regarding neonatal resuscitation. Instruction began in November. Education at the radiant warmer occurred individually and in small groups. This intervention was initially scheduled to occur over a one-month period, however, additional time was required to capture all staff. Post-assessments began in January. The NPs and HPs completed the NREA once again to assess improvement in preparing for neonatal resuscitation. The nurses, using the same tool as the pre-assessment was assessed post-instruction.

There are risks in undertaking any project. The risk management worksheet (Appendix F) was used to formulate and assign a level of severity. Four categories of risk were assessed: Financial, time, relational, and safety. Financial risk involved the source of funding for this project. The plan was for the organization to provide funding for all aspects of the project past the initiation cost. Deadlines have passed for grants specifically geared toward neonatal projects

through national neonatal organizations. Initial funding was provided by the initiator of the project, however, the goal going forward was to use hospital resources to copy required documents as needed along with lamination.

Time is an asset. Much of the teaching and review with the nursing staff was to occur on time outside of employment. With the unpredictability of the labor and delivery room acuity, the decision was made to arrive on the unit prior to the start of a shift and stay after a worked shift to meet with the labor and delivery room staff.

To obtain approval for this project was not a smooth journey. My trust in the organization was tested. Due to the difficulty of the situation, I had at one point considered leaving the organization. The hope for this project long-term was to promote more nurse-driven QI projects but with a difficult, and at times impossible process, it did not help to encourage further participation in any hospital-based projects.

Neonatal safety was the major motivation in the QI project to improve neonatal resuscitation readiness. Without the project, I envisioned more compromised neonates that would require admission to the NICU instead of Well Baby Nursery. With improper set up for neonatal resuscitation, there were delays in accessing equipment or supplies to begin neonatal resuscitation leading to a deterioration in the respiratory and cardiac status of the newborn.

The project was not designed to be punitive. With initial discussions with the NICU team, we considered completing incident reports in instances where there was a delay in neonatal resuscitation due to lack of or inappropriate equipment for neonatal resuscitation. This action was to document occurrences as well as lack of accountability possibly leading to punitive actions toward nursing.

To complete the risk assessment, a S.W.O.T. analysis (Table 1) was conducted. S.W.O.T. analysis is a method of brainstorming for a project which exams the strengths, weaknesses, opportunities, and threats (Phadermrod, Crowder, & Willis, 2016) involving internal and external factors. Internal factors are controllable. These are the strengths and weaknesses of the project. Strengths of the project would answer the following questions: What advantages does my practice setting have, what this practice does better than anyone else, what unique or lowest- cost resources are available and what do people see as strengths (Roberts, 2017). The external factors which are the opportunities and threats are uncontrollable which can enable a project to completion.

Completion of this DNP Scholarly project demonstrated benefits. The labor and delivery room staff demonstrated an increase in confidence in preparing the radiant warmer for delivery of a newborn and neonatal resuscitation. The staff felt comfortable and eager to use the provided reference tools. This project highlighted areas of neonatal resuscitation that required fortification. The design of the project had a fluid timeline which allowed me to obtain as much information as possible pre and post-intervention.

There was an unexpected benefit to this project. The organization has obtained new radiant warmers. Many staff members attributed this purchase to this DNP project however, I believe that the purchase was due to years of ongoing complaints about missing side rails on the radiant warmers. There were many discussions with the labor and delivery room nurses on the DNP programs and roles. Many are in the decision phase of planning career long-term goals. It was also an opportunity for me to market myself as a DNP and the expansion of my Nurse Practitioner (NP) role within the organization.

Phase I: Needs Assessment

This QI project was conducted within the confines of a 6-bed labor and delivery unit that contain two operating rooms. A radiant warmer is present in each room. Each radiant warmer is equipped with compartments to house some basic equipment for the neonate (bulb syringes, knit hats, pulse oximeter probes, temperature probes and probe covers). Depending on the make and model of the radiant warmer, additional supplies were shelved on the radiant warmer or a supply bin in the patient room. The facility contains a high-risk obstetrical practice which accounts for the increases in high-risk deliveries thus increasing the chance of a newborn requiring immediate neonatal intervention. Within the institution, 60% of deliveries are considered high-risk.

Currently, the hospital is initiating the use of inhaled nitric oxide. Until fully implemented, newborns requiring inhaled nitric oxide must be transported to a neighboring facility and often will be discharged from that facility. Neonatology staff has raised concerns regarding equipment issues with the need to provide neonatal resuscitation readiness. A more cohesive team is needed between the two units to improve neonatal resuscitation readiness.

There are four additional Level III and IV NICUs near this organization with the ability to provide more advanced care to neonates than our facility. The transfer of a neonatal to an outside facility for more advanced care means a loss of patient dollars for the organization.

Additional areas of potential study include the relationship in the delay of equipment preparedness to the transfer of a neonatal to an outside facility and the relationship between delays in equipment readiness to the rate of admissions to the NICU. Whether these theories can be proven would be a difficult task relying only on subjective data of those performing neonatal resuscitation. It would also be interesting to evaluate the number of admissions to the NICU due to respiratory distress or neonatal deterioration one year prior to this project and one year after

the completion of the project as another possible means to evaluate improvement in neonatal resuscitation readiness.

