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Breastfeeding Mother's Use of a Supplemental Feeding Tube Device

Frances Penny
University of Connecticut - Storrs, frances.penny@uconn.edu

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University of Connecticut, 2017

It is a global understanding that human milk is the ideal and optimal source of nutrition for infants. Human milk provides lifelong health benefits to both infants and mothers. Currently, world and national breastfeeding rates are below the recommendation of the World Health Organization and The Healthy People 2020. When breastfeeding mothers are having difficulty breastfeeding, they may turn to using feeding devices as an alternative means of providing nutrition to the infant with the intent of preserving the breastfeeding relationship. There remains no standard of practice with regard to specific supplementation methods for breastfed infants that result in the best means of support for mothers and infants while also preserving the breastfeeding relationship. The overall goal of this dissertation is to address the gaps in knowledge and practice recommendations of breastfeeding supplementation practices. First is an examination of what evidence already exists to support use of the Supplemental Feeding Tube Device (SFTD) for supplementation purposes. Second, current practices of supplementation by members of the Internationally Board Certified Lactation Consultants are described through the use of an international online survey. Lastly, through a pilot study, use of the SFTD is examined in relation to breastfeeding outcomes and maternal breastfeeding satisfaction. Despite the small sample size, it is shown that the SFTD is a method that could minimize exposure to bottle feeding, at least in the first few days or weeks to help avoid the detrimental effect of bottles on continued breastfeeding. As a complete dissertation, these manuscripts provide evidence for a plan of research concentrated on supplemental practices for breastfed infants in relation to continued and successful breastfeeding.

Breastfeeding Mother's Use of a Supplemental Feeding Tube Device

Frances Penny

B.S.N., Georgetown University, 1989

M.P.H., Johns Hopkins University, 1994

M.S.N., University of Connecticut, 2015

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Presented by

Frances Penny, RN, B.S.N., M.P.H., M.S.N.

Major Advisor _____
Jacqueline McGrath

Associate Advisor _____
Elizabeth Brownell

Associate Advisor _____
Michelle Judge

University of Connecticut
2017

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"*The future is not set, there is no fate but what we make for ourselves*"

Irish Proverb

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Breastfeeding Mother's Use of a Supplemental Feeding Tube Device

Table of Contents

Chapter 1
Frances Penny
University of Connecticut

Introduction

The global understanding that breast milk is the ideal and optimal source of nutrition for infants has been well established by health care professionals (American Academy of Pediatrics, 2009; World Health Organization, 2003). The World Health Organization recommends that infants be exclusively breastfed for the first six months of life, and a continuation of breastfeeding, with complementary foods up to 2 years of age and beyond (WHO, 2012). There is universal acceptance of the health benefits of breastfeeding for both infants and the mothers (Eidelman & Schanler, 2012). Infant health benefits include protection from illness and diseases such diarrhea, respiratory infections, ulcerative colitis and obesity (Sankar, Sinha, Chowdhury, Bhandari, Taneja, Martines, & Bahl, 2015). The effects of suboptimal breastfeeding have a large economic burden as well. In the United States alone, this adds a burden of approximately $3.0 billion each year in medical costs (Bartick & Reinhold, 2017).

In 2011, the Surgeon General issued a call to action through The Healthy People 2020 goals to increase breastfeeding rates to 81.9% at birth, 60.6% at 6 months and 34.1% at one year. The goal for exclusive breastfeeding at 3 months and 6 months is to reach 46% and 25% respectively, with the current rates in the U.S. at approximately 44% and 22% (Department of Health and Human Services). Of infants born in 2011, 51% were still receiving some or all breast milk at 6 months and only 30% at 12 months (CDC, 2014). These statistics illustrate that we are still far from reaching our 2020 goals.

To further support reaching these breastfeeding goals, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) launched the Baby Friendly Hospital Initiative (BFHI) program in 1991 as a global effort to encourage and offer recognition to hospitals and birthing centers that offer the highest level of support for breastfeeding mothers.

The initiative provides ten detailed steps for successful breastfeeding. Step Nine of these ten steps states: "Give no pacifiers or artificial nipples to breastfeeding infants" (Baby Friendly USA Inc., 2010). Justification for this step is that artificial nipples may confuse the infant's ability to respond to nursing at the breast after use of pacifiers or artificial nipples because the sucking mechanism requires less work for the infant than sucking from the breast (World Health Organization, UNICEF, 2012). Rationale for this step includes findings from studies that report that use of artificial nipples interferes with breastfeeding success in some infants (Cronenwett, 1992; Neifert, Lawrence & Seacat, 1996). Supportive initiatives related to this step have led to the use of feeding devices that are alternatives to bottles and artificial nipples. When breastfeeding mothers are having difficulty breastfeeding, they may turn to using feeding devices as an alternative means of providing nutrition to the infant with the intent of preserving the breastfeeding relationship. These feeding devices include cups, syringes and supplemental feeding tube devices (SFTD). The SFTD is a device that has a container with a small tube, much like a feeding tube, attached. The container is attached to the mother's shirt or garment at a level above the breast with the tube taped to the mother's nipple. The baby then latches normally to the nipple while also ingesting a supplement of formula or expressed breastmilk.

Though there have been many studies on the use of cups as an alternative feeding method, there have been very few studies on the use of SFTD as an alternative method. And yet, in the clinical setting, these devices continue to be commonly used to assist breastfeeding mothers (Abouelfettoh, Dowling, Dabash, Elguindy, & Seoud, 2008; Dowling, Meier, DiFiore, Blatz, & Martin, 2002). Although the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN), WHO and AAP, UNICEF, and the Academy of Breastfeeding Medicine (ABM) all recommend, discuss, or promote the benefits of cup feeding for breastfed infants,

there are varying opinions in the medical community as to its safety and efficacy in relationship to the continuation of breastfeeding (AAP, 2010; AWHONN, 2009; Holmes, McLeod & Bunik, 2013).

Even with the implementation of the Baby Friendly Initiative, nurses and physicians may have different beliefs and opinions on the negative influence of bottle-feeding for breastfed infants. One survey conducted in Canada reported that a belief in "nipple confusion" varied among professionals. While only 15% of neonatal intensive care unit (NICU) nurses subscribed to the belief of nipple confusion, 56.2% of pediatricians and 44% of postpartum nurses believed nipple confusion to be a viable theory for why to use alternative feeding methods (Al-Sahab, Feldman, Macpherson, Ohlsson & Tamin, 2010).

