

CHANGE IN PRACTICE USED TO QUANTIFY BREAST MILK INTAKE OF PRE-
TERM INFANTS IN A NEONATAL INTENSIVE CARE UNIT: TEST-WEIGHING
TO “SALT LAKE CITY FEED PLAN”

by

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ABSTRACT

A local community hospital in Montana expressed a desire to establish a written clinical guideline for transitioning preterm infants from enteral gavage feedings to oral feedings. This desire was prompted by a change in the method of quantifying breast milk intake of preterm infants when transitioning them from enteral gavage feedings to at-breast feedings in a Neonatal Intensive Care Unit (NICU). The hospital changed from the practice of test-weighing as a clinical indicator to quantify breast milk intake to the “Salt Lake City Feed Plan”. Procedures: Retrospective data from four consecutive years were collected from quality assessment chart audit data provided to the author in aggregate form. Twenty-nine records met the selection criteria. A descriptive presentation of the aggregate data follows. Results: The average number of total deliveries per year was 1,151. The average percentage of preterm deliveries that occurred between 32 - 37 completed weeks of gestation was 16.3 percent. Of the twenty-nine records that met the selection criteria, 17 were male and 12 were female. The birth weight ranged from 1.75 kilograms (kg) to 2.31 kg. Weight at discharge ranged from 2.66 kg. to 2.99 kg., indicating a weight gain of 0.68 kg. to 0.91 kg. at discharge. Number of days with an indwelling nasogastric enteral feeding tube ranged from 1 to 23 days. Length of hospital stay ranged from 7 to 29 days. The length of stay for exclusively bottle fed preterm infants ranged from 13 to 27 days, whereas the breastfeeding preterm infants who utilized test -weighing or the “Salt Lake City Feed Plan” ranged from 7 to 29 days. Breast fed preterm infants in whom test-weighing or the “Salt Lake City Feed Plan” was utilized had 4 to 4.315 fewer days of hospitalization compared to preterm infants who were exclusively bottle-fed. Conclusion: The literature review and the aggregate data collected by the rural community hospital provide baseline information to create, implement and support an evidence-based clinical guideline to transition preterm infants from enteral gavage feedings to oral feeding

CHAPTER ONE

INTRODUCTION

In 2006, one in eight babies (12.8% of live births) was born preterm in the United States (National Center for Health Statistics, final natality data). This rate increased by more than 16% between 1996-2006, with multiple births being approximately six times more likely to be born preterm as compared to singleton births in 2006 (National Center for Health Statistics, final natality data).

In 2006, in the state of Montana one in eight babies (11.9% of live births) was born preterm. This rate increased nearly 23% between 1996-2006, with multiple births being approximately six times more likely to be born preterm as compared to singleton births (National Center for Health Statistics, final natality data). The March of Dimes defines preterm birth as

A live birth before 37 completed weeks gestation. Some other classifications of preterm births include late preterm (34-36 weeks), moderately preterm (32-36 weeks) and very preterm (<32 weeks). These classifications are useful because they often correspond to clinical characteristics - increasing morbidities or illnesses with decreasing gestational age (National Center for Health Statistics, final natality data).

Breastfeeding or bottle feeding a preterm infant differs from feeding the term infant. Just as pediatric patients are not mini-adults, pre-term infants are not mini infants (Kerr & Kirk, 2001, Nutritional needs of the preterm infant, para 1). Preterm infants' physiological and physical development occurs much differently than full-term infants'. The rapid extrauterine growth rates and the loss of transplacentally acquired nutrients

requires Neonatal Intensive Care Unit (NICU) providers to pay special attention to the nutritional needs and method of nutrient delivery to the preterm infant (Bakewell-Sachs & Brandes, 2004, p. 205).

Parenteral or enteral nutrition methods are utilized until oral feedings can be introduced due to the preterm infants' inability to coordinate suck-swallow-breath, the limited biochemical and physiologic capabilities for digestion and absorption, and the immature motor function of the gastrointestinal tract (Bakewell-Sachs & Brandes, 2004, p. 206). Oral feeding preterm infants exclusively by bottle, by breast and bottle, or solely by breast is a challenging process due to the immature systems of preterm infants. Attainment of full oral feedings in preterm infants is one of the developmental milestones that must be met prior to discharge from the Neonatal Intensive Care Unit (Thorye, 2003a).

Breastfeeding Preterm Infants

Breastfeeding preterm infants is challenging for many reasons: the infants are separated from their mother immediately after birth, their physiological systems are immature, and the infant has a physical inability to orally and effectively transfer milk from the breast while preserving adequate energy to gain weight and develop outside of the womb. Because preterm infants are separated from their mothers immediately after birth, mothers must initiate breast milk production artificially by stimulating their breasts with a breast-pump. If mothers do not artificially stimulate their breasts on a schedule that mimics term infant breastfeeding behaviors, such as initiating pumping within the

first 24 hours following birth and continuing to pump every three hours, their breast milk supply will be inadequate to non-existent (Buckley & Charles, 2006; Lawrence & Lawrence, 2005; Schanler, Dooley, Gartner, Krebs, & Mass, 2006).

Mothers of the preterm infants must initiate and continue providing expressed breast milk until their infant is capable of at-breast or bottle feedings that will meet the preterm infant's caloric needs. The caloric needs are measured by weight gain and physical development. Once a preterm infant is introduced to at-breast feedings, NICU nurses and other providers, neonatologists, pediatricians, lactation consultants, and neonatal nurse practitioners must wean the preterm infant from enteral gavage feedings to at-breast feedings. The majority of preterm infants are discharged from the hospital utilizing a combination of at-breast feeds and bottle feeds of expressed breast milk and/or formula (Buckley & Charles, 2006). "In the United States breastfeeding rates of preterm infants receiving mother's milk exclusively at-breast upon discharge have been found to range from 18-32% at discharge from the hospital, increasing only slightly to "23-38% by four weeks post-discharge" (Buckley & Charles, 2006, Review, para. 3).

Goal amounts of breast milk intake per feed are carefully calculated by the NICU provider for each infant based on the infant's caloric needs. Nurses' use the goal amount as a guide for each preterm infant's feeding session. Typically preterm infants are fed on an every three to four hour schedule with six to eight feedings per day (Bakewell-Sachs & Brandes, 2004; Thorye, 2003a). For example, if the goal breast milk intake per feed is 45 milliliters, the NICU nurse must ensure that this amount is received by the preterm infant via an enteral gavage feed, or an enteral gavage feed and an at-breast feed, or