The question has been raised as to whether the organization would benefit from having a neonate, who is by all accounts supposed to be admitted to the Well Baby Nursery (WBN) or Transitional Care Nursery (TCN) instead of the NICU is in question. The organization will receive more dollars per baby in the NICU versus the WBN or TCN. With the promotion of breastfeeding and mother-infant bonding, the organization without a doubt would prefer that an infant is admitted to the WBN or TCN instead of the NICU.

Any efforts to keep newborns within the institution is welcomed. There is a push within the organization to increase QI projects by nursing from all units. The S.W.O.T. analysis was used for this project but can be used to determine personal and institutional challenges to overcome going forward in future hospital-based QI projects.

There are six dimensions of quality as stated by the Institute of Medicine (IOM). Healthcare should be safe, effective, efficient, timely, patient-centered, and equitable (Berwick, 2002). Incomplete neonatal resuscitation equipment readiness can lead to devastating consequences leaving a neonate with long-term medical recovery and possible neurological devastation. This QI project addressed the dimensions of safety and effectiveness. The idea was to capture data on specific elements that were missing, non-functional, or inappropriate for gestational age at the bedside leading to a delay in resuscitation.

Change can be voluntary or involuntary. It is the commitment to improve that can drive change among workers. The outcome of the neonate is left on the shoulders of the resuscitator with no responsibility presented to the delivery room nurse. Errors create urgency (Lukas et al.,

Table 1
S.W.O.T. Analysis

<u>Quality</u>	<u>Characteristics</u>
Strengths	<ol style="list-style-type: none"> 1. Population of neonates within a level III NICU 2. Labor and delivery nursing staff recognize the need for improvement in preparing for neonatal resuscitation 3. The NICU director, nursing educator, patient care manager, medical clinical director of labor and delivery acknowledge the need for staff education beyond the formal NRP certification 4. Neonatal Nurse Practitioners willing to review equipment with labor and delivery nursing staff 5. Ability to adapt the NRP resuscitation checklist to the unit
Weaknesses	<ol style="list-style-type: none"> 1. Poor staff interaction between the NICU NP/HP staff and the labor and delivery nursing staff due to repeated deficiencies in preparing for neonatal resuscitation 2. NP/HP staff attend all high-risk deliveries with one resident, and at times alone 3. Organization does not house a formal neonatal resuscitation team 4. Other facilities a respiratory therapist, a NICU staff nurse must attend all deliveries with the NP or HP 5. Director of Education initially did not approve project 6. Director of the NICU request the use of DNP Student’s materials to allow a retiring neonatologist 7. Currently, Director of Education not willing to work with University to establish a working relationship to facilitate the project 8. No administrative support in terms of willingness to speak to the Director of Education or the Director of Nursing from NICU director, Clinical Director for labor and delivery, Clinical Manager for labor and delivery 9. Director of NICU discourages DNP student from addressing weaknesses with the Director of Obstetrics and Gynecology.
Opportunities	<ol style="list-style-type: none"> 1. Due to the increasing amount of delay in neonatal resuscitation due to lack of equipment readiness, the project is needed 2. Opportunity to standardize neonatal resuscitation readiness by use of an adapted NRP checklist and therefore, improve quality of care 3. Establish a more collegial relationship between the labor and delivery staff and the NICU staff 4. Decrease the number of admissions to the NICU due to deterioration of neonate related to a delay in resuscitation due to issues with equipment 5. Decrease in the number of transfers to outside facilities for head cooling due to delays in neonatal resuscitation due to lack of equipment readiness leading to a deterioration in the neonate 6. Establish a culture of nursing quality improvement projects and nursing research within the organization 7. Decrease financial losses to organization from the transfer of neonates to outside facilities
Threats	<ol style="list-style-type: none"> 1. Upper-level nursing management (Director of Nursing and Director of Nursing Education) will continue to resist efforts to carry out the project at the organization 2. Director of Nursing Education unwilling to discuss possible solutions to initiating the project 3. Director of the NICU will not support the project if not approved by the Director of Nursing Education or the Director of Nursing 4. Retiring neonatologist to stay on performing projects for the NICU 5. Director of NICU moving forward with DNP student’s idea using a neonatologist

Note: S.W.O.T. analysis is the examination of the strengths, weaknesses, opportunities, and threats of a project (Phadermrod, Crowder, & Wills, 2016).

2007) especially those that produce potential neurological harm to a baby. This impetus to change was required to be within the delivery room staff. The mindset was to think of the newborn as the second priority to the mother instead of a mother-baby unit.

According to Lukas et al. improvement initiatives can contribute to transformation in at least three ways (2007). It was important to be able to sustain the proposed QI project. This can be accomplished by building a system of checking the neonatal warmer for resuscitation equipment within the current practices of the labor and delivery unit. At other facilities, this is customary. Currently practices assume this checking of equipment to be part of the daily routine, however actual bedside results state otherwise.

Alignment is an important factor in successful organizational change (Lukas et al., 2007) with accountability as a key aspect. Accountability is dependent on the behavior of individuals. Providing motivation is difficult at times when staff feel overworked and understaffed. Part of the alignment process is to bring together all aspects needed for this project. Appropriate staff ratios, equipment, and available supplies must align to produce results.