Following an extensive literature search, only one article was identified where the main focus was to examine the use and potential efficacy of the SFTD. This qualitative study, published in 2005, was a naturalistic inquiry that examined the mothers' experiences with the use of the SFTD device. The study used a purposive sampling of 22 exclusively breastfeeding or partially breastfeeding mothers and their infants (Borucki, 2005). Data were gathered from the participating mothers through interactive structured and semi-structured interviews. Study findings indicated that mothers reported having both positive and negative experiences with the SFTD; with very little substantive data to support recommending its use for all mothers experiencing difficulty with breastfeeding. This qualitative study did not explore breastfeeding outcomes in terms of length or duration. The SFTD is a very common device that is used by many lactation consultants and nurses to aid mothers who wish to continue breastfeeding but are having difficulty with establishing this relationship with their infant. It is important to understand the relationship of the SFTD to continued breastfeeding; does it significantly sustain

breastfeeding? Does it really make a difference or not? Baby Friendly hospitals adhering to the Ten Steps need research findings that can be applied to developing evidence-based practice policies regarding use of the SFTD.

While the positive health effects of breastfeeding are a universal belief, the Healthy People 2020 goals of exclusive breastfeeding through 3 months or any breastfeeding at 6 months have still not been achieved. There remains no standard of practice with regard to specific supplementation methods for breastfed infants that result in the best means of support for mothers and infants while also preserving the breastfeeding relationship. To increase breastfeeding rates, it is important that women be educated on all available supplementation methods with a consideration of clinical barriers in order to facilitate the selection of an optimal supplementation approach. Thus, providers, lactation consultants and nurses need to have current evidence to support their practice of using SFTD with mothers and infants in the clinical setting.

The overall goal of this three manuscript dissertation is to address the gaps in knowledge and practice recommendations of breastfeeding supplementation practices through findings from three different studies. We will be begin by first examining what evidence already exists to support use of the SFTD for supplementation purposes. Second, we will describe the current practices of supplementation by members of the Internationally Board Certified Lactation Consultants through the use of an international online survey, and lastly, in a pilot study, we will examine use of the SFTD in relation to breastfeeding outcomes and maternal breastfeeding satisfaction.

Manuscript One (Chapter 2)

Breastfeeding supplementation practices among nurses and providers for breastfed

infants vary widely. There is no one practice that is accepted over another and beliefs vary greatly from practitioner to practitioner. In a survey conducted at a Canadian hospital, bottle-feeding was found to be commonly used in newborn and Level II nurseries as the method of choice for supplementation (Al-Sahab, Feldman, Macpherson, Ohlsson & Tamin, 2010). Methods of supplementation include bottle-feeding, cup feeding, finger feeding, syringe feeding and the use of supplemental feeding tube devices. The emphasis of using evidence-based recommendations to guide practice should not be excluded for implementing methods of supplementation. Because there is no gold standard for supplementation, practitioners need more evidence to support their breastfeeding supplementation decisions. The use of SFTDs has been recommended for supplementing breastfeeding by the American Academy of Family Physicians, United States Breastfeeding Committee and many state health departments such as in Indiana and California (AAFP, 2014). The use of supplemental feeding tubes is also suggested in many of the books and references designed to support medical professionals (Walker, 2016). Sometimes the SFTD tube is used as the tube for "finger feeding". This is a process when the tube of the SFTD is taped to the finger allowing the infant to suck on the finger while ingesting the supplement of expressed breast milk or formula. This first manuscript in this dissertation is an Evidence Based Brief systematically examining the research using the SFTD. The purpose of this brief was to answer the question "What evidence exists to support the use of the SFTD as a method of supplementation for breastfed infants?" Understanding the strengths and weaknesses of the existing research that has examined the use of the SFTD and its relationship to continued breastfeeding will further provide a foundation for current recommendations that guide practice. Understanding the level of the evidence also provides a foundation for future research related to how, when or if these devices should be used with breastfeeding mothers and infants.

Manuscript 2 (Chapter 3)

The results of the second study are provided in Chapter 3. The aim of this study was to examine the supplementation practices of members of the Internationally Board Certified Lactation Consultants through an international online survey.

This study has the potential to reveal information on what supplementation practices are currently being used by members of the Internationally Board Certified Lactation Consultants. Questions in the survey provide useful information about the reasons for provider decision-making around breastfeeding supplementation, who is involved with these decisions and why, as well as participants' confidence in offering alternative supplemental methods. The results of this study will provide more information that addresses the gaps in understanding supplementation knowledge as well as practices of members of the Internationally Board Certified Lactation Consultants. These results will provide insight as to where research efforts should be focused in relation to supplementation for breastfed infants. This research could in turn lead to a better understanding of what supplementation practices best preserve the breastfeeding relationship when infants must be supplemented.

Manuscript 3 (Chapter 4)

When supplementation recommendations are made by nurses and lactation consultants, it is important to understand its relationship to continued breastfeeding. Thus, the purpose of this descriptive quantitative study was to describe the use of a SFTD by breastfeeding mothers as an alternative feeding method through exploring its' relationship to continued breastfeeding. This study examines mothers' satisfaction with breastfeeding when using this device using the

Maternal Breastfeeding Evaluation Scale (MBFES). This is a reliable and valid instrument that evaluates mothers' perception of her breastfeeding success. The MBES contains three subscales which are (1) Maternal Enjoyment/ Role Attainment, (2) Infant Satisfaction/Growth, (3) Lifestyle/Maternal Body Image. This study also explores the relationship between the MBFES at four weeks and continued breastfeeding at 4 weeks.

In addition, it is important to establish a baseline understanding of the baby's breastfeeding progress. This baseline was assessed by using the LATCH assessment tool. This a common tool used in the hospital setting to assess an infant's breastfeeding ability. The three aims of the study were to explore the relationship of the LATCH score from the first 2 days of life and SFTD use and continuation of breastfeeding; to explore the relationship between initial LATCH scores, the use of the SFTD, other feeding methods and mothers' breastfeeding satisfaction using the MBFES at 4 weeks of age and to explore the relationship of the use of the SFTD and continued breastfeeding.

