

**Neonatal Resuscitation Training for Health Care Providers in the Home Birth
and Birth Center Setting: A Proposal for Improving Neonatal Outcomes**

Penny Lane MSN, CNM, IBCLC
Thorntown, Indiana

Associate Science of Nursing, Ivy Tech State College, 1997

Bachelors of Arts in Maternal & Child Health: Lactation Consulting, Union Institute &
University, 2003

Master's in Nursing Science, Frontier School of Midwifery & Family Nursing, 2007

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_____ Committee Chair

Linda Cole CNM, DNP

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Dedication & Acknowledgement Page

First and foremost, I must acknowledge the consistent and consuming presence of the Lord in my life, and His unwavering dedication to maturing the passion He has placed within my heart. Many times, I've been reminded to stand against giants and not fear man's persecution. Battles persistent, and I suspect I haven't seen the greatest of them, but I am learning to be grateful for the refinement that comes with each one.

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Lord, here I am. Use me. This is my offering.

Abstract

Description of Clinical Problem: Neonatal death rates in the home birth setting exceed those of infants born within the hospital by as much as four-fold. As the primary care provider of the newborn, the home birth-based and birth center-based attendant has the professional responsibility to effectively and promptly perform neonatal resuscitation. Although the AAP/AHA's neonatal resuscitation training program is nationally recognized and the predominant training course for all maternity care providers, it is not accessible to all out-of-hospital birth attendants, nor does it address the unique need of home birth and birth center settings. **Project Proposal and Chosen Route for the Project:** Evidence underscores the need for additional training among home birth-based midwives in neonatal resuscitation and the need for improved collaboration efforts from home-based providers to hospital-based clinicians. Therefore, this doctoral capstone project offers a synthesis of the literature and proposes strategies for implementation within the current AAP/AHA neonatal resuscitation training program. **Approach and Anticipated Outcomes:** This capstone project was developed in effort to increase access to training for home birth-based and birth center-based attendants and enhance clinical skills specific to resuscitation of the neonate by home birth-based attendants and birth center staff, as well as, familiarize the hospital-based clinician with the resources available for neonates in these birth settings for facilitation of collaborative relationships and to set a standard of care for the neonate in out-of-hospital birth settings.

Key Words: home births; planned homebirth; home childbirth; midwifery; certified nurse-midwife; neonatal resuscitation; neonatal mortality; perinatal outcome; perinatal mortality; pregnancy outcome; risk management; safety; United States

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Certified nurse-midwives (CNMs) are responsible for providing a safe environment for birth, regardless of whether birth occurs in the hospital, birth center or home (ACNM, 2011). Key components of a safe birth environment entail having the necessary skills and resources to correctly and promptly perform neonatal resuscitation, extend the ability to effectively stabilize the neonate, and collaborate within the healthcare infrastructure in effort to access care as determined necessary (ACNM, 2012 & Zaichkin, 2011).

Background

Historically, the neonatal resuscitation program provided by the American Academy of Pediatrics (AAP) and the American Heart Association (AHA) has been the primary mechanism for training clinicians in effective and efficient resuscitation of the newborn. However, following publication of the sixth edition neonatal resuscitation textbook, the AAP/AHA training program limited new instructors to those who are *currently* working within the hospital as a registered nurse, physician, respiratory care practitioner, or physician assistant (Halamek, 2008 & Zaichkin, 2011). Thus, home birth-based attendants and birth center staff are no longer eligible to become certified instructors, which creates barriers for home birth and birth center-based attendants in acquiring the necessary training. An additional barrier created following the sixth edition update is the increased emphasis on the program being specific to care of neonates born in the hospital and subsequently, a number of facilities across the nation have interpreted this as a mandate that only hospital-based practitioners can attend the training.

Whether the AAP/AHA's neonatal resuscitation program is accessible to home birth-based providers and birth center staff or not, is only a component of a much more complex problem. Although the current training program meets almost all the needs of the home birth or birth center attendant, there are a few modifications that need to be addressed specific to the

unique nature of the home birth and birth center environment. While the birth setting within the hospital compared to the birth setting outside of one may be presumed as strikingly different, the equipment and supplies utilized in a neonatal resuscitation in either setting are essentially the same - all of which can be transported by a trained birth attendant.

An additional concern identified is the frequency of which program instructors are informing practitioners in home birth and birth center settings that because they do not have the resources of a hospital that they should limit their training to lessons 1 through 4, and 9. This recommendation fails to appreciate the primary care role the home birth-based or birth center attendant assumes, leaving them ill-equipped to intubate, visualize cords in the presence of meconium and a non-vigorous neonate, or administer emergency medications – all of which are necessary prior to the arrival of an emergency response team (AAP & AHA, 2011).

The sixth-edition (2011) Neonatal Resuscitation textbook states, “at every delivery, there should be at least 1 person in the delivery room who can be immediately available to the baby as his or her only responsibility and who is capable of initiating resuscitation, including administration of PPV and assisting with chest compressions. Either this person or someone else who is immediately available to the delivery area should have the necessary additional skills required to perform a complete resuscitation, including endotracheal intubation and administration of medications” (AAP & AHA, p 17). The 2011 textbook continues to clarify that, “It is not sufficient to have someone ‘on call’ (either at home or in a remote area of the hospital) for newborn resuscitations in the delivery room. When resuscitation is needed, it must be initiated without delay” (AAP & AHA, p 17).

Newborns have a right to effective and efficient resuscitation efforts no matter their birth setting (AAP, 2013). Kristi Watterberg, M.D., FAAP, lead author of the policy from the AAP

Committee on Fetus and Newborn states, “We think it’s very important that wherever babies are born, they get care that adheres to the same standards that the AAP has set forth that should happen in hospitals” (2014, www.aapnews.aappublications.org). Evidence demonstrates that training in obstetrical emergencies significantly reduces the incidence of infants born with a 5-minute Apgar score of 6 or less, and hypoxic-ischemic encephalopathy (HIE), and that this improvement is sustained over time (Draycott, Sibanda, Owen, Akande, Winter, Reading & Whitelaw, 2006). A large systematic review evaluating the mortality effect of immediate newborn assessment, stimulation, and basic resuscitation on neonatal deaths, due to term intrapartum-related events or preterm birth for facility and home births, concluded that neonatal resuscitation training reduces term intrapartum-related deaths by 30% (Lee, Cousens, Wall, Niermeyer, Darmstadt, Carlo, Keenan, Bhutta, Gill & Lawn, 2011).

Barriers to accessing quality resuscitation training by home birth-based or birth center-based attendants create a health disparity among a vulnerable population of neonates. Implementing teaching principles specific to the home birth and the birth center setting into the already established training program will further assist in familiarizing hospital-based providers with the resources available to out-of-hospital providers and establish a standard for neonatal care in the home birth and birth center environment throughout the midwifery and medical community.

Home birth and its safety has been a topic of controversy for several decades. However, the welfare of neonates born in the home birth setting specifically came into question following the publication of a large meta-analysis, published in 2010, reviewing eleven studies and the outcomes of 500,000 home births. Overall neonatal death for home born newborns was figured at three-fold those of hospital born newborns, and among nonanomalous neonates, the mortality

rate was more than four-fold. Deaths in this particular meta-analysis were primarily attributed to respiratory distress and failed resuscitation with authors suggesting specific contributors to be related to limited number of personnel, training, and equipment within the home birth setting. These rates were contributed only to “other midwives,” as studies that included home births attended by certified nurse-midwives demonstrated a neonatal death rate that was not significantly different from those born in the hospital (Wax, Lucas, Lamont, Pinette, Cartin & Blackstone, 2010).

It is important to note that this particular study was the center of intense critique, due to concerns about its methodological approach and its alleged statistical errors, and that the American College of Nurse-Midwives rejects the evidence offered by the Wax study (Kennedy, 2010). It is largely this study however, that the American Congress of Obstetricians & Gynecologists (2011) and the American Academy of Pediatrics (2013) have based their position statements and committee opinions about home birth (Olsen & Clausen, 2012; de Vries & Paruchuri, Lorenz, 2013).