Phase II: Obtaining Stakeholders Support

Medical care is a team sport, with the team being the only defense against error (Walker, 2014). For an organization to undergo change there are five criteria that will predict the success of an improvement project. According to Lukas et al. (2007) the five criteria are: an impetus to transform, leadership commitment to quality, improvement initiatives that actively engage staff in meaningful problem solving, alignment to achieve consistency of organizational goals with resource allocation and actions at all levels of the organization, and integration to bridge traditional intra-organizational boundaries among individual components. It is important to keep

in mind that no single element is sufficient to achieve organizational transformation (Lukas et al., 2007). Transformational leaders are needed to motivate and guide staff into change.

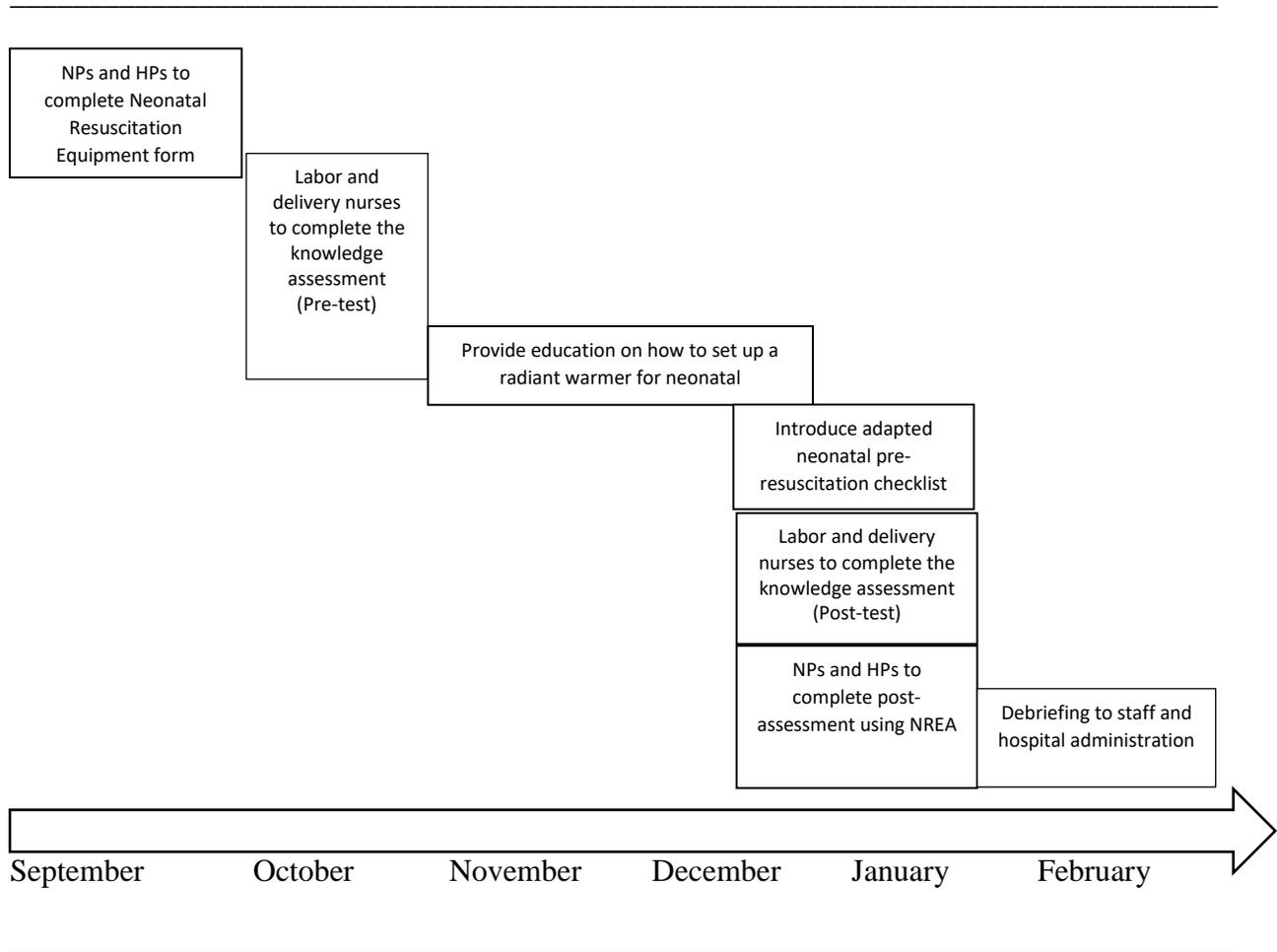
Transformational and transactional leadership styles are documented by Holten & Brenner (2013) to be positively related to the engagement of managers. Transformational leadership moves individuals and organizations toward change. Through leadership, change can be initiated by producing a sense of urgency along with a sense of passion to improve upon the past. The strength exhibited by the unit manager is one that will champion for resources and motivate staff toward change. Effective nurse leaders ensure that appropriate staffing and other resources are in place to achieve safe care and optimal patient outcomes (Wong, Cummings, & Ducharme, 2013). The importance is to inform staff that the actions of changing are not seen as punitive but improvement.

Phase III: Steps of Implementation

A projected timeline was drafted (Table 2). A fluid timeline allowed the educational component to reach all staff. Information from assessments occurred throughout the project with the intent to revise documents and methods of review/teaching as needed.

