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The late preterm infant: How much transition time is needed to prevent hypothermia?

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The Late Preterm Infant: How much transition time is needed to prevent hypothermia?

by

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Abstract

Late preterm infants are those infants born between 34 weeks and 36 and 6/7 weeks gestation. These infants are generally the same weight and appearance of full term infants and are treated in level one or well-baby nurseries the same as full term infants. Late preterm infants are not as physiologically mature as full term infants and have problems that may go overlooked. Late preterm infants experience complications such as hypothermia, hypoglycemia, respiratory difficulties, and feeding problems that lead to hyperbilirubinemia. These complications can lead to longer hospital stays or readmissions and higher healthcare costs. It is the purpose of this study to determine if hypothermia in the late preterm population can be decreased as a result of prolonged monitoring during the initial transition time immediately following birth. Clinical guidelines for care of the late preterm infant need to be developed and the results of this study will help assist in that need.

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CHAPTER I

Introduction

The number of preterm infants born in the United States is growing each year. There was a 31% increase in overall preterm birth rate from 1991 to 2003 (Davidoff et al., 2006). The majority of the preterm births are between 34 and 37 weeks gestation. The infants who are defined as infants born before the gestational age of 34 weeks and 0/7 days through 36 weeks and 6/7 days are called late preterm infants. Late preterm infants may appear more like term infants than extremely premature infants, making their unique vulnerabilities easy to overlook (Hubbard, Stellwagen, & Wolf, 2007). Late preterm infants enter the world without the benefit of the last few weeks in utero making them unable to handle their new responsibilities such as temperature regulation. These infants are at a higher risk for morbidity and mortality. Late preterm infants experience more complications such as hypothermia, hypoglycemia, respiratory problems, and feeding problems that lead to hyperbilirubinemia. Many of these complications lead to higher incidence of hospital readmissions and health care costs.

The late preterm infant is a relatively new concept having been defined by participants in the 2005 workshop on Optimizing Care and Outcome of the Near-Term Pregnancy and the Near-term Newborn Infant (Engle, Tomashek, & Wallman, 2007). The participants of the workshop decided to call infants born between 34 and 36 weeks late preterm infants instead of near-term infants because late preterm better conveys the sense of vulnerability of these infants. Late preterm infants are vulnerable to a myriad of problems resulting in higher morbidity and mortality than term infants. The primary

focus of this study is hypothermia and how it can be reduced or eliminated from the late preterm population.

Purpose of the Study

The purpose of this study is to determine if hypothermia in the late preterm infant can be decreased as a result of prolonged monitoring. Clinical guidelines for care of the late preterm infant need to be developed, and the intent of this study is to assist in that need. Many of these late preterm infants are born in small rural hospitals where they are placed in well baby nurseries and treated the same as term infants. "Late preterm infants are considered functionally mature and are managed according to protocols developed for full term infants" (Jain, 2007, p.3). Results in the proposed study will assist in using guidelines specific for the late preterm infant to decrease morbidity and mortality.

Statement of the Problem

The fetus, while in utero, is provided all the heat it needs from its mother. When an infant is born, it is typically in a cold room and the infant is wet. Without intervention the infant's temperature will drop rapidly. The normal thermoregulatory response of neonates to cold stress is involuntary muscle activity, vasoconstriction, and non-shivering thermogenesis (Aylott, 2006). Term infants have an increased metabolic rate and increased brown fat metabolism. Late preterm infants have a decreased metabolic rate and little to no brown fat to burn. The late preterm infant is also at a higher risk of hypothermia due to increased surface area to body mass ratio, decreased subcutaneous fat, greater body water content, immature skin, ineffective positioning ability, and

delayed development of skin blood flow control reducing the ability to vasoconstrict (Lyon, Pikaar, & Badger, 1997).

Conceptual Framework

When a late preterm infant is cold stressed, there is peripheral and pulmonary vasoconstriction which leads to hypoxia. Hypoxia leads to acidosis which increases respiratory compromise and shuts down surfactant production (Aylott, 2006). There is an increased need for glucose that the late preterm infant may not have. Hypoglycemia is found three times more often in late preterm infants than term infants (Wang, Dorer, Catlin, & Fleming, 2004). Hypothermia will cause hypoglycemia and respiratory distress in preterm and term infants. It is using this conceptual framework for practice that the importance of maintaining adequate temperature in the late preterm infant is realized. The Neonatal Energy Triangle is a conceptual framework which is intended to support the early care of the late preterm infant on admission to the neonatal unit (Figure 1).