A number of studies, each battling their own controversy surrounding their methodological approach, have supported the finding that neonates suffer a worse fate if born at home. A retrospective study published the same year as the Wax study (2010) demonstrated neonates to be twice as likely to die in the home birth environment than those born in the hospital, and if the attendant was not a nurse-midwife, neonatal deaths were nearly four-fold (Malloy, 2010). A third study also published in 2010, found perinatal deaths significantly higher among low risk pregnancies supervised by midwives in primary care, than in high-risk pregnancies supervised by obstetricians (Evers, Brouwers, Hukkelhoweve, Niddels, van Egmond-Linden, Hillegersberg, Snuif, Sterken-Hooisma, Bruinse, & Kwee, 2010). Older

studies, which may or may not hold any significance today, add to the debate (Bastian, Keirse, & Lancaster, 1998; Janssen, Lee, Ryan, & Saxell, 2003; Johnson & Daviss, 2005; Kennare, Keirse, Tucker, & Chan, 1996; Murphy & Fullerton, 1998; Northern Region Perinatal Mortality Survey Coordinating Group, 1997; Pang, Heffelfinger, Huang, Benedetti & Weiss, 2002)

Since publication of Wax et al (2010), Malloy (2010) and Evers et al (2010) studies, six additional peer-reviewed retrospective cohort studies have been published demonstrating consistency with the aforementioned studies: planned home births are associated with increased neonatal complications but fewer obstetrical interventions (Birthplace in England Collaborative Group, 2011; Chang & Macones, 2011; Cheng, Snowden, King, & Caughey, 2013; Cheyney, Bovbjerg, Everson, Gordon, Hannibal, & Vedam, 2014; & Grunebaum, McCullough, Sapra, Brent, Levene, Arabin & Chervenak, 2013). The Birthplace in England Collaborative Group study (2011) compared 64,538 eligible women who were attended in labor within the home setting, freestanding midwifery unit, midwifery-led hospital setting, or an obstetric unit and determined that the nulliparous woman attended at home had the poorest perinatal outcomes.

Chang & Macones (2011) utilized the Missouri vital record system for data gathering, which is considered reliable and adopted as a “gold standard” to validate other vital statistic databases in the United States. This study evaluated 859,873 singleton pregnancies from 1989 to 2005, included only home births that were planned and the attendant was identified as physician, nurse-midwife, or other midwife, and other. This study observed a higher rate of intrapartum fetal death in planned home births attended by physicians and CNMs, followed by planned home births attended by non-CNMs, compared with births in hospitals and birthing centers attended by physicians or CNMs (Chang & Macones, 2011).

Cheng, Snowden, King & Caughey (2013) evaluated 2,081,753 term, singleton live births

born in the United States in 2008 using the Vital Statistics Natality Data by the Centers for Disease Control and Prevention. Home births were identified as accidental, intended, or unknown and excluded if unclear. Attendants were also identified as Doctor of Medicine, Doctor of Osteopathy, Certified Nurse-Midwife, other midwife, others, and unknown. Infant outcomes after planned home births that were attended by certified nurse-midwives did not differ significantly from those that occurred in the hospital, except those born in the hospital were more likely to experience a NICU admission; however, neonates of women who had planned home births and were delivered by other midwives had an increase in the risk of 5-minute Apgar scores <4 and an increased risk of seizure compared with neonates born in a hospital. No neonatal deaths were reported (Chang, Snowden, King & Caughey, 2013b).

Grunebaum, Sapra, & Chervenak presented the results of their retrospective cohort using the CDC linked birth and infant death dataset, from 2007 to 2009, at the *Society for Maternal-Fetal Medicine* conference in New Orleans, on February 9th 2014. The full paper has yet to be published, although the oral concurrent session brief is available in the January (2014) edition of the *American Journal of Obstetrics & Gynecology* and Vicki Bendure of Bendure Communications, Inc, graciously shared the unpublished abstract with this author. Findings per the abstract state, "Patients delivered at home by midwives had a roughly four times higher risk of neonatal deaths than babies delivered in the hospital by midwives. The increased neonatal mortality risk is associated with the location of a planned birth, rather than the credentials of the person delivery the baby" (Grunebaum, Sapra & Chervenak, 2014).

Each of these publications however, are an intriguing comparison to the *Outcomes of Care for 16,924 Planned Home Births in the United States: The Midwives Alliance of North America Statistics Project, 2004 to 2009* published in the *Journal of Midwifery & Women's*

Health in January of 2014. Authors Cheyney, Bovbjerg, Everson, Gordon, Hannibal, & Vedom take a unique approach to data collection, by utilizing the voluntary submission of outcome statistics provided by approximately 432 different midwives (79.2% of who were certified professional midwives), providing a dataset of 24,848 women (2014a). The authors calculate the intrapartum fetal death rate as 1.30 per 1000, the early neonatal death rate as 0.88 per 1000, and the late neonatal death rate as 0.41 per 1000. The overall perinatal death rate is not figured for the reader, but adding the intrapartum fetal death rate, early neonatal death rate, and the late neonatal death rate, an overall rate of 2.59 per 1000 can be deduced. Cheyney et al., conclude the MANA Stats outcomes as consistent with the de Jonge et al. (2009) and the Birthplace in England Collaborative Group (2011). These two studies are not entirely congruent, as the de Jonge et al (2009) concluded home and hospital outcomes to be similar, but the Birthplace in England Collaborative Group (2011) determined neonatal mortality outcomes to be significantly higher among nulliparous women who choose to birth at home to those born in a freestanding midwifery unit, alongside midwifery units, or the hospital.

A review of the literature also provides surveys conducted throughout the past two decades of home birth-based midwifery practices which shed light on the standards that currently exist within home birth settings for care of the neonate. The College of Midwives of British Columbia determined following their 2003 evaluation of homebirth-based midwifery that competency in intubation skills should be examined due to the finding that not all distressed babies exposed to thick meconium during the study were suctioned by the trachea (Janssen, Lee, Ryan & Saxell, 2003). A survey (1998) of twenty-nine nurse-midwifery practices discovered that one midwifery practice did not carry a self-inflating resuscitation bag for providing positive pressure ventilation, only 68 percent routinely brought a laryngoscope and endotracheal tubes

and only 20 percent carried mechanical suction within their equipment as routine preparations for emergencies (Murphy & Fullerton). Anderson and Murphy's (1995) survey of 92 CNM practices found only 70 percent of nurse-midwives attending home births were certified in neonatal resuscitation, 6 percent did not carry neonatal resuscitation bags for ventilator assistance, and only 50 percent carried laryngoscopes and endotracheal tubes. The ability to conduct an effective and efficient neonatal resuscitation is the professional responsibility of the home birth-based nurse-midwife. Proper training of these clinicians in providing effective neonatal resuscitation, in an effort to improve neonatal outcomes, is currently unaddressed within the profession.

The Gap Between Evidence and Practice

The American Academy of Pediatrics has expressed concern about neonatal mortality rates in its position statement on home birth and in the same committee statement, identified the rights of the infant, no matter his or her birth setting, as that which deserves effective and efficient resuscitation (AAP, 2013), yet the American Academy of Pediatrics simultaneously limits access to training by home birth-based and birth center-based attendants, which has demonstrated effectiveness in improving neonatal outcomes (Draycott, Sibanda, Owen, Akande, Winter, Reading & Whitelaw, 2006). The neonatal resuscitation program jointly sponsored by the American Academy of Pediatrics (AAP) and the American Heart Association (AHA) has trained more than three million individuals in the United States since its inception in 1987 (AAP, 2012). The course is designed for hospital staff who care for newborns at the time of birth, with the sixth edition turning its focus from lecture and skills acquisition to using simulation, thereby, enhancing the development of critical leadership, communication and team work skills (AAP, 2012). Historically, birth center staff and home birth-based attendants have used the AAP/AHA's

course for training, because of its evidence-based approach and national recognition. Although, the creators of the original program identified the “need to be flexible and adapt readily to the changing needs of a diverse population of trainees” (Halamek, 2008, e 143), the AAP/AHA program has become increasingly difficult for home birth-based providers and birth center staff to access and fails to address the unique needs of home birth and birth center settings.

Online neonatal resuscitation courses have been developed in an effort to address the need of those without access to the AAP/AHA program, but they too fail to address the unique environment and circumstances faced by the out-of-hospital provider. More importantly, on-line courses do not offer skills practice, which is an integral component of the program for clinicians whose practice settings offer fewer opportunities to master clinical skills and manage neonatal emergencies. Furthermore, the on-line programs are not affiliated with or endorsed by the AAP/AHA and have no authority to issue cards for neonatal resuscitation certification (AAP, 2013).