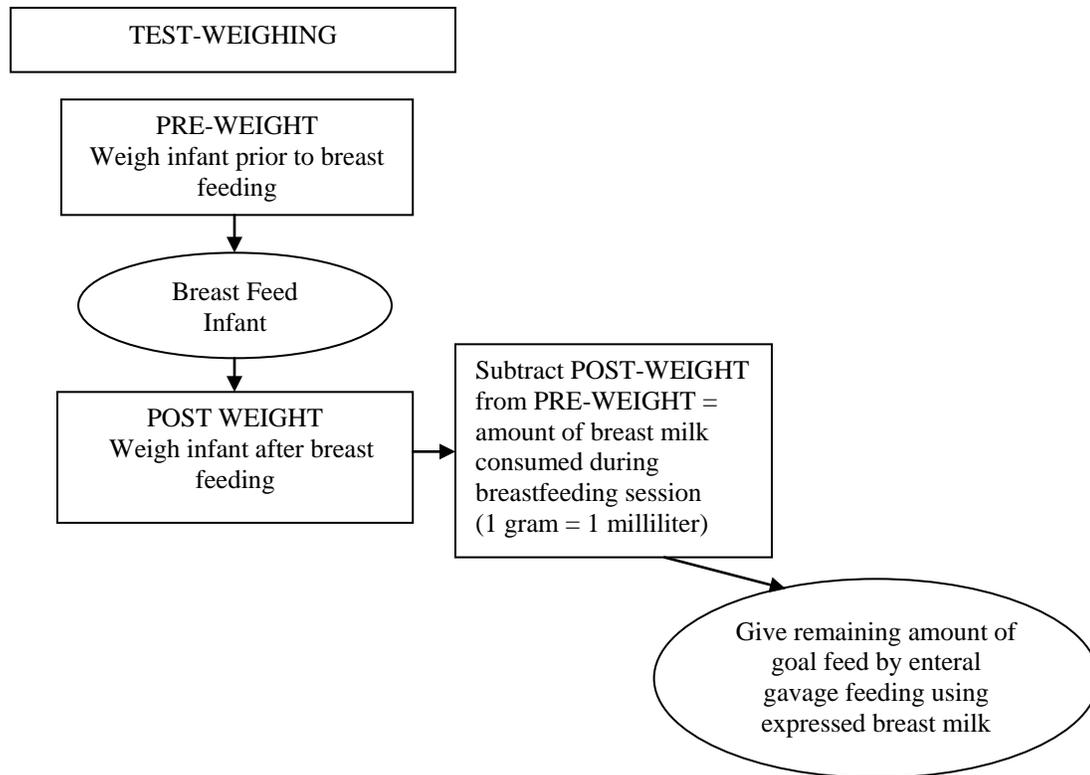
exclusively as an at-breast feed. The challenge in measuring the caloric intake, aside from weight gain per day, is how to quantify the amount of breast milk transferred by the preterm infant. Test-weighing, when done accurately is one method utilized to measure breast milk intake in preterm infants.

Test-weighing is defined as weighing the infant, using an electronic digital scale before (pre-feed) and after (post-feed) breastfeeding to determine breast milk intake (Iwinski, 2006). The electronic digital scale must have integrated functions that allow for infant movement and accuracy to two grams (Iwinski, 2006). The protocol for test-weighing follows:

- Weigh infant before breastfeeding (pre-feed)
- Breastfeed infant
- Weigh infant after breastfeeding (post-feed)
- Calculate the difference in weight: subtract post-feed weight from pre-feed weight, this equals the amount of breast milk transferred by the infant while breastfeeding
- The weight is measured in grams, one gram equals one milliliter
- Calculate the amount taken by breast at the feeding and subtract from goal feed
- Give infant the remaining amount of goal feed via enteral gavage feeding using expressed breastmilk

In addition to being cumbersome, the accuracy of test-weighing can be a challenge for several reasons: 1) the digital scale is only accurate +/- two grams (Iwinski, 2006); 2) preterm infants may only transfer anywhere from zero to four grams from the breast with initial feeds; and 3) the documentation may be inconsistent.

Figure 1. Test-Weighing



Several authors have suggested additional clinical indices of quantifying breast milk intake such as daily weight gain (Thoyre, 2003a, p. 82), sucking time at-breast (Meier, Engstrom, Fleming, Streeter, & Lawrence, 1996, p. 24), and audible swallowing (Angeron, Gill-Hopple, & Riordan, 2005, p. 411) have also been suggested and studied. However, at this time there is not a standard clinical guideline suggested to quantify breast milk intake of preterm infants by assessing clinical indices without the use of test-weighing.

Preterm infants that are exclusively bottle fed or, who receive supplementation by bottle, do not require the use of test-weighing or clinical indices to quantify intake, for

the obvious reason that the quantity is measured in the bottle. Exclusively bottle fed preterm infants face many of the same challenges as breastfed preterm infants face when transitioning from enteral gavage feedings to oral feedings. However, attainment of full oral feedings at the breast, or a combination of breast and bottle feedings of expressed breast milk requires the added skill of quantifying breast milk intake, by both the mother and care providers (Meier, et al., 1996; Spatz, 2004).

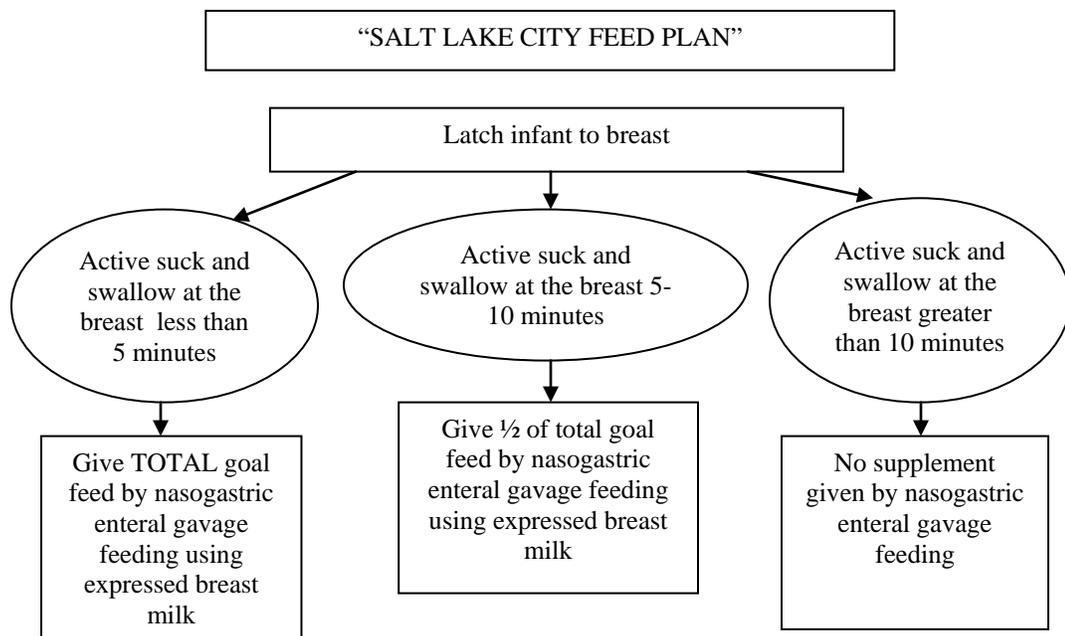
Statement of the Problem

In 2007, one pediatrician practicing in the NICU at a rural community hospital in Montana introduced a change in practice from test-weighing to the “Salt Lake City Feed Plan”, when transitioning preterm infants from enteral gavage feedings to at-breast feedings. The change in practice was prompted after the pediatrician noted inaccuracies of quantifying breast milk intake by test-weighing. The pediatrician contacted the NICU at Intermountain Primary Children’s Medical Center in Salt Lake City, Utah to inquire about their protocol when transitioning preterm infants from enteral gavage feedings to oral feedings. The pediatrician was specifically interested in quantifying breast milk intake of preterm infants. Following this the conversation, the pediatrician introduced the “Salt Lake City Feed Plan” to the NICU nursing staff. In 2008, the other six pediatricians in the rural community adopted the “Salt Lake City Feed Plan” as the standard of practice. The protocol for the “Salt Lake City Feed Plan” is less cumbersome than the test-weighing plan. The protocol follows:

- 5 minutes or less of active sucking and swallowing at the breast = give total feeding by nasogastric tube
- 5-10 minutes of active sucking and swallowing at the breast = give ½ of total feeding by nasogastric tube
- 10 minutes or longer of active sucking and swallowing at the breast = no supplement given by nasogastric tube
- At-breast intake is quantified by clinical indices of active sucking and swallowing, and daily weight gain.