These three aims will address the purpose of this study to describe the relationship of the use of the SFTD and continued breastfeeding as well as an examination of mothers' satisfaction with breastfeeding while using this device in relation to breastfeeding at 4 weeks.

Conclusion

To reach the Healthy People 2020 goals of continued and exclusive breastfeeding it is important that providers, nurses and lactation consultants use the best practices to preserve the breastfeeding relationship. It has been shown that hospital practices can be significantly associated with duration of breastfeeding. These practices are also amenable to change (Wright, Rice, Wells, 1996; Powers & Naylor, 1994). In order to positively effect breastfeeding rates,

hospitals and birthing centers should have policies and procedures in place that best improve breastfeeding outcomes. Supplementation guidelines should be a part of these policies and procedures. Outdated research findings demonstrate that alternative methods of supplementation may prevent and replace the use of bottles, therefore improve breastfeeding outcomes (Jones, 1994; Lang, Lawrence, Orne, 1994). Newer studies are needed to better understand the current practices, particularly practices that relate to the use of SFTDs as a method of supplementation. Evidence-based standards and recommendations are needed to provide guidance when assisting mothers with breastfeeding supplementation related to different clinical scenarios. The findings of each study presented in this dissertation will be instrumental in the understanding of how alternative supplementation methods are currently being used to assist mothers in preserving the breastfeeding relationship as well as the role these methods play in a mothers' satisfaction with and the continuation of breastfeeding. Closing the gap in knowledge about the efficacy of these methods can help practitioners, nurses and lactation consultants provide the best, evidence-based approach to supplementation methods.

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Chapter 2

Frances Penny

University of Connecticut

What is the Evidence for Use a Supplemental Feeding Tube Device as an Alternative Supplemental Feeding Method for Breastfed Infants?

Frances Penny, RN, BSN, MPH, MSN, IBCLC[a, b]

Michelle Judge, PhD[b]

Elizabeth Brownell, PhD[c, d]

Jacqueline M. McGrath, RN, PhD, FNAP, FAAN[b, c]

Corresponding Author:
Frances Penny, affiliated with University of Connecticut, PhD candidate
12 Acorn Drive
Old Saybrook, CT
06475
860-575-3449

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[a] Southern Connecticut State University, School of Nursing, New Haven, CT
[b] University of Connecticut, School of Nursing, Storrs, CT
[c] Connecticut Children's Medical Center, Hartford, CT
[d] University of Connecticut, School of Medicine, Farmington, CT

ABSTRACT

Background: The sustainability of breastfeeding duration rates within the United States have not been achieved according to the Healthy People 2020 goals. To increase these rates, it is important that women with breastfeeding difficulties receive support that is needed to continue breastfeeding. When supplementation of breastfed babies occurs, it is essential that the breastfeeding relationship be preserved. Various methods of supplementation are often recommended including the supplemental feeding tube device (SFTD).

Purpose: The question guiding this brief is "what evidence exists to support the use of a SFTD as a method of supplementation for breastfed infants? "

Search Strategy: The PubMed and CINAHL databases were queried for articles of original research published in English from 1990 through July 2016. Search terms included "supplemental feeding tube", "breastfeeding", "term infants", "premature infants", "Supplemental Nursing System", "Lact-aid", and "supply line".

Findings: Very limited research exists on the use of SFTD as a method of supplementation for breastfed infants; however, existing research suggests that a SFTD may be useful as a supplementation method for breastfed infants. High-quality, research is needed to evaluate the effect of use of a SFTD on exclusive and all breastfeeding rates.

Implications for Practice: Nurses and providers need to be educated and trained in the use of SFTD. Information on the efficacy and use of the SFTD should also be included in breastfeeding policies.

Implications for Research: Further research should determine best methods of supplementation for breastfed infant and should examine differences in breastfeeding rates when using the SFTD.

Introduction

The United States Office of Disease Prevention and Health Promotion identified the goal for breastfeeding initiation in the United States to be 81% by 2020 with a current rate of 79% for breastfeeding initiation. The goal for exclusive breastfeeding at 3 months and 6 months is to reach 46% and 25% respectively, with the current rates at only 44% and 22% (2013). The goal for any type of breastfeeding at 6 months is 60%. Of infants born in 2013, 51% were still breastfeeding at 6 months and only 30% at 12 months.[1] Among high risk or preterm infants, fewer mother/infant dyads achieve targeted exclusive breastfeeding goals. Regardless of risk status, these statistics illustrate that we are still far from reaching Healthy People 2020 goals.

In 1991, The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) launched the Baby Friendly Initiative's program as a global effort to encourage and offer recognition to hospitals and birthing centers that provide the highest level of support for breastfeeding mothers. The 10 Steps within the Baby Friendly Initiative emphasize the importance of providing breastfeeding support and enforcing policies within the hospital to facilitate increased breastfeeding rates. Step 9 of these 10 Steps states: *"Give no pacifiers or artificial nipples to breastfeeding infants"*.[2] Supportive initiatives related to implementing this step have led to the use of alternative supplemental feeding methods rather than the use of bottles for supplemental feeding of breastfed infants.

When breastfeeding mothers are experiencing difficulty with breastfeeding, but wish for their babies to still receive breast milk or infants need supplementation of any type, they often turn to other methods for feeding their babies. Medical reasons for supplementation include prematurity, hyperbilirubinemia, insufficient milk intake, delayed bowel movements, and hypoglycemia unresponsive to breastfeeding.[3] The reasons for supplementation without a medical indication include mothers not understanding their babies' needs and/or feedings cues or

generally not understanding the demands of the baby, maternal fatigue, and the perception that breastfeeding was not effective.[4]

When supplementation is required or desired, mothers need a method for supplementation. Moreover, as a means to meet the requirements of the BFHI's Step 9, providers often turn to the use of alternative feeding devices with the intent of preserving the breastfeeding relationship without using bottles or pacifiers. These feeding devices include the use of cups, syringes, as well as finger feeding, and supplemental feeding tube devices (SFTD). Cup feeding includes using a flexible small feeding cup or a traditional feeding device (cup with a spout) to deliver the feeding. Syringe feeding is described as providing the feeding using a small syringe in which breast milk or formula is dropped into the baby's mouth. Finger feeding is a method where the supplement is in a container that is attached to a small feeding tube that is then attached or held on a caregiver's finger. The infant sucks on the finger and ingests the supplement through the tube on the finger. Lastly, a SFTD is a container with a small tube attached; much like an enteral feeding tube (see Figure 1). The tube is taped to the mother's nipple and the container is attached to her shirt or garment at a level above the breast.