Teaching neonatal resuscitation, as an AAP/AHA instructor, and accumulating years of experience as a homebirth-based nurse-midwife has allowed for insight into the challenges of attempting to extrapolate teachings and techniques from the already established AAP/AHA's hospital-based neonatal resuscitation training program to one that recognizes the unique nature of out-of-hospital birth. Personal communications with program attendants has demonstrated that instructors within hospital taught courses are typically unfamiliar with the resources available to home birth-based attendants and birth center staff, often assuming such settings are without the availability of basic equipment such as oxygen and subsequently, not allowing for training in more advanced skill sets.

It has been expressed by physicians and midwives within various professional encounters that intubation and administration of emergency medications via an umbilical line is beyond the scope of the nurse-midwife with the argument that the onus for neonatal resuscitation efforts falls on the emergency responder. A limited number of nurse-midwives within ACNM listserv discussions have also expressed strong opinion that the risk of performing these procedures outweighs any benefit acquired for the neonate. Such opinions fail to appreciate that the outcome of not obtaining an adequate airway is death and no risk supersedes this consequence. Nurse-midwives are trained to handle a number of complex procedures and few offer such high reward, while each and every baby born regardless of their birth environment has the right to efficient and effective neonatal resuscitation. Member(s) of the Neonatal Resuscitation Steering Committee have also expressed similar concern; however, the text makes clear that the extent to which each facility trains their staff and assures their competency is outside the role of the neonatal resuscitation course, and clearly states that every birth should be attended by at least one provider capable to extend full resuscitation efforts (AAP & AHA, 2011).

Nurse-midwives, Toepke and Albers, published an article in the *Journal of Nurse-Midwifery*, in 1995 stating, “CNMs who perform home birth need greater skill in detecting subtle changes in the newborn’s physical status and appearance and proficiency in identification of abnormal findings than those who practice in hospital settings, where these functions are usually assumed by pediatric personnel” (p 532). Additionally, they recognize “an infant ambu bag and mask, intubation and suction equipment (laryngoscope with infant blade, infant endotracheal tubes, suction catheters), and an oxygen source with tubing as minimum equipment for neonatal resuscitation” (Toepke & Albers, 1995, p 531). In the same edition, Sullivan and Witte offered standards specific to care of the neonate in the home setting, acknowledging, “Until or unless the

collaborating physician accepts management responsibility (referral) for the newborn, the CNM maintains primary responsibility for his/her care. This responsibility includes keeping the newborn warm and continuing any necessary resuscitation as outlined by NALS criteria” (1995, p 539).

The incidence of home birth has more recently taken a steep climb, with an increase of 41% between 2004 and 2010, and ten percent of that increase occurring between 2009 and 2010 (Cheyney, Bovbjerg, Everson, Gordon, Hannibal & Vedam, 2014b). The American Academy of Pediatrics (2013) recognizes the nurse-midwife as the primary provider of the neonate, yet the Neonatal Resuscitation Steering Committee lacks representation of a nurse-midwife or an out-of-hospital provider among its team. In effort to avoid a predisposition towards hospital-based resuscitation efforts or physician groups, the NRP Steering Committee is encouraged to consider opening up a seat among its membership for a nurse-midwife with home birth or birth center expertise. Each would share the common goal of optimizing neonatal outcomes, no matter their birth setting preference.

Consequences of the Gap Between Evidence and Practice

Nurse-midwives have demonstrated the non-interventive approach to maternal and neonatal care as superior and are experts in normal birth, while also demonstrating themselves as expert clinicians (American College of Obstetricians & Gynecologists, 2011; Sandall, Soltani & Gates, Shennan, & Devane, 2013; Sandall, Hatem, Devane, Soltani, & Gates, 2009; World Health Organization, 2006). That said, it could be argued that nurse-midwives and particularly other midwives who lack nursing training aren't well prepared to manage rare complications, particularly in out-of-hospital settings (Anderson & Murphy, 1995; Bastin et al., 1998; Janssen et al., 2003; Cheng et al, 2013; Evers et al., 2010; Grunebaum et al., 2013; Kennare et al., 1996;

Malloy, 2010; Northern Region Perinatal Mortality Survey Coordinating Group, 1997; Pang et al., 2002; Wax et al., 2010).

In effort to increase public perception of home birth and shape an infrastructure of healthcare that allows for seamless collaboration, nurse-midwives must simultaneously strive for the highest standard of care available within their practice setting. Home birth is not mutually exclusive to technology. It should be used judiciously while respecting the midwifery model of care, but when implemented with discernment, the nurse-midwife has the training and skill set to provide level-one care management within the home birth or birth center setting, including primary care of the neonate with prescription authority (Osborne, 2011).

The growing body of literature demonstrating concern for neonates born outside the hospital provides opportunity for home birth-based midwives to incorporate new evidence into practice that might lead to improved outcomes and greater acceptance by their medical colleagues and community. ACOG's position towards home birth has moved in a positive direction since 2007. While the congress is still hesitant to extend their support for home birth and they do "not support the provision of care by lay midwives or other midwives who are not certified by the American Midwifery Certification Board," they do recognize certified midwives and certified nurse-midwives as "well-educated, highly trained" and "well integrated into the health care system" (ACOG, 2011, p 3). The American Academy of Pediatrics recently (2013) shared a position statement that is in agreement with ACOG regarding the support of certified midwives and certified nurse-midwives, and offers an outline of standards within which care in the home birth setting should be provided. The AAP further encourages pediatricians and institutions to "develop and sustain communications and understanding of the basis of

professional interaction and mutual respect throughout the health care system” (2013, p 1019, para 7).

Statement of the Problem

Since 1995, the nurse-midwifery profession has identified its role and responsibility in out-of-hospital birth as one that requires competency in neonatal resuscitation through intubation of the neonate (Toepke & Albers, 1995). Nearly two decades later, the home birth-based provider and birth center staff are without training opportunities specific to their unique needs, nor does the AAP/AHA program recognize the necessity of addressing these needs for optimizing outcomes for neonates born at home. Multiple studies however, demonstrate that this oversight should no longer be ignored (Anderson & Murphy, 1995; Bastian et al., 1998; Cheng, et al., 2013; Evers et al, 2010; Grunebaum et al., 2013; Janssen et al., 2003; Kennare, Keirse et al., 1996; Malloy, 2010; Northern Region Perinatal Mortality Survey Coordinating Group, 1997; Pang et al., 2002; Wax et al., 2010).

Statement of Project Purpose

The purpose of this clinical doctorate capstone project is to develop an in-depth evidence-based synthesis of the literature specific to neonatal resuscitative measures in effort to improve neonatal outcomes for families who choose to birth within the privacy of their own home, or within a birthing center. A comprehensive plan of action for implementation would then be presented to various stakeholders, including proposed modifications for the AAP/AHA's neonatal resuscitation training program.

Based on a review of the literature, evidence exists to support a knowledge and/or clinical skill deficit among home birth-based attendants with regards to providing competent neonatal resuscitation (Anderson & Murphy, 1995; Bastian et al., 1998; Janssen et al., 2003; Malloy,

2010; Northern Region Perinatal Mortality Survey Coordinating Group, 1997; Pang et al., 2002; Wax et al., 2010) and evidence demonstrates that medical professionals are not generally receptive of home birth-based attendants or their clients upon transfer from home to hospital within the United States, leading to poor outcomes (Freeze, 2010; Jackson & Bailes, 1995; Lundgren, 2010). This doctoral capstone project would not only serve as an initial step to improve access to evidence-based training for out-of-hospital providers in neonatal resuscitation, as well as increase clinical competence through proposing modifications to the existing training program, but would also assist in familiarizing hospital-based providers with the level of care capable in the home birth and birth center setting in effort to improve collaboration between home birth-based, birth center-based and hospital-based providers (ACOG, 2011 & AAP, 2013).