The protocol for the “Salt Lake City Feed Plan” utilized by the local community hospital is not reflective of the oral feeding clinical pathway currently practiced in the NICU at Intermountain Primary Children’s Medical Center in Salt Lake City, Utah. The current practice at the local community hospital only utilizes one concept of the oral feeding clinical pathway, and is not practiced with the same parameters as the NICU at Intermountain Primary Children’s Medical Center in Salt Lake City, Utah (Kirk, Alder, & King, 2007).

Figure 2. “Salt Lake City Feed Plan”



Purpose Statement

After the change in practice from test-weighing to the “Salt Lake City Feed Plan” was initiated, the Neonatal Intensive Care nursing staff at the local community hospital in Montana expressed a desire to establish a written clinical guideline for transitioning preterm infants from enteral gavage feedings to oral feedings. The purpose of this project was to review retrospective aggregate data collected by the rural community hospital in Montana, and conduct a literature review to obtain information that could be utilized as baseline information to assist them in developing a clinical guideline or clinical pathway for transitioning preterm infants from enteral gavage feedings to oral feedings.

Significance

Health Care costs continue to be scrutinized. Data collected from the 2001 Nationwide Inpatient Sample from the Healthcare Cost and Utilization Project showed that preterm/low birth weight admissions represented “ ... 47% of the costs for all infant hospitalizations and 27% for all pediatric stays ” (Russell, et al., 2007, p.e1). The average hospital stay of an uncomplicated newborn was 1.9 days, with an average cost of stay six hundred dollars. The average length of hospital stay for a preterm/low birth weight infant was 12.9 days with an average cost of \$15,100 (Russell, et al., 2007, p.e1). Private/commercial insurance was identified as the expected payer for 50% of all preterm/low birth weight hospital stays, while Medicaid was identified for 42% (Russell, et al., 2007, p e1). This is a significant cost shared by insurance companies, Medicaid, hospitals, patients, and the community. Decreasing the number of preterm deliveries is

imperative, especially after noting the increase in preterm infants during the recent decade of 1996-2006. However, it is also critical that quality, cost-effective care is available and provided to preterm infants. One way to promote quality and cost-effective healthcare is to facilitate breastfeeding of preterm infants.

In the long-term, breastfeeding has many benefits for the well-being of the preterm infant, the mother, and the community. Weimer (2001) discussed the direct costs related to formula, and fees associated with physician visits, clinic visits, hospital stays, lab tests and procedures, and the indirect costs related to lost wages of infants' parents that were reduced as a result of breastfeeding. The report concluded that a "... minimum of 3.6 billion dollars would be saved if the prevalence of exclusive breastfeeding increased from the current rates to those recommended by the Surgeon General" (Weimer, 2001, p. iii). The current rates stated in this report were "... sixty-four percent of mothers breastfeeding in-hospital and twenty-nine percent at six months post-partum ..." (Weimer, 2001, p. iii). The recommendations of the Surgeon General for breastfeeding referenced in this report were seventy-five percent of mothers should be breast feeding in-hospital prior to discharge, and fifty percent of mothers still breastfeeding at six months post-partum (Weimer, 2001, p. 1). The recommendation in this report written by the United States Department of Agriculture does not differentiate between term and preterm infants.

The report by the United States Department of Agriculture also included an analysis of data looking at three childhood illnesses, otitis media, gastroenteritis, and necrotizing enterocolitis, and the cost benefits of breastfeeding related to them. The 3.6

billion dollar figure was determined to most likely underestimate the true economic benefits of breastfeeding, because the cost of over-the-counter medications for otitis media and gastroenteritis symptoms, treatment of necrotizing enterocolitis by physicians, and savings related to long-term morbidity were excluded from this data (Weimer, 2001).

Benefits of Breastfeeding the Preterm Infant

Data on the benefits of breastfeeding have been documented unanimously by research conducted nationally and internationally, by organizations such as the World Health Organization (WHO), Le Leche League International, United Nations International Children's Emergency Fund (UNICEF), and the American Academy of Pediatrics (AAP).

The advantages of breastfeeding and use of human milk for infants, mothers, families, and society include "... health, nutritional, immunologic, developmental, psychological, social, economic, and environmental benefits" (American Academy of Pediatrics Section on Breastfeeding, 2005, p. 496). Breast milk is a natural first food for infants that provides immunities that help protect infants from infectious and chronic diseases, promotes cognitive and sensory development, facilitates quicker recovery from childhood illnesses, and decreases infant mortality related to pneumonia or diarrhea. The mothers' health and well-being are also protected by breastfeeding. Breastfeeding decreases the risk of ovarian cancer and breast cancer, facilitates spacing of children and provides the mother a safe, secure, and environmentally friendly way to nourish her infant. In turn this facilitates the economic health of a community by decreasing the

number of infant death or illness, and chronic life-threatening diseases of mothers (Bakewell-Sachs & Brandes, 2004; Kerr & Kirk, 2001; Lawrence & Lawrence, 2005; Wight, Morton, & Kim, 2008; World Health Organization-Breastfeeding. <http://www.who>).

In addition, there are numerous physiological advantages of breast milk, expressed or at-breast, over formula that benefit both the term and preterm infant. Some physiologic advantages include: host resistant factors and anti-infective properties; enhanced fat, amino acid, and carbohydrate absorption and digestion; improved gastric emptying; increased absorption of zinc and iron; low renal solute load; and entero-mammary immune system which improves host defenses in the vulnerable preterm infant (Bakewell-Sachs & Brandes, 2004, p. 222). While there are many advantageous of breast feeding it is also important to be cognizant of special considerations associated with breastfeeding preterm infants such as transmission of infection; maternal drug use; supplementation of protein, calcium, phosphorus and other vitamins; proper technique of expressing, collecting and storing breast milk to prevent colonization of bacteria must also be assessed (Bakewell-Sachs & Brandes, 2004, p. 222-223).

Challenges of Breastfeeding the Preterm Infant

Charles (2006) identified the following multiple factors that contribute to the resistance and/or inability of mothers to transition their preterm infants to exclusive at-breast feeds versus bottle feeding expressed breast milk:

inadequate breast milk supply, maternal feelings of vulnerability and lack of confidence, infants' immature feeding behaviors, lack of commitment or desire to breastfeeding prior to the birth, personal choice, convenience

of bottle feeding, ability of father or other family members to participate in feedings, avoidance of embarrassment of feeding in public, ease of pumping and storing breast milk, maternal lack of confidence, parental need to quantify intake, and lack of informational and emotional support (Buckley & Charles, 2006, Impediments toward transitioning mothers to at-breast feedings, para. 1).

In addition to the aforementioned factors the preterm infants' physiologic and physical immaturities, breast milk supply, maternal self-confidence in breastfeeding, knowledge and support to exclusively breastfeed, length of hospital stay, and post-discharge follow-up will be discussed further.