Once approved, the project was implemented. Over a one-month period, the NREA form was used by the NICU team to obtain information on equipment readiness following the attendance at each high-risk delivery. The pre-intervention assessment was performed by all labor and delivery room staff the month following the NREA. Education at the radiant warmer occurred over a 2-month period to allow all staff to be trained. The radiant warmer was where learners could handle any unfamiliar equipment. Two reference tools were formulated. One, the adapted NRP pre-resuscitation checklist on one side and the radiant warmer set-up on the reverse side along with the lanyard reference card were used to facilitate memory.

Table 2
Project Timeline



Note: The arrow depicts the fluidity of the project. Time spans are not rigid.

Phase IV: Ongoing Implementation

The adapted NRP Pre-resuscitation checklist was adapted to the flow of the unit. Laminated reference tools were reproduced without difficulty. Lamination of the reference card will ensure some durability of the product. The reference tools will decrease the incidence of inappropriate for gestational age equipment and enhance proper preparation of equipment. What makes this unique is that the list of supplies and steps in preparing for neonatal resuscitation is brought to the fingertips of the bedside nurse.

It is proposed that this intervention, however simple, will, in theory, decrease admissions to the NICU, decrease the transfer of neonates to other institutions for more advanced neonatal care, keep health care dollars within the current institution, and prevent separation of the newborn from the mother thus promoting mother-family-infant bonding.

Currently, all nursing staff within the institution receive NRP certification through an outside organization with nurses left to their own devices to locate an NRP course either online or through an outside organization. This is different for the NP and House Physician (HP) staff. NPs and HPs working within the NICU receive NRP certification through one of the neonatologists. It is a consideration that not everyone is “on the same page” due to the fact that information is coming from different sources.

Phase V: Project Evaluation

Measurement is a critical part of testing and implementing changes (IHI, 2016). In addition to access and finance, quality is one of three main pillars supporting the AAP Agenda for Children (McInermy & Sachdeva, 2013). Quality measures have four primary uses: for internal quality monitoring and improvement, for accreditation, as a basis for incentive payments to improve care, and for public reporting (Acquaviva & Johnson, 2014). Measures should be balanced (IHI, 2016) using measures for the outcome, process, and balancing.

Increase in the quality of care will be evaluated based on information from the pre and post-assessment NREA forms. These forms were continually monitored as well as the pre and post Labor and Delivery Neonatal Resuscitation Knowledge Assessments. Results were compared to evaluate the overall effectiveness of this DNP project. Appendix G compare the results obtained from the NREA prior to working with the nursing staff and following the educational component and reference tool.

There was not an increase in the completion of the NREA forms by the NICU team. The team completed 93 forms (83%) out of 112 high-risk deliveries attended during the pre-assessment phase of the project. The percentage remained unchanged with 90 forms (83%) completed out of 109 high-risk deliveries attended. The reason for the lack of increase in participation could not be accounted for. The radiant warmer not being prewarmed prior to delivery was unchanged. This was a surprise element as a major component of the education process was providing the rationale for the importance of thermoregulation. The number of blankets placed on the radiant warmer regardless of whether the warmer was on, increased to at least five blankets to provide for drying and warmth. Of note, system failure did occur in one of the radiant warmers which resolved when the warmer was turned off then back on.

An improvement was seen in the availability of side rails. This is attributed to the purchase of new radiant warmers in which it is difficult to remove the side rails. Side rails are no longer missing. The staff initially stated that the purchase of the warmers was due to this project, but it was an incidental and welcomed intervention. There was no incidence of missing equipment for intubation reported on the post-NREA assessment.

The oxygen flowmeters for the resuscitation bag, NeoPuff, and blow-by were major areas where improvement was needed. The incidence of turning on the flowmeters or setting the flowmeters to the appropriate flowrate was unchanged at 27%. There were no concerns expressed in 54% of the deliveries documented by the NICU team during the pre-assessment phase which increased to 66% with post-instruction assessment.

The results of the Labor and Delivery Neonatal Resuscitation Knowledge Assessment was evaluated after a one-month period of completion to analyze a starting point for re-education. Following the education period, both the NPs and HPs along with the labor and

delivery nurses once again completed their allocated assessments. The results revealed areas of improvement (Appendix H). The nurses were asked not to put their names on the questionnaire but to note the number of years they have worked on the unit.

There was improvement seen in the knowledge of the labor and delivery room nurses. Scores improved in all questions except question number eight. This pertained to the side rails. Safety is one of the components of quality care. It was important to address the side rails. During the pre-assessment process, the older radiant warmers were dominant on the unit. It was distressing as practitioner coming in for a high-risk delivery to find the side rails, not in place. This was an issue if coming to the delivery without a second person. Although not expected to roll as a newborn, the idea of an even slight probability, required a pause. It was felt that having all side rails available demonstrated a concern for safety to parents, visitor, staff, and the organization.

Another area of improvement needed was in setting the flowmeter to the recommended flow rate. There was an improvement from 25% to 22% in these assessment areas. Many nurses did not know and were taking an educated guess of the required flowrate. NRP recommends that the flow rate for bag-mask ventilation, NeoPuff, and blow-by be set at 10 to 15 liters per minute. A flow rate of 10 was suggested for all three pieces of equipment to provide a standard for setting the equipment noting that the NICU could adjust the flow as needed.