Synthesis of Evidence

This doctoral capstone project was initiated from a synthesis of evidence that had accumulated over the length of a career. Additional papers were identified from the reference list of these papers and from the extensive bibliography accompanying the AAP/AHAs *Neonatal Resuscitation Textbook* (6th Ed.). From December 10th, 2012 through February 15th, 2014 a number of searches via CINAHL and MEDLINE were conducted using search terms individually and in combination: homebirth, birth center, outcomes, nurse-midwife, midwife and neonatal resuscitation, in effort to identify additional papers of interest.

It should be noted that common methodological challenges exist in the study of the relative risks and benefits of planned home birth. Conclusions can be difficult to ascertain when nonrepresentative sampling occurs. A small sample size, lack of comparison groups, and the rare nature of severe maternal and neonatal morbidity and death further complicates the research and one's ability to draw accurate conclusions. These challenges direct researchers towards the

utilization of birth and death certificates, in effort to obtain large datasets. This strategy however, opens up concern for the application of variable definitions that are used to quantify and qualify morbidity. One significant challenge has been the inability to exclude unplanned homebirths from the study sample (Martin, Wilson, Osterman, Saadi, Sutton & Hamilton, 2013).

Further challenges come in attempting to identify whether intrapartum transfers from home to hospital should be classified as home births or hospital births and whether the attendant present had any specific expertise. Pooling data from different countries, ascertainment that relies on self-reporting or voluntary submission, and controlling for confounding and mediating factors further complicates one's ability to contribute to and evaluate the body of evidence specific to home birth outcomes. The meta-analysis holds a privileged spot atop the pyramid of best evidence; however, until the aforementioned methodological challenges can be rectified, utilizing the meta-analysis for determining the safety of home birth and birth center may not be the most appropriate strategy (Nove, Berrington & Matthews, 2012).

de Vries, Paruchuri, Lorenz and Vedam (2013) published the article, *Moral Science: Ethical Argument and the Production of Knowledge about Place of Birth* in *The Journal of Clinical Ethics*, evaluating the findings of eight predominant research articles specific to home birth. The authors state, "the direction of the conclusions of the studies on the safety of home birth coincide almost perfectly with the profession of the first authors. Studies done by midwives find no association between mortality and place of birth, while studies done by gynecologists-obstetricians find increased risk of perinatal/neonatal death associated with planned home birth" (p 230). The authors also discuss the interesting degree to which various home birth specific studies have been criticized, with those demonstrating worse neonatal outcomes when attended at home among the most intense, such as the Wax (2010) and Evers (2010) studies.

Randomized control trials, the gold standard of all scientific evidence, are unlikely to be conducted as women would be unwilling to agree to random assignment to home or hospital deliveries (Dowswell, Thornton, Hewison & Lilford, 1996). The current literature on the safety of home birth consists of large population-based studies mostly from outside the United States, where midwifery training and infrastructure of care is significantly different from that in the states. Although some studies demonstrate no difference in perinatal outcomes in women who had planned home births compared with those who had hospital births (Ackermann-Liebrich U., Voegeli, T., Gunter-Witt, K., Kunz, I., Zullig, M., Schindler, C., Maurer, M., & Zurich Study Team, 1996; Cox, Schlegel, Payne, Teaf, & Albers, 2013; de Jonge, van der Goes, Ravelli, Amelink-Verburg, Mol, & Nijhuis, 2009; Janssen, Lee, Ryan & Saxel, 2003; & Wiegers, Keirse, van der Zee, & Berghs, 1996), other studies demonstrate worse neonatal outcomes in planned home birth, even in countries which have established an infrastructure of care that includes midwifery care based in the home setting (Bastian, Keirse, & Lancaster, 1998; Birthplace in England Collaborative Group, 2011; Chang & Macones, 2011; Cheng et al., 2013; Evers et al., 2010; Grunebaum et al., 2013; Kennare et al., 1996; Malloy, 2010; Pang et al., 2002; Wax et al., 2010; & Wax et al., 2010).

Forty-one papers specific to homebirth were reviewed including five professional organizations' opinion statements (American Academy of Pediatrics, 2013; American College of Nurse-Midwives, 2011; American College of Nurse-Midwives, 2003; & American College of Obstetricians & Gynecologists, 2011; & Canadian Association of Midwives, 2014); one meta-analysis (Wax, Lucas, Lamont, Pinette, Cartin & Blackstone, 2010b); two systematic reviews (Hodnett, Downe & Walsh, 2012; & Olsen & Clausen, 2012); one integrative review (Fullerton, Navarro & Young, 2007); fourteen retrospective, population-based cohort studies (Anderson &

Murphy, 1995; Bastian, Keirse, Lancaster, 1998; Chang & Macones, 2011; Cheng, Snowden, King & Caughey, 2013; Declercq, 2012; de Jonge, Mesman, Mannien, Zwart, van Dillen, & van Roosemalen, 2013; de Jonge, van der Goes, Ravelli, Amelink-Verburg, Mol, & Nijhuis, 2009; Dummer & Parker, 2014; Janssen, Lee, Ryan & Saxell, 2003; Kennare, Keirse, Tucker, & Chan, 2009; Martin, Wilson, Oserman, Saadi, Sutton, & Hamilton, 2013; Northern Region Perinatal Mortality Survey Coordinating Group, 2007; Pang, Heffelfinger, Huang, Benedetti & Weiss, 2002; Ravelli, Jager, de Groot, Erwich, Rihinks-van Driel, Tromp, Eskes, Abu-Hanna, & Mol, 2011; Wax, Pinette, Cartin & Blackstone, 2010a); nine prospective cohorts (Ackermann-Lieblich, Voegeli, Gunter-Witt, et al, 1996; Birthplace in England Collaborative Group, 2011; Durand, 1992; Evers, Brouwers, Hukkelhoeven, Niddels, van Egmond-Linden, Hillegersberg, Snuif, Sterken-Hooisma, Bruinse, & Kwee, 2010; Janssen, Carty, & Reime, 2006; Janseen, Lee, Ryan, Etches, Farquharson, Peacock, & Klein, 2002; Johnson & Daviss, 2005; Murphy & Fullerton, 1998; & Wiegers, Keirse, van der Zee, & Berghs, 1996); five retrospective, descriptive studies (Boucher, Bennett, McFarlin, & Freeze, 2009; Cheyney, Bovbjerg, Everson, Gordon, Hannibal, & Vedam, 2014; Cox, Schlegel, Payne, Teaf, & Albers, 2013; Declercq, Paine, & Winter, 1995; Malloy, 2010); one mixed-methods study (Vedam, Schummers, Stoll, Rogers, Klein, Fairbrother, Dharamsi, Liston, Chong, & Kaczorowki, 2012); two qualitative phenomenological studies (Lundgren, 2010; & Morison, Hauck, Percival & McMurray, 1998); one qualitative population-based study (Lindgren, Radestad, Christensson, Wally-Bystrom & Hildingsson, 2008); one qualitative semi-structured interview-based study (Andrews, 2004); two clinical opinions (Chervenak, McCullough, Brent, Levene, & Arabin, 2013; & Vedam, Goff & Marnin, 2007); and three expert reviews (de Crespigny & Savulescu, 2014; de Vries, Paruchuri,

Lorenz & Vedam, 2003; & Freeze, 2010). One abstract for an oral concurrent session was reviewed for a yet unpublished, retrospective cohort (Grunebaum, Sapra, & Chervenack, 2014).

Papers have also been written that assisted in this synthesis, in spite of their not being part of the hierarchy of evidence. Jackson & Bailes (1995) offered expert opinion that set a standard for home birth-based attendants, prior to the publication of any studies that documented the safety of either home or hospital birth. Sullivan & Witte (1995) provided a similar report in the same journal, same volume, as did Toepke & Albers (1995).