The SFTDs have been recommended for supplementing breastfeeding by the American Academy of Family Physicians, United States Breastfeeding Committee and many state health departments such as in Indiana and California.[5] The use of supplemental feeding tubes is also suggested in many of the references for medical professionals.[6,7]Sometimes the SFTD tube is used as the tube for finger feeding.

There are two different SFTD on the market today. The Supplemental Nursing System™ (SNS™), a commonly used SFTD, developed, manufactured, marketed and distributed by *Medela* is advertised as *"An economical feeding device that is perfect for moms looking for*

short-term help with giving their babies supplements or when initiating breastfeeding. It is used for "inducing lactation, weak or ineffective "nursers", low milk supply, and premature babies".[8] Any evidence to support the use of this product is lacking on the company website.

The Lact-aid device, another brand of SFTD, was originally developed in the late 1960's by parents wishing to breastfeed their adoptive baby.[9] It is currently advertised as used for "*low milk supply, slow gaining baby, sore nipples, poor suckling, premature baby, delayed breastfeeding and adoption and surrogacy*.[8] It has been used for assistance with re-lactation and adoptive nursing since the 1970's.[10]

Currently, SFTDs are used by providers, nurses and lactation consultants with mothers who need or wish to supplement their breastfed baby. Yet, the evidence to support the use of these devices is not well understood. Policies about their use in the clinical setting are often lacking and individual clinicians and lactation consultants use them in different ways to support the breastfeeding mother.

With 434 hospitals designated as Baby Friendly in the United States, the use of supplementation methods other than bottles is a major part of hospital breast feeding policies. It is difficult to provide guidance regarding the most appropriate supplementation methods when there is so little research on the use of alternative methods. The use of the SFTD in practice is not evidence based yet, but it is clinically used as a supplemental feeding method.

Clinical Question and Search Strategy

A literature search was conducted to answer the question, "what evidence exists to support the use of supplemental feeding tube devices as a method of supplementation for breastfed infants?". The PubMed and CINAHL databases were queried for articles of original research published in English from 1990 through July 2016. The year 1990 was based on the

launching of the Baby Friendly Hospital Initiative, which occurred in 1991. This initiative, as a global effort, was to improve maternity services and care to promote breastfeeding. It stressed the importance of the maintaining the breastfeeding relationship without the use of bottles and encouraged alternative supplementation methods. This year marked a shift in hospital policies to improve breastfeeding outcomes.

Search terms included "supplemental feeding tube device", "breastfeeding", "term infants", "premature infants", "Supplemental Nursing System", "Lact-aid", and "supply line". Articles were read for inclusion of the use of a supplemental feeding tube with breastfed infants. When queried, there were 10 articles that surfaced were found that included use of the SFTD Three of these were not included because they were "letters to the editor " (see Figure 2). Two studies were too old and outside the years of inclusion of this review. Only one study was located with the primary purpose of studying the use of a supplemental feeding tube with breastfed infants. Given the scarcity of research in this area, additional studies were included in this review that addressed re-lactation or adoptive nursing where supplemental feeding tubes were used by participants in the study.

Summary of Evidence

Study Findings

The one study that focused on the use of a SFTD as a method of supplementation was a qualitative study. This study was a naturalistic inquiry of 22 mothers and a total of 26 infants.[11] Data were collected through semi-structured interviews. This study included primarily mothers term infants that used the SFTD for various reasons. Fifteen of the 22 mothers began the SFTD in the first two weeks. The others began use between 1 and 3 months. The mothers in the study supplemented their breastfeeding for various maternal reasons including sore nipples, delayed

lactogenesis, previous breast reduction, adoption and real or perceived milk insufficiency. Reasons related to infant issues included poor latch, weak suck, poor weight gain. The challenges associated with using the device were noted among the study results. Many mothers felt that the device was difficult to use and needed assistance with it. The difficulties described included finding that use of the device was time consuming and cumbersome. Most women in the study reporting received help from the product instructional booklet beyond what they received from the lactation consultants and nurses. The other sources of assistance were from an experienced user or from the person who provided the device. However, it is important to note that many liked using the device because it felt like they were doing something to help with the breastfeeding issues. Overall the women had a strong desire to breastfeed and found the SFTD as an acceptable alternative method of supplementation.

There were three studies that focused on understanding support during relactation that discussed the use of a SFTD.[12-14] One study was a prospective study on the use of galactogogues, conducted among 50 mothers with hospitalized infants that were less than four months of age. These mothers were randomly assigned to two groups. Both groups received breastfeeding education, instruction on nipple stimulation and massage, instruction to put the baby to suck at the breast 8-10 times a day for 15 minutes and to use a Lact-aid nursing supplementer to assist with breastfeeding. Group two also received 10 mg metoclopramide orally, 3 times a day for 10 days. The study measured milk intake (measured by infant weights), urine output and satisfaction (measured by sleep after feeds). Relactation was defined as establishment of milk supply. This was defined by time appearance of first milk upon expression, when milk supplement was reduced by half and the time when infant gained adequate weight on breast milk alone. There was a total of 49 mothers that were able to relactate with 46 with successfully

reaching their goal of complete relactation. Metoclopramide had no significant effect on relactation. The authors emphasized that it is the quality of support and the frequent sucking of the infant (where the Lact-aid assisted with this) and the help of the skilled health care worker that assist the mother with successful relactation.

Another study assessing relactation used a sample size of 8 mothers that were characterized as separate case studies.[13] These mothers were noted to have experienced complete or partial lactation failure. All babies were supported to suckle at the breast every 2-3 hours under supervision of the nursing staff. Babies who initially refused the breast were able to suckle at the breast when they used a Lact-aid supplementer. Relactation was successful in 6 of the 8 mothers. Of these 6, there were 4 with complete relactation and 2 with partial relactation (not defined in the study). The authors concluded that suckling at the breast and the use of the Lact-aid nursing device were helpful to establish breastfeeding.