Oral or at-breast feedings should not be considered until the preterm infant is stable physiologically. Gastrointestinal perfusion and peristalsis must be confirmed by "... auscultating bowel sounds, monitoring stooling patterns, and measuring abdominal girth" (Bakewell-Sachs & Brandes, 2004, p. 225) to ensure the gastrointestinal tract is stable. "Immature motor function limits the ability to move nutrients through the gastrointestinal tract as evidenced by lack of sucking coordination, decreased esophageal sphincter tone, delayed gastric emptying, and slow intestinal transit" (Bakewell-Sachs & Brandes, 2004, p. 206). Episodes of apnea-bradycardia and/or oxygen desaturation must not be severe, frequent or worsen during oral feeds (Thoyre, Shaker, & Pridham, 2005).

After the preterm infant is deemed physiologically stable, the physical development of suck-swallow-breath must be assessed. Functional coordination of suck, swallow, and breathing is "... not developed before 31 to 34 weeks gestation with complete synchrony expected by 36-38 weeks" (Bakewell-Sachs & Brandes, 2004, p. 206). A fine balance of caloric intake and output must be monitored closely. Preterm infants feed more slowly and consume lower volumes per suck, which is related to low

suction pressures and irregular sucking bursts (Buckley & Charles, 2006). Preterm infants are often times unable to meet caloric requirements with breastfeeding alone because of their inefficient suck and transfer of milk, therefore utilizing more calories to feed at-breast than consumed at-breast. “Adequate caloric intake should be assessed on the basis of appropriate daily weight gain or 10-20 g/ kg/day for preterm infants” (Bakewell-Sachs & Brandes, 2004, p. 211).

While mothers of preterm infants noted that initiating and maintaining an adequate milk supply is rewarding, the downside is that it is very time consuming. Early initiation of breast milk expression within 24-48 hours following delivery and efficient milk expression using an electric breast pump at scheduled pump times have been shown to improve and provide an adequate breast milk supply while the preterm infant is in the NICU (Schanler, Dooley, Gartner, Krebs, & Mass, 2006). Hospitals can facilitate the success of breast milk production for mothers of preterm infants by providing education and support through the use of lactation consultants and NICU nurses, as well as providing breast pumps, storage containers, a place to pump, and a refrigerator/freezer to store the expressed breast milk (Buckley & Charles, 2006).

Barriers to initiating and maintaining an adequate breast milk supply include separation of the mother and infant at birth and during the NICU hospitalization, and the mothers’ inability to routinely pump her breasts because of other commitments, such as work and family (Buckley & Charles, 2006; Wight, et al., 2008).

The mother’s personal reasons for breastfeeding and/or pumping may influence the ability of transitioning to exclusive at-breast feeds. For example, the mother may not

have planned to breastfeed, but agrees to provide expressed breast milk because it “is best”. She may not have a desire to breastfeed. The mother’s initial reasons for breastfeeding a term infant may differ from breastfeeding a preterm infant, for example maternal anxiety, vulnerability, depression, or guilt may be associated with the preterm delivery (Buckley & Charles, 2006).

A mother’s lack of self-confidence in breast feeding her preterm infant may be increased by her lack of confidence in assessing feeding cues and the inability to quantify the amount of breast milk intake. However, consistent knowledge and support provided by family and staff that are educated and committed to breast feeding preterm infants can boost maternal confidence. This practice will potentially increase the rate of preterm infants who are discharged exclusively breastfeeding. “Mothers that were able to breastfeed exclusively or feed at-breast more than half of the time had significantly higher levels of confidence than those who were giving breast milk and infant formula” (Buckley & Charles, 2006, Impediments towards transitioning mothers to at-breast feedings, para. 5).

The length of hospital stay is also an influencing factor in the success of exclusive at-breast feeds at discharge. The long hospital stays of some preterm infants may be a deterrent to breastfeeding due to outside commitments and/or the emotional and physical stamina required to continue pumping and breast feeding. The pressure of insurance companies and hospital administration to decrease length of hospital stay may also negatively impact exclusively breastfed preterm infants. The mother may not have enough time to confidently establish exclusive at-breast feeds prior to discharge or

adequate follow-up support to establish exclusive at-breast feeds after discharge (Buckley & Charles, 2006). Some of the challenges that face breastfeeding preterm infants may be overcome by the support and education that NICU staff can provide to the families of preterm infants (Wight, et al., 2008).

CHAPTER TWO

LITERATURE SEARCH

The following word and terms were used to search CINAHL, PubMed, Cochrane Library, Google search databases: breastfeeding and the preterm infant, preterm infants, benefits of breastfeeding, cost benefits of breastfeeding, healthcare cost of preterm infants, clinical guidelines and breastfeeding preterm infant, clinical pathways, oral feeding and preterm infants, feeding readiness assessment tools, non-nutritive sucking and preterm infants. This literature review will focus on three major topics: successful breast feeding, clinical guidelines and clinical pathways, and nutritional monitoring.

Successful Breastfeeding

The World Health Organization (WHO) (World Health Organization, 2006, *Baby-Friendly Hospital Initiative*) and United Nations International Children's Emergency Fund (UNICEF) (United Nations International Children's Emergency Fund, (n.d.), *Baby-Friendly Hospital Initiative*) launched an international breastfeeding initiative in 1991 known as the Baby Friendly Hospital Initiative (BFHI). This initiative was launched in an effort to facilitate exclusive breastfeeding. Breast milk, the food produced naturally for all infants, is delivered via the learned behavior of breast-feeding. The WHO and UNICEF recognized that by facilitating and supporting mothers in the learned behavior of breastfeeding, this could substantially impact the success of exclusively breastfed infants globally. A facility can be dubbed "baby friendly" when it implements

the “Ten Steps to Successful Breastfeeding” (Table 1) and does not accept “free or low-cost breast milk substitutes, feeding bottles, or teats” (United Nations International Children’s Emergency Fund , (n.d.), *The Baby Friendly Hospital Initiative*).

Table 1. Ten Steps to Successful Breastfeeding

<ol style="list-style-type: none"> 1. Have a written breastfeeding policy that is routinely communicated to all health care staff. 2. Train all health care staff in skills necessary to implement this policy. 3. Inform all pregnant women about the benefits and management of breastfeeding. 4. Help mothers initiate breastfeeding within one half-hour of birth. 5. Show mothers how to breastfeed and maintain lactation, even if they should be separated from their infants. 6. Give newborn infants no food or drink other than breast milk, unless medically indicated. 7. Practice rooming in - that is, allow mothers and infants to remain together 24 hours a day. 8. Encourage breastfeeding on demand. 9. Give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding infants. 10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic. <p>(United Nations International Children’s Emergency Fund , (n.d.), <i>The Baby Friendly Hospital Initiative</i>).</p>

Although the “Ten Steps to Successful Breastfeeding” was targeted for term infants, it has indirectly positively influenced the rate of breastfeeding preterm infants in NICUs internationally. “Baby Friendly” hospitals in the United States, Australia, Brazil, and Sweden report increased rates of breastfeeding in their NICUs as a result of a change in attitude and practice that filtered from their healthcare partners caring for term infant-mother pairs (Nyqvist & Kyleberg, 2008).