Thirty-six papers specific to neonatal resuscitation were reviewed, including one Cochrane Review (Rabe, Reynolds & Diaz-Rossello, 2006); four randomized control trials (Cernadas, Carroli, Pellegrini, Otano, Ferreira, Ricci, Casas, Giordano, & Lardizabal, 2006; Grajeda, Perez-Escamilla-Perez, & Dewey, 1997; Mercer, Vohr, McGrath, Padbury, Wallach & Oh, 2006; & Vain, Szyld, Prudent, Wiswell, Aguilar, & Vivas, 2004); four retrospective systematic reviews (Ghidini & Spong, 2001; Lawn, Lee, Kinney, Sibley, Carlo, Paul, Pattinson, & Darmstadt, 2009; Lee, Cousens, Wall, Niermeyer, Darmstadt, Carlo, Keenan, Bhutta, Gill, & Lawn, 2011; Newton & English, 2006); six committee opinions (American Academy of Pediatrics, 2013; American College of Obstetricians & Gynecologists, 2012; American Heart Association, 2005a; American Heart Association, 2005b; American Heart Association, 2005c; International Liaison Committee on Resuscitation, 2006); three prospective cohorts (Handcock, 1992; Odd, Lewis, Whitelaw, & Gunnell, 2009; & Trevisanuto, Cengio, Doglioni, Cavallin, Zapardo, Parotto, & Weiner, 2013); two retrospective cohorts (Draycott, Sibanda, Owen, Akande, Winter, Reading & Whitelaw, 2005; Mercer, Nelson & Skovgaaard, 2000); one literature review (Mercer, Erickson-Owens, Graves, & Haley, 2007); nine expert opinions (American Academy of Pediatrics, 2011; American Academy of Pediatrics, 2011b; American

Academy of Pediatrics, 2011c; American Heart Association, 2009; American Heart Association, 2009b; American Heart Association, 2006; Clark, 2013; Ghidini & Spong, 2001; Kattwinkel, Periman, Aziz, Colby, Fairchild, Gallagher, Hazinski, Halameck, Kumar, Little, McGowan, Nightengale, Ramirez, Ringer, Simon, Weiner, Wyckoff & Zaichkin, 2011; & Wyckoff, 2013); and one technical up-date (Roggensack, Jefferies, & Farine, 2009).

Ten papers were reviewed specific to delayed cord clamping, including three systematic reviews (Newton & English, 2006; Rabe, Reynolds & Diaz-Rossello, 2006; & Rabe, Reynolds, & Diaz-Rossello, 2006); two committee opinions (American Academy of Pediatrics, 2013; & American College of Obstetrics & Gynecologists, 2012); three randomized controlled trials (Cernadas, Carroli, Pellegrini, Otano, Ferreira, Ricci, Casas, Giordano, & Lardizabal, 2006; Grajeda, Perez-Escamilla-Perez, & Dewey, 1997; Mercer, Vohr, McGrath, Padbury, Wallach, & Oh, 2006), and one literature review (Levy & Blickstein, 2006), one cohort (Mercer, Nelson, & Skovgaard, 2000).

One large prospective cohort study evaluating an integrated collaborative relationship was also reviewed (Jackson, Lang, Swartz, Ganiats, Fullerton, Ecker & Nguyen, 2003) and one retrospective cohort evaluating training in obstetric emergencies for improving neonatal outcomes (Draycott, Sibanda, Owen, Akande, Winter, Rading & Whitelaw, 2006). All eighty-nine studies are summarized in the Evidence Matrix in Appendix A, B & C.

Background Issues Affecting the Problem

Stakeholders

The American Academy of Pediatrics (AAP) and the American Heart Association (AHA) have developed a very comprehensive and well-respected neonatal resuscitation program that has been implemented throughout the country, even required within state statute for many birth

attendants. The American College of Nurse-Midwives, the American Congress of Obstetrics and Gynecology, the American College of Family Physicians, the American Association of Birth Centers, the American Hospital Association, Joint Commission, and the Midwives Alliance of North America have vested interest in outcomes this project could optimize. Consumer groups such as Citizens for Midwifery should also not be overlooked, as well as individual practitioners and childbearing families themselves.

Information Needs of Each Group

Stakeholders would require strong evidence that demonstrates their group's investment would not only improve perinatal outcomes, but would effectively advance their mission with benefit to their own stakeholders. Strong support from professional organizations in either position statements and/or changes within their teaching programs would trickle down through their own members, creating a new standard of care for home births and birth centers as providers become more familiar with these practice settings and the resources available to them. As new standards are adopted, credibility would subsequently be enhanced for home birth-based nurse-midwives, as well as improved perinatal outcomes through enhanced knowledge and skill of attendants.

Financial Considerations

Injury to the neonate as a consequence of delayed, incomplete, or ineffective neonatal resuscitation has serious financial implications for the community, individual families and their practitioners. Both acute and long-term health care costs can be staggering, as well as subsequent educational expenses and the consequences of legal action from malpractice claims. The profession itself stands to lose significantly if it were to face multiple suits that would threaten its integrity.

Political Considerations

The climate surrounding home birth is complex. Although in the past, American College of Obstetricians and Gynecologists has opposed home birth, as the body of evidence grew demonstrating improved maternal outcomes for those having birthed at home to those who birthed in the hospital, so did ACOG's support. In 2011, ACOG revised their position recognizing certified nurse-midwives as well educated and highly trained clinicians, yet were unable to support home birth by other midwives, who at this time, are the more prominent attendants of home births. The American Academy of Pediatrics published a subsequent home birth position statement in 2013 with the same sentiment, while they supported the certified nurse-midwife as a home birth-based clinician, they were unable to extend the same support to other midwives (AAP, 2013 & ACOG, 2011).

A common theme among cohort studies reporting lower rates of perinatal mortality in North America is the provision of nurse-midwives, while those that combine outcomes by certified nurse-midwives with those home births attended by other midwives or analyze specifically the outcomes of certified professional midwives, mortality rates are significantly increased for home born neonates compared to those born in the hospital (AAP, 2013; ACOG, 2011; Cox et al, 2013; Malloy, 2010; Wax, 2010; Fullerton et al, 2007; Johnson & Daviss, 2005; and Pang et al, 2002).

Cultural Considerations

A qualitative study published by Andrews and colleagues (2004) utilizing semi-structured interviews of eight women found that safety was an important factor in deciding to birth at home. Women desired ownership of their birth and wanted to take responsibility for their experience, but the decision to birth at home was reached after much thought and determination in effort to

obtain a safe birthing experience. Boucher and colleagues performed a secondary analysis of data obtained via survey, which supports findings of the aforementioned survey. The most common reason given for wanting to birth at home among 160 women in the United States was their belief that it was safer (Boucher, Bennett, McFarlin, & Freeze, 2009).

Nurse-midwives are divided in their position on homebirth (Vedam, Stoll, White, & Schummers, 2009) and those working within the home environment are divided about how care should be provided. In effort to change the behavioral beliefs of homebirth attendants, this project must demonstrate the potential benefits of its implementation while maintaining the midwifery-model-of-care. This clinical doctorate capstone project is positioned to demonstrate that home birth-based and birth center-based nurse-midwives are capable of providing first-level clinical care to the neonate similar to that of a remote facility and because evidence demonstrates safety is the leading reason consumers choose to birth in out-of-hospital environments, nurse-midwives are charged to acquire appropriate skills, as supported by evidence, for proper assessment and effective resuscitation of the neonate (Ajzen, Joyce, Sheikh & Cote, 2011, & Boucher et al, 2009). Homebirth consumers expect this level of care and homebirth-based nurse-midwives can acquire these skills without compromising their approach to care.

Theoretical Framework

Ajzen's (1991) Theory of Planned Behavior guides this capstone project. While this particular theory can be utilized within intervention programs aimed at consumers, with the intent to support behavioral change such as smoking cessation or increasing regular condom use, it has also proven invaluable for changing behaviors among healthcare workers who do not otherwise intend to perform the desired target behavior (Fishbein & Ajzen, 2005). This capstone project will introduce an evidence-based argument that will work to change the perception of the

out-of-hospital nurse-midwife, who might never have contemplated utilizing the T-piece resuscitator or intubating a neonate within the home or birth center setting, instead depending entirely on the emergency response team. Acknowledging oneself as the primary care provider of the neonate when attending births at home or within a birthing center, as well as the laboring mother, is critical for improving neonatal outcomes. The home birth-based attendant and birth center staff must assume responsibility for comprehensive assessments of the neonate and competency in performing neonatal resuscitation. This project will also work to change the perception of the NRP Steering Committee with regards to the nurse-midwife's role in neonatal resuscitation, specifically in assuming the primary care role and therefore, having preparation for extending full resuscitation efforts in the home birth and birth center setting.

