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Developing Neonatal Gavage Tube Guidelines to Decrease Feeding Intolerance

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
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Abstract

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MS, University of Maryland at Baltimore, 1993

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Project Submitted in Partial Fulfillment

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Abstract

A nutritional method commonly used to deliver feedings to premature infants is the use of a gavage tube. To measure for any undigested breastmilk or formula, a gastric aspirate is checked prior to the next feeding. There is a gap in practice as to what to do if these aspirates signify feeding intolerance. The project question centered on identifying evidence-based guidelines in the literature that would help to define best practices related to feeding intolerance of gavage-fed infants. The Johns Hopkins Nursing Evidence-Based Practice model and the Appraisal of Guidelines Research and Evaluation provided the frameworks for gathering and evaluating evidence as well as the process used in forming the practice guideline. The primary methods employed were a team approach that included a Neonatal Intensive Care Unit (NICU) Project Team and NICU expert opinion along with a literature review conducted by the doctor of nursing practice student. The NICU Project Team collected the NICU experts' input via surveys they developed and distributed as well as e-mails to authors identified from the literature review. The surveys yielded a 76% response rate from the registered nurses and a 59% response rate from the medical providers. All data collected were shared and descriptive statistics were used to evaluate the data. One of the central research findings was that gastric aspirates should no longer be routinely obtained on stable infants and, if used in evaluating feeding intolerance, they must be used in combination with other indicators. An enteral feeding guideline was developed to reflect this finding that can be shared with other NICUs and nurseries in the United States and globally to decrease the morbidity and mortality of neonates.

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Dedication

This DNP Project is dedicated to all who help to care for NICU patients as well as the neonates' families. May the end result of this project help to standardize the care gavage-fed infants receive in an effort to prevent feeding intolerance and result in sending NICU infants home without delay.

Acknowledgments

I would like to begin by acknowledging my husband Paul. My journey to achieve my DNP degree would have been far more challenging without his enduring support, patience, and help. In addition, I would like to thank my family and friends for all of their encouragement and care that they extended throughout this endeavor.

My appreciation must also be noted to the NICU where this project took place. The medical and nursing staff was welcoming and reassuring as I progressed through the program. An additional thank you is directed toward the NICU Project Team and especially the NICU educator whose expertise and inspiration aided in the development of the enteral feeding guideline. Finally, I am grateful to my DNP committee and specifically to the Chair, Dr. Mattie Burton whose knowledge, guidance, warmth, and diplomatic manner were instrumental in the successful completion of my DNP Project and degree.

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Section 1: Nature of the Project

Introduction

Premature infants can be saved as early as 23 weeks of gestation due to advances in technology (Frakt, 2014). These infants have immature digestive systems making it difficult for them to tolerate enteral feedings needed for growth and development (Gregory & Connolly, 2012). One method employed to combat this feeding intolerance is to use a gastric feeding tube placed into the stomach to feed the infants by gavage (Parker et al., 2015). Prior to instilling the feeding, an aspirate is obtained to check for proper tube placement and to ascertain for undigested breast milk or formula. If an aspirate is acquired, there are varying opinions as to whether it should be returned to the infant or discarded. If these aspirates are not correctly addressed, it can lead to serious, if not fatal, consequences to the infants.

Recommended health care practices related to caring for infants with trouble digesting feedings were explored for this doctor of nursing practice (DNP) project. The compilation of these recommendations resulted in a proposed guideline for the Neonatal Intensive Care Unit (NICU) where this project took place. In addition to searching the literature for best practices related to addressing feeding intolerance, an expert team approach was used. The NICU educator, the two coadministrators of the Neonatal Nurse Practitioners (NNP) and a Clinical III NICU nurse made up the NICU Project Team along with the doctoral student. The NICU educator, NNP coadministrators, and the doctoral student each have over 30 years of NICU experience and the NICU nurse has over 20 years of NICU experience; therefore, they have expert experience in the feeding

of premature infants. Their medical input as well as the data they collected regarding the responses of NICU nurses, NNPs, and the neonatologists to a case scenario regarding the handling of gastric aspirates to prevent feeding intolerance was sought and utilized throughout this project. Soliciting specific feedback from health care providers who are proficient in their field through the use of a questionnaire to form guidelines is known as the Delphi technique (McMillan, King, & Tully, 2016). The goal of this technique is to allow individuals to give anonymous input in the hopes of obtaining consensus in addressing a practice concern. The combination of the best practices identified in the literature, the opinions of the NICU Project Team, and the data this team collected all contributed to the development of the guideline to address feeding intolerance in infants with a gavage tube. The NICU Project Team and the doctoral student presented the final proposed guideline to the two main neonatologists, the NICU nurse manager, and the NICU Education Committee for input before the final version is presented to the NICU nurses and NNPs.

Prematurity is the number one reason for infant disease and death in the United States and other countries (Gregory & Connolly, 2012). Participating in identifying best practices in improving premature infants' ability to tolerate feedings and help decrease the incidence of gastrointestinal (GI) disease and death in infants can have far-reaching effects. These findings can be shared with other NICUs and perhaps stimulate further research on this feeding dilemma.

Problem Statement

In the NICU where this DNP project took place, there was not a policy regarding how to address aspirates obtained from infants who are being fed via a gastric feeding tube. In addition, there was no consistency among the NNPs in the management of aspirates. Further complicating matters was that not all of the NICU nurses reported aspirates to the NNPs if, based on their experience, they believed it was too small to bring to their attention. Moore and Pickler (2013) stated that observing for beginning signs of feeding intolerance rests with the bedside nurse. However, an additional needed component is for the facility to assess the competency of the nurses in recognizing the signs and symptoms of feeding difficulties as well as implementing the most updated evidence-based practice known on this topic.

Meeting the challenge of providing optimal nutrition for premature infants is a common goal for all neonatal care providers (Fanaro, 2013). The ultimate goal is to duplicate the physiological growth premature infants would have experienced in utero until they have reached term status. What constitutes the best nutritional plan for these infants can be highly individualized. If premature infants' feeding plans are interrupted due to feeding intolerance, this can prevent the intestinal tract from continuing to develop as well as meeting the caloric needs of the infants (Chen, Tzeng, Gau, Kuo, & Chen, 2013). Providing best practices to address unclear aspects (what to do with a gastric aspirate) related to feedings is a needed component in attempting to meet the nutritional needs of premature infants.

Establishing guidelines on how to handle gastric aspirates in premature infants, based on best practices available in current literature and expert opinion, will help to fill a gap that exists in nursing practice for all who take care of premature infants as they grow. This project was a team effort. The idea for this project was identified by the NICU educator as a needed endeavor in conjunction with the pediatric department chair in the NICU. The NICU Project Team was comprised of the NICU educator, the coadministrators of the NNPs, and a senior NICU nurse. Also, the neonatologists and the NICU Education Committee provided input in the development of these guidelines as well as reviewed the final proposed guidelines prior to sharing with the NICU nurses and NNPs. Interprofessional teams have been shown to increase the quality of health care delivered to patients, have a positive effect on inspiring staff, and assist in developing a team mentality (Al Sayah, Szafran, Robertson, Bell, & Williams, 2014).

When a clinical question arises, evidence must be sought to find the answer. No longer can nursing practice be provided based on tradition. This evidence can be found by searching the literature for peer reviewed research in a variety of academic databases (Zimmerman, 2017). The data gleaned from this search was evaluated along with the experience of experts in the clinical field to establish practice recommendations. Implementing these recommendations into nursing practice is known as evidence-based practice (EBP). The main goal of EBP is to advance the health of patients while providing quality care tailored to individual preferences whenever possible. It aids in ensuring nursing practice is kept up-to-date and contributes to making sound clinical care decisions (Jyothi, 2012). In addition, the use of EBP can decrease patient care errors and

facilitate the continual education needed by nurses to remain current in nursing practice. Furthermore, EBP provides a basis for the development and revision of nursing policies and procedures. Finally, EPB facilitates the delivery of efficient and effective patient care.

Purpose

Currently, the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) (AWHONN Position Statements, 2017), a professional organization noted to guide the nursing care of neonates, does not have standards of care or recommendations on how to handle feeding intolerance in terms of gastric aspirates. Furthermore, Torrazza et al. (2015) reported a lack of information in connection with accurately assessing gastric aspirates attained before feeding premature infants. Parker et al. (2015) stated there is not a clear method regarding whether gastric aspirates should be given back to infants based on the amount and color of the aspirates. Moreover, in general, there are no universally accepted standards for addressing the topic of gastric aspirates in premature infants (Lucchini, Bizzarri, Giampietro, & DeCurtis, 2011; Parker et al., 2015; Salas et al., 2015). Providing guidelines on addressing gastric aspirates based on the findings in the literature will help to fill in the gap that currently exists.

The guiding practice focused question for this DNP project was: What evidence-based recommendations are best practices in managing feeding intolerance in neonates who have a gastric tube in place. In this doctoral project, the team compiled the outcomes identified in the literature related to this topic to create a guideline. The research studies that were accessed were evaluated for the type and quality of the

evidence. Additionally, the Appraisal of Guidelines Research and Evaluation (AGREE) II tool's six domains were used to guide the development of the practice guideline to ensure rigor and quality of the guideline content (AGREE, n.d.). Once the guideline was developed in conjunction with the NICU project team, and then presented to the neonatologists, the NICU nurse manager, and the NICU Education Committee for further feedback, it can be used as an EBP model to bring about change in nursing practice when caring for premature infants. Also, after the completion of this project, this guideline can be shared with other NICUs across the United States and globally.

Nature of the Doctoral Project

A wide range of sources of evidence were used to determine the content of the guideline to address gastric aspirates in relation to feeding intolerance in premature infants. The coadministrators of the NICU NNPs, the NICU educator, and the Clinical III NICU nurse who is on the education committee comprised the project team that interacted with the DNP student as best practices were defined based on the literature review. The databases CINAHL Plus with Full Text, PubMed, and the Agency for Healthcare Research and Quality (AHRQ) National Clearinghouse found in the online Walden Library were accessed for articles that were pertinent to this project. The UpToDate and AWHONN websites were also explored. To ensure that a thorough literature review was conducted, a hospital librarian was added to the project team. In addition, the results of the SurveyMonkey® surveys that were sent out to the medical and nursing providers by the NICU Project Team served as feedback from expert opinions regarding the current practice of managing gastric aspirates in gavage-fed infants.

The approach used in this project was to conduct a thorough literature search for best practices in relation to feeding intolerance in infants with gavage tubes in place. Additionally, on-going communication with the NICU Project Team to participate in the definition of these guidelines was conducted by the DNP student through the use of e-mail and meetings. Together with the identified best practices, the NICU Project Team's feedback, further input from the neonatologists and the NICU Education Committee, the guideline for nursing practice when managing feeding intolerance in infants with a gastric tube was developed. The education of the new guidelines was discussed with the NICU Project Team and a plan will be composed as to how to educate the NICU staff on the new guideline. Terry (2015) advised when it is time to decide how to implement a new change in practice, include key stakeholders as their involvement can help to create buy-in to the modification in practice. The literature review was presented in table form to the NICU Project Team to aid this team in determining the content of the new feeding guideline.

Determining a guideline that addressed feeding intolerance including gastric aspirates in preterm infants will help to create a starting point for other NICUs to follow as well as serve as a basis for further research. This guideline addressed not only whether to return or discard feeding aspirates, but also components to prevent feeding intolerance, the process for initiation of enteral feedings and full enteral feedings, and the required documentation when having infants on enteral feedings. Currently, there is a shortage of information on all of these factors in the literature.

Significance

The stakeholders affected by this DNP project began with the bedside nurses at the project site as they are the frontline caretakers of premature infants. Other stakeholders included the neonatologists and the NNPs. Buy-in from this group was essential to ensure that all will abide by the new guideline thus helping to ensure consistency in caring for the infants related to feeding intolerance and gastric aspirates. The NICU educator also had a stake in the new guideline as part of her role is to guide the clinical practice in the NICU. The NICU technicians must pass a unit competency to insert oral gavage tubes and gavage feed the infants and will need to be oriented to the new guideline so they can be engaged with this change in practice (Facility Educator, personal communication, November 2, 2017). Finally, and most importantly, the NICU patients and their families will benefit from this project in that this guideline will help to prevent unnecessary interruption of feedings as well as promote early recognition of feeding intolerance which can lead to necrotizing enterocolitis (NEC) (Riskin et al., 2017).

Having a guideline on addressing feeding intolerance that included how to handle gastric aspirates in premature infants was needed to facilitate optimal nutrition in compromised premature infants. The NICU nurses where this project took place shared with the DNP student a range of responses when asked how they dealt with gastric aspirates. Responses received ranged from “they are never sure what to do with the aspirates,” and “it depends on which nurse practitioner you ask.” This guideline will help

to standardized nursing practice when feeding premature infants who may become feeding intolerant.