The third study related to relactation was a report of a single case study. [12] This case study examined the progress of relactation of a gravida 2 mother who weaned her 10-day-old infant due to a rare illness of pyoderm gangrenosum. After treatment, the mother was able to resume breastfeeding at nine weeks postpartum. Techniques that aided in relactation were breast massage, breast pumping with electric pump, hand expression and putting the baby at the breast. When baby was put at the breast, the Supplemental Nursing System (SNS) was used with formula or breast milk from the baby's aunt. The baby was gradually weaned from the supplement. The baby did receive some bottle feedings until 13 weeks postpartum whenever the mother felt that the baby did not get enough at a breastfeeding. The study report included problems that occurred during relactation. Two of these problems specifically related to the SNS. It was noted that the infant became frustrated at the slow flow associated with using the SNS.

At 12 weeks the infant refused to suck at the breast with the SNS. In both instances the infant was supplemented with a bottle feeding.

The last study was also a single case study where the focus was induced lactation, which included the use of a SFTD.[15] In this study, induced lactation was examined with a gravida 3 para 0 adoptive mother. Beginning when the infant was 10 days old the mother fed the infant at the breast using a supplemental feeding tube. She did this in conjunction with use of metoclopramide three times a day and pumping every 3-4 hours. By the end of five weeks, the mother was obtaining 4 ounces of milk with each pumping session. At that time she discontinued the supplemental feeding tube. The adoptive mother exclusively breastfed her infant for 10 weeks and partially breastfed for total of 4 months. The mother described breastfeeding her adoptive baby as "one of the best experiences of her life".

Additional Findings

Other articles included commentary articles titled as letters to the editor. These initially surfaced during the literature search and were excluded as not original research. These authors have advised that more research needs be conducted on efficacy of supplemental feeding using these SFTD's.[15] For example in a recently published commentary article, there was a round table discussion on supplemental feeding devices with physicians from 5 hospitals in Palestine, Shri Lanka, Sweden, Taiwan and the United States.[16] Members discuss their opinions and reasons for alternative feeding methods. All members agree that methods other than the bottle are best for preserving the breastfeeding relationship. One member from the United States discussed the use of a SFTD and stated "we don't think this method is user friendly".[16]

Several of the textbooks that are used by lactation consultants and clinicians discuss and recommend the use of supplemental feeding tube devices for assistance with relactation and

other breastfeeding issues, however, no evidence is presented to support these recommendations.[7] It is important to note these published recommendations continue to influence the use of these devices in the clinical setting regardless of the limited evidence for their use.

Recommendations for Practice

There is a strong national focus on the improvement of infant health through breastfeeding.[17] Currently there are 420 hospitals in the United States designated as Baby Friendly with approximately 18.9% of all births occur at a Baby Friendly hospitals.[2] With this designation, hospitals must adhere to the Ten Steps which include Step 9 which states: "*Give no pacifiers or artificial nipples to breastfeeding infants*".[2] It is important that lactation consultants, nurses and providers have the knowledge and skills to offer the best possible method of supplementation for mother and a baby to preserve the breastfeeding relationship. Though the evidence is extremely limited, the use of a supplemental feeding tube device may help to retain or attain the breastfeeding relationship. In all the case studies when relactation or induced lactation was successful, the SFTD was a part of the plan to achieve breastfeeding success. The qualitative study of 22 mothers that used the SFTD discussed that mothers who wished to maintain a breastfeeding relationship found the SFTD to be a successful alternative. The study discusses the desire of the mothers to succeed as well as the willingness to use a technology to assist in the outcome. Mothers did report that they did not like the difficulties associated with the SFTD such as lack of ease of use.

The results of the limited cases studies and qualitative naturalistic inquiry along with expert recommendations to implement alternative methods of supplementation for breastfed infants indicates that the use of the SFTD would be a beneficial tool to breastfeeding mothers.

It is important to involve the mother in the decision-making process for selecting methods of supplementation. Mothers also need to actively participate in all instructional sessions related to the chosen supplementation methods.[11] Nurses and Lactation Consultants need to be knowledgeable and confident in assisting breastfeeding mothers with the use of the SFTD as well as other methods of supplementation. Baby Friendly hospitals must also follow steps one and two of the Ten Steps. These steps are 1) Have a written breastfeeding policy that is routinely communicated to all staff and 2) Train all health care staff in the skills necessary to implement this policy. These two steps need to include the various alternative methods of supplementation. Preserving the breastfeeding relationship must be priority for mothers who wish to continue breastfeeding.

Implications for Research

It is important for nurses and lactation consultants to be knowledgeable and skilled in the use of all alternative supplemental feeding methods that are available. The Baby Friendly policy stipulates that alternatives that do not use and artificial nipples should be used. The SFTD is an acceptable method, however, more research needs to be conducted on the efficacy of this method. If preserving the breastfeeding relationship is the goal as a means to increase breastfeeding rates, it is important to have more data on whether this method truly facilitates attainment of this goal. The fact that mothers report that there is some difficulty with the use of this method indicates that research should be conducted to see what can ease this difficulty. [11]The reported lack of ease of use as well as it being time consuming is an issue that might be resolved with better support and education for the mothers, lactation consultants and nurses. Randomized controlled studies would be difficult to conduct, but not impossible, if different methods are being compared to each other and there is safe guard in the protocol that continues to support the

mother's breastfeeding success. A large retrospective study could also be used to examine the use of SFTD and breastfeeding rates, ease of use and mothers' satisfaction. A prospective study could examine breastfeeding rates and satisfaction with supplemental methods. A study that includes the type of education and training that could assist with the use of alternative feeding methods would be useful in helping to preserve the breastfeeding relationship and therefore increase breastfeeding rates.

The impetus to use alternative methods for supplementation for breastfed infants is emphasized through the increase in the number of Baby Friendly hospitals and the goal to increase breastfeeding rates. The supplemental feeding tube device is one such method that is accepted among lactation consultants and nurses, however there is a lack of evidence for its use. More research is necessary so that practitioners can use results for evidence-based decisions when working with breastfeeding mothers who require supplementation.