In effort to change the behavioral beliefs of out-of-hospital birth attendants, this capstone project must demonstrate the consequences of not utilizing the proposed changed behaviors and the potential benefits of its implementation. Normative expectations must be established through extrapolating data demonstrating improved neonatal outcomes of such interventions in the hospital, to the potential for improved outcomes when appropriately utilized within the out-of-hospital environment. This clinical doctorate capstone project is positioned to demonstrate that home birth-based and birth center-based practitioners are capable of providing first-level clinical care to the neonate similar to that of a remote facility and because evidence demonstrates safety is the leading reason consumers choose to birth in out-of-hospital environments, attendants are charged to acquire appropriate skills, as supported by evidence, for proper assessment and effective resuscitation of the neonate (Ajzen, Joyce, Sheikh & Cote, 2011, Boucher et al, 2009). The American Academy of Pediatrics' recent home birth position statement is perfectly positioned to support the efforts of this doctoral capstone project via their neonatal resuscitation

program, as is the mission of the original neonatal resuscitation program developers who identified the “need to be flexible and adapt readily to the changing needs of a diverse population of trainees” (American Academy of Pediatrics, 2013; Halamek, 2008, e 143).

Accurate information is no guarantor of wise judgments and knowledge, although necessary, and is not sufficient to create the desired change in behavior (Ajzen, Joyce, Sheikh & Cote, 2011). This project therefore, will go beyond changing intentions of healthcare practitioners, whether home birth-based, birth center-based or hospital-based providers, to also creating an action plan for implementation within the already well established neonatal resuscitation training program sponsored by the American Academy of Pediatrics and the American Heart Association.

Plan of Action

The AAP/AHA's Neonatal Resuscitation program is already thoroughly implemented within the midwifery profession with well-respected steering committees that assist in maintaining up-to-date programs. Instructors for both programs saturate the country, growing even internationally. Rather than create an independent program requiring a separate budget, expert committee, curriculum, and instructors, even statute up-dates in some states, it would behoove the mission of this project to implement these teaching principles into already established programs. The current NRP steering committee has within its team a liaison representative for neonatal nurse practitioners. It may prove beneficial to also implement a nurse-midwifery liaison position within the steering committee that has home birth or birth center expertise, while building relationships with each of the additional stakeholders in an attempt to identify how best to implement modifications that would optimize perinatal outcomes for families who choose to birth outside the hospital. The purpose of this doctoral capstone project is

to analyze and synthesize the literature, crafting proposed changes to the current AAP/AHA neonatal resuscitation program, so that following completion of the program, findings can be presented to the NRP steering committee for consideration.

Project Goals and Measurable Objectives

The goals of this doctoral capstone project are to prepare a strategy for change, which will ultimately improve neonatal mortality among home birth and birth center neonates by addressing the gap in evidence to practice within the current neonatal resuscitation training program offered by the APA/AHA. Implementation of teaching principles within programs that hospital-attendants are already exposed will increase their familiarity with home birth and birth center standards for the care of neonates, which lends itself to improving collaborative efforts among clinicians. Additionally, the implementation of the proposed modifications within a nationally recognized training program will provide guidance for professional groups, policy makers, and individual midwifery practices when crafting position statements or clinical practice guidelines.

Measurable objectives of this project were designed to establish the strategic plan for coordinating efforts among stakeholders, culminating with the NRP Steering Committee appreciating the learning needs of home birth-based and birth center-based attendants, and implementing modifications specific to those needs within their current training program. A Logic Model can be found within Appendix B for further details.

- Identify and analyze the body of literature specific to neonatal resuscitation and home birth by February 15th, 2014
- Synthesizing the evidence in effort to develop recommendations for implementation within the AAP/AHA neonatal resuscitation program

- Investigate barriers to extending effective and efficient neonatal resuscitation in the home and birth center birthing environment by February 15th, 2014
- Investigate barriers home birth-based and birth center-based attendants face when seeking and acquiring training in neonatal resuscitation by February 15th, 2014
- Recommend a minimum and optimal staffing ratio within the home birth setting
- Propose recommendations for standard supplies and equipment that nurse-midwives should have readily available in every home birth and birth center setting
- Propose guidelines for transitioning care to a higher level facility in the midst of neonatal resuscitation efforts
- Present proposed strategy for change to various stakeholders in effort to gain support prior to submitting recommendations to the NRP Steering Committee following completion of the doctoral program
- Publication of analysis and synthesis of literature specific to neonatal resuscitation in the home birth and birth center setting following completion of the program

Plan for Implementation and Evaluation Plans (Formative and Summative)

This doctoral capstone project is an effort to address the healthcare disparity newborns born at home are suffering. Failed resuscitation efforts have been identified as a cause of increased death rates among newborns born at home and within the birth center environment (Wax, Lucas, Lamont, Pinette, Cartin & Blackstone, 2010). Limited personnel numbers, inadequate training, and insufficient equipment within the home birth and birth center setting has been hypothesized as the primary causes that create increased neonatal mortality in these environments, each of which could be addressed through modifications to the current NRP training program (Wax, Lucas, Lamont, Pinette, Cartin & Blackstone, 2010). Setting staffing

standards, extending access to high quality training, and identifying appropriate equipment for resuscitating the neonate in out-of-hospital settings would be recognized by professional organizations, their members and policy makers.

Home birth providers, as well as those working within birthing centers, require access to high quality neonatal resuscitation training courses that recognize their role as primary care providers of the neonate. The United States is a resource-rich nation with well-educated and highly trained nurse midwives, who are well integrated into the health care system and recognized by the American Congress of Obstetrics & Gynecology and the American Academy of Pediatrics (ACOG, 2011 & AAP, 2013). The healthcare disparity affecting neonates born within the home or birth center can be addressed through recognizing the gap in evidence to practice, and correcting this through modifying small components of the current neonatal resuscitation training program provided by the American College of Pediatrics and the American Heart Association.

A thorough literature review was the first step in this project plan, and an effort to identify and analyze additional evidence has continued throughout the development of this project. Literature searches included clinical practice points, committee opinions, outcome statistics, population cohorts, and commentary among researchers and clinicians. The training program developed by the AAP/AHA was closely evaluated as well, appreciating the evolution of the program as having originally derived from the opinion of experts to a more concerted effort today to base the recommendations on experimental or experiential evidence (AAP & AHA, 2011).

Doctoral Committee Meetings were scheduled throughout project development. While the Content Chair, Dr. Linda Cole, remained consistent throughout project development, the

Committee Chair for this project evolved. Dr. Suzan Ulrich was initially the Committee Chair, followed by Dr. Rebecca Barroso and then, Dr. Janet Engstrom when which the bulk of the project materialized. Dr. Linda Cole assumed the Committee Chair appointment for the final term through project completion. During the first and second terms, discussion meetings were primarily scheduled with Dr. Linda Cole. Near conclusion of the second term and upon initiation of the third term, two lengthy phone discussions with Dr. Barroso occurred, and then regular and substantial meetings with Dr. Engstrom initiated early third term and continued every week and then every other week through her resignation at the end of fourth term. Dr. Linda Cole offered necessary edits and assisted in making points clear for the reader during the final term.

Project activities focused on the acquisition of leadership skills, better understanding system organization, enhancing communication skills particularly among groups with a history of intractable relationships, and building a collaborative network. Twelve neonatal resuscitation courses were taught through project development, each evolving as the body of evidence for this project grew. These courses offered opportunity to continually evaluate the learning needs of home birth-based and birth center-based attendant and recognize the modifications necessary to enhance their training. The counsel of respiratory therapy experts was sought for guidance in how neonatal resuscitation supplies and equipment can be optimized and transported from birth to birth, in the hands of a homebirth attendant vulnerable to the extremes of weather and potentially, limited modern-day resources. Finally, a substantial commitment to engage in nursing leadership within the state of Indiana was pursued, not only in effort to advance the profession of nursing but also in effort to acquire leadership experience that will certainly prove necessary during the implementation portion of this project.