The key to QI in the NICU is to develop the structures for good care and to ensure the processes are reliable (Lachman et al., 2014). One of these processes is to have every delivery room within our organization to be 100% prepared for neonatal resuscitation. Evidence-based improvements in patient safety and reduction in patient care errors also directly contribute to

improved patient outcomes (Kilday et al., 2013). The main goal is to prevent deterioration of the neonate following delivery regardless of high-risk status.

This improvement project can have ongoing sustainability by incorporating the initiative into nursing orientation through the Department of Nursing Education. In addition to the initial required NRP completion, all labor and delivery staff nurses will be required to review neonatal resuscitation equipment readiness to complete the hospital annual mandatory education component. It is hoped that as the labor and delivery unit improve in setting up for neonatal resuscitation, it will foster dialogue for the staff to ask questions if unsure of a piece of equipment and what is needed that is appropriate for the expectant gestational age. This should further encourage the goal to improve neonatal outcomes from the delivery room leading to quality care of the newborn.

In assessing neonatal resuscitation readiness, it was noted that there was a tendency to place too many supplies at the bedside. In theory, it appears to be a good idea however what I added to the discussion is the element of cost containment. At many deliveries, there would be one or two of each size ETTs, ETT holders along with multiple bulb syringes, cord clamps, and other items stacked upon each other. I discussed with the nurses and OB techs on the importance of tailoring preparation for each anticipated gestational age and the importance of not overstocking.

I provided an example: I come to a delivery where there is heavy meconium and after initial interventions, I am now required to intubate this particular baby. I go to reach for the ETT, laryngoscope and am required to dig through unnecessary equipment not related to this patient to locate the needed items for this baby. I have now contaminated supplies that must be discarded. The scenario is the same regardless of the presence or absence of meconium.

This helped to reinforce the need to tailor the radiant warmer for the anticipated gestational age. The loss of unused supplies is a cost to the institution, loss of income for desired projects, and loss of additional or present staff.

Of note, during this project, there was a shift in personnel. Some nurses resigned, not due to this project, and some nurses were starting their careers. OB techs were initially not scheduled to participate in the QI project, however, as their valued role was realized, it was determined that the OB techs would participate. This accounted for some of the initial knowledge gaps which improved as the project progressed.

Summary

Conclusions

Quality and Safety Education for Nurses (QSEN) overall goal is to meet the challenge of preparing future nurses with the qualities to improve quality and safety of the healthcare systems. Qualities include knowledge, skills, and attitudes (KSAs). These KSAs are used in the competencies developed by the Institute of Medicine to nurture quality in healthcare. Competencies include patient-centered care, teamwork along with collaboration evidence-based practice (EBP), quality improvement, safety, and informatics. The QSEN project provided knowledge, skills, and attitudes that are used to change how nurses work (Cronenwett et al., 2007).

Patient-centered care brings the patient to the focus of care. This project required competencies in QI and teamwork along with collaboration. Designed as a QI project, *Improving Neonatal Resuscitation Readiness* focuses on preparing nurses working within labor and delivery to prepare radiant warmers for neonatal resuscitation. This QI project involved not only the nurses on labor and delivery but the NICU include NPs and HPs.

Quality improvement is described by QSEN Institute as using data to monitor outcomes along with using methods to improve quality and safety (2017). Using QSEN, a clinical situation was identified that poses harm to neonates immediately after delivery. An identified problem was a lack of preparedness for neonatal resuscitation demonstrated by equipment at the radiant warmer that was nonfunctional, missing, or inappropriate for gestational age. This presented an ethical problem of whether nursing staff preparing the radiant warmer knowingly set up inappropriately or did so due to a lack of knowledge. This was the basis for the formulation of the Labor and Delivery Neonatal Resuscitation Knowledge Assessment tool. All five QSEN competencies are demonstrated in the project with the primary focus on teamwork and collaboration along with quality improvement.

According to Roberts and McArthur (2016), a scholarly project should lay the groundwork for further work on the topic of specialty content. This QI is the foundation for additional projects related to neonatal resuscitation and neonatal outcomes related to neonatal resuscitation. Efforts by organizations and individuals to develop transformational and relational leadership reinforces organizational strategies to improve patient outcomes (Wong et al., 2013).

Working within a team dynamic requires patience. Taking the time to learn the team dynamics of labor and delivery assisted in the development of this QI. The workflow of labor and delivery provided insight into the responsibilities of the staff nurses in addition to assessing or acquiring knowledge as to which individuals are responsible for the preparation of radiant warmers for neonatal resuscitation.

Self-assessment allows reflection of strengths, weaknesses, and limitations working within the team dynamics of labor and delivery. Having organizational skills kept task on schedule and fostered progression in an orderly manner. The ability to communicate the purpose

of the QI and the progression of the project. All communication with the labor and delivery room staff was professional and non-threatening. Progression of phases was in an organized manner allowing flexibility working around the labor and delivery census. Each task was approached with the mindset of “we are in this together.” This allowed the staff to feel comfortable in asking questions to increase their knowledge. Strength was also shown in having my own strong sense of self and perseverance. These qualities were needed to label a known problem within the organization and persevere to obtain approval to proceed with my desired DNP project. Strength also lies in the design of the project. This project is sustainable and provides the bases for ongoing QI projects related to neonatal resuscitation. Materials can be readily reproduced as needed. In all, this was a low-budget project to implement. The proposed budget of \$7360 was not used. The major cost was the purchase of the colorful bins which were returned due to a lack of feasibility. The cost for ongoing supplies to reproduce reference materials will be provided by the organization. In addition, the cost to attend one conference out of state per year will be covered by the organization.