This project was specific to the NICU setting (Level III) and their patients; therefore, the guideline that was developed can be transferred to other Level III NICUs. Additionally, other lower levels of NICUs could also benefit from this guideline causing a change in practice as they work with the developing preterm infant. Moreover, stepdown nurseries where premature infants often are moved to feed and grow could also take advantage of the new guideline.

Meeting the premature infants' nutritional needs may help stop other disease factors from occurring such as delayed development of the GI system in terms of gastric motility, which can adversely affect tolerance of feedings and the onset of sepsis (Gregory & Connolly, 2012). Lack of motor and motility of a GI system prevents premature infants from developing an organized system of sucking, swallowing, and breathing needed to be able to breast or nipple feed. It also can delay gastric emptying and prevent adequate absorption of needed nutrients. Furthermore, a postponement of achieving the required nutritional needs may disrupt the needed protection to prevent infection in the GI tract of premature infants. Proper nutrition throughout the neonatal time frame will guarantee continued growth and development through childhood. Assisting this population to grow will increase chances of survival. Finally, altering the preterm infants' morbidity and mortality rate for the better is a definite step in the right direction.

Summary

The reasons why this DNP project was selected were presented as well as the process employed in the development of a neonatal gavage tube guideline to reduce feeding intolerance. How this project related to the NICU was discussed and the significance to nursing was proposed as it will help to address the nursing practice gap on this topic. A NICU Project Team, who participated in the development of this guideline and the dissemination of this information, was identified. Additional sources that were accessed for the project were mentioned and the relationship of the project's purpose and its link to the practice gap were introduced. The stakeholders who were affected by the change in nursing practice were acknowledged. Moreover, the outcome of the project's contribution to the practice of nursing was examined and how the findings could be applicable to other health care areas hypothesized. Finally, the possible effects of this project and how it can positively bring about social change was specified.

Section 2 will reiterate the clinical concern that led to the DNP project and its practice-focused question. An evidenced-based model selected for this project will be described and the significance to nursing practice of addressing feeding intolerance in the gavage-fed neonate given. In addition, how this project relates to the clinical setting where the guideline was developed will be explained as well as background on the hospital setting where this project took place. Finally, the role of the DNP student and the NICU Project Team during this project will be defined.

Section 2: Background and Context

Introduction

A common method of feeding premature infants is through the use of a gastric feeding tube (Lucchini et al., 2011). Due to immature digestive systems, there is a potential that these infants will have difficulty tolerating enteral feedings. Current nursing practice dictates that before administering a feeding through this tube, a syringe is connected to the gastric tube to check for any undigested stomach contents as well as ascertain proper tube placement. The dilemma that follows is what to do with these aspirates as there is a lack of guidelines that speak to this practice issue therefore, the practice-focused question was: What evidence-based recommendations are best practices in managing feeding intolerance in neonates who have a gastric tube in place.

This section will identify, describe, and state the reasons for using the model chosen to guide the doctoral project. A review of the current nursing practice related to managing gastric aspirates and feeding intolerance will be provided as well as a summary of the current research on this topic. In addition, the background and local evidence for this undefined nursing practice will be explored as well as the DNP student role throughout this project. Lastly, the collaboration with the NICU Project Team along with the doctoral student in developing the guideline for decreasing neonatal gavage tube feeding intolerance will be described.

Concepts, Models, and Theories

The Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) model was selected to guide this project as it facilitated the incorporation of research findings into

nursing practice with the participation of an interprofessional team of nursing and medicine (McEwen & Wills, 2014). The main purpose of this model was to determine solutions to clinical practice concerns and covered the areas of nursing practice, nursing instruction, and nursing inquiry (White, Dudley-Brown, & Terhaar, 2016). This model endorsed looking at the value of the research and its relationship to a specific clinical issue (Newhouse, Dearholt, Poe, Pugh, & White, 2007). In addition, it supported reaching out to other resources if the research was scarce on the topic at hand. Furthermore, the JHNEBP model recognized the influence of internal factors (the culture, beliefs, and values of the organization) and external factors (legislation, accreditation bodies, standards of care). For EBP to work, the institution must believe that this process will result in quality patient outcomes. The health care facility where this DNP project took place is a magnet hospital, therefore its culture is to embrace EBP to guide the nursing care provided (Warren, Montgomery, & Freidmann, 2016). EBP is used at hospital-wide nursing meetings such as the education, practice, and quality improvement councils and drives nursing policies.

One of the categories from the JHNEBP involved looking at, evaluating, and summarizing the evidence (Newhouse et al., 2007). Standards of care for this DNP project were challenging to find nor were there any accreditation bodies that have addressed this clinical concern. The main resources that were accessed were PubMed and CINAHL. Folders were set up in PubMed and CINAHL to save articles that were pertinent to the DNP project to facilitate the evaluation and summarization of the content.

Another category concerned developing a plan to incorporate the evidence into nursing practice, evaluation of the practice outcomes, and sharing the findings with stakeholders (Newhouse et al., 2007). This category was not planned to be done in its' entirety due to the nature of the project. However, the ultimate desired outcome was the adoption of a guideline in the NICU setting locally and nationwide.

Newhouse et al. (2007) explained one of the main concepts of the JHNEBP model that was used in the doctoral project. The first concept was EBP and how it is ever changing. The challenge is for nurses to know how to access and evaluate the evidence that exists to answer a nursing practice dilemma. This model looked at research and nonresearch evidence meaning data based on personal experiences, nurses' intuition, their values, and ethics. In addition, the process of establishing a practice question, looking at the evidence, and translating the evidence into practice made up the foundation of EBP.

According to the JHNEBP model, the entire EBP process begins with a well thought out practice question, moves on to evaluating whether the evidence can be applied to the question at hand, and ends with the final answer to the practice in question (Newhouse et al., 2007). Once the final question has been determined, it is important to reflect upon the answer to make sure that it is accurate in answering the question. Nurses need to be willing to refine their knowledge and skills needed to conduct EBP. This mindset will increase the nurses' self-assurance that the identified change in practice will help to define protocols and standards of care for patients.

Relevance to Nursing Practice

The main objective when providing nutrition to premature infants is to replicate the nourishment of the unborn fetus that is the same gestational age in order to promote growth (Culpepper, Hendrickson, Marshall, Benes, & Grover, 2017). If these infants begin to exhibit symptoms that may signal the beginnings of feeding intolerance, feedings can be stopped which interrupts their growth and may have detrimental effects on their neurodevelopment. Gastric aspirates were identified as one of those early symptoms signifying difficulty in feeding; however, there is inadequate proof that obtaining these aspirates prior to instilling a feeding via a gastric feeding tube is a reliable indicator of feeding intolerance (Gephart, Fleiner, & Kijewski, 2017; Parker et al., 2015). Yet, this practice continues and has become a controversial topic among NICU staff. Riskin et al. (2017) found that if gastric aspirates are not obtained prior to gavage feedings, the infants obtained the desired goal of maximum enteral feedings more quickly and the risk for developing NEC did not intensify. On the other hand, Salas et al. (2015) found that obtaining gastric aspirates and refeeding them to the infants who ranged from 23 weeks to 28 weeks of gestational age did not delay the time required to reach full feedings.

The current state of this nursing practice related to gastric aspirates and feeding intolerance of premature infants is that health care providers use this clinical symptom to determine whether to continue, decrease, or stop feedings (Parker et al., 2015). In addition, some of these gastric aspirates are routinely discarded which could contain gastric enzymes needed for digestion of feedings (Torrazza et al., 2015). Carter (2012)

stated there is a lack of conformity amongst health care providers as to what combination of feeding intolerance symptoms premature infants must display before a decision is made to intercede. Moore and Pickler (2013) stated that a combination of gastric aspirates, increase in abdominal girth, inability to retain feedings, stools that test positive for guaiac, delayed breathing for 20 seconds, heart rate below 100 beats per minute, low blood pressure, and problems maintaining a consistent temperature all may indicate feeding intolerance.

The main present strategy used to address this inconsistency in the literature of the role gastric aspirates play in feeding intolerance is to alter the plan of the infants' feeding (Moore & Pickler, 2013). Regardless of whether the feeding is held, decreased, or stopped, the premature infants' path to reach full feedings has been delayed. In addition, many health care providers depend on the assessment of the bedside nurses regarding any symptoms connected with difficulty in feeding premature infants prior to making a medical decision on the next steps. Some health care facilities have policies in place to address symptoms of feeding intolerance and others do not. A complete literature review needed to be conducted to summarize the findings on this topic in order to create a guideline based on evidence to facilitate the premature infants' attainment of optimal nutrition needed for growth and to help prevent the occurrence of NEC.

This doctoral project will advance nursing practice in the NICU in terms of the creation of a guideline for neonates who are being fed by a gavage tube to decrease feeding intolerance. Presently, this type of guideline is missing from the literature. Furthermore, the findings could change the current NICU practice of obtaining gastric

aspirates if it is found that they are not conclusive to signaling feeding problems. Finally, having this guideline will help with consistency of the medical management of premature infants and preventing unnecessary disruptions in their feedings.

Local Background and Context

There were no official guidelines in the NICU where this doctoral project took place on what to do with gastric aspirates once obtained from a gastric feeding tube. As validated by NICU leadership, this lack of guidelines resulted in a variety of opinions from the NNPs as to what to do with the aspirate which translated into inconsistency in nursing care. Furthermore, the National Association of Neonatal Nurses (NANN), the national governing body for NICU nursing, defined the procedure for inserting and maintaining a gastric feeding tube, but did not have published guidelines on how to handle gastric aspirates in terms of feeding intolerance (Ikuta & Beauman, 2011). AWHONN did not address this issue either. *Merenstein and Gardner's Handbook of Neonatal Intensive Care* suggested an algorithm of what to do if gastric aspirates exceed 50% of the total volume to be fed every three hours (Brown et al., 2016). Also recommended was if a gastric aspirate is less than 50% of the total volume to be fed every three hours than it should be refed to the infant. Neither of these recommendations was being consistently followed in the NICU where this project occurred.

This NICU is located in an inner city hospital in the eastern region of the United States. It is a 24 bed, level III-B NICU that offers care to premature infants and any infants that may require intensive care in the newborn period. Many of the parents of the NICU infants come from challenging life situations. This population may not have

access to or have accessed prenatal care and may have chosen a lifestyle that puts the unborn infant at high risk for being born prematurely. The hospital's published mission is to serve all people by providing compassionate, quality care in the clinical and residential setting. Their vision is to continue to be a teaching hospital for medicine and nursing, form partnerships with the community and businesses in Baltimore and the surrounding area, and display the spirit of the hospital to be one of caring, optimism, and warmth. Additionally, the NICU is part of a Magnet certified hospital that supports and expects the use of evidence-based practice to guide the nursing practice (Warren et al., 2016). Moreover the hospital is accredited by The Joint Commission and holds numerous hospital, physician, and nursing awards.

On a federal level, Medicaid and the Children's Health Insurance Program (CHIP) reimburse hospitals for half of all of the infants born in the United States ("CMCS maternal and infant health initiative," n.d.). If premature infants' feedings are disrupted, it can delay growth and development, necessitate invasive methods of delivering nutrition which can intensify the potential for infection to set in, and ultimately adversely affect length of stay in the hospital (Carter, 2012). In the United States, the cost of hospitalization for infants born at less than 28 weeks of gestation is over $100,000; for infants born between 28 and 31 weeks of gestation, $40,000 to $100,000; for infants born between 32-34 weeks of gestation, $10,000 to $30,000; and less than $4,500 for infants born between 35 and 36 weeks of gestation (Soilly, Lejeune, Quantin, Bejean, & Gouyon, 2014).

Role of the DNP Student

I have been a practicing nurse for the past 32 years. With the exception of two or three years, I have worked in a NICU setting. These settings have ranged from a well-known large university hospital to smaller NICUs around the city. Seeing premature infants being able to grow and develop to the point they can go home is inspiring and a large part of why I am a NICU nurse. I have also seen infants who seem to be doing well and within a 12 hour shift, end up being transferred to a university setting for an operation due to the development of NEC or worse yet, not make it out of the NICU. How can I play a part in helping to prevent feeding intolerance and NEC from occurring?

I was the main facilitator of this project. With the help of the NICU educator, I was able to select the topic of my doctoral project. I have reviewed the literature, sought information from other sources related to this topic, and did an introductory meeting with the NICU Education Committee and the NNPs' staff meeting. I also consulted with the hospital's librarian regarding the most efficient manner to review the literature in a thorough manner. Additionally, I primarily worked with the NICU Project Team in the development of this guideline and continued to do so throughout the project following appropriate ethics boards review and approvals.