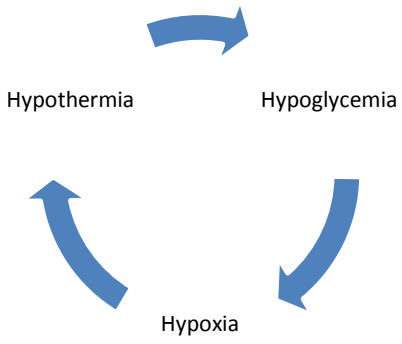

Figure 1. Neonatal Energy Triangle

Theoretical Framework

This study utilizes a new middle range theory of health promotion for preterm infants based on Levine's conservation model of nursing that can be used to guide neonatal nursing practice. In Levine's conservation model (Figure 2), the goal of nursing is the conservation or keeping together of the wholeness of the individual, who is identified as a patient. The environment includes the internal environment (physiologic processes), and three components of the external environment. They are perceptual, operational, and conceptual. (Mefford, 2004) Wholeness is when the internal and external environments fit best or interface. It is the nurse's job to restore or maintain health by using therapeutic and supportive nursing interventions in accordance with conservation principles of nursing.

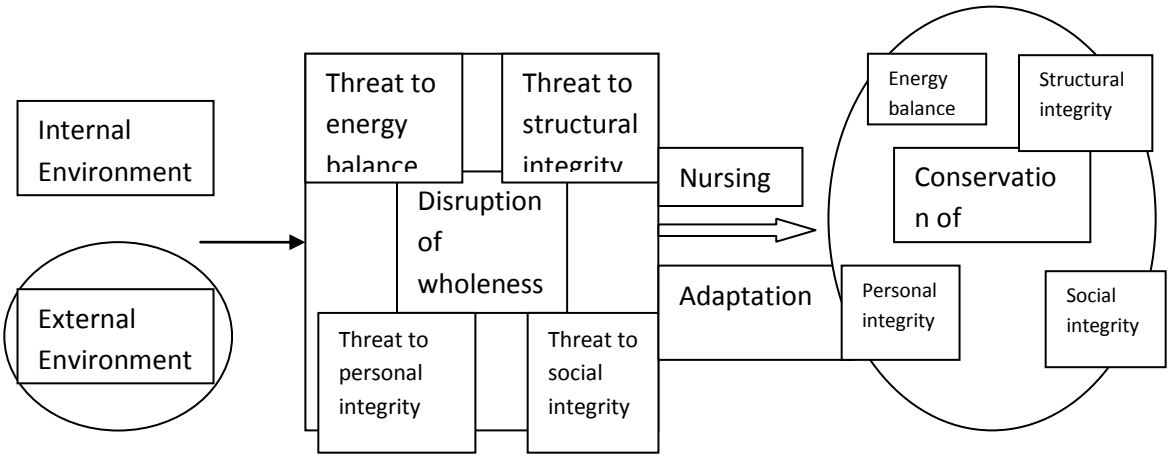

Figure 2. Conceptual Diagram of Levine's Conservation Model of Nursing

Research Question

The research question in this study is: Will prolonged transition time decrease hypothermia in the late preterm infant? The transition time is the time immediately following delivery when the late preterm infant is acclimating to extra uterine life and is being monitored for any signs of distress. It is proposed that increasing this time from two hours to six hours will decrease the incidence of hypothermia in the late preterm infant. Hypothermia is defined as a skin (peripheral) temperature below 35.5° C or an axillary (core) temperature below 36.3° C or 97.3° F (Aylott, 2006).

Significance to Nursing

This study is significant because late preterm infants have a higher risk of mortality and morbidity and should not be treated as term infants. Late preterm infants are typically put in the well-baby nursery and treated as term infants. Problems such as temperature control or glucose regulation are overlooked because late preterm infants appear to be as physiologically mature as full term infants (Engle et al., 2007). Nurses must be aware of complications that late preterm infants may have and that they may require longer and more extensive monitoring after birth. Research specific to this newly defined group is still sparse, and by developing guidelines for care of the late preterm infants, hospital stay and costs can be reduced and late preterm infants will have better outcomes.

CHAPTER II

Literature Review

All preterm births place infants at a higher risk of morbidity than term births. Little is known about the risk of morbidity among late preterm infants even though they account for greater than 70% of all preterm births in the United States (Tomashek et al., 2006). A complication of the late preterm infant is hypothermia. The purpose of this study is to determine if hypothermia in the late preterm infant can be decreased as a result of prolonged monitoring. Database searches including the Cumulative Index to Nursing and Allied Health Literature, Sage Journals, and Gale database were used in this literature review. The researcher will examine what is known about morbidity, specifically hypothermia in the late preterm infant, and discuss maternal risk factors that may help determine which preterm infants are at greatest risk of morbidity and mortality. Thermoregulation and the late preterm infant will also be examined.

Discussion of Theoretical Literature

In utero a fetus does not regulate their temperature. The mother provides all heat needed for her infant. When an infant is born, it is typically in a cold room and the infant is wet. The infant's body temperature will drop rapidly without intervention. The normal thermoregulatory response of neonates to cold stress comprises increased involuntary muscle activity, vasoconstriction, and non-shivering thermo genesis (Aylott, 2006). The infant has an increased metabolic rate due to pituitary and thyroid hormone, and increased brown fat metabolism due to the sympathetic nervous system releasing catecholamine and corticosteroids. The late preterm infant has a large surface area which

also causes rapid cooling. There is decreased subcutaneous fat with little to no brown fat. Cold stress in a late preterm infant can cause peripheral and pulmonary vasoconstriction which can lead to hypoxia. When there is hypoxia, the late preterm infant develops acidosis which increases respiratory compromise and shuts down surfactant production (Aylott, 2006). This also increases glucose consumption. The preterm infant does not have reserves of glucose for extra energy production. Hypothermia will cause hypoglycemia and respiratory distress in preterm and term infants.