Weakness and limitations were seen in the availability of the labor and delivery room staff. Time is needed to provide education at the radiant warmer. This meant working around the census of labor and delivery. Efforts were made to have set scheduled times to provide education. Unfortunately, these scheduled times were interrupted by emergencies either on the labor and delivery unit or within the NICU. Initially the thought was to schedule teaching sessions on non-working days, however, this was dismissed as wasted time into the city with the added expense of bridge tolls and parking with no guarantee of working with the labor and delivery nurses. In the spirit of teamwork, educational times were flexible. Periodic checks with

the labor and delivery room staff allowed assessment of workflow for a shift and gauged opportunities to provide education.

Recommendations

Recommendations are to add the adapted pre-resuscitation checklist to the maternal electronic record, thereby increasing accountability. There must be some accountability for one aspect of neonatal outcomes: resuscitation readiness. Some forms of accountability can be more constructive for safety than others (Dekker, 2008). The initial thought of a checklist was shadowed by the potential to hear complaints of additional paperwork from the labor and delivery staff nurses. Research performed by Thongprayoon et al. (2016) tested the use of electronic checklist on workload and concluded that the electronic checklist did indeed reduce workload and errors. In addition, the hospital is transitioning to electronic medical records, therefore additional papers would not be a wise investment.

To decrease the possibility of hypothermia, consideration should be addressed to move the radiant warmers to the opposite side of the delivery room, if logistically possible, away from the window. The purchase of new radiant warmers aided in the improvements in the elements of this QI however at the time of this project, not all rooms were equipped with a new warmer. One room continued to house an older model and the operating suites have an updated version, but not new. It is recommended that the organization continue to standardize the equipment. There should also be continued education on the use of the newly purchased radiant warmers. Many staff were not familiar with the suction available on the warmer leaving set-up for suction lacking. Education instruction continues the equipment.

It was learned that all nurses working in labor and delivery and NICU are required to obtain NRP certification from an outside vendor rather than from the neonatologist. This is

believed to have caused the gap in knowledge. To continue to narrow the gap in knowledge, it is recommended that the organization provide funding for one NP to become a certified NRP instructor. This will also provide consistency in training and dissemination of information. Although the intentional focus was to be the use of the adapted NRP pre-resuscitation checklist, education contributed to its success. The rationale for each step in preparing for neonatal resuscitation provided a better understanding and thus willingness to improve performance. Nurses stated that information provided regarding the rationale was not provided during their NRP recertification. It is recommended that the process is standardized in that at least one NP receive training as an NRP instructor and provide this service to organizational NICU and labor and delivery nursing staff. For NRP instruction from an NP to be ongoing and successful, it is advised that the organization provide designated protected time for the NP to provide this educational service to the organization. In addition, it is recommended that assistant patient care managers act as “super-instructors” for radiant warmer preparation. These nurses will take the responsibility to provide instruction to each new hire for labor and delivery on the preparation of the radiant warmer for delivery and neonatal resuscitation using the adapted NRP pre-resuscitation checklist.

As stated earlier, there is limited literature on the use of a checklist to prepare for neonatal resuscitation. The information presented is intended for neonatal resuscitation, however, I encouraged the nurse to use this information for any anticipated delivery. It would be interesting to have feedback from nurses from other organizations. According to Landrum (as per Chism, 2016) promotion, in addition to list product, price, and place are tools to market the promotion of the DNP. Presenting at conferences would be a vehicle for gaining some insight into the feasibility of the checklist usage. This is also a strategy to market my reference lanyard

card. My goal is present at a 2018 or 2019 conference such as the National Neonatal Nurses Conference or the National Advanced Practice Neonatal Nurse Conference. This would be a positive step in gaining feedback but also to promote my personal branding as a DNP.

This project progressed with perseverance and determination. It is also imperative to note that unexpectant encouragement, openness, and enthusiasm of the labor and delivery room nurses enhance the experience of leadership. If only one pearl was learned from each member of staff, it was worth the effort of this project.

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Appendices

Appendix A

Adapted NRP Pre-resuscitation checklist

NRP Neonatal Pre-Resuscitation Checklist	
Action	Steps to follow
To warm newborn	Preheat warmer Warm towels or blankets Temperature probe Temperature probe cover Plug in temperature probe Knit cap
To clear airway	Suction canister holder Clean suction canister Suction canister tubing Turn on suction Set suction at 80-100 mm Hg Attach appropriate size suction catheter for GA Term: 10 FR/8 FR Preterm: 8 FR/6 FR Bulb syringe
To listen to heart and lungs	Stethoscope
To provide oxygen	Set up tubing to oxygen for blow by Set flowmeter to 10 LPM Set up Neopuff with appropriate size mask for GA Set oxygen initially at: 21% for Term 30% for Preterm Pulse oximeter Pulse oximeter probe
To ventilate newborn	Neonatal resuscitation bag with tubing Connect tubing to blended oxygen source Attach appropriate size for GA resuscitation mask to neonatal resuscitation bag Set flowmeter to 10 LPM 8F feeding tube and 20 ml syringe to decompress stomach
To intubate newborn	More than 1 of each item available within reach of the radiant warmer: Laryngoscope Size 0 and 1 (size 00 optional) blades with functional light bulbs Stylets End tidal CO2 detectors Laryngeal mask airway (size 1) and 5-ml syringe ETT holder appropriate for GA Tape to secure ETT Scissors to cut tape and ETT
Medications for neonatal resuscitation	Access to 1:10,000 epinephrine and normal saline Syringes to administer medications Supplies to place emergency UVC line Supplies to provide documentation
To transport newborn to NICU	Warmed transporter incubator with Neopuff and blended oxygen source