I have worked in the setting of the doctoral project for the past 23 years, first as a clinical nurse specialist (CNS) in the NICU and now as a flex pool nurse in the NICU. I was acquainted with the educator before she worked in the NICU and many of the nurses that were present when I was the CNS are still working in this NICU. The Chair of the Department of Pediatrics is a neonatologist that started the same year that I did at this

health care institution. I also know many of the attending physicians and some of the NNPs from when I worked fulltime in this setting. However, there are many NICU nurses and NNPs that I did not know well therefore, during my practicum, whenever I could, I introduced myself and gave a brief explanation of why I was there and not taking care of patients as well as the topic of my project.

I wanted to be able to have an impact on what role nursing can participate in to prevent neonates from being delayed in their growth and development. In addition, I wanted to be able to help prevent them from developing mild to serious consequences due to complications from feeding intolerance. There was a concern that, despite what data I found in the literature and from other resources on this project, the NNPs and neonatologists may not readily accept the evidence. The NICU nurses may also have objections to the findings. Again, this is a topic that stirs many different thoughts about what should be done and how it should be handled.

A possible bias that I may have possessed was that I have worked with the NICU educator, many of the NICU nurses, NNPs, and the neonatologists. There was the potential that I could have gravitated more to the nurses and NNPs that I knew instead of those that I did not know when having discussions about the doctoral project. Roumen, F. J. and Roumen (2015) defined this behavior as a bias in that I would be in conflict with my role as an objective party and could be influenced by those I know and neglect others when seeking feedback. To counteract this potential for bias, I worked closely with the NICU Project Team and the other central stakeholders in the NICU where this project took place.

Role of the Project Team

This doctoral project involved a collaborative effort between the NICU Project Team and the doctoral student. In addition, once the feeding guideline was developed, further feedback was sought from the neonatologists, the NICU nurse manager, and the NICU Education Committee. Henderson and Fletcher (2015) found that nurses often feel that the decision to implement EBP is made by someone above them and that their interaction with evidence found in the literature is something they do not have time or even interest in. Utilizing a combination of nursing and medical staff and involving all in the development of this guideline helped to foster engagement in this project.

The NICU educator helped to facilitate communication between the NICU Project Team and the doctoral student. Furthermore, based on recommendations from members of the NICU Project Team, the NICU Education Committee, NNPs, the main neonatologist, and the hospital librarian were introduced to the doctoral project. This doctoral student visited the NICU Education Committee and a NNP staff meeting which also included the two main neonatologists and presented this project and solicited their feedback as to the nature of the project as well as the process to be employed. It is vital to include the stakeholders in this project because they may have a different perspective or foresight regarding the project that the DNP student may have missed (Terry, 2015). Individual assignments were not made.

Summary

The inconsistency in practice and in the literature concerning guidelines to prevent feeding intolerance in infants who are fed with a gavage tube defines the current

gap in the knowledge of what constitutes best practice on this clinical topic. Section 3 will explain the methods to be used to help answer the practice-focused question of this project. Also, the various databases and other resources that were accessed will be shared. Moreover, an explanation will be given on how the data associated with this project will be collected, analyzed, and synthesized.

Section 3: Collection and Analysis of Evidence

Introduction

The clinical problem that this DNP project addressed was the lack of NICU guidelines concerning what to do with gastric aspirates in neonates who are fed with a gavage tube in order to prevent feeding intolerance. Due to the neonates' underdeveloped GI system, they often have difficulty digesting either breast milk or formula (Lucchini et al., 2011). Gastric aspirates could be a beginning sign of feeding intolerance and, if left unchecked, could lead to disease and death of the bowel (Thomson, 2016). Furthermore, the presence of gastric aspirates often leads to the interruption of feedings thus interfering with the neonates' growth and neurological development (Carter, 2012). This potential for medical complications can prolong the infants' length of stay, which has an impact on the federal level in terms of hospitalization costs for Medicaid and CHIP. Additionally, there exists a lack of consensus among the medical health care providers regarding how to address these aspirates as well as the process the nurses employ to handle these aspirates.

The JHNEBP model was identified for use in this project as it supported the process of EBP (Newhouse et al., 2007). Furthermore, this model fostered the implementation of critical thinking and advocated for the importance of keeping an open mind when researching an identified clinical concern. In addition to examining the literature in relation to the clinical practice in question, this model also supported the influence of expert opinion as well as internal and external factors associated with the setting where the clinical change took place. Finally, the JHNEBP model embraced the

notion of developing a plan to share the findings with the stakeholders and also disseminate the findings to a broader audience.

A description of the practicum site along with measures to avoid publication bias was given. The role of the DNP student and the NICU Project Team was described. And the plan for this project to be collaborative in nature with medicine and nursing was introduced.

Section 3 will cover details regarding the practice-focused question. How the manner of searching the literature for evidence related to the practice question and clarify any definitions associated with this project will be reviewed. Next, data that was obtained from the practicum site will be described and how it related to the DNP project. Finally, the method utilized to process this data will be presented.

Practice-Focused Question

There were no guidelines where the project occurred regarding preventing feeding intolerance in regard to gastric aspirates in the neonates who are gavage-fed. This practice concern generated the practice-focused question: What evidence-based recommendations are best practices in managing feeding intolerance in neonates who have a gastric tube in place? To further challenge this practice concern, there are no published guidelines on this subject. The DNP student conducted a literature search concerning this clinical dilemma. The results of this search were shared with the NICU Project Team for review and other key NICU staff identified by this team. Once these findings were reviewed, the guideline was developed with the NICU Project Team and

whomever else they deemed to be part of this process prior to presenting to all NICU staff.

In addition to the literature search, the NICU Project Team developed and distributed to the fulltime (FT) NICU nurses and the NICU medical providers surveys that each contained the same patient scenario. However, the NICU nurses were given two questions related to their current nursing practice and gastric aspirates with one of the questions directing them to select all that apply (See Appendix A to view the NICU nurses' survey). The NICU medical health care providers were given three to four questions (dependent on their responses to one of the questions) inquiring as to their first step when being made aware of their patients having gastric aspirates (See Appendix B to view the medical providers' survey). The goal of these surveys was to ascertain the current nursing practice in the NICU of the handling of gastric aspirates and the care the medical providers deliver based on information given by the nurses. Additionally, the medical providers' survey sought to determine what symptoms neonates need to display that would cause them to go and examine the infants.

These surveys were developed in a program entitled SurveyMonkey®. This program was selected to use because it offered a variety of survey templates, it was not difficult to use, and the surveys could be sent out via a variety of platforms (SurveyMonkey®, 2017). Also, the SurveyMonkey® program allowed the data collected to be sorted and various custom reports obtained. Lastly, one of the members of the NICU Project Team already had an account with this program therefore, there was not any additional expense incurred to conduct these surveys.

Sources of Evidence

The PubMed and CINAHL Plus with Full Text databases were accessed to conduct the literature search as well as the AHRQ National Clearing House. In addition, the American Society for Parenteral and Enteral Nutrition (ASPEN), UpToDate, and the AWHONN websites were searched for any information related to the practice-focused question. Expert opinion from the neonatologists, NNPs, and the NICU nurses also served as resources for the final determination of the DNP project guideline for the NICU.

The evidence gathered from the literature search through PubMed and CINAHL Plus with Full Text databases assisted in narrowing the research articles from the broad category of feeding intolerance to the more narrow focus of feeding intolerance in gavage-fed neonates. The AHRQ National Clearing House site did not provide practice guideline summaries related to this project that are evidence-based (U.S. Department of Health and Human Services: AHRQ, n.d.). The ASPEN website offered some clinical information related to the nutrition of the neonate (ASPEN: Clinical guidelines, n.d.) and the UpToDate website provided one article that addressed enteral nutrition for premature infants (UpToDate: Approach to enteral nutrition in the premature infant, October 16, 2017). Position statements on a variety of clinical topics were found on AWHONN's main website related to the care of infants but did not prove to be helpful to this project (AWHONN: Position statements, 2017). The strength of the evidence was graded by using the five levels denoted in the JHNEBP model (Newhouse et al., 2007). Level 1 indicated the research was a randomized control trial or an experimental study. Level 2

signified a study was quasi-experimental in its design (citation). Level 3 connoted the study was qualitative in nature or nonexperimental. Level 4 represented nationally recognized experts' opinions derived from the evidence established in the research. And Level 5 designated nationally recognized experts' opinions formulated from nonresearch evidence. This rating system represented a pyramid of evidence with Level 1 being at the top (strongest level of evidence) and Level 5 being at the bottom (weakest level of evidence).

The incorporation of NICU expert opinion concerning the guideline represented a consensus of all asked as opposed to only hearing from certain NICU players. This process helped to eliminate only hearing from the most outspoken people and potentially swaying the outcome of opinion related to the clinical concern. This process is known as the Delphi technique which is often utilized to create practice guidelines (McMillan et al., 2016). Components of this technique were used in the formation of the project's guideline. For example, the results of the surveys gathered by the NICU Project Team that was sent to the FT NICU nurses and the medical providers are planned to be shared with both groups by the NICU Project Team when the guideline is disseminated. In addition, the NICU Project Team provided these results with the DNP student which assisted in the identification and prioritization of the components needed to be included in the guideline that was developed.

The information extrapolated from the literature, websites, and expert opinion supported the JHNEBP model of gathering and evaluating evidence (Newhouse et al., 2007). In addition, when developing practice guidelines, AGREE II provided a structure

that can be employed to help guide the development of guidelines for clinical practice (AGREE, n.d.). In particular, AGREE's third domain refers to defining the measures to be used when looking at the evidence. It centered on the process that should be followed to collect and combine the evidence when developing clinical guidelines; that is, how strong the evidence was as well as any limitations found that needed to be addressed. The procedure that follows to develop the guidelines must be explained and a clear connection from the evidence-based findings to the content of the guidelines needs to be evident. Furthermore, experts in the field must be a part of this process and have appraised the clinical guidelines prior to implementation. Due to the current variations in practice connected to this doctoral project, the quality and strength of all resources, along with the interpretation of the results, were essential in order to produce an evidence-based guideline.

The NICU Project team members added to the evidence needed to develop the guideline to prevent feeding intolerance in gavage-fed infants by the two different SurveyMonkeys® surveys that this team developed and distributed. The members of the NICU Project Team were selected due to their expertise in the care of NICU patients and the groups that they represent. The coadministrators of the NNPs have over 30 years' experience in neonatology and represented the medical care that is given in the NICU where this project took place. The NICU educator helped to identify this practice concern and her knowledge of NICU nursing along with the cultural climate in the NICU was invaluable. In addition, she was well-versed in the process of evidence-based practice as she guides all new nursing graduates in their required evidence-based projects.

The NICU nurse is a member of the NICU Education Committee, is a Level III out of IV levels on the education ladder, and is well respected in the NICU for the care she delivers to the infants and their families. She voiced her opinion that deciding what to do with gastric aspirates was a topic that needed to be clarified.

Other participants who provided information related to this project's practice question were the FT NICU nurses, NNPs, and two main neonatologists. Their completion of the surveys by the NICU Project Team provided additional expert opinion that was important to incorporate with the research findings as recommended by McMillan et al. (2016).

The main technique used to gather evidence needed for this project was the literature review that was completed after accessing the various databases of PubMed, CINAHL Plus with full text, and AHRQ National Clearing House and the websites of ASPEN, UpToDate, and AWHONN. Additionally, the surveys that were developed by the NICU Project Team were sent out by this team to the intended stakeholders via the hospital e-mail system with a link provided to the appropriate survey. The surveys were out for all to complete over a 1 month time period. The NICU nurse manager also facilitated the completion of the survey for the nurses. He reminded the NICU staff at a NICU staff meeting and e-mailed each of the NICU charge nurses to encourage all staff to complete the survey. The NICU Project Team was responsible for gathering the results of the SurveyMonkey® surveys.

The strategies used to help validate the content of the surveys began with the NICU Project Team consulting with each other. The coadministrators of the NICU NNPs

relied upon their 30 plus years of experience as NICU NNPs in the evaluation of the survey questions. The NICU clinical educator practiced as a NICU NNP for 10 years and has been in the clinical educator role now for almost the same amount of time. She brought her expertise to the content of the survey by bringing both the medical and nursing aspect into play. The Level III NICU nurse's 26 years of NICU nursing brought her patient care expertise to the table in helping to keep the scenario and possible choices realistic. Clinical expertise can complement research findings by providing a level of knowledge not commonly found in the literature (Oyebode, Patrick, Walker, Campbell, & Powell, 2016). Moreover, based on the content of the project's practice question, there was not a right or wrong answer per se as the goal of the surveys was to look at the trend in the care of preventing feeding intolerance in gavage-fed infants who have gastric aspirates.