Discussion of Empirical Literature

A retrospective study was conducted by Wang et al. (2004), to test the hypothesis that late preterm infants (those between 34 to 36 and 6/7 weeks), have more medical problems after birth than full term infants, and that hospital stays might be prolonged and costs increased. The medical records of 90 late preterm infants and 95 term infants were used in the study. The infants were born between October 1997 and October 2000. The researchers found that median lengths of hospital stay for late preterm and full term infants were comparable; however, wide variations in hospital stay were documented for the late preterm infant after both vaginal and cesarean deliveries (Wang et al., 2004). Late preterm newborns were more likely than full term infants to exhibit temperature instability (10% vs. 0%) or hypoglycemia (15.6% vs. 5.3%). Late preterm infants received intravenous infusions more often (26.7% vs. 5.3%). Late preterm infants had respiratory distress more often (28.9% vs. 4.2%), and were clinically jaundiced much more often (54.4% vs. 37.9%) than full term infants. Late preterm infants also underwent sepsis workups more frequently (36.7%vs12.6%), (Wang et al., 2004). The aim of the

study was to explore whether late preterm infants have more clinical problems and longer hospital stays generating higher costs. “Given that delivery decisions are driven by both maternal and fetal indications, in settings where near term delivery is contemplated but non-urgent, these data detailing clinical problems encountered in near term infants may be instructive” (Wang et al., 2004, p. 376).

A population based birth cohort was enrolled in Pelotas southern Brazil in 2004 by Santos et al. (2008). The purpose of the study was to test the hypothesis that late preterm infants are at increased risk for neonatal medical complications and dying in the first years of life compared to term infants. This study used a total of 4,134 infants, 447 (10.8%) were late preterm infants. The mothers were interviewed and the infants examined at birth. The mothers were interviewed again at three months of life. The researchers found that maternal age < 20 years was associated with an adjusted probability of late preterm birth 30% higher than moms 20-34 years old. The probability of late preterm delivery was 30% higher for mothers with hypertension during pregnancy and the risk of neonatal morbidity (hypothermia, hypoglycemia, or respiratory dysfunction) was almost three times higher among late preterm infants.(Santos et al., 2008). Late preterm infants show an important increase in risk of death, especially during the neonatal period. “As a consequence, preterm births should be avoided and, if that is not possible, babies should be given special care by trained staff, regardless of the severity of the preterm condition” (Santos et al., 2008, p. 357).

Kitsommart et al. (2009) did a retrospective study in order to review the prevalence of major morbidities and mortality of late preterm infants. The data on 1,193

late preterm infants and 8,666 term infants was compared. These infants were born in a Canadian hospital from 2004-2008. “The prevalence of intensive care admission, respiratory support, pneumothorax, and mortality in late preterm infants was significantly higher compared with term infants” (Kitsommart et al., 2009, p. 844). The researchers state that due to the burden of illness that comes with the delivery of late preterm infants, maternal and newborn practices should be reexamined with each obstetrical service and improved to avoid preterm delivery (Kitsommart et al., 2009, p. 849.)

One of the most debated issues in the management of premature rupture of membranes, (PROM), is the optimal gestational age of delivery. A retrospective cohort study by Mateus et al. (2010) was conducted to determine gestational age-specific neonatal outcomes of late pre-term infants delivered as a consequence of premature rupture of membranes. A convenience sample of 192 infants born to mothers electively delivered because of preterm PROM at greater than or equal to 34 and 0/7 weeks from 2005 to 2007. The researchers found that the 34 and 0/7 to 34 and 6/7 weeks infants had a significantly higher neonatal intensive care admission rate (72.5%), compared to 35 and 0/7 to 35 and 6/7 weeks (22.8%), and at 36 and 0/7 to 36 and 6/7 weeks (17.8%) (Mateus et al., 2010). The highest rate of neonatal distress syndrome and longest hospitalizations were also in the 34 week group and were lowest in the 36 week group. The researchers emphasized the importance of further investigation into new clinical strategies, including the use of antenatal steroids for pregnancies affected by preterm PROM at greater than 34 weeks (Mateus et al., 2010). They also cautioned against treating the late preterm infants the same as term infants.