A NICU at the University Hospital in Upssala, Sweden conducted a study aimed at collecting suggestions to modify the “Ten Steps to Successful Breastfeeding” for

preterm infants by surveying mothers of very preterm infants. The suggestions given by the mothers in this study are not necessarily reflective of current standards of care, but are conclusions based on their perceptions of breastfeeding in the NICU. Modifications and expansions to the original ten steps, as well as the addition of three new steps, were derived upon conclusion of the study. Table 2 describes the modified Thirteen Steps to Successful Breastfeeding in Neonatal Care According to Swedish Mothers (Nyqvist & Kyleb, 2008).

Table 2. Thirteen Steps to Successful Breastfeeding in Neonatal Care According to Swedish Mothers

- Step 1: Have a written breastfeeding policy, adapted to infants who require neonatal care, that is routinely communicated to all concerned staff and to parents. **BFHI Step 1: Have a written breastfeeding policy that is routinely communicated to all health care staff.**
- Step 2: *Treat every mother with sensitivity, empathy and respect for her maternal role. Support her in taking informed decisions about milk production and breastfeeding according to her own wishes.*
- Step 3: Educate and train all staff in the specific knowledge and skills necessary to implement this policy. **BFHI Step 2: Train all health care staff in skills necessary to implement this policy.**
- Step 4: Inform all pregnant women about initiation of lactation and breastfeeding in the event that the infant is born preterm or ill. **BFHI Step 3: Inform all pregnant women about the benefits and management of breastfeeding.**
- Step 5: Encourage early, continuous and prolonged mother-infant skin-to-skin (kangaroo mother care) without unwarranted restrictions and offer opportunities for mothers to remain together for 24 hours a day. **BFHI Step 7: Practice rooming in - that is, allow mothers and infants to remain together 24 hours a day.**
- Step 6: Inform, encourage and support mothers in early initiation and establishment of breast milk expression and maintenance of milk production. **BFHI Step 5: Show mothers how to breastfeed and maintain lactation, even if they should be separated from their infants.**
- Step 7: Encourage and support mothers in early initiation of breastfeeding, with infant stability as the only criterion. Give mothers individual support. **BFHI Step 4: Help mothers initiate breastfeeding within one half-hour of birth.**

Table 2. Thirteen Steps to Successful Breastfeeding in Neonatal Care According to Swedish Mothers - Continued

- Step 8: Give the infant the mother's own milk as first choice, pasteurized donor breast milk as second choice, fortified when indicated. **BFHI Step 6: Give newborn infants no food or drink other than breast milk, unless medically indicated.**
- Step 9: Encourage breastfeeding on demand as early as possible, with semi-demand breastfeeding as a transitional strategy for preterm infants (the mother nurses when an infant shows signs of interest, and in addition offers her infant the breast in order to reach a breastfeeding frequency per 24 hours that is sufficient for adequate infant milk intake. **BFHI Step 8: Encourage breastfeeding on demand.**
- Step 10: Offer the infant a pacifier for relief of pain, stress and anxiety, and for stimulating the uptake of nutrients during tube-feeding. Introduce bottle-feeding when there is a reason. **BFHI Step 9: Give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding infants.**
- *Step 11: Provide a family-centered and supportive physical environment.*
- *Step 12: Support the father's presence without restrictions, as the mother's main supporter and the infant's caregiver.*
- Step 13: Plan the infant's discharge by early transfer of the infant's care in the neonatal unit to the parents. Inform the mother about where she can obtain breastfeeding support after discharge by staff or members of breastfeeding support groups with adequate knowledge. **BFHI Step 10: Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.**

Original BFHI Steps in bold, addition steps italicized, additions and modifications to original BFHI steps in regular text.

(Nyqvist & Kyleberg, 2008, p. 255).

The following have been identified as factors that help meet the challenges of breastfeeding the preterm infant: skin-to-skin contact, also known as kangaroo care; non-nutritive sucking; early breastfeeding when transitioning from enteral gavage feedings to at-breast feedings; assessment of readiness to breastfeed, close nutritional monitoring; support and education both during the hospitalization and after discharge (Schanler, et al., 2006, pp. 196-200). The use of nipple shields for preterm infants has also been noted to positively affect breastfeeding outcomes of preterm infants by increasing the volume of

milk intake at the breast without decreasing total duration of breastfeeding for preterm infants (Meier, et al., 2000, p. 112).

Kangaroo care, the practice of holding a diaper-clad infant skin-to-skin and upright in prone position against the parent's bare chest covered by a blanket (Spatz, 2004, p. 390), is a cost-effective intervention proven to be beneficial to the parents and preterm infants. Not only is kangaroo care proven to enhance milk production and confidence in the mother's ability to breastfeed, but has beneficial physical effects on the preterm infant (World Health Organization, 2003, *Kangaroo Care – a practical guide*). The following physical effects of preterm infants have been noted "... thermoregulation, heart rate stability, oxygen saturation, periodic breathing, and weight gain" (Schanler, et al., 2006, p.196).

Although non-nutritive sucking, defined as suckling on a pacifier or "empty" breast between and/or during enteral gavage feedings, is thought by some to facilitate the "... development and strengthening of muscles used for sucking..." and provide a "...training effect for future oral feeding" (Schanler, et al., 2006, p. 197). Other experts argue that the collective outcome of studies on non-nutritive sucking and the preterm infant remain inconclusive resulting in an agreement that the "... positive cues provided by the infant as to enjoyment of non-nutritive sucking make this a valuable intervention" (Bakewell-Sachs & Brandes, 2004, p. 251). Support of more research looking at the effects of non-nutritive sucking and how this facilitates oral readiness and success of the preterm infant to breastfeed should be considered.

Early opportunities to “practice” breastfeeding are recommended as soon as the preterm infant is extubated and physiologically stable, or as early as 30 weeks post-conceptual age (Thoyre, et al., 2005, p. 76). It is recommended that breastfeeding for nutritive purposes be initiated at 32 weeks post conceptual age (Thoyre, et al., 2005, p. 76). Physiological and developmental readiness of the preterm infant to breastfeed should be determined by assessment of “... gestational age, physiologic status, sleep/wake states, sucking patterns, and behavioral cues” (National Guideline Clearinghouse, 2006, Assessment: Determining Readiness to Breastfeed, para 1). This assessment is done by astute observation skills of the NICU team providing care to the preterm infant. The Early Feeding Skills (EFS) Assessment has been suggested and introduced to neonatal healthcare providers as an evidence-based approach to assessing early oral feeding skills (Thoyre, et al., 2005). The EFS Assessment is divided into three sections, oral feeding readiness, oral feeding skill, and oral feeding recovery, with specific skills within each section to evaluate. The EFS Assessment tool is an example of a clinical guideline to help facilitate the success of preterm infant breastfeeding.

Support and education given to the parents and/or primary caregiver of the preterm infant both during the hospitalization and after discharge is imperative to the success of breastfeeding (Thoyre, et al., 2005, p. 62). Anticipating and planning for the needs of the preterm infant and the mother related to breastfeeding while hospitalized facilitates successful breastfeeding after discharge.

Small, thin, silicone nipple shields are known to help nursing mothers who have flat and/or large nipples. Nipple shields also facilitate breastfeeding of preterm infants' because

The nipple shield is less pliable than the maternal nipple, so the preterm infant does not slip off the breast during pauses in sucking bursts. As a result, shield use appears to increase both the duration of sucking bursts and the volume of milk consumed during breastfeeding for preterm infants (Meier, et al., 2000, p. 107).