The members of the NICU Project Team were asked to participate in this project because of the different NICU groups that they represented, their roles in the NICU, and their NICU knowledge. Each member was asked by the DNP student to be a part of this team after they received information about the clinical concern needing to be addressed. The DNP student has known three of the four members for over 20 years and the other member for the last 3 years. As for the rest of the participants, they embodied the nursing and medical bedside care that NICU infants receive. The DNP student visited the NNP staff meeting and the NICU Education Committee meeting to introduce the project's topic.

Each person that completed a survey remained anonymous in the sense that the result of each survey could not be linked to any one person or computer. Maintaining anonymity in surveys can help to increase the validity of responses by encouraging honest replies (Ripper, Ciaravino, Jones, Jaimie, & Miller, 2017). An incentive of a chocolate bar was offered to each person that completed the survey. Once the survey was completed, the participants wrote their name on a sticky note and placed it on one of the NICU Project Team's office door. The sticky note was attached to the chocolate bar and taped back up on the door for the participant to pick up. Although encouraged to participate in the surveys, it was made clear that this was a voluntary act and not mandated.

This proposal was sent to Walden University's Institutional Review Board (IRB) for review and approval prior to any data retrieval or implementation of the DNP project. All recommendations were followed by the team.

Analysis and Synthesis

The system utilized to gather a major portion of the evidence related to this project was the conduction of a literature review in the following databases: CINAHL Plus with Full Text, PubMed, and the AHRQ National Clearing House. The ASPEN, AWHONN, and UpToDate's websites were also searched. Key search terms were determined in combination with the DNP student and the hospital librarian and were as follows: enteral nutrition, feeding tubes, gastric tube, gavage tube, nasogastric tube, orogastric tube, intubation and feeding and tolerance or feeding intolerance, feeding intolerance, gastric residual, gastrointestinal contents AND preterm infants or premature

infants or very low birth weight or NICU. The integrity of all identified research articles were evaluated using the JHNEBP Individual Evidence Summary chart. This chart not only recorded the author, date, and results or recommendations of the research, it also asked for the type of evidence, details about the sample, any study limitations, and the strength and quality of the study (Newhouse et al., 2007).

The other type of evidence obtained was the expert opinions of the NICU nursing and medical staff. These opinions were attained and the results summarized by the SurveyMonkey® system that the NICU Project Team collected and reviewed. This system automatically recorded the responses for the surveys in their system and displayed the data in percentages for each question asked on the surveys (SurveyMonkey®, 2017). These percentages appeared in a bar graph format and showed the NICU Project Team the current trend in caring for infants who have gastric aspirates. This trend highlighted where there were gaps in understanding elements related to this symptom and its connection to feeding intolerance. The results of the medical provider survey aided in shaping the content of the guideline and the accompanying algorithm that will be taken from the guideline once this DNP project ended. The results of the survey developed and sent by the NICU Project Team to the nurses will guide the education of the new enteral feeding guideline for gavage-fed infants.

Each nurse and medical provider was asked to take the SurveyMonkeys® only once. Although the NICU Project Team cannot fully state that someone took the survey more than once, they can see the time the survey was taken. This time stamp allowed the team to determine that the main responders for the nurses had been the day shift. This

finding alerted the team to focus on communicating with the night shift nurses in encouraging them to complete the survey. The medical provider survey had just been sent out therefore results were limited at this point in time.

Descriptive statistics were utilized to analyze the data once permission was obtained from Walden University's IRB (Polit, 2010). This type of statistic allows the data that was collected to be described. A summary of the survey responses for each question was given. There were two different sets of descriptive statistics given: one based on the survey responses of the FT NICU nurses and the other based on the survey responses of the NICU medical providers.

The synthesis of all of this data was incorporated into the clinical guideline for decreasing feeding intolerance in gavage-fed infants. This guideline will standardize the care given to these infants who begin to have symptoms related to feeding intolerance in the NICU where this project took place. After the formation and acceptance of this guideline, the DNP student recommends that this guideline is shared with other NICUs in need of this direction. The implementation of this guideline can help to prevent unnecessary interruptions of gavage-fed infants feeding thus promoting growth instead of delaying their growth and neurological development.

Summary

Section 3 began with the genesis of the DNP project and its connection to the development of the practice-focused question. The SurveyMonkey® system used by the NICU Project Team to create and distribute surveys to the NICU nurses and medical providers was explained. The various databases and websites were identified in the

conduction of the literature review. How the JHNEBP model promoted the gathering of evidence was shared along with the AGREE II Clinical Guideline Development's principle of the importance on ensuring a direct link between the evidence and the guidelines. The determining factors involved in selection the members of the NICU Project Team were denoted as well as the tactics utilized in collecting the evidence to be used in the development of the feeding intolerance guidelines of the gavage-fed infant. Specifics concerning the validity of the surveys and the protection of the respondents were addressed and how the data from these surveys will be obtained. Finally, how descriptive statistics were employed to summarize the data was described.

Section 4: Findings and Recommendations

Introduction

In the NICU where this project takes place, inconsistent care is provided to gavage-fed infants who have gastric aspirates and exhibit other symptoms of feeding intolerance. A contributing factor to this inconsistency is a lack of a unit guideline that addresses the prevention of feeding intolerance in this population. This gap in practice led to the practice-focused question: What evidence-based recommendations are best practices in managing feeding intolerance in neonates who have a gastric tube in place? The purpose of this DNP project was to analyze and synthesize the recommendations derived from the literature review and expert NICU opinion to formulate an evidence-based enteral feeding guideline that will be utilized in the NICU.

A variety of sources were used to conduct the literature review. CINAHL Plus with Full Text, PubMed, and AHRQ National Clearing House databases were continually accessed, and the A.S.P.E.N., UpToDate, and AWHONN websites were checked for relevant articles and guidelines related to feeding intolerance in gavage-fed infants. Moreover, the results of the SurveyMonkey® surveys that the NICU Project Team developed and sent out to the FT nursing staff and the medical providers regarding symptoms and management of feeding intolerance served as an assessment of the current NICU practice. This assessment was used as a starting point in the investigation of this practice challenge. In addition, the NICU Project Team sent out electronic inquiries to the authors who conducted research on gastric aspirates and to clinicians who were

referred to the Team by the some of the authors. Their responses were also used in the formation of the enteral feeding guideline.

Findings and Implications

The data from the electronic SurveyMonkey® survey that was sent to the FT NICU nurses developed by the NICU Project Team had a 76% response rate. The first question that dealt with how the nurses would handle the aspirate described in the given scenario resulted in 70% contacting the medical provider, 22.5% returning the aspirate and feeding the total volume ordered, 5% discarding the aspirate and feeding the total volume ordered, and 2.5% returning the aspirate and subtracting the amount of the aspirate from the total volume of feeding ordered. The second question asked if the nurses had to contact the medical provider based on the scenario given, what parameters or information would they gather before contacting them. One hundred percent would report on the trend of the abdominal girth, 95.12% would include the infants' stooling pattern, 82.93% would discuss the infants' tone and activity level, 80.49% would speak to the result of the infants' occult blood testing, 58.54% would share the infants' vital signs, 56.10% would discuss the number of apneas, bradycardias, and desaturations the infants were experiencing, 48.74% would bring up the infants' perfusion, and 31.71% would report on the infants' glucose as obtained by a glucometer.

The results of the survey the nurses received provided a picture of the current NICU nursing practice when handling gastric aspirates and what components are reported to the medical providers when notifying them of the gastric aspirates. These responses represent 41 fulltime NICU nurses (out of 54) with NICU experience ranging from 1year

to 40 years, according to NICU leadership. Seventy percent hold a baccalaureate degree in nursing and six hold a master's degree in nursing or education. The information gained from this survey will also help to guide the structuring of the education provided to the nurses regarding the new enteral feeding guideline. For example, checking stools for occult blood as part of feeding intolerance was not discussed in 12 of the 15 articles chosen to be reviewed that examined feeding intolerance in gavage-fed infants. Lucchini et al. (2011) mentioned that stools that test positive for occult blood should not be viewed in isolation of other symptoms. Carter (2012) stated that bloody stools can occur for a myriad of reasons. However, if stools are covered in blood this could warrant further investigation. Schanler (2017) claimed that having stools positive for occult blood is a common occurrence and how this symptom related to the overall clinical picture is uncertain.

For the medical provider SurveyMonkey® survey, there was an overall 59% response rate if the two neonatologists are included along with the 15 NNPs. The NNPs represent 4 to 37 years of NICU NNP experience and the two medical providers each with over 30 years of NICU experience, according to NICU leadership. When asked how the providers would direct the care given to the infant in the scenario that most closely reflects their practice, 80% would examine the infants before deciding how to proceed and 20% would return the aspirate and keep the ordered feeding volume the same. For the second question, 90% would not alter the care the infants received if the aspirate were mucous versus 10% that would change the care the infants received. It is interesting to note that only one of the articles selected for this project supported altering infants'

feeding due to an aspirate that contained mucous. Parker et al. (2015) asserted that gastric residuals can contain needed acids and enzymes to maintain a healthy balance of bacteria in the intestines therefore, there may be times when they should be returned. Overall, the medical provider survey assisted in identifying any trends related to the care of infants with gastric aspirates as well as any inconsistencies in medical care.

The results from the two SurveyMonkey® surveys were not unanticipated. The NICU Project Team thought that due to the lack of guidelines regarding the prevention of feeding intolerance and the role gastric aspirates play that the responses would vary. Also, the main limitation of these surveys was the fact that there was not a 100% response rate from the nursing and medical providers.

There were five Level I studies. Two of these studies did not find that obtaining routine gastric residuals, on their own, was indicative of feeding intolerance (Riskin et al., 2017; Torazza et al., 2015). In addition, in the groups that eliminated checking for gastric aspirates prior to each feeding, both studies found that these infants reached full feeds more quickly than the groups who continued the practice of acquiring gastric aspirates before each feeding. Furthermore, there was not found to be an increase in the risk of infants developing NEC if gastric aspirates were no longer regularly done in asymptomatic infants. Salas et al. (2015) studied whether premature infants who were receiving either breast milk or formula, who were refed their gastric aspirates, reached full feeds more quickly than those infants who were not refed their gastric aspirates. It was determined that refeeding gastric aspirates does not accelerate early gestational age infants to reach full feeds and the influence of breast milk versus formula had no impact

on the time needed to accomplish full feeds. Kaur et al. (2015) looked at whether gastric residuals or abdominal circumference was a better indicator of feeding intolerance. The results of the study determined that abdominal circumference was superior to gastric residuals in signaling feeding intolerance. Additionally, full feeds were met in the abdominal circumference group 4 days before the gastric residual check group. Finally, Chen et al. (2013) inspected which position, whether prone or supine, was the best position to promote feeding digestion after being gavage-fed. The researchers concluded that the prone position was the best; however, this study did not examine if the lateral positions had any effect on decreasing the amount and number of gastric aspirates.

Four of the Level I studies did not have a large enough study population to have statistical power resulting in their findings to not be statistically significant (Kaur et al., 2015; Riskin et al., 2017; Torazza et al., 2015). Chen et al. (2013) only studied gastric residuals and positioning in NICU infants who were fed breast milk. Due to this limitation, the recommended prone position is not generalizable to any other type of feedings. Despite these constraints, the recommendations found in these articles were used to develop the enteral feeding guideline due to the limited number of studies that could be located on the topic of gastric aspirates and feeding intolerance in gavage-fed infants.

There were two Level II articles. Shulman, Ou, and Smith (2011) focused on 50 infants who fell within the age of 25 to 32 weeks of gestation. A connection between the amount of gastric aspirates (milliliters/day) and feeding outcomes was not found. It was determined that gastric aspirates are a result of premature infants' immature digestive

system and motility challenges as opposed to feeding intolerance. Also found was that the amount of gastric aspirates (greater than 50 milliliters or greater than 2 milliliters/kilogram) did not correlate with an increase in abdominal girth. Finally, abdominal distention was most related to the quality of the gastrointestinal tract's motor functioning rather than feeding tolerance issues. Sangers et al. (2013) discovered that the left lateral and supine positions fostered an increase in the amount and frequency of gastric residuals versus the right lateral and prone positions. The population studied were infants between 28 – 36 weeks of gestation and who were on Day 4 of life (n = 147).

The limitations with the results of the Shulman et al. (2010) study started with the fact they were not able to obtain gastric noninvasive intestinal tests prior to the infants reaching full feeds. This lack of opportunity prevented finding a significant link between gastric aspirates, abdominal girths, and feeding intolerance. In addition, the thresholds decided upon for the gastric residuals may be defined differently in other studies which could yield different results. Sangers et al. (2013) did not evaluate the relationship between vent supported infants and gastric aspirates. Furthermore, the infants studied only received breast milk minus any additives which could have an impact on the findings.