A retrospective population based cohort study was conducted by Shapiro-Mendoza et al. (2006) to compare the incidence of neonatal morbidity between "healthy" late preterm infants with and without infant, obstetric and sociodemographic factors by calculating risk ratios adjusted for confounding. A convenience sample of 9,522 singleton late preterm infants vaginally delivered in Massachusetts hospitals between 1998-2002 was studied. Researchers found that of the 9,552 late preterm infants, 4.8% had an inpatient readmission, and 1.3% had an observational stay. Infants with neonatal morbidity were more likely to be firstborn, be breastfed at discharge, have labor and delivery complications, be a recipient of a public payer source at delivery, or have an Asian/Pacific Islander mother (Shapiro-Mendoza et al., 2006). The researchers identified that the knowledge of risk factors for neonatal morbidity among "healthy" late preterm infants can be used to identify infants needing closer monitoring and earlier follow up after hospital discharge (Shapiro-Mendoza et al., 2006).

Tomashek et al. (2006) conducted a study to better understand how late preterm infants are affected by discharge policies created for term infants to aid in preventing post-discharge neonatal morbidity. A convenience sample was used of live born singleton infants of 34-41 weeks gestation, who were delivered vaginally between January 1, 1998-November 30, 2002 at a Massachusetts hospital. There were 1,004 late preterm and 24,320 term infants in the study. The researchers found that late preterm infants were 1.5 times more likely to require hospital related care and were 1.8 times likely to be readmitted than term infants. The breast fed late preterm infants were 2.2 times more likely to be readmitted. Jaundice and infection accounted for the majority of readmissions

(Tomashek et al., 2006). Late preterm infants in this study were shown to experience slightly more morbidity than term infants discharged early, but it may be true only for breast fed infants. “Evidence based recommendations for appropriate discharge timing are needed to prevent neonatal morbidity for the late preterm infant” (Tomashek et al., 2006, p. 61)

Keeping infants warm during the early postnatal period was proven to be associated with higher survival rates in the 1960’s (Bredemeyer, Reid, & Wallace, 2005). This is especially important for the preterm infant. A retrospective preintervention audit and then a prospective post intervention audit following introduction of the new policy, was conducted by Bredemeyer et al. (2005) to report the effect on admission temperatures with the use of occlusive polyethylene wrap applied immediately after birth of the preterm infant. The convenience sample included all babies born at less than 30 weeks gestation for the months of January through December, 2001. The implementation of the new protocol was January to March, 2002. The prospective audit was on all babies born less than 30 weeks from April 2002-March 2003 (Bredemeyer et al., 2005). The researchers found that use of polyethylene wrap improved admission temperatures for infants less than 27 weeks. “There was no significant improvement in admission temperatures for infants 27-29 weeks” (Bredemeyer et al., 2005, p. 482).

A prospective cohort study was conducted by De Almeida et al. (2007) to evaluate the needs for resuscitative procedures at delivery of the late preterm infant. A convenience sample of all live born infants born in September, 2003 from 34-41 weeks gestation without congenital anomalies was used. They were born in 35 public hospitals

in 20 Brazilian state capitals. The researchers found that of the 1,054 late preterm infants, 32% received only free flow oxygen, 14% were bag and mask ventilated, 3% were intubated, and 10 of 27 received chest compressions and/or medications. Bag and mask ventilation was associated with twin gestation, maternal hypertension, non-vertex presentation, cesarean delivery, and lower gestational age (De Almeida et al., 2007). The researchers identified that one in seven late preterm infants without congenital malformations required ventilatory support at birth. Improving prenatal care with a better control of maternal hypertension, prolonging gestation for one to two weeks and restricting cesareans to conditions that impose a real risk to maternal, and fetal health could improve the vitality of the neonate at birth (De Almeida et al., 2007, p. 765).

Summary

The late preterm infant has unique vulnerabilities that may not be apparent. Though they resemble term infants they are developmentally and physically immature compared with term infants (Shapiro-Mendoza, 2009). Late preterm infants experience more complications during and after birth than term infants. These include respiratory complications, jaundice, hypoglycemia, and temperature instability. Late preterm infants receive more medical therapies such as intravenous infusions and sepsis evaluations with antibiotic administration. “Late preterm infants have higher rates of rehospitalization with jaundice, feeding difficulties and dehydration as the primary diagnoses” (Hubbard et al., 2007, p. 52). Currently there are no clinical guidelines for the care of the late preterm infant in the hospital or out. Smaller hospitals tend to place these infants in the well-baby nursery and treat them like term babies, while some larger hospitals place them in

NICU's until discharge home. By determining if hypothermia in the late preterm infant can be avoided with prolonged transition time, this study intends to assist in developing guidelines for care that are specific for the late term infant to help decrease morbidity and mortality.

CHAPTER III

Methodology

Late preterm infants are those born between 34 0/7 to 36 6/7 completed weeks gestation. These infants are a vulnerable population that has been treated the same as term infants. There are problems specific to this group of infants such as hypothermia, hypoglycemia, and respiratory distress syndrome. The purpose of this study was to determine if the occurrence hypothermia in the late preterm infant can be decreased as a result of prolonged monitoring after initial transition is completed. The study was completed at a 209 bed, acute care hospital in the upstate of South Carolina. There are 1,225 employees and 386 active physicians on staff. The hospital is accredited by The Joint Commission. Evidence based clinical guidelines for care of the late preterm infant need to be developed and it is the intent of this study to assist in this need.