Lactation supporters are sometimes reluctant to use nipple shields because of philosophical reasons versus proven scientific reasons. This is a challenge at times in facilitating breastfeeding of the preterm infant despite the scientific evidence that use of nipple shields can be beneficial to breastfeeding success (Meier, et al., 2000, p. 112).

“Inconsistent, inaccurate information and lack of support by healthcare professionals have been cited as reasons for breastfeeding failure among many groups of mothers” (Wight, et al., 2008, p. 185). The consistency of practice is challenged by the inconsistent nature of when developmental “milestones” are met by the preterm infant, the varied level of education and experience of neonatal staff, interest of clinical leaders, and the number of respected scientific organizations that influence the research and standard of practice of neonatal care (Thoyre, 2003a). The challenge both internationally and nationally is to provide care that is consistent and evidence-based. The United Nations International Childrens Emergency Fund (UNICEF) and the World Health Organization (WHO) are working to standardize the breastfeeding practices internationally for term infants. The Baby Friendly Hospital Initiative (BFHI) has had a positive effect on the rate of term infants who are exclusively breastfeeding at discharge,

illustrating the success of evidence-based clinical guidelines. Current practices support the use of both test-weighing and other clinical indices such as suck and swallow, quantify breast milk intake when transitioning from enteral gavage feedings to at-breast feedings.

Clinical Guidelines and Clinical Pathways

Documented efforts to create clinical guidelines and clinical pathways exist to manage the care of breastfeeding the preterm infant. The clinical guidelines and pathways combine the utilization of feeding readiness assessment tools independently, and/or how to utilize these tools to advance preterm infants from enteral gavage feedings to full oral or at-breast feedings.

The Early Feeding Assessment (EFA) Tool and the Preterm Infant Nipple Feeding Readiness Scale (PINFRS) are two examples suggested to assess a preterm infant's readiness to commence feeding (Crow, Chang & Wallace, 2006). A small study was conducted in Australia in an effort to validate the Modified Latch Assessment (MLA) Score as a method to quantify the amount of breast milk a preterm infant is able to ingest during a breastfeed. The preliminary data of this study of 15 premature infants, "... suggest that the MLA score may be able to accurately assess the efficacy of the preterm baby's breastfeeding ability...." as well as predict milk intake (Sheehy, Craig, & Kluckow, 2007, A96). "The MLA score was compared against the percentage of expected feed when measured by a test-weight" (Sheehy, et al., 2007, A96). Currently

there is a review, “Instruments for assessing readiness to commence suck feeds in preterm infants: Effects on time to establish full oral feeding and duration of hospitalization” being conducted by Crowe, Change, and Wallace. “This review will address “the balance of benefits and risks of screening instruments for commencement of suck feeds in preterm infants to assist in establishing an evidence base for clinical decision making” (Crowe, et al., 2008, p. 2). The results of this review may be beneficial for clinical leaders to consider when creating and implementing clinical guidelines or clinical pathways.

Intermountain Primary Children’s NICU currently uses “Breastfeeding Premature and/or Sick Newborn Infant Protocol” as their clinical pathway (Debbie Thomas, PT, PCS , Intermountain Primary Children’s NICU, personal communication, February 1, 2009). This cue-based clinical pathway created to initiate and advance oral feedings in preterm infants was developed by the combined efforts of neonatal providers in Salt Lake City. After initiating this evidence-based clinical pathway, which combines the use of the Modified LATCH Breastfeeding Assessment Newborn Scoring Tool and an Oral Feeding Clinical Pathway for Premature Infants, the NICU reported that preterm infants attained full oral feedings six days earlier than without the use of the clinical pathway (Kirk, et al., 2007). These documented studies demonstrate that efforts are being made to

understand and standardize the practices of transitioning preterm infants to at-breast or oral feedings.

Nutritional Monitoring

Nutritional monitoring is imperative for the growth and development of preterm infants. Key parameters to monitor are weight, length, head circumference, and biochemical parameters (Wight, et al., 2008, p. 36). A daily weight gain of 10-20 g/kg/day for preterm infants is necessary (Verklan & Walden, 2004, p. 211). An increase of head circumference and length by approximately one centimeter per week should be expected (Schanler, et al., 2006, p.199). Fortification of human milk is common practice for preterm infants receiving expressed breast milk.

Human milk alone, both mature and preterm, cannot meet the additional calories, protein, sodium, calcium, and phosphorus for the growing preterm infant. Preterm milk has greater protein (total nitrogen content) content for the first several weeks after birth. Fat, protein, and sodium content of human milk decreases during lactation (Bakewell-Sachs & Brandes, 2004, p. 222).

Fortification of human milk is one measure taken by healthcare providers to ensure that the nutritional needs of preterm infants are being met.

CHAPTER THREE

PROJECT DESCRIPTION

The purpose of this project was to review retrospective aggregate data from a rural community hospital in Montana after a change in practice was initiated by a local pediatrician to quantify breast milk intake of preterm infants when transitioning them from enteral tube feedings to at-breast feedings. The change in practice was from test-weighing to the “Salt Lake City Feed Plan”. The hospital nursing staff requested this information as baseline information to assist them in developing a clinical guideline or clinical pathway for transitioning preterm infants from enteral gavage feedings to oral feedings.

The nursing staff was interested in three specific patient outcomes, related to three specific feeding methods utilized when transitioning preterm infants from enteral gavage feedings to oral feedings. The three specific patient outcomes were: 1) length of hospital stay; 2) number of preterm infants exclusively breastfeeding at discharge; and 3) number of bottle fed preterm infants exclusively receiving expressed breast milk at discharge. The three specific feeding methods were: 1) test-weighing; 2) “Salt Lake City Feed Plan”; and 3) exclusively bottle fed.

The rural community hospital described in this project delivers Level IIB specialty care as defined by the American Academy of Pediatrics Policy Statement “Levels of Neonatal Care”. Level IIB specialty care is defined as the following:

Level II (specialty): a hospital special care nursery organized with the personnel and equipment to provide care to infants born at more than 32 weeks' gestation and weighing more than 1500 g who have physiologic immaturity such as apnea of prematurity, inability to maintain body temperature, or inability to take oral feedings; who are moderately ill with problems that are expected to resolve rapidly and are not anticipated to need subspecialty services on an urgent basis; or who are convalescing from intensive care. Level II care is subdivided into 2 categories that are differentiated by those that do not (level IIA) or do (level IIB) have the capability to provide mechanical ventilation for brief durations (less than 24 hours) or continuous positive airway pressure (American Academy of Pediatrics Committee on Fetus and Newborn Policy Statement: Levels of Neonatal Care, 2004, p. 1345).