Eight Level IV articles were identified during the literature search related to the topic of gavage-fed infants, gastric aspirates, and feeding intolerance. Lucchini et al. (2011) acknowledged the absence of a standard of care guideline in the literature for dealing with gastric aspirates. This article presented recommendations regarding the prevention of feeding intolerance with the first being it is best to begin enteral nutrition as

soon as possible. Early initiation of feedings will help with the premature infants' maturation and mobility of the GI tract as this immaturity results in the obtainment of gastric residuals. This pathophysiology contributes to these aspirates often not being clinically significant in the very low birth weight infant. Although there exists a lack of agreement in the community as to the definition on what is considered an abnormal amount of a gastric aspirate, Lucchini et al defined it as being greater than 50% of infants' ordered feedings. Additionally, these aspirates are more telling if done in conjunction with other symptoms exhibited by the infants (apnea and bradycardia, frank blood in stools, unstable temperature, bloated abdomen, and bilious vomiting). As for abdominal girths, any increase from the baseline measurement greater than 2 centimeters is considered significant.

Carter (2012), Fanaro (2013), Kaminski, Clancy, and Steward (2014), Li et al., (2014), and Parker et al. (2015) conducted summative reviews. All of these articles pointed out there are an absence of consensus as to how much of a role gastric residuals play in the decision to stop feedings. In addition, all of the authors, with the exception of Carter, stated that gastric residuals are not effective in foretelling feeding intolerance if used alone therefore, must look at other symptoms the infants may display. Kaminski et al., Li et al., and Kaminski et al. all recognized the need for further research on the role gastric aspirates play in denoting feeding intolerance.

Fanaro (2013) stated that it was challenging to figure out the relationship of gastric residuals to NEC and that suggested these residuals are attributed more to the infants' immature GI system. Also noted was that abdominal girths are not effective

either as a predicator of feeding intolerance when used alone. Parker et al. (2015) defined having a gastric residual greater than 3.5 milliliters or 33% of the feedings as an increasing symptom of the risk to develop NEC. Li et al. (2014) contended that hemorrhagic gastric residuals are a greater indicator of NEC then bilious residuals. Kaminski et al. (2014) pronounced administering bolus feedings slowly was favored over giving continuous feedings in an effort to prevent feeding intolerance. Moreover, many NICUs will interrupt premature infants' feedings solely based on if gastric residuals are present therefore; all NICUs need to have a standard protocol that reflects the evidence to date. Finally, Carter (2012) recommended that if gastric aspirates exceed 50% of the ordered feeding, or if the aspirate is blood tinged or bilious the feedings need to be stopped. Additionally, if the infants have episodes of bile- or blood-stained emesis greater than three times in 24 hours, the feedings should be stopped, and the infant examined. Checking the stool for blood is not routinely recommended; however, noting the number of apneas and bradycardias is appropriate. Carter went on to advise the following nursing interventions: (a) ensure the infants are fed at the appropriate ordered intervals to help prevent a decreased amount of time to digest feedings; (b) alternate the infants' positions (right lateral and prone are best) for a half hour after the feeding to help promote digestion; (c) be diligent about noting the infants' vital signs and the presence of any apneas and bradycardias; and (d) be consistent in measuring the infants' abdominal girth at the umbilicus and document the measurement placement on the chart. If the abdominal girth should increase greater than 2 centimeters from the initial shift assessment, this could indicate the need for further examination of the infants.

Schanler (2017) surmised that trends of gastric residuals, not just the amount, must be looked at as well as the infant. An algorithm was produced to prevent gastric residuals starting with (a) the importance of checking for proper placement of the feeding tube, paying attention to the infants' position after feeding and whether it encourages digestion, (b) remembering to look at the infants' overall all symptoms (abdominal distention, emesis, changes in amount or color of gastric residuals, and a bowel sound changes), and (c) a reminder not to view symptoms in isolation. Green aspirates could signal a bowel obstruction whereas red aspirates could indicate trauma to the stomach mucosa. Furthermore, if small gastric residuals are obtained, this should not equate to stopping feedings but rather decreasing the total amount of the feedings.

The final Level IV study provided information to formulate guidelines to address feeding intolerance (Dutta et al., 2015). It was not recommended to regularly check for gastric residuals as they are not as strong of an indicator of NEC as once thought nor are abdominal girths to be regularly checked. The abdominal girth can vary as much as 3.5 centimeters over a feeding cycle in a stable premature infant. This statement is in direct contrast to the Carter (2012) statement that if a change in abdominal girth is greater than 2 centimeters then that can be a cause for concern. Red or yellow aspirates have been associated with NEC but green aspirates could be indicative of reflux from the duodenum, a naturally occurring event.

Although the Level IV articles shared information that was in agreement in terms of symptoms of feeding intolerance and acknowledging gastric aspirates are often the consequences of an immature gastrointestinal tract and slowed motility (Carter, 2012;

Fanaro, 2013; Kaminiski et al., 2014; Li et al., 2014; Lucchini et al., 2011; Parker et al., 2015; Schanler et al., 2017), there were also points of discrepancies. For example, not only does there appear to be a difference of opinion regarding what constitutes a problematic increase in abdominal girths but also what color of aspirate should be of concern. Carter (2012), Dutta et al. (2015), and Li et al. (2014), all stated that gastric aspirates that are red can signal the need to stop feedings and Li et al. found that red is a higher warning symptom than a green aspirate. Carter, as well as Schlaner et al. (2017), considered a green aspirate as a reason to stop feedings. On the other hand, Dutta et al. stated that a green aspirate can be a sign of reflux of the duodenum and should not cause alarm. These variances instill the need to establish guidelines to address feeding intolerance in gavage-fed infants in an effort to counteract the inconsistencies of care provided to this population.

Other data collected for the content of the enteral feeding guideline involved one member of the NICU Project Team who e-mailed the main authors of the five Level I studies. Dutta et al. (2015) was one, as this article provided a format for guideline development, and Premji (2005) was another, as she presented a feeding protocol, to ascertain whether they had implemented the findings noted in their research into their practice. Although the Premji article is 13 years old, the team member felt that the information Premji shared was in line with the more recent articles and wanted to also reach out to this author. Premji referred the team member to a colleague who coauthored articles with her. This coauthor replied that gastric residuals are not checked with infants who are fed continuous feeds with nasojejunal feeding tubes (J. Scotland, personal

communication, November 6, 2017). For infants who are fed with bolus feedings, gastric residuals are checked every other feed and once they reach what they define as full feeds, they are no longer checked. The only exception to this rule is if the infants exhibit minor and major clinical indicators which were listed and coincide with other symptoms noted previously. Abdominal girths are only done for trends, stools checked for occult blood only if blood is visible in the stool, and if the gastric residual is less than 50% of the feeding, it is refed and current feeding is given. If it is greater than 50% of the feeding, feedings are held for 1 hour, findings are reported to the medical providers, and there is the potential that the next feeding will be given at the volume of the last feeding tolerated.

Three of the Level I authors responded to the NICU Project Team member's e-mail. Riskin et al. (2017) stated that prior to the study, residuals were checked and after the results of the study, residuals are no longer regularly checked. He went on to share that abdominal circumferences are not routinely measured anymore, occult blood testing is not a reliable indicator due to the potential for many false positive readings, and if residuals are obtained they are mostly refed due to the gastric juices contained within. Riskin concluded with the importance of looking at the entire clinical picture of premature infants when screening for feeding intolerance and the potential for NEC which supports his study's findings. Torazza et al. (2015) referred the NICU Project Team member to one of his coauthors, Parker. Parker answered that new feeding guidelines would be published in 2018 as the result of a National Institute's of Health funded study (L. Parker, personal communication, November 12, 2017). The new

guidelines will not recommend conducting routine gastric residual checks however they will recommend performing abdominal circumferences every 6 - 8 hours. Testing stools for occult blood is not done for the same reason Riskin shared. If the infants exhibit abdominal loops, distention and any other signs of feeding intolerance, the medical provider is contacted to examine the infants. In the Kaur et al. (2015) study, Saluja was listed as the contact. She specified that as a result of the study, abdominal girths are regularly watched however, gastric residuals are not normally checked as a result of the study (S. Saluja, personal communication, December 14, 2017). If the infants exhibit an increase in abdominal girth greater than 2 centimeters or have emesis containing abnormal contents, then gastric residuals are checked.

All of the evidence found during the literature review, and the personal responses from the authors and colleagues of the authors was compiled. In addition, feedback from content experts in the NICU where this project took place was gathered. This collation of information was sifted through and incorporated into the enteral feeding guideline (See Appendix C).

The implications of the enteral feeding guideline that was developed as a result of this doctoral project have the potential to be widespread. Gregory and Connolly (2012) reported on the results of a neonatal enteral survey where 92.9% of the responses utilized the presence of gastric aspirates to decide whether to postpone or stop feedings. Premature infants stand to gain the most as this guideline may aid in preventing the unnecessary interruption of their feeding by standardizing the care provided in gavage-fed infants. Additionally, the use of standardized feeding guidelines may be instrumental

in averting or reducing the occurrence of NEC (Gephart & Hanson, 2013). Being able to have an impact on minimizing the effects of feeding intolerance in the NICU population may help to reduce the morbidity and mortality rates in NICUs across the United States as this disease affects 4% to 11% of very low birth weight neonates. Survivors of NEC may experience neurological delays, suffer from adverse visual and cognitive affects, and be behind in their growth due to nutritional challenges. Furthermore, to be able to prevent these morbidities from occurring by providing best practices in the care of gavage-fed infants may also prevent the neonates' parents and communities from needing to provide special accommodations to meet their lifelong needs.

Premature infants are born with a higher probability of developing developmental disabilities and adverse health consequences than full term infants (Kumar et al., 2017). Curtailing the occurrence of feeding intolerance has the power to reduce the average premature infants' length of stay in a hospital. Delivering proper nutrition can arm this population from developing other comorbidities. The prevention or reduction of NEC can save between $500,000,000 and $1,000,000,000 per year in the care of infants who develop NEC in the United States (Naberhuis, Wetzel, & Tappenden, 2016). In 2013, premature infants born in the United States totaled 11.4% of all births. Providing premature infants with a strong start in life that will help them to grow and develop without complications is a goal of parents, nursing and medical providers, and society as a whole.

Recommendations

The enteral feeding guideline that was developed in conjunction with the NICU Project Team, NICU expert opinion, and the DNP student follows the format of the project site's requirement and is reflected of the findings discussed under the Findings and Implications section. The purpose, expected outcome, and key definitions comprise the beginning of the guideline. The role and responsibilities of the end users of this guideline are explained in a chart format. Next, under the heading of Guideline, there are three sections found in this document. The first reflects nursing interventions that can be employed to prevent gastric distention and feeding intolerance. The second section revolves around the care infants should receive when introducing and increasing enteral feedings. How often and where to measure infants' abdominal circumference is given, the criteria and the procedure for performing gastric residual checks explained, and what symptoms to assess for when monitoring infants for feeding intolerance are provided. The third section delves into the process of beginning full enteral feedings with the highlighted section of C4c representing the largest change in nursing practice in the NICU where this project took place. Once infants are stable and have reached full feeds for five days, gastric residuals do not need to be regularly checked unless symptoms of feeding intolerance are present. A clarification of which infants are covered under this enteral feeding guideline is stated in the next area. The final portion covers what documentation is needed when caring for gavage-fed infants. References to the resources listed at the end are scattered throughout the guideline. The information contained in this guideline reflects the results and findings of the selected articles from the literature

review as well as judgment from NICU experts. In addition, the development of clinical practice guidelines can assist in connecting research with practice (White et al., 2016). It also offers a process to assess the effectiveness of the interventions that are recommended in the literature. This in turn can lead to evidence-based practice.

It is recommended that the results of the SurveyMonkey® surveys completed by the nursing and medical providers are utilized in the education of the new enteral feeding guideline. These results can highlight where practice and research differ; therefore, extra background may be needed in order to promote compliance with the new guideline. Providing a clear link between the scientific evidence and endorsement may facilitate acceptance of the new guideline (White et al., 2016). Likewise, the more disciplines involved in the development of the guideline could foster further acquiescence of the end users.

Another recommendation is that the NICU educator develops an algorithm which contains the same information spelled out in the enteral feeding guideline. This suggestion stems from feedback from the NICU Education Committee. Their rationale for this request is that there are different types of learners and some nurses would rather review an algorithm then read all of the information included in a guideline. Gee, Andreyev, and Muls (2018) advised that when using algorithms to provide information on patient care, to also provide case studies. These case studies can help nurses practice using algorithms to provide patient care.