Design

The study is a secondary analysis using a retrospective preintervention audit then a post intervention audit following the introduction of a new policy for monitoring the late preterm infant. Prior to conducting the study, the researcher obtained permission from the Internal Review Board (IRB) from Gardner Webb University and from the IRB for the participating hospital (Appendix A).

Samples

The study included a convenience sample of all infants born at 34-36 completed weeks' gestation from June 2010-May 2011. The implementation of the new protocol for monitoring the late preterm infant began June 2011. A post intervention audit was

conducted from June 2011 to June 2012. Exclusions to both audits were infants born with congenital anomalies, and infants having respiratory distress or suspected sepsis. The identity of all the subjects was protected. No identifying names or numbers were used in the study.

Data Collection and Analysis

Data was collected on all infants born June 2010 – June 2012 who were between 34-36 completed weeks by chart audit. The demographic information collected was gestational age, maternal age, parity, education level, race, marital status, and employment. The demographic tool used for this study was developed by the researcher (Appendix B). The variables to be examined were infant weight, temperature at end of transition (2 hours after delivery), any temperature instability, (hypothermia), and age of infant in hours at the time of hypothermia. The length of time the infant was monitored after hypothermia was also noted. The new protocol for monitoring late preterm infants began June 2011. It required all infants to be admitted to the special care nursery for frequent vital signs, radiant warmer intervention, continuous apnea monitoring, and pulse oximetry for at least six hours. Temperature, heart rate, respiratory rate, and oxygen saturation were recorded every three hours. For the post intervention audit, data was collected on all infants who were born from June 2011 – June 2012 who fit the study criteria. The same variables were examined as in the pre-intervention audits.

The variables in both groups of infants, those before the new protocol and those after the protocol, were compared to see if there was any correlation between temperature instability and time monitored after delivery. Gestational age was assessed using prenatal

maternal ultrasound, (if available) and The New Ballard Exam gestational assessment tool. The validity and reliability of the New Ballard Exam has been proven in many studies. “The New Ballard Score is a valid and accurate gestational assessment tool for extremely premature infants and remains valid for the entire newborn infant population.” (Ballard et al., 1991, p. 417). The New Ballard Score is used in most hospitals throughout the United States. Coded data was entered into a personal computer for analysis utilizing the Statistical Package for Social Sciences (SPSS), version 19.

Conclusion

It has been shown through research that late preterm infants have more medical problems after birth than full term infants, even though they are treated with the same policies and procedures. Hypothermia is but one problem faced by this vulnerable population. Fortunately the vulnerabilities of late preterm infants are predictable, preventable, and manageable. By maintaining temperature stability, it is possible to eliminate subsequent problems such as hypoglycemia or respiratory distress syndrome. Evidence based research will help to develop guidelines for care of these infants.

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CHAPTER IV

Presentation of Findings

The late preterm infant is a population whose needs are not always met after delivery. Late preterm infants are at higher risk for morbidity and mortality, and experience more complications such as hypothermia, hypoglycemia, respiratory problems, and feeding problems. It was the purpose of this study to determine if hypothermia in the late preterm infant could be decreased as a result of prolonged monitoring immediately after delivery.

Sample

The target population for this study reflected specific characteristics. The late preterm infants that were studied were between 34 and 36 and 6/7 weeks of gestation and were born from June 2010 to June 2012. The infants that were born between June 2010 and May 2011 were in the pre-intervention group and were monitored for two hours after delivery. The infants born between June 2011 and June 2012 were in the post intervention group and were monitored for six hours after delivery. Monitoring included placing each infant under a radiant warmer and monitoring heart rate, respirations, and temperature every thirty minutes. Blood glucose was checked after delivery and every hour until two samples above 40 mg/dl were obtained. There were a total of 63 infants studied, 37 in the pre intervention group and 26 in the post intervention group. The pre intervention group consisted of 22 females and 15 males. The post intervention group contained 16 females and 10 males. Infants excluded from the study were those that had congenital anomalies, respiratory distress, or suspected sepsis.

Demographics

Basic demographic information was gathered by chart audit for each mother and infant. Maternal demographics included maternal age, parity, educational level, race, marital status, and employment. Infant demographics included gestational age, gender, and weight. The maternal age of the total sample population, both pre intervention and post intervention groups, ranged from 17 to 38 with a mean maternal age of 26 and a standard deviation of 5.402. The majority of mothers, 39.7 %, in the total sample were Para 2. Forty six percent of mothers had graduated high school and25% had been to college for four years. Forty seven mothers were Caucasian and 16 were African American. Thirty mothers were single and33 were married. The majority of the mothers, 65.1%, were employed (Table 1).