Data Collection

Quality assessment data from four consecutive years were collected and secured via hospital policies and procedures by the hospital staff. This data were provided to the author in aggregate form. The aggregate data were submitted to the chair of the Institutional Review Board (IRB) at Montana State University for consultation. Since the aggregate data for this project were collected and reported in such a manner that the subjects cannot be identified, directly or through identifiers linked to the subjects, the IRB board did not require a formal review and approval. The original data were obtained from written birth logs, chart audits, and review of medical records of preterm infants, 32-37 weeks gestational age. The selection criteria for the study group of preterm infants follows: 1) preterm singleton infants 32-34 6/7 weeks gestation at birth based on dates calculated by last menstrual period; 2) delivered and solely cared for at a local community hospital in Montana; and 3) transitioned from enteral gavage feedings to exclusive bottle feedings, at-breast feedings, or at-breast and bottle feedings, prior to

discharge. Exclusion criteria were: 1) preterm twins or multiple births; 2) preterm infants born with congenital anomalies that interfere with feeding; and 3) chromosomal disorders that are incompatible with life. The selection criteria did not differentiate preterm infants who were receiving supplemental oxygen, or having apnea and bradycardia spells, and those that were not.

Data Analysis

The following aggregate data were provided for analysis. Data from four consecutive years that noted the total number of deliveries per year; annual percentage of preterm births between 32- 37 completed weeks gestation; total number of preterm infants that met the selection criteria for data collection; and data related to three specific feeding methods when transitioning from enteral gavage feedings to oral feedings: 1) test-weighing; 2) “Salt Lake City Feed Plan”; and 3) exclusively bottle fed. Additionally, aggregate data noted the gender, birth weight, discharge weight, number of days with an indwelling enteral nasogastric feeding tube, length of stay, and type of feeding at discharge.

Results

A descriptive presentation of the aggregate data follows. The average number of total deliveries per year, over four consecutive years, was 1,151. Table 3 describes this data. The average percentage of preterm deliveries that occurred between 32 - 37 completed weeks of gestation was 16.3 percent. Of the twenty-nine records that met the selection criteria, 17 were male and 12 were female. Table 4 summarizes the number of

subjects from each year that met the selection criteria. The birth weight ranged from 1.75 kilograms (kg) to 2.31 kg. Weight at discharge ranged from 2.66 kg. to 2.99 kg, indicating a weight gain of 0.68 to 0.91 kg at discharge. Number of days with an indwelling nasogastric enteral feeding tube ranged from 1 to 23 days. Length of hospital stay ranged from 7 to 29 days. The length of stay for exclusively bottle fed preterm infants ranged from 13 to 27 days, whereas the breastfeeding preterm infants who utilized test-weighing or the “Salt Lake City Feed Plan” ranged from 7 to 29 days. Breast fed preterm infants whom utilized test-weighing or the “Salt Lake City Feed Plan” had 4 to 4.315 fewer days of hospitalization compared to preterm infants that were exclusively bottle-fed.

Table 3. Summary of Delivery Aggregate Data

YEAR (data collected from four consecutive years)	TOTAL NUMBER OF DELIVERIES	NUMBER OF PRETERM DELIVERIES (less than 37 completed weeks gestation, includes singleton and twin deliveries)
YEAR 1	1051	185 (17.6% of total deliveries)
YEAR 2	1148	176 (15% of total deliveries)
YEAR 3	1212	193 (16% of total deliveries)
YEAR 4	1193	197 (16.5% of total deliveries)

*Gestational age determined by last reported menstrual period.

Table 4. Summary of Subjects Aggregate Data

YEAR (data collected from four consecutive years)	Number of preterm singleton infants that met the selection criteria
Four consecutive years	Total: 29
YEAR 1	8
YEAR 2	6
YEAR 3	5
YEAR 4	10

*Selection criteria for subjects: 1) Preterm singleton infants delivered between 32-34 completed weeks gestation based on dates calculated by last menstrual period; 2) delivered and solely cared for at a local community hospital in Montana; and 3) transitioned from enteral gavage feedings to exclusive bottle feedings, at-breast feedings, or at-breast and bottle feedings, prior to discharge.

Summary of Client Outcomes

The average length of hospital stay was 15 days for preterm infants who had been test-weighed, 15.375 days for preterm infants who utilized the “Salt Lake City Feed Plan,” and 19.7 days for preterm infants who were exclusively bottle fed. It is interesting to note that exclusively bottle fed preterm infants had the longest length of hospital stay.

Two preterm infants from the test-weighing group were exclusively breastfeeding at discharge, and none of the preterm infants were exclusively breast feeding in the “Salt Lake City Feed” group. Three preterm infants exclusively received expressed breast milk at discharge from the bottle fed group.

Test-Weighing Group

Fourteen preterm infants comprised the test-weighing group, eight males and six females. The birth weight ranged from 1.76 kilograms (kg) to 3.17 kg, with a mean birth weight of 2.21 kg. The discharge weight ranged from 1.98 kg to 2.99kg, with a mean discharge weight of 2.34 kg. The number of days with an indwelling nasogastric tube in place ranged from 1 to 23 days, with an average number of 10.5 days. The length of hospital stay ranged from 7 to 29 days, with an average length of stay at 15 days. The number of preterm infants exclusively feeding at-breast at discharge was two. See Table 5.

Table 5. Summary Test-Weighing Aggregate Data

Number of preterm infants	14
Gender	8 males, 6 females
Birth weight	1.76 kg – 3.17 kg (range) 2.21 kg (mean)

Discharge weight	1.98 kg – 2.99 kg (range) 2.34 kg (mean)
Number of days NG tube in place	1-23 days (range) 10.5 days (mean)
Length of hospital stay	7-29 days (range) 15 days (mean)
Number of exclusively breast feeding at discharge	2

“Salt Lake City Feed Plan” Group

Eight preterm infants comprised the Salt Lake City Feed group, four males and four females. The birth weight ranged from 2.04 kilograms (kg) to 2.57 kg, with a mean birth weight of 2.31 kg. The discharge weight ranged from 2.03 kg to 2.65 kg, with an average discharge weight of 2.29 kg. The number of days with an indwelling nasogastric tube in place ranged from 7 to 18 days, with an average of 11.25 days. The length of hospital stay ranged from 8 to 29 days, with an average length of 15.375 days. The number of preterm infants exclusively feeding at-breast at discharge was zero. See Table 6.

Table 6. Summary of “Salt Lake City Feed Plan” Aggregate Data

Number of preterm infants	8
Gender	4 males, 4 females
Birth weight	2.04 kg – 2.57 kg (range) 2.31kg (mean)
Discharge weight	2.03 kg - 2.65 kg (range) 2.29 kg (mean)
Number of days NG tube in place	7-18 days (range) 11.25 days (range)
Length of hospital stay	8-29 days (range) 15.375 days (mean)
Number of exclusively breast feeding at discharge	0

Exclusively Bottle Fed Group

Seven preterm infants comprised the exclusively bottle-fed group, five males and two females. The birth weight ranged from 1.75 kilograms (kg) to 2.51kg, with a mean birth weight of 2.10 kg. The discharge weight ranged from 1.84 kg to 2.66 kg, with a mean discharge weight of 2.3 kg. The number days with an indwelling nasogastric tube in place ranged from 2 to 16 days, with an average of 8.7 days. The length of hospital stay ranged from 13-27 days, with an average of 19.7 days. Four received formula, and three received expressed breast milk by bottle at discharge. See Table 7.