For the medical providers, it is suggested they are educated on the enteral feeding guideline based on input from the coadministrators of the NICU Project Team. Since

they have been more intimately involved in the development of these guidelines, they can provide further background to the content within if requested. One suggestion is to present this guideline at their monthly NNP meetings in which the two main neonatologists attend.

The NICU educator and the DNP student have discussed one method that can be used in the evaluation of this new enteral feeding guideline. The educator reported a plan to look at a random number of charts prior to the implementation of the enteral feeding guideline to ascertain how many infants' feedings were delayed and their total length of stay and compare it to the same information found in the charts of infants post initiation of the enteral feeding guidelines. Another strategy the educator may engage in is to consult with one of the main neonatologists who reports to the Vermont Oxford Network the number of infants diagnosed with NEC per year. With time, she can examine if there is any decrease in the number of NEC diagnoses post implementation of the enteral feeding guideline.

Contribution of the Doctoral Project Team

The DNP project began with meeting with the NICU Project Team once the members were identified. Most of the communication occurred electronically and the team members did not have individual assignments throughout this project. The whole team developed the SurveyMonkey® surveys which provided valuable information as to the current nursing and medical practice in addressing gastric aspirates and feeding intolerance. The Team was also instrumental in the movement of the development of the enteral feeding guideline. The two coadministrators of the NNPs asked questions and

requested the summary of the articles chosen for this project to make sure the DNP student was on the correct tract. The NICU Level III nurse provided feedback in various stages of this project and was helpful in transferring all of the literature findings that went into the final development of the guideline. Lastly, the NICU educator was instrumental in her assistance in not only facilitating communication between the medical providers, the two main neonatologists, and the DNP student, but also she took charge of following up with many of the researchers and authors of the articles used to reflect best practices in the care of gavage-fed infants. In addition, her involvement enabled pertinent information to be shared among the NICU Project Team. Finally, the NICU educator's NICU expertise helped to guide the progression of the content for the guideline by not only seeking out other sources of data but also in helping to organize the findings and drafting the guideline.

Now that the enteral feeding guideline is done, there is potential that the DNP student may assist in the education of the NICU nurses and possibly the NICU technicians on the guideline since she works on an as needed basis in the NICU at the project site. Also, if requested, the DNP student may help the coadministrators of the NNPs to present the guidelines to the NNPs as a whole group. As a final point, the enteral feeding guideline may be shared with the NICU consortium which is made up of area NICUs.

Strengths and Limitations of the Project

One of the strengths of this doctoral project is that the gap in practice that exists surrounding the management of gastric aspirates and feeding intolerance in the NICU

where the project took place was identified by the NICU educator and the NICU nursing staff. Their interest in standardizing the care gavage-fed infants receive will lead to providing care based on best practices. Having a guideline to address feeding intolerance often results in increased infant growth in a timely manner without needless dependence on parenteral nutrition (Gephart & Hanson, 2013). It allows for treatment decisions to be based on individual symptoms displayed by the infants and is a cost effective way to care for infants. Another advantage of this project is the care gavage-fed infants receive as a result of the guideline can be used to evaluate the evidence and recommendations found in the literature. If other symptomatology and preventative measures are discovered, the guideline can be amended to reflect any needed adjustments.

The main limitation of this doctoral project involved the input from some of the medical providers. As noted in the Findings and Implications section, none of the selected articles found or recommended the attainment of gastric aspirates on a routine basis in the gavage-fed infant. However, some of the medical providers stated they were not comfortable totally eliminating the practice of obtaining gastric aspirates despite what the findings of the literature review contained. This preference is the reason why the implementation of the enteral feeding guideline will need a medical provider's order and is not applicable until the infant is stable and has been on full feeds for five days. Another concern expressed by the medical providers was the use of 50% of the infants' total feeding volume as the deciding factor as to whether the gastric aspirate is returned or brought to the attention of the medical providers. Despite the recommendations found in the literature regarding using 50% as the benchmark to denote potential feeding

intolerance, one of the neonatologists stated his discomfort with this percentage and requested it to be changed to greater than or equal to 30% of the total feeding volume. This change was made to the guideline as expert opinion was a contributing factor to the development of the guideline due to the limited current research that has been conducted on this topic.

One future potential project related to feeding intolerance includes researching the literature for evidence or recommendations as to whether continuous feeding or bolus feeding represents best practice in promoting optimal nutrition for gavage-fed infants (Kaminski et al., 2014). The same process utilized in this doctoral project could be employed with the final product being a standard of care that addresses which method promotes efficient digestion. Another possible project related to the feeding of gavage-fed infants is conducting a literature review on whether it is safe practice to conduct enteral feedings on infants if they have an umbilical arterial catheter (UAC) in place (Schanler, 2017). Often these infants only receive parenteral nutrition which can delay their growth and increase their potential to develop complications (Gregory & Connolly, 2012). The results of this project could also be formatted into an enteral feeding guideline for infants with a UAC in place and follow a similar process to the one used in this doctoral project.

Summary

Section 4 discussed the findings and implications gleaned from the SurveyMonkey® surveys, the literature review, and personal communication with some of the authors of the research and summative reviews. Similarities and differences were

pointed out and limitations encountered presented. The prospective impact the enteral feeding guidelines may have on individuals, communities, and institutions were explored in addition to how the guideline may bring about positive social change. This section also explained the content of the enteral feeding guideline that was created and how the effects of this guideline can be evaluated. A description of how the NICU Project Team worked was provided and further potential involvement of the DNP student after this project was completed was surmised. Strengths and weaknesses of the doctoral project were listed and this section concluded with suggestions for upcoming projects along the same vein as this doctoral project.

Section 5: Dissemination Plan

The enteral feeding guideline was e-mailed to all members of the NICU Project Team, the NICU nurse manager, the pediatric department chair, and the other main neonatologist for a final review. Ruppar et al. (2015) reinforced the importance of having all of the main stakeholders participate from the beginning to the end when developing guidelines. A meeting was held to discuss the content of the guideline and needed edits were identified as well as the incorporation of the suggestion to include the rationale for certain nursing actions within the guideline to help foster compliance. An additional meeting was conducted with the NICU Education Committee to present and solicit feedback regarding the new guideline. A suggestion was made that an algorithm be developed that mirrored the guideline as some of the nurses prefer the information to be in this format as opposed to the hospital required guideline format. The NICU educator and one of the members of the NICU Project Team will develop this algorithm and both documents will be presented to the NICU nursing staff once the guideline has been approved by the hospital-wide practice council. The senior nurse who served on the NICU Project Team will present the enteral feeding guideline to this committee as she is a member of the practice council. Once final approval is obtained, the NICU Education Committee will be instrumental in the education and implementation of the guideline with the NICU nurses. Additionally, the coadministrators of the NNPs will present the guideline to the NNPs at one of their NNP meetings that the neonatologists also attend.

Although the enteral feeding guideline is geared towards changing the nursing practice in NICU nurses, Level I and Level II nursery nurses, and pediatric nurses would

also benefit from implementing this guideline as they care for gavage-fed infants. Proper nursing assessment of symptoms of feeding intolerance can be instrumental in identifying early signs of NEC (Naberhuis et al., 2016). Furthermore, the more standardized evidence-based care nursing and medical providers (NNPs, pediatric nurse practitioners) follow the less disparity there may be in obtaining positive clinical outcomes of infants in terms of their growth and nutritional status (Gregory & Connolly, 2012).

The enteral feeding guideline can be shared locally via the NICU Consortium which is made up of multiple NICUs in the area. This consortium has an electronic distribution list that can be used to disseminate this guideline. On a national level, the guideline can be presented via a poster presentation or in a breakout session at a NANN or AWHONN national conference. In addition, this doctoral project and resulting guideline can be submitted for publication in national journals such as *Neonatal Network* and *Advances in Neonatal Care*. Even though there are a variety of neonatal journals, many neonatal nurses are either members of the Academy of Neonatal Nurses and receive their journal *Neonatal Network* or are members of NANN and receive the journal *Advances in Neonatal Care*. Both of these journals are specific to the nursing practice related to the care of neonates.

Analysis of Self

In the role of practitioner, one of my long term professional goals is to remain current in my NICU skills and knowledge. By remaining on the nursing staff as a per diem nurse where this project took place, I am able to accomplish this goal. This connection helped to interface with the nursing and medical providers while working on

this project. In addition, when discussing the guideline with the medical providers, I could provide first hand examples of the inconsistencies in current nursing practice concerning the handling of gastric aspirates thus serving as an advocate for the NICU infants. Saunders (2015) espoused that being able to advance nursing care to offer quality patient outcomes begins with the clinical bedside nurse. Furthermore, this project facilitated an interprofessional collaboration as the input from the medical providers (neonatologists and NNPs) was necessary due to the limited literature published on the topic of my project. This joint effort supports one of the DNP essentials which centers on the importance of communicating in a manner that enables practice guidelines to be developed in a collaborative manner (Pritham & White, 2016). Finally, due to my continuing practice in the NICU, along with the knowledge gained in my DNP program regarding evidence-based practice, the content of the enteral feeding guideline was organized in a logical manner that was reflective of this project site's nursing practice.

The process employed to answer my project's practice focused question promoted scholarly activities. The development of a practice guideline based on identified best practices by following the steps denoted in the JHNEBP model facilitated my understanding of the process of creating evidence-based practice. This knowledge will be shared with nursing students who are in the nursing program where I work. It has been my experience that many nursing students do not realize how it has become an expectation that nursing practice must be based on evidence and in combination with expert opinion. This leads to my long term scholarly goal of incorporating evidence-

based assignments and activities into the nursing curriculum on a consistent basis both in the classroom and clinical settings.

I have managed many projects throughout my nursing career; however, none as long-term and detailed as this project has been. Long term goals of mine related to being a project manager include remaining organized and focused on the job at hand, ensuring the right players are at the table, and keeping the lines of communication open with all of the necessary players. I remained organized and focused as I kept all correspondence and paperwork between the NICU Project Team and myself in one folder on my computer and on a clipboard that I carried with me to my practicums. Whenever I interacted with the NICU Project Team or individual members of the team, I would remind them where we last left off and what still needed to be done. The NICU Project Team represented the medical providers, NICU educator, and a senior NICU nurse – all key members who represented roles that would be affected by the development of the enteral feeding guideline. As for communication, I presented my project in the beginning and at the end to the NICU Education Committee. For the medical providers, I presented on my project in the beginning, throughout the process, and at the end of the project. I maintained weekly contact with members of the NICU Project Team, in particular the NICU educator who also served as my practicum mentor. In the end, an enteral feeding guideline that addressed both the prevention of feeding intolerance until the infants reach full feeds and the care of infants once they reach full feeds was produced. This guideline reflects best practices and answered my project's practice focused question. And with the acceptance of the medical providers and the NICU Education Committee, and anticipated

acceptance by the hospital-wide practice council, the project site is preparing to implement the enteral feeding guideline into practice.

The final completion of this project rested on the feedback from the medical providers when the enteral feeding guideline was presented to them as the NICU Education committee had already voiced their endorsement of the guideline. One of the challenges that occurred during this project was whether the medical providers on the NICU Project Team and the two main neonatologists reviewed the literature findings sent to them as requested. As stated in Section 4, one of the neonatologists voiced his concern with using 50% of the prescribed feed as the guiding percentage to designate how to handle a gastric aspirate especially with very low birth weight infants. Despite the fact that this recommendation was found in the literature and from other expert opinions that was previously shared with all present, it was not until the final meeting with the medical providers that his opinion was made known. I stressed to all present that the model chosen to guide this project welcomes the input of expert opinion and the guideline was not meant to dictate medical care. After further discussion it was decided to change all non-trophic gastric aspirates' guiding amount to be 30% in place of the 50%.

The other main challenge that occurred with this project was finding research and other peer reviewed articles that addressed gastric aspirates and what other symptomatology designated signs of feeding intolerance. My initial meeting with the project site's librarian explained which databases were most specific to my topic and helped set up a system that would pull articles that contained specific search words related to my topic. Some of the references in these articles lead to other articles that had

not been identified through the search terms search. Another helpful action occurred when a member of the NICU Project Team e-mailed the authors of the research articles and other selected authors of the chosen articles. Their feedback was utilized in the development of the content of the enteral feeding guideline.

Summary

This subject of this doctoral project was ultimately defined by the NICU educator. The project was a Quality Improvement initiative intended to regulate the nursing care NICU infants receive who are being fed via a gavage tube with the goal of improved patient outcomes (a decrease in unnecessary interruptions of enteral feedings and a decrease in the occurrence of NEC). A collaborative approach was implemented with the creation of a NICU Project Team that comprised nursing and medicine along with input from the hospital librarian. The JHNEBP model provided the framework for the project and the NICU Project Team collected data from SurveyMonkey® surveys to ascertain current nursing and medical practice related to gastric aspirates and feeding intolerance. After conducting a literature review, contacting NICU experts associated with the articles used in this project, and holding numerous meetings with key stakeholders throughout the project, an enteral feeding guideline was developed. This guideline can be used while NICU infants are on trophic feeds as well as once they reach full feeds.