Table 1

Summary of Demographic Data

Characteristic	Frequency	Percent	M	SD
Maternal Age			26	5.402
Parity				
0	11	17.5%		
1	19	30.2%		
2	25	39.7%		
3	4	6.3%		
4	3	4.8%		
6	1	1.6%		
Educational level				
10th grade	1	1.6%		
11th grade	2	3.2%		
12th grade	29	46%		
13 years	5	7.9%		
14 years	6	9.5%		
16 years	16	25.4%		
17 years	2	3.2%		
18 years	2	3.2%		

Race				
Caucasian	47	74.6%		
African Amer.	16	25.4%		
Marital Status				
Single	30	47.6%		
Married	33	52.4%		
Employed				
Yes	41	65.1%		
No	22	34.9%		
Infant Gender				
Female	38	60.3%		
Male	25	39.7%		
Gestational Age				
34 weeks	8	12.7%		
35 weeks	19	30.2%		
36 weeks	36	57.1%		
Gram Weight			2626	474.703

Major Findings

Comparisons were made between the pre intervention group and the post intervention group in regard to gestational age and infant weight. The mean gestational age for the pre intervention group was 35.46 with a standard deviation of 1.660. The post intervention group had a mean of 35.04 with a standard deviation of .824. There were no 34 week infants in the pre intervention group and eight 34 week infants in the post intervention group. There was a statistically significant difference in gestational age between the groups. Using a t test for equality of means, t (35.512) = 3.890 and p=.000 (Table 2)

Table 2

Gestational Age Comparison

Gestational Age	Group 1	Group 2
34 weeks	0	8
35 weeks	10	9
36 weeks	27	9

Note. Group 1 = Pre intervention group. Group 2 = Post intervention group.

The mean weight of infants in the pre intervention group was 2,717 grams with a standard deviation of 541.506 grams. The range was minimum 1,523 grams and maximum 4,819 grams. The post intervention group had a range of 2,050 grams to 3,075

grams with a mean of 2,496 grams and a standard deviation of 326.493 grams. There was no statistically significant difference in infant weight between the groups (Table 3).

The temperature of each infant at the end of transition was recorded and analyzed for both groups. The mean temperature for the pre intervention group was 98.46 F with a standard deviation of .505. The mean temperature for the post intervention group was 98.58 F with a standard deviation of .504. There was no statistically significant difference in temperature at the end of the two hour transition or the six hour transition (Table 3).

The incidence of hypothermia between the pre intervention group and the post intervention group was also recorded and compared. Using a t test for equality of means, $t(52.549) = 2.779$ and $p = .008$. There was a statistically significant difference in the number of hypothermic infants between the group that was monitored for two hours and the group that was monitored for six hours (Table 3).

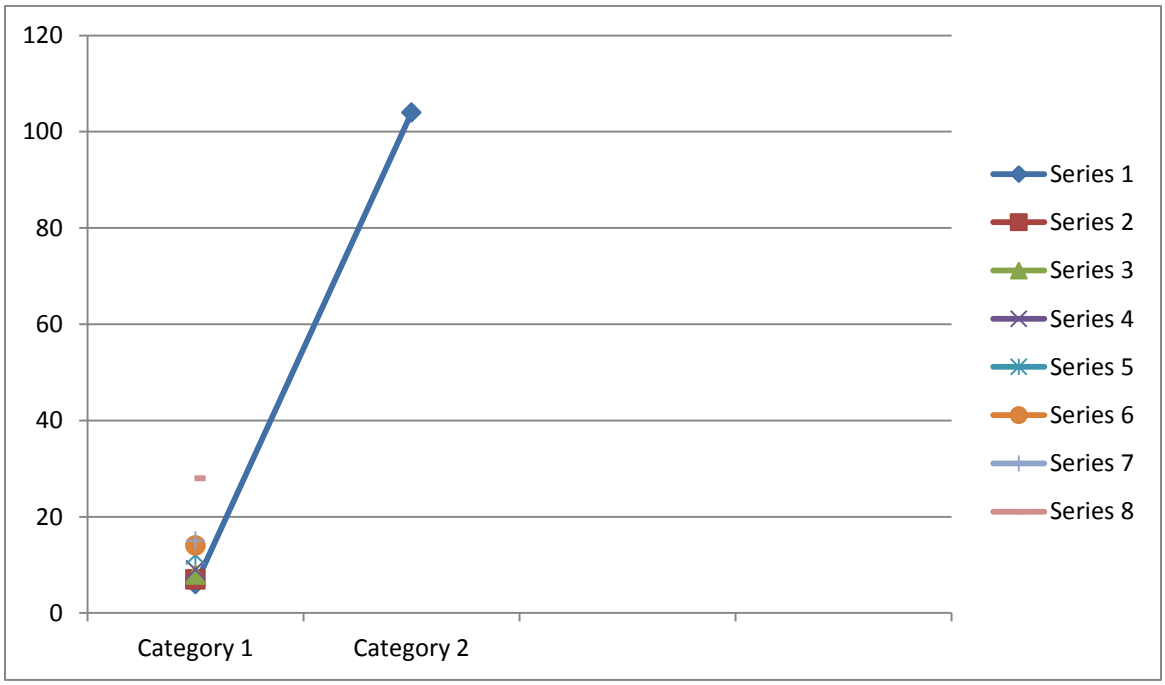
Table 3

Comparison of Weight, Temperature and Incidence of Hypothermia between Groups

Group 1	N	M (SD)	Group 2	N	M (SD)
Weight in Grams	37	2717.51 (541.5)		26	2495 (326.5)
Temperatures at Transition end	37	98.46 (.505)		26	98.58 (.504)
Incidence of Hypothermia	37	.27 (.450)		26	.04 (.196)