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Table 1. Research on Supplemental Feeding Tube

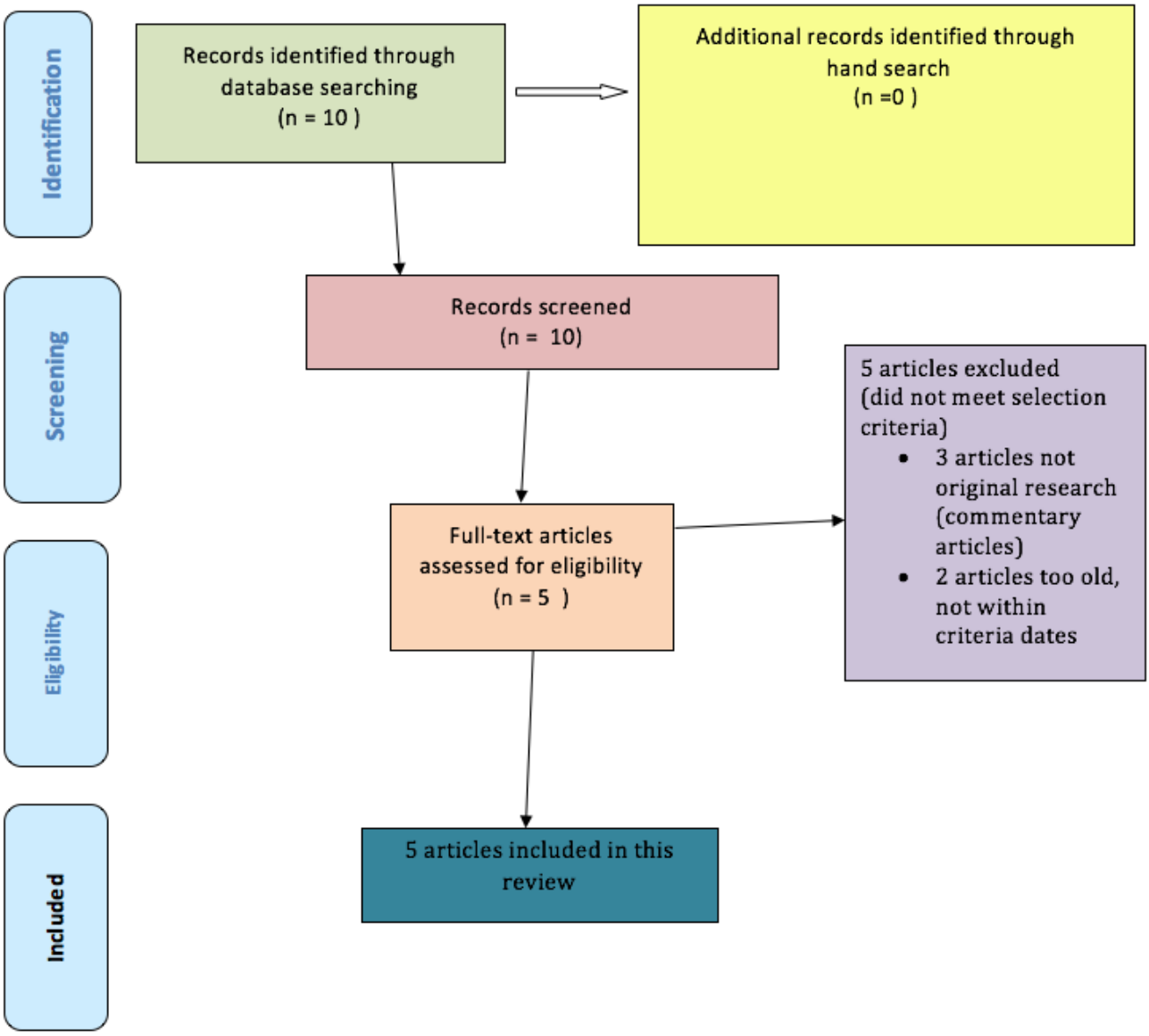
Author/Location	Design and Subjects	Use of SFTD	Results	Implications
Borucki (2005) United States	Naturalistic Inquiry Purposive Sampling N=22	Used for supplementation at breast to establish or reestablish milk supply or to supplement milk supply	SFTD was an acceptable method of supplementation. Mothers developed confidence with using device A commitment to breastfeeding Allowed continuation of breastfeeding with supplementation	Indicated SFTD is acceptable form of supplementation for women in the study Various reasons for relying on SFTD for supplementation SFTD was worth the effort for women in the study
Chaturvedi (1994) India	Sample of 8 separate case studies	Relactation of complete or partial lactation failure (reasons not included in study)	Relactation (full or partial) was successful for 6 of 8 mothers.	Author concludes that sucking at the breast with SFTD is an integral part of relactation success
Muresan (2011) Romania	Case Study, one subject	For relactation of mother that had weaned her baby after 10 days due to illness of mother	Infant was fully breastfed by one month after beginning of relactation process	Author concludes that a SFTD should be a part of a relactation process
Seema, Patwari & Satanarayana (1997) India	Prospective Study , 50 mothers	Mothers using galactogogues with partial or complete lactation failure. Comparison group used	Metoclopramide had no significant effect on relactation.	Authors conclude that quality of support and frequent sucking that aid in relactation success
		Metoclopramide		
Cheales-Siebenaler	One Case Study	Used for induced lactation on adoptive mother	Mother exclusively breastfed for 10 weeks and breastfed for 4 months	Device was a successful pat of induced lactation

Summary of Recommendations for Practice

What we know	• Mothers experiencing difficulty with breastfeeding may need to offer supplementation • Supplementation methods that preserve the breastfeeding relationship are the best alternative • Baby Friendly Step 9 recommends no artificial nipples • Supplemental Feeding Tube Devices are one such supplemental method
What needs to be studied	• The relationship of SFTD and continued breastfeeding • Best practice on the use of the SFTD by nurses and providers
What we can do today	• Provide options of supplementation to mothers that will help preserve breastfeeding relationship • Educate providers, lactation consultants and nurses on the use of the SFTD

Figure 1. Diagram of Supplemental Feeding Device

Figure 2
Flow Diagram of Article Section for Inclusion in Review



Chapter 3

Frances Penny

University of Connecticut

International Board Certified Lactation Consultants Practices related to Supplemental Feeding Methods for Breastfed Infants.