The creation of an enteral feeding guideline for NICU patients at the project site is a starting point in defining best practices to prevent and address feeding intolerance. The effect the enteral feeding guideline has on improved NICU patient outcomes must be evaluated. This guideline can and should be edited as new evidence is made available.

Interprofessional input should continue as to the content of this guideline in order to sustain compliance with evidence-based practice and normalization of the care of gavage-fed infants.

References

AGREE. (n.d.). AGREE II overview tutorial. Retrieved fromhttp://agree2.machealth.ca/players/open/index.html

Al Sayah, F., Szafran, O., Robertson, S., Bell, N. R., & Williams, B. (2014). Nursing perspectives on factors influencing interdisciplinary teamwork in the Canadian primary care setting. *Journal of Clinical Nursing*, *23*(19/20), 2968-2979. doi:10.1111/jocn.12547

American Society for Parenteral and Enteral Nutrition (ASPEN). (n.d.). *ASPEN Clinical guidelines*. Retrieved from http://www.nutritioncare.org/Guidelines_and_Clinical_Resources/Clinical_Guidelines/

Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN). (2017). *Position statements*. Retrieved from http://www.awhonn.org/?page=PositionStatements

Brown, L. D., Hendrickson, K., Evans, R., Davis, J., Anderson, M.S., & Hay Jr., W. W. (2016). Enteral nutrition. In S. L. Gardner, B. S. Carter, M. E. Hines, & J. A. Hernandez (Eds.), *Merenstein and Gardner's handbook of neonatal intensive care* (8^{th} ed.), (pp. 377-418). St. Louis, MO: Elsevier.

Carter, B. M. (2012). Feeding intolerance in preterm infants and standard of care guidelines for nursing assessments. *Newborn and Infant Nursing Reviews*, *12*(4), 187-201. doi:10.1053/j.nainr.2012.09.007

Chen, S., Tzeng, Y., Gau, B, Kuo, P., & Chen, J. (2013). Effects of prone and supine

positioning on gastric residuals in preterm infants: A time series with cross-over study. *International Journal of Nursing Studies, 50,* 1459-1467. doi:10.1016/j.ijnurstu.2013.02.009

CMCS maternal and infant health initiative. (n.d.). Retrieved from https://www.medicaid.gov/medicaid/quality-of-care/downloads/maternal-and-infant-health-initiative.pdf

Culpepper, C., Hendrickson, K., Marshall, S., Benes, J., & Grover, T. R. (2017). Implementation of feeding guidelines hastens the time to initiation of enteral feeds and improves growth velocity in very low birth-weight infants. *Advances in Neonatal Care, 17*(2), 139-145. doi:10.1097/ANC.0000000000000347

Dutta, S., Singh, B., Chessell, L., Wilson, J., Janes, M., McDonald, K., & ... Fusch, C. (2015). Guidelines for feeding very low birth weight infants. *Nutrients*, *7*(1), 423-442. Retrieved from https://www.ncbi.nim.nih.gov/pmc/articles/pmc4303848

Fanaro, S. (2013). Feeding intolerance in the preterm infant. *Early Human Development, 89,* S13-S20. doi:10.1016/j.earlhumdev.2013.07.013

Frakt, A. (2014). High-tech care can save lives--but it also may create incentives that result in lives lost. *JAMA: Journal of the American Medical Association, 312*(20), 2081. doi:10.1001/jama.2014.14531

Gee, C., Andreyev, J., & Muls, A. (2018). Developing advanced clinical practice skills in gastrointestinal consequences of cancer treatment. *British Journal of Nursing*, *27*(5), 237-247. doi:10.12968/bjon.2018.27.5.237

Gephart, S. M., Fleiner, M., & Kijewski, A. (2017). The connection between abdominal

signs and necrotizing enterocolitis in infants 501 to 1500 g. *Advances in Neonatal Care, 17*(1), 53-64. doi:10.1097/ANC.0000000000000345

Gephart, S. M., & Hanson, C. K. (2013). Preventing necrotizing enterocolitis with standardized feeding protocols. *Advances in Neonatal Care, 13*(1), 48-54. doi:10.1097/ANC.Ob013e31827eceOa

Gregory, K. E., & Connolly, T. C. (2012). Enteral feeding practices in the NICU: Results from a 2009 neonatal enteral feeding survey. *Advances in Neonatal Care, 12*(1), 46-55. doi:10.1097/ANC.Ob013e3182425aab

Henderson, E. M., & Fletcher, M. (2015). Nursing culture. *Journal of Child Health Care*, *19*(4), 550-557. doi:10.1177/1367493514530956

Ikuta, L. M., & Beauman, S. S. (Eds.). (2011). *Policies, procedures, and competencies for neonatal nursing care.* Glenview, IL: NANN

Jyothi, N. (2012). Evidence-based practice - the future of nursing and the role of nurse. *International Journal of Nursing Education*, *4*(2), 82-84. http://www.ijone.org/

Kaminski, M., Clancy, K., & Steward, D. (2014). Dilemmas surrounding interpretation of gastric residuals in the NICU setting. *ICAN: Infant, Child, & Adolescent Nutrition*, *6*(5), 286. doi/full/10.1177/1941406414539005

Kaur, A., Kler, N., Saluja, S., Modi, M., Soni, A., Thakur, A., & Garg, P. (2015). Abdominal circumference or gastric residual volume as measure of feed intolerance in VLBW infants. *Journal of Pediatric Gastroenterology and Nutrition*, *60*(2), 259-263. doi:10.1097/MPG.0000000000000576

Kumar, R. K., Singhal, A., Vaidya, U., Banerjee, S., Anwar, F., & Rao, S. (2017). Optimizing nutrition in preterm low birth weight infants – consensus summary. *Frontiers in Nutrition, 4*(20), 1-9. doi:10.3389/fnut.2017.00020

Li, Y.F., Lin, H. C, Torrazza, R. M., Parker, L., Talaga, E., & Neu, J. (2014). Gastric residual evaluation in preterm neonates: A useful monitoring technique or a hindrance? *Pediatrics and Neonatology, 55*(5), 335-340. doi:10.1016/j.pedneo.2014.02.008

Lucchini, R., Bizzarri, B., Giampietro, S., & DeCurtis, M. (2011). Feeding intolerance in preterm infants. How to understand the warning signs. *The Journal of Maternal-Fetal and Neonatal Medicine, 24* (S(1)), 72-74. doi:10.3109/14767058.2011.607663

McEwen, M., & Wills, E. M. (2014). *Theoretical basis for nursing* (4th ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

McMillan, S. S., King, M., & Tully, M. P. (2016). How to use the nominal group and Delphi techniques. *International Journal of Clinical Pharmacy, 38*(3), 655-662. doi:http://dx.doi.org.ezp.waldenlibrary.org/10.1007/s11096-016-0257-x

Moore, T. A., & Pickler, R. H. (2013). Evaluating the precision of clinical assessments for feeding intolerance. *Newborn & Infant Nursing Reviews, 13*(4), 184-188. doi:10.1053/j.nainr.2013.09.005

Naberhuis, J., Wetzel, C., & Tappenden, K. A. (2016). A novel neonatal feeding

intolerance and necrotizing enterocolitis risk-scoring tool is easy to use and valued by nursing staff. *Advances in Neonatal Care, 16*(3), 239-244. doi:10.1097/ANC.0000000000000250

Newhouse, R. P., Dearholt, S. L., Poe, S. S., Pugh, L. C., & White, K. M. (2007). *Johns Hopkins nursing evidence-based practice model and guidelines*. Indianapolis: Sigma Theta Tau International.

Oyebode, O., Patrick, H., Walker, A., Campbell, B., & Powell, J. (2016). The ghost in the machine? The value of expert advice in the production of evidence-based guidance: A mixed methods study of the NICE interventional procedures programme. *International Journal of Technology Assessment in Health Care, 32*(1/2), 61-68. doi:10.1017/S0266462315000690

Parker, L., Torrazza, R. M., Li, Y. Talaga, E., Shuster, J., and Neu, J. (2015). Aspiration and evaluation of gastric residuals in the neonatal intensive care unit: State of science. *The Journal of Perinatal & Neonatal Nursing, 29*(1), 51-59. doi: 10.1097/JPN.0000000000000080

Polit, D. (2010). *Statistics and data analysis for nursing research* (2nd ed.). Upper Saddle River, NJ: Pearson Education Inc.

Premji, S. S. (2005). Enteral feeding for high-risk neonates: A digest for nurses into putative risk and benefits to ensure safe and comfortable care. *The Journal of Perinatal & Neonatal Nursing, 19*(1), 59-71. https://journals.lww.com/jpnnjournal/toc/2005/01000

Pritham, U. A., & White, P. (2016). Using program evaluations to capture healthcare

system change. *The Nurse Practitioner, 41*(4), 44-53. doi:10.1097/01.NPR.0000481509.24736.c8

Ripper, L., Ciaravino, S., Jones, K., Jaime, M. D., & Miller, E. (2017). Use of a respondent-generated personal code for matching anonymous adolescent surveys in longitudinal studies. *Journal of Adolescent Health, 60*(6), 751-753. doi:10.1016/j.jadohealth.2017.01.003

Riskin, A., Cohen, K., Kugelman, A., Toropine, A., Said, W., & Bader, D. (2017). The impact of routine evaluation of gastric residual volumes on the time to achieve full enteral feeding in preterm infants. *The Journal of Pediatrics, 189*, 128-134. doi:10.1016/j.jpeds.2017.05.054

Roumen, F. J., & Roumen, F. E. (2015). Industry-sponsored research: How to eliminate bias? *European Journal of Contraception & Reproductive Health Care, 20*(3), 155-157. doi: 10.3109/13625187.2015.1046254

Ruppar, T., Dobbels, F., Lewek, P., Matyiaszcyk, M., Siebens, K., & Geest, S. (2015). Systematic review of clinical practice guidelines for the improvement of medication adherence. *Internal Journal of Behavioral Medicine, 22*(6), 699-708. doi:10.1007/s12529-015-9479-x

Salas, A. A., Cuna, A., Bhat, R., McGwin, G., Carlo, W. A., & Ambalavanan, N. (2015). A randomized trial of re-feeding gastric residuals in preterm infants. *Archives of Disease in Childhood. Fetal & Neonatal Edition, 100*, F224-F228. doi: 10.1136/archdischild-2014-307067

Sangers, H., de Jong, P.M., Mulder, S.E., Stigter, G.D., van den Berg, C.M., te Pas, A.B.,

& Walther, F.J. (2013). Outcomes of gastric residuals whilst feeding preterm infants in various body positions. *Journal of Neonatal Nursing*, *19,* 337-341. doi:10.1016/j.jnn.2012.12.003

Saunders, H. (2015). Translating knowledge into best practice care bundles: A pragmatic strategy for EBP implementation via moving postprocedural pain management nursing guidelines into clinical practice. *Journal of Clinical Nursing, 24*(13/14), 2035-2051. doi: 10.1111/jocn.12812

Schanler, R. J. (2017). Approach to enteral nutrition in the premature infant. In A.G. Hoppin (Ed.), *UpToDate*. Retrieved from https://www.uptodate.com/contents/approach-to-enteral-nutrition-in-the-premature-infant.

Shulman, R. J., Ou, C., Smith, E. O. (2011). Evaluation of potential factors predicting attainment of full gavage feedings in preterm infants. *Neonatology, 99*(1), 38-44. doi: 10.1159/000302020

Soilly, A. L., Lejeune, C., Quantin, C., Bejean, S., & Gouyon, J. B. (2014). Economic analysis of the costs associated with prematurity from a literature review. *Public Health, 128*(1), 43-62. doi:10.1016/j.puhe.2013.09.014

SurveyMonkey®. (2017). *Ask more, know more, do more.* Retrieved from https://www.surveymonkey.com/mp/take-a-tour/?ut_source=header

Terry, A. J. (2015). The importance of research in the doctor of nursing practice degree. *Clinical research for the doctor of nursing practice.* (pp. 3-26). (2nd ed.). Burlington, MA: Jones & Bartlett Learning.