Note. Group 1 = Pre intervention group that was monitored 2 hours after birth. Group 2= Post Intervention group that was monitored for 6 hours after birth.

The hypothermia in the late preterm infants developed at different hours of age. These times of low temperature varied from 6 hours to 28 hours of age. There was only one infant in the post intervention group that was hypothermic after 6 hours of monitoring. That infant was hypothermic at 104 hours of age and was diagnosed with trisomy 21. (Figure 3)



Category 1= Pre intervention group; Category 2 = Post intervention group

Figure 3. Graph of Hours of Age at Hypothermia

Summary

In this retrospective chart audit, the charts of 63 infants were studied. The pre-intervention study group had 37 infants that were monitored for two hours after delivery. The post intervention group had 26 infants monitored for six hours after delivery. Demographic data was collected on all mothers and infants. The weight, gestational age, and temperature at the end of monitoring were compared between the two groups of infants. The incidence of hypothermia was also compared between the pre intervention and post intervention groups, and it was shown that the infants monitored for six hours after birth had less hypothermia than those monitored for two hours after birth. The hours of age of each infant that exhibited hypothermia was also recorded. It was the intent of this study to help create guidelines for monitoring the late preterm infant to help reduce hypothermia during the first days of life.

CHAPTER V

Discussion

The late preterm infant is the infant born between 34 and 36 6/7 weeks and may appear to be completely developed physically and neurologically, but is not. All preterm births place infants at higher risk for morbidity and mortality than term births and the risk of neonatal morbidity is almost three times higher in late preterm infants (Santos et al., 2008). Late preterm infants experience more complications such as hypothermia, hypoglycemia, respiratory problems, and feeding problems. It was the purpose of this study to determine if hypothermia in the late preterm population could be decreased as a result of prolonged monitoring immediately after birth. Sixty three late preterm infants were studied. The pre intervention group that was monitored for two hours after delivery consisted of 37 late preterm infants. The post intervention group that was monitored for six hours consisted of 27 late preterm infants. Monitoring included recording temperatures, heart rates, and respiratory rates for the infants while they were under pre heated radiant warmers. Blood glucose was monitored after delivery and every hour until two samples above 40 mg/dl were obtained.

Interpretation of Findings

The results of this study indicate that there is a significant relationship between prolonged monitoring of the preterm infant immediately after birth and a decrease in hypothermia. There was a statistically significant difference in the number of hypothermic infants between the group that was monitored for two hours and the group that was monitored for six hours. The pre intervention group had nine infants that

exhibited hypothermia after the two hour monitoring or transition time was completed. The post intervention group had only one infant that became hypothermic after six hours of transition time. This infant was diagnosed with trisomy 21.

There is a statistically significant difference in gestational age between the pre intervention group and the post intervention group. There were no 34 week gestation infants in the pre intervention group and eight 34 week gestation infants in the post intervention group. Given that 34 week infants are less mature than 35 or 36 week infants, hypothermia would be more prevalent in the 34 week population. 'It is estimated that that nearly 50% of infants born at 34 weeks gestation require intensive care; this number drops to 15% at 35 weeks and 8% at 36 weeks gestation" (Jain, 2007, p. 1). However, there was less hypothermia in the post intervention group that had eight infants of 34 weeks than the pre intervention group that had no infants of 34 weeks gestation.

There was no statistically significant difference between the infant weight in the pre intervention and post intervention groups. Therefore, weight had no bearing on the ability for the infants to maintain thermogenesis in either group. There was no statistically significant difference between the pre intervention group and the post intervention group in regard to infant temperature at the end of transition (the time monitored). All the late preterm infants were normo thermic at the end of being monitored and were then allowed to room in with their mothers. They were kept in open cribs and wrapped in blankets like full term infants.

The infants that developed hypothermia after the initial monitoring time did at different time intervals. Hypothermia occurred at six, seven, eight, nine, fourteen, fifteen,

and twenty eight hours of age. There was one infant in the post intervention group that recorded a low temperature at 104 hours of age. He was later diagnosed with Trisomy 21 and therefore had underlying complications.