Table 7. Summary of Exclusively Bottle Fed Aggregate Data

Number of preterm infants	7
Gender	5 males, 2 females
Birth weight	1.75 kg – 2.51 kg (range) 2.10 kg (mean)
Discharge weight	1.84 kg – 2.66 kg (range) 2.3kg (mean)
Number of days NG tube in place	2-16 days (range) 8.7 days (mean)
Length of hospital stay	13-27 days (range) 19.7 days (mean)
Number of exclusively receiving expressed breast feeding at discharge	3

Strengths

Quality assessment data were collected and reported as aggregate data by the local community hospital. The outcomes were documented from the aggregate data. The outcomes provided were reported to the nurse manager for discussion. The data will serve as a baseline for planning and developing a unit-based clinical guideline, or clinical

pathway to transition preterm infants from enteral gavage feedings to at-breast or oral feedings. It is interesting to note that the length of stay for the breast fed infants was four days less than those who were bottle fed. It is also important to note that test-weighting Plan and the “Salt Lake City Feeding Plan” had very similar outcomes in terms of length of stay.

Limitations

The aggregate data were provided by retrospective chart audits, limiting the ability to track influencing factors if they were not documented consistently. The sample size was small, which does not allow for the data to be generalized. Aggregate data were only presented as range and mean. It would be helpful to be able to calculate the mode.

The aggregate data provided by the local community hospital did not include information related to factors that may have had a positive or negative effect on the outcomes. Factors that should be considered in future data collection include: a) administration of betamethasone prior to delivery, b) administration of surfactant, c) number of days on ventilator, d) number of days on parenteral nutrition, e) treatment of reflux, f) treatment of apnea and bradycardia spells, g) neonatal resuscitation interventions, h) number of days of supplemental oxygen use, i) nipple shield use, j) duration of human milk fortifier use, k) kangaroo care initiation and duration, l) use of non-nutritive sucking, m) day of life at-breast feeds introduced, n) day of life bottle introduced to breast fed and exclusively bottle fed preterm infants, m) mother available to room-in or stay at hospital, n) access to lactation consultants and occupational therapists,

o) record of apnea and bradycardic spells, and p) day of life consistent weight gain prior to discharge.

Personal attitudes, perceptions, and skill level of parents and practitioners related to test-weighing or the “Salt Lake City Feed Plan” were unable to be analyzed because the data were collected retrospectively. Maternal anxiety and skill, as well as practitioner preference, may have had an indirect influence on reported outcomes.

CHAPTER FOUR

PROJECT OUTCOMES

Implications and Recommendations for Nursing Practice

The aggregate data collected by the local community hospital in Montana provide preliminary groundwork to evaluate current and old practices related to transitioning preterm infants from enteral gavage feedings to at-breast feedings. The aggregate data also allowed comparison of patient outcomes for preterm infants that are exclusively bottle fed to preterm infants that are breastfed within the institution. The change of practice from test-weighing to the “Salt Lake City Feed Plan” was not supported by a written evidence-based guideline, or clinical pathway, prior to implementation. These findings suggest that creation and implementation of an evidence-based clinical guideline and/or clinical pathway may be beneficial to support the practices of NICU healthcare providers at the local community hospital in Montana. Collection and reporting of clinical data related to implementation of clinical pathways to transition preterm infants to at-breast or oral feedings are also needed.

The average length of hospital stay for a preterm/low birth weight infant was 12.9 days with an average cost of \$15,100 as reported by data collected from the Nationwide Inpatient Sample from the Healthcare Cost and Utilization Project in 2001 (Russell, et al., 2007). The aggregate data collected by the local community hospital in Montana reported that exclusively bottle-fed preterm infants had a longer, average length of

hospital stay by 4.325 to 4.7 days, as compared to breastfed preterm infants in the study. This reported outcome could be an influential factor for the local community hospital when assessing the need for a clinical guideline to transition preterm infants from enteral gavage feedings to oral feedings in the NICU.

Recommendations

Other information to be considered in future data collection may include: insurance coverage of patients, cost of care per day in the NICU at the local community hospital, mothers' desire to breastfeed prior to admission, maternal anxiety related to quantifying breast milk intake of preterm infant, and mother's previous experience with breastfeeding term and preterm infants. Data collection and review of medical interventions that may also have had a positive or negative effect on the length of hospital stay include: administration of betamethasone prior to delivery, administration of surfactant, number of days on ventilator, number of days on parenteral nutrition, treatment of reflux, treatment of apnea and bradycardia spells, neonatal resuscitation interventions, and number of days of supplemental oxygen use.

Institutions have devoted countless resources in developing, implementing, and maintaining clinical pathways as a way to measure specific patient outcomes, implement and deliver evidence-based practice, effectively manage resource allocation, and decrease hospital length of stay (Rotter, Koch, Kugler, Gothe, Kinsman, & James, 2007). The evidence to support the effectiveness of implementing clinical pathways varies considerably (Rotter, et al., 2007).

Some studies report that the introduction of clinical pathways for a broad range of interventions or diagnoses... can reduce the length of stay and total costs of acute hospital admissions while maintaining quality of care, improving patient outcomes, interdisciplinary co-operation and staff satisfaction. Conversely, there are studies reporting no benefit regarding length of stay and total costs (Rotter, et al., 2007, Background, para 2).

It is imperative that creation, implementation, and utilization of clinical pathways be continuously evaluated by individual institutions to assess effectiveness. This helps to ensure that the specified outcomes and the needs of the patients are being met, as well as staff compliance and utilization.

The review of literature noted that research related to breastfeeding has primarily focused on term infants and acknowledged the need for continued research related to breastfeeding the preterm infant. It is imperative that continued research be supported to further understand the transition of preterm infants from enteral gavage feedings to at-breast feedings. Several tools that assess breast fed infant's nutritional intake were noted.

Implementing a Practice Change

Implementing a change in practice, such as a clinical guideline to be utilized within a unit, requires strategic planning by clinical leaders related to theories of change. "The role of change agents is to lead change efforts through thinking that is systems- and theory -based, tolerant of ambiguity, and mindful of the big picture" (Menix, 2007, p. 322). Those that will implement the change and those that will be affected by the change "... must participate in the change-planning process from the beginning" (Menix, 2007, p. 328). The use of planned change models can be effective. "Thus, managing the influencing factors of a change situation in conjunction with a plan's elements for the

change can lead to creative results” (Menix, 2007, p.667). When leading change, it is recommended that a general framework be developed. For example, the following guidelines can be used as a general framework: 1) Situational Assessment and Analysis, 2) Implementation Plan, 3) Evaluation and Revision, and 4) Conclusion. Situation assessment and analysis help to identify the actual situation that needs change, the elements operating in the situation, and helps identify the facilitators and barriers to change. Implementation of the plan includes specifying desired outcomes, the objectives required to meet the desired outcomes, the plan to address predictable unexpected occurrences, and the methods that will be utilized to monitor the change process. Evaluation and revision is essential to assess the effectiveness and to make improvements as necessary to the plan for change, the implementation of the change, and the change in practice itself. To conclude, the degree in which the outcomes/goals were met, overall evaluation of the change process, and the outcome/goal quality should be assessed and evaluated.

Conclusion

The aggregate data that were collected by the staff at the local community hospital in Montana, integrated with clinical expertise, and the best available research, could be utilized to create an evidence-based clinical guideline or clinical pathway to transition preterm infants from enteral gavage feedings to at-breast or bottle feedings. Clinical leaders willing to develop and implement an evidence-based clinical guideline at

the local community hospital, Neonatal Intensive Care Unit (NICU) in Montana, could help ensure a successful change in practice, by leading a well-planned and organized change.

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