Note: GA=gestational age, UVC=umbilical venous catheter. Neonatal Pre-resuscitation Checklist. Adapted from "Neonatal resuscitation program quick pre-resuscitation checklist", by T. Wade, 2014. Retrieved from <http://www.tomwademd.net/nrp-quick-pre-resuscitation-checklist/>

Appendix C

Facility Approval Letter



January 23, 2018

Seton Hall University
College Of Nursing
400 South Orange Avenue
South Orange, NY 07079

To Whom It May Concern,

This is to inform that Bronx Lebanon Hospital Center has approved the Quality project conducted by doctorate student Benay Johnson titled "Increasing Neonatal Resuscitation Readiness".

If you have any questions, please feel free to contact me at (718) 518-5744.

Sincerely,

A handwritten signature in black ink that reads 'Theresa Uva'.

Theresa Uva RN MS
Director of Patient Care Services:
Med-Surg & Maternal Child Health

1650 GRAND CONCOURSE, BRONX, NEWYORK 10457
T 718-590-1800



Appendix D

Labor and Delivery Neonatal Resuscitation Knowledge Assessment

These questions will assess your knowledge regarding preparation for neonatal resuscitation. You will have the opportunity to take this assessment again once you have attended your neonatal resuscitation update.

Please answer the following questions. Check all that apply.

1. Baby A was delivered and successfully transferred to newborn nursery. To prepare the radiant warmer for the next delivery, after cleaning the radiant warmer one task that the nurse must do is:
 - Replace the temperature probe
 - Clean off the temperature probe before reusing
 - Replace used or missing supplies
 2. Oxygen flow should be set at ___LPM for oxygen blow by?
 - 5
 - 15
 - 10
 3. What size suction catheter is appropriate for an anticipated 27 weeker?
 - 6F
 - 10F
 - 8F
 4. In preparation for delivery, how many blankets should be warming on the radiant warmer?
 - 1 is enough
 - 10
 - At least 5
 5. Oxygen flow should be set at ___LPM for the NeoPuff with initial pressures of___?
 - 5 LPM and Inspiratory pressure of 10 PEEP +5
 - 10 LPM and Inspiratory pressure 20 PEEP +5
 - 8 LPM and Inspiratory pressure 15 PEEP +4
 6. For a baby that is anticipated to be less than 1000 grams, what size ETT should be at bedside?
 - 3
 - 2
 - 2.5
 7. First thing to do when you arrive at the radiant warmer to set up is?
 - Check flowmeter on the warmer
 - Turn unit on
 - Check light source
 8. How many side rails should be on the radiant warmer?
 - 2 sides
 - Bottom only
 - All 3 sides
 9. What is the LPM for Positive Pressure Ventilation?
 - 5
 - 10
 - 15
 10. Oxygen should be set at___% for an anticipated term newborn and___% for an anticipated preterm newborn?
 - 40% for term 50% for preterm
 - 30% for term 40% for preterm
 - 21% for term 30% for preterm
- Date of completion: _____ Number of years working in L/D: _____

**Appendix E
Lanyard Reference Card**

RADIANT WARMER

- TURN ON WARMER
- COVER MATTRESS WITH BLANKET AND ADDITIONAL BLANKETS
- REPLACE TEMPERATURE PROBE AND PROBE COVER
- SET TEMPERATURE
- REPLACE SUCTION TUBING
- REPLACE SUCTION CATHETER WITH GESTATIONAL AGE APPROPRIATE TUBING FOR MOUTH AND NP
- TURN ON SUCTION
- BLOW BY TUBING/ TURN ON BLOW BY
- NEOPUFF WITH AGE APPROPRIATE FACIAL MASK
- RESUSCITATION BAG WITH AGE APPROPRIATE FACIAL MASK AND PEEP VALVE
- PULSE OXIMETER MACHINE AND NEW PROBE

NRP Neonatal Pre-Resuscitation Checklist	
Action	Steps to follow
To warm newborn	Preheat warmer Warm towels or blankets Temperature probe Temperature probe cover Plug in temperature probe Knit cap
To clear airway	Suction canister holder Clean suction canister Suction canister tubing Turn on suction Set suction at 80-100 mm Hg Attach appropriate size suction catheter for GA Term: 10 FR/8 FR Preterm: 8 FR/6 FR Bulb syringe
To listen to heart and lungs	Stethoscope
To provide oxygen	Set up tubing to oxygen for blow by Set flowmeter to 10 LPM Set up Neopuff with appropriate size mask for GA Set oxygen initially at: 21% for Term 30% for Preterm Pulse oximeter Pulse oximeter probe
To ventilate newborn	Neonatal resuscitation bag with tubing Connect tubing to blended oxygen source Attach appropriate size resuscitation mask to neonatal resuscitation bag Set flowmeter to 10 LPM 8F feeding tube and 20 ml syringe to decompress stomach
To intubate newborn	More than 1 of each item available within reach of the radiant warmer: Laryngoscope Size 0 and Size 1 (and size 00, optional) blades with functional light bulbs Stylets End tidal CO2 detectors Laryngeal mask airway (size 1) and 5-ml syringe ETT holder appropriate for GA Tape to secure ETT Scissors to cut tape and ETT
Medications for neonatal resuscitation	Access to 1:10,000 epinephrine and normal saline Syringes to administer medications Supplies to place emergency UVC line Supplies to provide documentation
To transport newborn to NICU	Warmed transporter incubator with Neopuff and blended oxygen source