Frances Penny, RN, BSN, MPH, IBCLC[a, b]
Michelle Judge, PhD[b]
Elizabeth A. Brownell, PhD[c, d]
Jacqueline M. McGrath, RN, PhD, FNAP, FAAN[b, c]

Corresponding Author:
Frances Penny
12 Acorn Drive
Old Saybrook, CT
06475
860-575-3449

[a] Southern Connecticut State University, School of Nursing, New Haven, CT
[b] University of Connecticut, School of Nursing, Storrs, CT
[c] Connecticut Children's Medical Center, Hartford, CT
[d] University of Connecticut, School of Medicine, Farmington, CT

ABSTRACT

Background: Often breastfeeding mothers need to supplement their infants. According to the Baby Friendly Initiative, supplementation should be offered by alternative methods other than the bottle. To best support this initiative, it is important to understand the supplementation practices of Internationally Board Certified Lactation Consultants (IBCLCs).

Research Aim: Examine the supplementation practices of IBCLCs.

Methods: An exploratory, descriptive, cross sectional survey of IBCLCs was conducted to gain information about use of supplemental feeding methods to support breastfeeding mothers and infants. Survey on IBCLC supplemental practices were sent out to the International Board of Lactation Consultant Board of Examiners listserv via email invitation. Pearson Chi Square tests and Kruskal-Wallis tests were also performed for analysis of data.

Results: A response of 2308 (10%) surveys were returned. There was no one standard method of supplementation among IBCLC or even one that is overall preferred. IBCLC's feel confident in advising mothers on alternative methods. The majority of respondents believe the SFTD best preserves the breastfeeding relationship and it is their preferred method of supplementation. However, the bottle was ranked as the number one used method in the United States, Australia and Canada. Results also showed that alternative methods can be overwhelming to the mother.

Conclusion: In order to avoid discontinuation breastfeeding, supplementation could help preserve the breastfeeding relationship, by extending the duration of mother's milk receipt, and thus allowing for increased adherence to the Healthy People 2020 goals.

Introduction

Breastfeeding provides protection against infant disease such as otitis media, respiratory illness and an improvement of overall morbidity (Duncan, Eye, Holberg, Wright, Martinez & Taussig, 1993; Dewey, Heinig & Nommsen-Rivers, 1995; Stanley, Chung, Raman, Chew, Magula, DeVine, Litt, Thomas,& Lau, 2007). It is recognized worldwide as the optimal method of infant feeding (World Health Organization, 2012; American Academy of Family Medicine 2014).

The United States (US) Department of Health and Human Services identified the 2020 goal for breastfeeding initiation in the United States to be 81% with a current rate of 79%. The 2020 goal for continuation of exclusive breastfeeding at 3 months and 6 months is 46% and 25% respectively, with the current rates at only 44% and 22%. The goal for any type of breastfeeding (exclusive or partial; human milk from a bottle or from the breast) at 6 months is 60% the current rate is 51%. These statistics demonstrate that we are still far from reaching our 2020 goals. (CDC, 2011; Office of Disease Prevention and Health Promotion, 2016)

In 1991 the World Health Organization (WHO) launched the Baby Friendly Hospital Initiative as a global effort to encourage and offer recognition to hospitals and birthing centers that provide the highest level of support for breastfeeding mothers. This initiative includes Ten Steps that emphasize the importance of providing breastfeeding support by developing and putting hospital policies in place that facilitate increasing breastfeeding rates. Step Nine of these Ten Steps states: "Give no pacifiers or artificial nipples to breastfeeding infants" (Baby Friendly USA Inc., 2010). Hospital initiatives developed to support this step have led to the use alternative supplemental feeding methods rather than the use of bottles or artificial nipples for supplemental feeding of breastfed infants.

When breastfeeding mothers experience difficulty with transitioning to and/or continuing breastfeeding, but wish for their infants to still receive breast milk or when the infant needs supplementation for medical reasons, caregivers often turn to alternative methods. Medical reasons for supplementation include hyperbilirubinemia, insufficient milk intake, delayed bowel movements, and hypoglycemia unresponsive to breastfeeding (Chantry, 2009). Often mothers may supplement their infants without a medical reason (Tender, et al. 2009). Common reasons include misunderstanding the feeding demands of their infant, maternal fatigue, and other commonly encountered breastfeeding problems (DaMota, et al., 2012). Methods of supplementation include cup feedings, syringes, finger feeding and supplemental feeding tube devices (SFTD). The SFTD is a device that has a container with a small tube, much like a feeding tube, attached. The tube is taped to the mother's nipple and the container is attached to her shirt or garment at a level above the breast (See Figure 1).

Many health professionals and lactation consultants throughout the world use supplemental feeding devices other than the bottle. Cup feeding has been well studied among both term and preterm infant populations and is the supplemental feeding method of choice outside the US (Abouelfettoh, Dowling, Dabash, Elguindy & Seoud, 2008; Dowling, Meier, DiFiore, Blatz & Martin, 2002; Freer, 1999, Gilks & Watkinson, 2004; Gupta, Khanna & Chattree, 1999). However, substantive research related to the use of SFTD is lacking. Following and extensive literature search, only one investigation was identified evaluating a SFTD. This 2005, qualitative study was a naturalistic inquiry that examined the mothers' experiences with the use of SFTDs. Prevalence of use of SFTDs to support breastfed infants was included in this particular study's scope of research by reporting on the experience of mothers who use this supplemental method. Although there is no clinical evidence, the use of SFTDs is recommended

by the American Academy of Family Physicians, US Breastfeeding Committee and many state health departments including Indiana and California and is recommended by clinical breastfeeding experts (USbreastfeeding.org, 2014, AAFP, 2014). It is also recommended by Dr. Spatz, a nurse breastfeeding expert, that nurses who care for newborns be familiar with the use of the SFTD (Spatz, 2005).

Likewise, an exhaustive literature search yielded very little research on the use of finger feeding as an alternative, supplemental feeding method. Of the sparse research related to the use finger feeding, one study determined that the use of finger feeding in premature infants increased the rate of breastfeeding at discharge for these infants (Glenn & Oddy, 2003). We found no studies related to prevalence of use of finger feeding as a method for supplemental feeding for breastfed infants. Collectively, an evidence gap exists in knowledge, efficacy, safety and procedural considerations surrounding SFTD and finger feeding practices.