Thomson, B. (2016). Feeding in the NICU: Comparing bolus and continuous feedings. *Newborn & Infant Nursing Reviews, 16*(3), 126-128. doi:10.1053/j.nainr.2016.08.006

Torrazza, R. M., Parker, L. A., Li, Y., Talaga, E., Shuster, J., & Neu, J. (2015). The value of routine evaluation of gastric residuals in very low birth weight infants. *Journal of Perinatology, 35*(1), 57-60. doi:10.1038/jp.2014.147

UpToDate. (2017). *Search UpToDate*. Retrieved from https://www.uptodate.com/contents/search

U.S. Department of Health and Human Services: Agency for Healthcare Research and Quality (AHRQ) National Clearing House. (n.d.).Retrieved from https://guideline.gov/

Warren, J. I., Montgomery, K. L., & Friedmann, E. (2016). Three-year pre-post analysis of EBP integration in a magnet-designated community hospital. *Worldviews on Evidence-Based Nursing, 13*(1), 50-58. doi:10.1111/wvn.12148

White, K. M., Dudley-Brown, S., & Terhaar, M.F. (2016). *Translation of evidence into nursing and health care* (2nd ed.). New York, NY: Springer.

Zimmerman, K. (2017). Essentials of evidence based practice. *International Journal of Childbirth Education*, *32*(2), 37-43. http://icea.org/about/icea-journal/

Appendix A: NICU Gastric Aspirates - RN

1. A neonate who is 31 weeks of gestation reached full feeds for the week (30 ml q 3 hours). There is no history of aspirates or emesis. His abdominal girth has been stable for the entire shift and he has been fed on time for every feeding for this shift. At 1800, his abdomen shows mild loops, non-tender, no discoloration of abdomen, and he had vitamins and Ferinsol at 1200. He normally stools twice a day and the last was at the previous feeding. The abdominal girth is up 2 cm for this feeding and there is a 3 ml aspirate of undigested milk without any discoloration.

What would you do with this aspirate? I would more likely,

Select the answer that most closely mirrors your practice.

- o Return the aspirate and feed the full volume
- o Return the aspirate and subtract the 3 ml from the full volume
- o Discard the aspirate and feed the full volume
- o Other (please specify)

2. If you were to contact the medical provider, what parameters/information would you obtain before contacting the medical provider?

Check all that apply:

- o Trend of abdominal girth
- o Episodes of A, B, & D
- o Stooling pattern
- o Occult blood testing results
- o Activity and tone of infant
- o Vital signs (TPR, BP)
- o Perfusion
- o Glucose – by glucometer
- o Other (please specify)

Appendix B: NICU Gastric Aspirates - Medical Providers

1. A neonate who is 31 weeks of gestation reached full feeds for the week (30 ml q 3 hours). There is no history of aspirates or emesis. His abdominal girth has been stable for the entire shift and he has been fed on time for every feeding for this shift. At 1800, his abdomen shows mild loops, non-tender, no discoloration of abdomen, and he had vitamins and Ferinsol at 1200. He normally stools twice a day and the last was at the previous feeding. The abdominal girth is up 2 cm for this feeding and there is a 3 ml aspirate of undigested milk without any discoloration.

The nurse comes to you and provides you with this information, what instructions would you tell him/her to do?

Please select your first action based solely on the scenario above, which closely mirrors your practice. I would…..

- o Return the aspirate and feed the full volume
- o Return the aspirate and subtract the 3 ml from the full volume
- o Examine the infant before making a decision
- o Hold this feeding and obtain an x-ray
- o Discard the aspirate and feed the full volume
- o Other (Please specify

2. If the aspirate were mucous would it change your response?

- o Yes
- o No

3. ***If you answered "Yes" to the last question***, what would you do differently?

4. ***If you answered examine infant in question 1, answer N/A to this question in the textbox.***

What would have to be different in this scenario to lead you to examining this patient?

Appendix C: Enteral Feeding Guideline

<table>
<tr><td colspan="3"></td><td colspan="3">Patient Care Services
□ Divisional □ Departmental
X Unit-based</td></tr>
<tr><td colspan="6">Name of PPPG: Enteral Feeding Guideline</td></tr>
<tr><td>□ Policy</td><td>□ Procedure</td><td>□ Protocol</td><td>X Guideline</td><td>Number</td><td></td></tr>
<tr><td colspan="4">Responsible Unit:
Neonatal Intensive Care Unit (NICU)</td><td>Effective Date</td><td></td></tr>
<tr><td colspan="4" rowspan="2">Appropriate Clinical Areas:
Neonatal Intensive Care Unit (NICU)</td><td>Supersedes</td><td></td></tr>
<tr><td>Archive Date</td><td></td></tr>
<tr><td colspan="6">Key Words:</td></tr>
<tr><td colspan="6">Disclaimer: The information contained in this document is intended to set forth general information and considerations for patient care. However, the decisions concerning the care of any individual patient are subject to the presentation of each patient and the clinical judgment of the health care provider.</td></tr>
</table>

I. PURPOSE: The purpose of this guideline is to focus on the key elements to assess infants with enteral feedings, to promote early identification, and notification of potentially subtle symptoms associated with feeding intolerance. In addition, this guideline will assist the nurse in the decision making process regarding feeding residuals, interventions to reduce incidence of gastric distention, and facilitate clear communication of the infant's status with the provider notification.

II. EXPECTED OUTCOME: Infants will achieve full enteral feedings with minimal interruption of nutritional plan to maintain adequate growth.

III. DEFINITIONS:

A. Necrotizing enterocolitis – inflammation or necrosis of the infant's intestines which can result in infant morbidity and mortality (Parker et al., 2014).

B. Gastric residuals/aspirates – volume of undigested contents in a preterm infant's stomach obtained via an OG tube prior to the instillation of the next feeding (Carter, 2012).

IV. RESPONSIBILITIES:

ROLE	FUNCTION
Registered Nurse	1. Performs and documents assessments of infants on enteral feedings 2. Manages gastric residuals/aspirates 3. Notify medical provider of any feeding intolerance
Nursing Support Tech	1. Provides enteral feedings according to nurse instructions 2. Notifies RN of any changes in infant status, residuals, increased girth, or change in infant's activity
Medical Providers	1. Writes order to initiate enteral feeding guideline

V. GUIDELINE:

A. **Prevention of gastric distention/feeding intolerance**

1. Gastric Venting
    a. Connect a 10 ml syringe to the gastric tube to vent air out of the infant's stomach for any infant who:
        1) Requires respiratory support
        2) Is NPO and does not have a dual lumen tube
        3) Is receiving enteral feedings
    b. Change venting syringe every 24 hours
2. Administration of medications - give Poly-vi-sol, Fer-in-sol, electrolytes with feedings and not into an empty stomach for improved tolerance by the infant
3. May place infant prone and/or in side-lying position (Dutta, et. al., 2015) after feedings until 33 post-menstrual age (PMA) which may facilitate gastric emptying. At 33 weeks PMA discuss with medical providers initiating transition to Safe to Sleep positioning
4. Maintain consistent time interval between feedings to allow for complete digestion of previous feed

B. **Evaluation of Introduction & Increasing of Enteral Feedings**

1. Assessments (1, 4, 5)
    a. <u>Abdominal circumference</u> –
        1) Is performed as part of the RNs initial shift assessment
        2) Measurements are taken across the umbilicus. If there is still an umbilical cord or lines present, then measure just above the umbilicus.
        3) Nursing techs will continue to do abdominal circumferences with each feeding until otherwise notified by RN
    b. <u>Gastric Residual checks</u> –
        1) Are performed prior to each feeding until the infant achieves full feeds. After the infant has tolerated full feeds times 5 days, discuss plan with medical provider to advance infant to the Full Enteral Feeding Guideline, as stated in section "C", below
        2) Use a 5 or 6 ml enteral syringe and gently aspirate contents from stomach (2)
            a) If no aspirate is obtained, insert 1 ml of air into feeding tube and auscultate over stomach area to confirm placement, then massage stomach. Attempt to aspirate gastric contents again.
            b) If nothing is obtained on this 2nd attempt, re-measure for appropriate insertion distance for the feeding tube and compare this measurement to the actual distance of the

current tube position. If a change in position is necessary, adjust tube distance and recheck for aspirate and position.

i. ***Note:*** *the infant may have grown since the initial insertion of the feeding tube, thus altering the position*

ii. ***Note:*** *Some presence of gastric contents should be visible in the feeding tube, this does not have to be a significant volume, just a presence, to help confirm placement*

c. Residuals (2, 3, 7)
   1) **<50% of total trophic feeding OR <30% of total feeding volume,** without other symptomatology, refeed residual volume and give full feeding volume
   2) Include actions and assessment in documentation
   3) **≥ 30% of feeding volume**
      a) Hold feeding
      b) Measure abdominal girth
      c) Hold return of residual until the provider exams the infant
      d) Notify medical provider and include any symptoms of feeding intolerance, stooling pattern, and time interval of last feeding

d. Monitor for signs of feeding intolerance – notify medical provider if any of these symptoms are present
   1) Abdominal tenderness on palpation or presence of any discoloration of abdomen
   2) Frequent (3 or more in 24 hours) emesis, or bilious emesis, or frank blood in emesis/aspirate (1)
   3) Visible bowel loops
   4) Decreased bowel sounds
   5) Increased abdominal girth by 2 cm (1)
   6) Frank blood in stool
   7) Changes in clinical condition as noted by: increased episodes of apneas, bradycardia, desaturations, changes in vital signs, perfusion, decrease in tone or activity
   8) Residuals as stated above (B1c)

C. **Full Enteral Feeding Guideline**
   1. ***Once the infant has reached and tolerated full feeds for 5 days***, the infant will be evaluated for progression to the **Full Enteral Feeding Guideline**
   2. Discuss progression of feedings in rounds with medical providers

3. Medical provider will write an order to initiate the **Full Enteral Feeding Guideline**
4. Assessments:
    a. Continue to monitor for signs and symptoms of feeding intolerance as stated in the section B (above) under Assessments
    b. Abdominal circumferences on initial assessment and with changes. Nursing techs will continue to perform abdominal circumferences with each feeding until infant is on full oral feedings or otherwise indicated by RN
    c. ***Residuals are not routinely checked, unless the infant is presenting with symptoms of feeding intolerance or there is a change in infant condition*** *(2,3,5,6)*

VI. PEDIATRIC CONSIDERATIONS: Only applicable to NICU infants

VII. DOCUMENTATION:

A. Document feeding tube placement (cm marking) with every feed as the infant may have grown since the feeding tube was originally placed
B. Document any symptoms of feeding intolerance
C. Document abdominal circumferences as depicted in guideline and when there is a change in infant's medical condition
D. Document any feeding residuals
    1. Describe contents
        a. Curdled, partially curdled
        b. Undigested
        c. Mucous
        d. Blood flecks
        e. Discoloration due to medication
    2. Indicate amount of gastric residual/aspirate
    3. Indicate which medical provider was notified
    4. Document intervention plan

VIII. REFERENCES:

1. Carter, B. M. (2012). Feeding intolerance in preterm infants and standard of care guidelines for nursing assessments. *Newborn and Infant Nursing Reviews*, *12*(4), 187-201. doi:10.1053/j.nainr.2012.09.007
2. Dutta, S., Singh, B., Chessell, L., Wilson, J., Janes, M., McDonald, K., . . . Fusch, C. (2015). Guidelines for feeding very low birth weight infants. *Nutrients, 7*(1), 423-442. doi:10.3390/nu7010423
3. J. Scotland, personal communication, November 6, 2017.
4. Kaminski, M.,M., Clancy, K.,L., & Steward, D., K. (2014). Dilemmas surrounding interpretation of gastric residuals in the NICU setting. *Infant, Child, & Adolescent Nutrition.* doi:10.1177/1941406414539005
5. Parker, L., Torrazza, R. M., Li, Y. Talaga, E., Shuster, J., and Neu, J. (2015). Aspiration and evaluation of gastric residuals in the neonatal intensive care unit: State of science. *The Journal of Perinatal & Neonatal Nursing, 29*(1), 51-59. doi:10.1097/JPN.0000000000000080
6. Riskin, A., Cohen, K., Kugelman, A., Toropine, A., Said, W., & Bader, D. (2017). The impact of routine evaluation of gastric residual volumes on the time to

achieve full enteral feeding in preterm infants. *The Journal of Pediatrics*, *189*, 128-134. doi:10.1016/j.jpeds.2017.05.054

7. Torrazza, R.M., Parker, L.A., Li, Y., Talaga, E., Shuster, J., & Neu, J. (2015). The value of routine evaluation of gastric residuals in very low birth weight infants. *Journal of Perinatology, 35*, 57-60.

IX. APPROVAL:

Date Approved	Department	Approver' s Name	Approver's Signature
	Director of Nurseries Chief of Pediatrics		
	Nursing Director of Family Childbirth Children's Center		
	Nursing Practice Council		
	Sr. Vice President Patient Care Services		