Appendix F
Risk Management Worksheet

Risk Management Worksheet

Type of Risk	Jeopardy	Description of Risk	Expectation of the Risk (1-5)	Impact of the Risk (1-5)	Severity of the Risk (Expectation x impact)	Contingency Plan of Action
Financial	Funding to initiate and sustain project	This project will require paper supplies and ink to produce questionnaires, checklist, and lanyard card. A lack of resources could hinder production	3	3	9	Researching possible grants or organizational willingness to provide supplies and resources
Time	Less time at home to complete schoolwork	The educational component of the project will require personal time. This will require additional travel into the city for a total of two hours per trip.	4	5	20	Attempt to schedule educational sessions before and after I complete my shift.
Relational	My trust in the organization	This has placed doubt as an employee in the organization of the hospital, nursing, medical management of the NICU. At this point I do not want to participate in any NICU projects.	4	5	20	If this process to initiate a quality improvement project or nursing research, it does encourage the process.
Safety	More compromised neonates that will require admission to the NICU instead of Well Baby Nursery	With improper set up for neonatal resuscitation there is a delay in accessing equipment or supplies to begin neonatal resuscitation leading to a deterioration in respiratory and cardiac status of the newborn.	5	5	25	Begin to complete incident reports in instances where there is a delay in neonatal resuscitation due to lack of or inappropriate equipment for neonatal resuscitation.

Appendix G NREA Scores

Pre-Assessment		Post-Assessment	
112 Deliveries Attended by NP/HP staff		109 Deliveries Attended by NP/HP staff	
69 on days 43 on nights		68 on days 41 on nights	
93 forms completed	83%	90 forms completed	83%
54 forms on Days	78%	56 forms on days	82%
39 forms on Nights	91%	34 forms on nights	83%
Heat Source			
Radiant warmer not on	5		5
Examination light not available	2		2
Side rails not on warmer	4		0
Inadequate number of blankets	7		3
Missing head caps	4		0
Missing temperature probe/cover	7		7
Used probe in place	1		0
Warmer system failure	2		1
Suction Equipment			
Suction not turned on	4		5
Missing bulb syringe	3		1
Nonfunctional suction canister	1		2
Inappropriate size suction tubing	1		4
Respiratory Equipment			
Air/oxygen supply	3		2
Bag/tubing not connected to oxygen source	5		3
Resuscitation mask not connected to PPV bag	3		4
No blow-by oxygen source	2		4
Flowmeter for air/oxygen not set to 10 LPM	14		10
NeoPuff source not available	6		3
No mask for NeoPuff	3		4
Flowmeter for NeoPuff not set at 10 LPM	9		10
Pulse oximeter not available	3		1
Airway management			
Missing ETTs	4		0
Inappropriate ETT	1		0
Missing laryngoscope	4		0
Missing End tidal CO2 detector	6		0
Too many supplies at bedside	1		0
No concerns	50		61

Appendix H

Labor and Delivery Neonatal Resuscitation Knowledge Assessment Scores

		Pre-test 42 forms				Post-test 38 forms					
	QUESTIONS	# of staff that provided the correct answer	%	# of staff that provided the incorrect Answer	%	# of staff that did not answer the question	# of staff that provided the correct answer	%	# of staff that provided the incorrect Answer	%	# of staff that did not answer the question
1	Baby A was delivered and successfully transferred to newborn nursery. To prepare the radiant warmer for the next delivery, after cleaning the radiant warmer one task that the nurse must do is:	28	67	2	4	1	30	79	8	21	0
2	Oxygen flow should be set at ___LPM for oxygen blow by?	17	40	22	52	2	33	87	4	11	1
3	What size suction catheter is appropriate for an anticipated 27 weeker?	37	88	4	10	0	35	92	3	8	0
4	In preparation for delivery, how many blankets should be warming on the radiant warmer?	38	90	2	4	1	38	100	0	0	0
5	Oxygen flow should be set at ___LPM for the NeoPuff with initial pressures of ___?	13	31	23	55	5	30	79	5	13	3
6	For a baby that is anticipated to be less than 1000 grams, what size ETT should be at bedside?	13	31	27	64	1	29	76	7	18	2
7	First thing to do when you arrive at the radiant warmer to set up is?	38	90	3	7	0	38	100	0	0	0
8	How many side rails should be on the radiant warmer?	42	100	0	0	0	36	95	1	3	1
9	What is the LPM for Positive Pressure Ventilation?	26	62	15	36	0	36	95	1	3	1
10	Oxygen should be set at ___% for an anticipated term newborn and ___% for an anticipated preterm newborn?	29	69	11	26	1	36	95	0	0	2
	Number of years working in L/D	Average 7.8 years									