An interview with Janette Zaichkin NNP, Editor of the *Neonatal Resuscitation Instructor Manual*, on August 21st, 2013 was enlightening. While she was unable to speak for the American Academy of Pediatrics or even the NRP Steering Committee, it was helpful to understand her knowledge base about the clinical skill level of homebirth providers, and her impression that the two groups had tremendous opposition to homebirth that would prevent any recognition of this project's effort. However, prior to this interview, Janette Zaichkin NNP was unaware of the new Committee Opinion on *Planned Home Birth* published by the American Academy of Pediatrics (2013) supporting the provision of care only by midwives who are certified by the American Midwifery Certification Board (p 1017). The committee additionally stated, "every newborn infant deserves health care that adheres to the standards high-lighted" within their statement, which outlines that at least one person should be trained and have resources to "perform a full resuscitation of the infant in accordance of the principles of the Neonatal Resuscitation Program" (p 1017). This opens up opportunity for discussing the care delivery and training of home birth-based and birth center-based attendants. Ms. Zaichkin was intrigued and suggested this doctoral capstone project be presented to the NRP Steering Committee as the seventh edition of the textbook is currently in development.

A milestone for this author while working on this project, was accepting an invitation to join the Home Birth Section of the American College of Nurse-Midwives in effort to create standards specific to the home birth setting as practiced by nurse-midwives. This paper is currently undergoing review by ACNM leadership, following a number of revisions as the ACNM Board and the ACNM Home Birth Section negotiates terms and best practices. Recognizing the challenges in creating evidence-based statements within a committee passionate in their position was well appreciated through this experience. Implementing this project will

require mastery in navigating the politics, passions, visions, and perceptions of each stakeholder while appreciating the economic, financial, and ethical and policy barriers, all while simultaneously maintaining an up-to-date body of literature on the topic.

Finally, an oral presentation of the completed Capstone Project was made on March 12th, of 2014, after approval of the Capstone Committee. Evaluation of the capstone project consisted of assessment of goals and measurable objectives to determine whether each had been achieved. Activities were evaluated to insure completion and timeliness. Adjustments to the implementation plan were made as new barriers were identified, and ongoing evaluation of this process will continue post-program completion. Importantly as well, evaluation of the success of this project includes a humble self-reflection of this DNP candidate in areas of leadership, ability to analyze the scientific underpinnings of the profession, maturity in systems thinking, and development of strategies for interprofessional collaboration.

Sustainability Plan & Expected Outcomes of Project

This doctoral capstone project is an analysis and synthesis of evidence with proposed strategies for change within the neonatal resuscitation program jointly sponsored by the American Academy of Pediatrics and the American Heart Association. The sustainability of this project is specific to data collection and intellectual review without project implementation prior to completion of the program. The anticipated outcome is the successful creation of a well-supported argument that is persuasive in motivating the AAP/AHA to openly dialogue about necessary changes for the NRP program that will work to equip home birth attendants and birth center staff, and for the first time, set a minimum standard for such practice settings. It is further expected that this project will have outcomes beyond the program timeline that will assist in

improving the skill set of home birth-based attendants which will work to decrease neonatal mortality associated with this birth setting.

Congruence of Project Action Plan with Project Site's Strategic Plan

The home birth community and the medical infrastructure have a long history of intractable conflict that has been destructive, and while it will be difficult to overcome, it is certainly not an impossible feat. In 2007, the American College of Obstetricians and Gynecologists (ACOG) issued a sharply worded Committee Opinion on Planned Home Birth declaring that "ACOG does not support programs or individuals that advocate for or who provide home births" (<http://midwife.org/index.asp?bid=59&cat=7&button=Search&rec=92>). Four years later, in 2011, ACOG released an updated statement that supported the attendance of homebirth by nurse-midwives but because of the deeply rooted conflict between the professions, many home birth advocates were unable to recognize and appreciate this monumental progress. The American Academy of Pediatrics followed suit in 2013, releasing their own Committee Opinion on home birth, supporting attendance only if attended by a nurse-midwives (2013).

The conflict between the home birth community, and ACOG and AAP, has a history of non-negotiation. The cost of getting out of this conflict has been viewed as more costly than remaining within it; therefore, each have held firm to their positions. The one common ground has been the growing body of evidence for which neither can ignore, yet both can utilize for dialogue of shared interests.

Home birth-based midwives and hospital-based physicians have a history of producing two competing sets of data that are experimentally collected to justify each of their own perceptions. Yet, in the most recent Committee Statements by ACOG and the AAP, each recognized improved outcomes for mothers who birth at home when in the care of nurse-

midwives but made clear, evidence did not support this outcome to extend to the newborn, especially when attended by midwives other than those credentialed through the Accreditation Commission for Midwifery Education (ACME). A growing body of home birth-based nurse-midwives recognizes the need for standardization in care delivery within the home, and welcomes the movement to embrace Best Practices within this birthing environment. Standards for the practice of nurse-midwifery, when attending births in the home setting, are currently awaiting approval by the ACNM Board of Directors. Both parties are moving forward in closing the gap in what has been a long history of conflict, all in effort to improve maternal and neonatal outcomes.

Project Timeline

This doctoral capstone project is a synthesis of evidence regarding neonatal resuscitation specific to the provision of care by the home birth-based and birth center-based attendant. Demonstrating the gap between current evidence to practice within the current neonatal resuscitation training program jointly sponsored by the American Academy of Pediatrics and the American Heart Association and identifying modifications that could serve to improve the training and skill acquisition of the out-of-hospital attendant is the culmination of the project prior to program completion. This was largely accomplished through on-going review of the available literature and experience as a neonatal resuscitation instructor for the program; however, with a vision for proposing such strategies to stakeholders, development in leadership, communication, and collaboration was sought during the DNP journey so implementation would prove fruitful following completion of the doctoral program.

Early into the program, a board position within the two most predominant professional nurse-midwifery groups was sought as an avenue for building an understanding for the

complexity of leadership and as a mode for advancing the nursing profession. The secretary position within the Indiana Affiliate of the American College of Nurse-Midwives (ACNM), as well as the nurse-midwife representative for the Coalition for the Advance Practice of Nurse-Midwives, has offered valuable insight. Midway through the doctoral program, an invitation to join the Home Birth Section of the American College of Nurse-Midwives was accepted and work quickly commenced to create the first standards for home birth practice by nurse-midwives. During the final days of writing this paper, the author was also asked to join the ACNM HIT section and has joined efforts with a newly developed ACNM workgroup, specific to the affiliate leaders, which will collaborate in effort to address scope of practice issues.

Further details regarding the timeline of this doctoral capstone project can be found in the GANTT chart within the Appendix; the SWOT Analysis and Matrix of Evidence is also available within the appendix for further assessment of the work completed during the program and the action plan to follow.

Recommendations

Neonatal outcomes for infants born at home appear to compare poorly to those born in the hospital. The American Academy of Pediatrics and the American Heart Association has recommended both within the *Neonatal Resuscitation Textbook (6th Ed.)* and within their Home Birth Committee Statement (2013) that every birth should be attended by at least one attendant who is capable of providing a *full* resuscitation. This makes clear that limiting the training or extensiveness of such training due simply to the site the attendant extends care is unacceptable; however, not only does access and extensiveness of such training need addressed, so does the content. Currently the program does not meet the unique needs of the out-of-hospital attendant.

Further research is necessary to identify the variable for improving neonatal outcomes, whether that be increased academic preparation, more thorough clinical experience and competency, improved access to training programs, greater ease in collaborating among a multi-disciplinary team within the healthcare infrastructure, or increased access to necessary supplies and equipment. Studies specific to the training of home birth-based and birth center-based attendants could be conducted offering important data, such as: evaluating outcomes based on whether resuscitation was provided during the presence of an intact umbilical cord verses a clamped umbilical cord; evaluating the effectiveness of using the self-inflating bag verses the T-piece resuscitator in the home or birth center setting among nurse-midwives and other midwives; evaluating the methods for currently managing difficult airways or the presence of meconium in a non-vigorous infant; and conducting a survey specific to the equipment and staff ratios among home birth-based and birth center-based practices.

In addition to research, another recommendation is to urge the Neonatal Resuscitation Steering Committee to consider modifications to the current program, including:

1. Addressing the level of responsibility of the home birth-based or birth center-based attendant and the minimal course requirements recognizing that neonates in all birth settings should have immediately available an attendant who can perform a complete resuscitation (APA, 2013; AHA & APA, 2011);

It is no more inappropriate for the hospital born baby to have the neonatal resuscitation team outside the birth setting, than for the home born baby to rely on the emergency response team to provide their resuscitative needs (AHA & AAP, 2011, p 17).