Application to Theoretical/ Conceptual Framework

Levine's conservation model of nursing is used to guide neonatal nursing practice and was used to guide this study. In Levine's conservation model, the goal of nursing is to conserve the wholeness of the individual. In this study, the individual is the newly born late pre term infant. Levine's model includes an internal environment (physiological processes) and an external environment. Wholeness is when the internal and external environments mesh or fit together. In this study, the internal environment is the late preterm infant's ability to regulate their temperature after birth. Infant thermoregulation is accomplished through many processes such as vasoconstriction and non-shivering thermogenesis and increasing their metabolic rate, and burning brown fat. The external environment is the delivery room and the ambient air temperature. The nurse must help the late preterm infant adapt to the external environment by providing the most effective and efficient care. In this case, drying the infant and providing warmth while providing cardio respiratory support. The nurse must continue this support until the infant can maintain wholeness (normal temperature) on their own. This study has found that it is beneficial for the nurse to provide monitoring of the late preterm infant for six hours after birth instead of two hours after birth to help the infant maintain thermogenesis without support.

The Neonatal Energy Triangle is a conceptual framework that helps to support the care of the late preterm baby on admission to the nursery. This concept suggests that hypothermic infants become hypoglycemic which compounds acidosis. Acidosis increases the need for oxygen that increases respiratory distress and increases hypoxia. Therefore hypothermia leads to hypoglycemia which leads to hypoxia. The nurse can help the late preterm infant eliminate all of these problems simply by keeping the infant warm.

Limitations

There are several limitations in this study. First, the study took place in a small hospital that had a limited representation of ethnic groups and cultures. The findings cannot be generalized to all late preterm infants because the number of participants was small and the pre intervention group and post intervention groups needed to have a more equal representation of the 34 week gestation infants. There was also a weakness in keeping the infant with the Trisomy 21 in the post intervention group, as he may have skewed the results of the statistical analysis of the infants included in the hypothermic group. Other confounding variables such as the ambient temperature in the mother's room and amount of time the infant was unwrapped while in the mother's room were not recorded.

Implications for Nursing

The impact of nursing care on neonatal morbidity and mortality should not be underestimated for late preterm infants. The vulnerable neonate may develop signs and symptoms of ineffective adaptation to extra uterine life and require supportive measures.

The late preterm infant must be carefully monitored for several hours after birth to maintain health. Nurses must know how to properly monitor heart rate, axillary temperature, respiratory rate, and blood sugar. This study has shown that it is more effective to monitor the late preterm infant for six hours instead of two hours immediately after delivery to decrease hypothermia. It is the duty of the nurse to anticipate and intervene to prevent compromise to the late preterm infant.

Recommendations

It would be beneficial to complete more studies of the late preterm infants using multiple centers and a larger population to include a diverse selection of ethnicities and cultures. Looking at different time intervals for transition would be helpful to determine if longer monitoring of the late preterm infant would decrease or alleviate hypothermia at any time during the hospital stay. Standardized education for parents of the late preterm infant to prevent hypothermia would be helpful to ensure that nurses are educating parents consistently and properly on temperature control.

Conclusion

The rate of preterm births is higher than ever. “More than seventy percent of all pre term births occur in the late pre term period” (Jorgensen, 2008, p. 313). The health care community is becoming aware of the vulnerability of the late preterm infant population and that they experience a number of complications in the time immediately after birth. Late preterm infants have longer lengths of hospital stay and greater hospital costs than term infants (Wang et al., 2004).

Hypothermia is a problem for the late preterm infant that can be decreased or eliminated with the proper guidelines for care. Hypothermia is defined as a core or axillary temperature below 36.3° C (97.3 F) (Aylott, 2006). It was shown in this study that six hours of monitoring for transition was more effective at reducing hypothermia in the preterm population than two hours of monitoring immediately after delivery.

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Appendix A

Agency Approval

MARY BLACK
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Gardner-Webb University
Institutional Review Board
Boiling Springs, NC

October 16, 2012

Dear IRB Member:

This letter is in regards to a research proposal by Sandi Lane, a MSN candidate at Gardner-Webb University. The Leadership Team at our facility has reviewed her research proposal regarding transition time for late pre-term infants and the potential effect of hypothermia on their transition time. Please accept this letter as permission for her to perform retroactive chart reviews of late preterm infants born between June 2010and June 2012. To ensure confidentiality, we understand that no identifying data will be utilized in the collection of this data or in the subsequent research publication. Please do not hesitate to contact me should you need additional information regarding this research.

Sincerely,

Chanda Flynn, RN, MSN, CEN, NEA-BC

Chief Nursing Officer

Appendix B

Maternal and Infant Demographic Form

Demographic Form for Late preterm Infant Study

Maternal Demographics

1. Maternal Age
2. Weeks of Gestation
3. Parity
4. Education Level
5. Race A-Caucasian B- African American C- Hispanic D- Other
6. Marital Status A-Married B- Single C-Divorced D- Other
7. Employment A- Full Time B-Part Time C- Unemployed D- Student D- Other

Infant Demographics and Information

1. Gestational Age
2. Weight in Grams
3. Temperature at Transition Completion
4. Amount of Time in Transitional Monitoring
5. Hours of Age at time of Hypothermia