2. Identifying minimum personnel in the home birth and birth center setting, specifically including having one person present who can provide a full resuscitation and an

immediately available assistant, neither of which who would simultaneously be caring for the immediately postpartum mother;

Arguably, this demonstrates the need for three attendants within the home birth and birth center setting at each birth, with at least two NRP certified attendants, one capable of performing a full resuscitation and another who can assist, as well as a third who can be fully responsible for the immediate needs of the postpartum mother (AHA & AAP, 2011, p 17).

3. Addressing the need to adapt to the unfamiliar environment of each individual home; therefore, advanced preparation is required and the need to establish routine in setting-up of supplies and equipment no matter one's birth setting (see Appendix G for sample pre-birth set-up check list);
4. Implementing teaching specific to use of compressed air, oxygen tanks and use of blenders (see Appendix H for an equipment list specific to home and birth center settings);
5. Addressing risk of weather conditions, such as extreme cold, to items such as emergency medications, oxygen, compressed air and intubation blades;
6. Addressing the process of meconium aspiration, if this remains a procedure the NRP Steering Committee continues to endorse. The Res-Q-Vac and DeLee suction catheter are more conducive to frequent transport than larger and heavier mechanical suction options; however, neither utilize the meconium aspirator, yet do allow for larger bore catheters and suctioning from the endotracheal tube;
7. Address how ongoing resuscitation efforts should be managed during transport with regards to oxygen delivery, as well as supplemental oxygen, if without the presence of a blender;

The sixth edition of the neonatal resuscitation textbook, edited by Kattwinkel (2006) states, “If an oxygen blender and pulse oximeter are not immediately available, start PPV with 21% oxygen [room air] while you are obtaining an air-oxygen source and oximeter” (p 89). Home birth and birth center staff utilizing the T-piece resuscitator with compressed air may have an oximeter among their supplies and equipment. Some also have oxygen blenders, while others do not. This gives the home birth and birth center attendant who utilize the T-piece resuscitator the option of continuing to resuscitate with compressed air and 21% oxygen, or transitioning to 100% oxygen. A third option would be transitioning from the T-piece resuscitator to a self-inflating bag, removing the oxygen reservoir and therefore, delivering approximately 40% oxygen to the neonate when the bag is squeezed, although this option would invite the risk of not maintaining an adequate seal, over-inflation and operator fatigue (Kattwinkel, 2006).

8. Discussing need for hospital, birth center, and home birth-based attendants to identify and coordinate plans for urgent and immediate transfers of care as deemed appropriate;

Not only is the need for identifying a local medical team for which to transfer care vital, so is coordinating care management with the local emergency response team prior to necessity. The time of transfer from the home or birth center setting to the hospital can invite great chaos which may delay emergency treatment, or prevent the highly educated and clinically skilled nurse-midwife from continuing effective and efficient neonatal resuscitation measures because of jurisdiction issues that had not previously been addressed. Communication among home birth-based and birth center-based midwives to 911 operators and emergency response teams can also present challenges; therefore, identifying how the attendant may allocate her attention wisely, delegate work optimally, present oneself professionally and communicate effectively could not be under appreciated. Hospital groups as well, are responsible for having in place procedures for

accepting home birth transfers so as not to delay necessary care. Evidence demonstrates that when practitioners attend home births with 'first-level' skill sets within an infrastructure allowing for seamless collaboration and transfer, outcomes are similar to hospital births (AAP, 2013; ACOG, 2011; Davis-Floyd, 2002; Fullerton, 2007; Hays, 1995; Kattwinkel, 2011).

9. Discussing methods of transport that optimizes neonatal outcomes, including management of neonatal thermoregulation and safely transporting a neonate within an ambulance;
10. Implement physiology specific to delayed cord clamping into the basic principles of resuscitation;
11. Consider the unique resuscitative needs of the infant born into a birthing spa, including obtaining an optimal airway and providing continued warmth;
12. Consider implementing scenarios specific to out-of-hospital environments; and
13. Consider implementing ethical principles and scenarios specific to home birth and birth center settings and management of transports by staff, *as well as* receiving of such transports by hospital staff.

It has been recognized that the unhappiest of all birthing couples are those that had planned a home birth and transferred into the hospital. Many express treatment of abuse and hostility, some leading to poor outcomes and punishment by the hospital staff (Davis-Floyd, 2002). The principles of autonomy, beneficence, nonmaleficence and justice apply in home birth and birth center neonatal resuscitation efforts equally as those within the hospital.

Finally, the transition of the neonatal resuscitation training program from a lecture and test format to a simulation-model with debriefing continues to overlook the role and learning needs of the home birth-based and birth center-based attendant. Simulation scenarios are nearly

exclusive to hospital-based scenarios with language, teams, and equipment specific to that environment. While the NRP program creators encourage the adaption of course teaching to the needs of the class attendants, hospital-based instructors need training in the unique needs of home birth and birth center attendants. Non-nurse midwives in particular, may need additional teaching of neonatal principles and skill acquisition practice with equipment and environments with which they are familiar. Integrating a skills station performance checklist for the home birth and birth center setting, that allows these providers to learn neonatal resuscitation within familiar scenarios, but also allows those without such experience to become familiar with the resources and skill set of such providers is recommended.

Congruence of the Project with Specific *AACN-DNP Essentials*

This doctoral capstone project embraces the full scope of essentials for doctoral education as an advanced practice nurse. The synthesis of published research for practice specific to home birth and birth center outcomes, as well as evidence specific to the implementation of neonatal resuscitation laid the groundwork for this project's proposal. Utilizing the scientific underpinnings for practice and incorporating clinical scholarship and analytical methods, this project evolved into one that should certainly work to advance the practice of nursing, recognizing that the nurse-midwife is a primary care provider of the neonate, who is well-educated and highly skilled, no matter her environment of practice.

Implementation of this project's purpose will require organizational and systems leadership to improve the quality of care provided neonates in the home birth and birth center setting, which will manifest only through acceptance and implementation by each stakeholder. For home birth-based midwives, this means embracing the responsibility of providing a full resuscitation to the neonate born within the home or birth center environment, which will also

require appreciation for information and patient care technology that at times, may seem to infringe upon the philosophy of a non-interventive birthing environment. For the NRP Steering Committee, this also means recognizing the rights of the neonate born at home or in the birthing center as having equal rights to a full resuscitation by a trained provider and therefore, increasing access to training and implementing such training into the already conceived program so that interprofessional collaboration for improving neonatal outcomes may be achieved. Finally, one can't ignore the fact that new standards of care, in print, often lead to health policy changes in state statute. It will be especially important to monitor implementation and provide recommendation that will improve neonatal outcomes without creating unintended barriers to care.

Plan for Publication and Dissemination of Project Findings

It is vital for this project's success that stakeholders, both professional and consumer, appreciate and support its purpose. Sharing the synthesis of evidence and proposed modifications to the current NRP training program through speaking engagements and publication is critical. It may prove advantageous to "plant seeds" within midwifery groups, so to speak. Publishing a *Share with Women* health article within the *Journal of Midwifery & Women's Health*, a column written to consumers yet also read by nurse-midwives, that would outline questions to ask the midwife when interviewing for a home or birth center birth may establish a standard for which midwives will also refer. The author has already received multiple requests from NRP instructors for simulation scenarios specific to home and birth center settings. Addressing these learning needs and providing a number of scenarios for publication would also assist in disseminating the work of this project as negotiations with the AAP NRP Steering Committee are underway.

Publication of the synthesis of evidence within peer-reviewed journals is also important for consideration among professionals throughout the discipline of maternal and child health. This will require restructuring of the project to meet publication requirements within appropriate journals, and submitting such work for the approval process. Continuing efforts to improve neonatal outcomes among the Home Birth Section of the American College of Nurse-Midwives national group will be an on-going commitment, and ultimately requesting invitation to submit project findings and strategies to the NRP Steering Committee is the project's goal.

Conclusion

Neonatal resuscitation within the home birth setting, performed by nurse-midwives, has been a long and complex passion of the author's, which was well cultivated within this doctoral program. The physiology and performance of such procedure was less the focus of this author's professional development, and more the synthesis of available research and the ability to disseminate such work into a profession with intense passion and deeply rooted conflicts surrounding the data and the project's position.

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