Purpose

The purpose of this cross-sectional study was to determine which supplemental feeding methods are being used by Internationally Board Certified Lactation Consultants (IBCLCs). We also examined under what circumstances the supplemental feeding methods were being used, who are making supplemental decisions, and IBCLC confidence with recommending and supporting alternative methods of feeding.

Methodology

Design and Setting

We performed an exploratory, descriptive, cross-sectional study of members of the Internationally Board Certified Lactation Consultants with a questionnaire designed by the first

author to gather information regarding the use of supplemental feeding methods to support breastfeeding mothers and infants.

Study Procedure and Ethical clearance.

Data was collected via completion of the emailed survey from a link to Survey Monkey. The study was anonymous as no IP addresses were collected. The study received IRB approval from the University of Connecticut and approval from the International Board of Lactation Consultant Examiners.

Sample

The sample consisted of Internationally Board Certified Lactation Consultants (IBCLCs) that are on the email list of the International Board Lactation Consultant Examiners. An IBCLC is a health care professional that works with mothers and babies on breastfeeding issues. They are certified by the International Breastfeeding Lactation Consultant Examiners which has been in existence since 1985. This agency is certified by the National Commission of Certifying Agencies. There are a little over 28,000 IBCLC's throughout the world, representing 105 countries. The majority of IBCLCs reside in the United States (15,738; 54.5%) and Australia (2,202 7.6%). An IBCLC is certified by exam and must have specific, extensive education in health sciences and lactation as well as up to 1000 hours of lactation-specific clinical practice. The certification exam is given either as computer based and paper pencil, where needed. It is given in English as well as 17 other languages. There are approximately 20,000 Internationally Board Certified Lactation Consultants on this list serve which represents 7 countries. Not all of the 28,000 IBCLCs have a working or up-to-date email address, therefore the list serve remains at approximately 20,000.

Survey

The 30-item questionnaire included 10 demographic questions and 20 questions related to alternative feeding methods used to support breastfeeding. Of these questions, 16 questions were on a 5 point Likert scale and two were ranking questions with responses ranging from Always (1) to Never (5). Survey included questions on IBCLC preferred methods of supplementation, confidence on giving advice on methods of supplementation and who makes supplemental decisions. The methods included in the questionnaire were finger feeding, bottles, and SFTD's (Table 1). Content validity was accomplished via expert content and literature review

Analysis

Questionnaire results were analyzed using SPSS. Descriptive analyses included means, standard deviations, ranges, and percentages of the demographics collected. Pearson Chi-Square tests were performed to test for dependence between independent variables and questions related to methods of supplementation related to advice by IBCLC and confidence with giving advice. In instances of non-normally distributed responses, Kruskal-Wallis, rank based, non-parametric tests were performed for the supplemental device used most often related to geographic reason and for the reasons for supplementation related to geographic reason (Tables 3 and 4).

Results

There was a total of 2308 returned responses. Surveys that were not complete were retained for item analysis and percentages were based on totals for that item. Of the 20,000 requested to participate in the study there was a total of 2308 responses provided within the response time of two weeks representing a 11.5% response rate (Table 2).

The age of respondents ranged between 22 and over 60 years with the majority ofparticipants being between 51 and 60 years of age (34.2%). Table 2 provides a summary of the demographic characteristic including: licenses held, geographic area of practice, education, number of years as an IBCLC. The US represented the majority of respondents (1536, 66%). The next highest percentage of respondents was from Europe (268, 11.6%) (Figure 2).

Determinants of Supplementation in the Practice Setting. The majority of respondents worked within a facility that had protocol on supplementation of breastfed infants (66.7%) of these IBCLC's, 60.1% of the time this same protocol applied to both term and preterm infants. Supplementation decisions were often guided by someone else other than the IBCLC. Results showed that 30.2% of respondents reported that supplementation method was determined by the primary provider and 34.7% of the respondents stated that supplementation method was determined by the mother. Only 17.6% of respondents reported that the IBCLC was the caregiver who recommended the method of supplementation.

Confidence and Practice. The majority of respondents reported that mothers sometimes (33.7%), "very often" (53.5%) and "always" asked for advice on supplementation methods. Only about half of the respondents had a preferred method of supplementation either "very often" or "always" (56%). Of the methods offered, 38.7% offered the SFTD as a method "very often" (31.3%) or "always" (7.4%) and 38.3% "sometimes" offered advice on SFTD. The other methods of cup feeding finger feeding were also used by the IBCLC's with 35.8% of respondents reporting that they offer cup feeding "very often or "always" and finger feeding as 33.8% as "very often" or "always".

Approximately 70% of respondents responded that they were confident "very often" or "always" in offering all three types of alternative feeding methods. Also, 70% of the time

respondents felt that "very often" or "always" it was clear to them which supplementation method to use with individual mothers and infant. A chi-square test for independence indicated a significant association between practice setting and confidence with cup feeding, X^2 (8, N=2282) =33.13, p<.001; practice setting and SFTD, X^2(8, N=2249)=21.761, p<.005; practice setting and finger feeding X^2 (8, N=2283)=38.140, p<.001. Also, there was a significant relationship between practice location and whether it was always clear as to which supplementation method to use, X^2 (8, N= 2282)=19.04, p=.013). IBCLCs in a hospital setting felt the choice was clear "always" or "very often" 72% of the time compared to Health Clinics (63%) and Home Based practice (67%).

Preferences and Best Practice. To those responding, it was important for the IBCLCs to include the mother in the supplementation decision. A total of 97% reported that they included the mother "very often" or "always" and 67% of the time the IBCLC felt that mothers had a preferred method of supplementation. However, alternative methods were believed to be overwhelming to the mother by the IBCLC who completed the questionnaire. Finger feeding was "rarely" or "never" considered overwhelming by 22.9% of the IBCLC's. The results showed that the method most overwhelming to a mother was the SFTD where only 6.6% felt it was "rarely" of "never: overwhelming. Approximately 17% of respondents chose cup feeding was "rarely" overwhelming.

The most preferred method of supplementation was the SFTD with 33.2% of respondents choosing it as such. The next most preferred was cup feeding (21.9%). The SFTD was also the method which IBCLCs felt most preserved the breastfeeding relationship with 54% of respondents choosing this method. The cup was the second highest method thought to preserve the breastfeeding relationship (16.3%). The most often used supplemental feeding for all

geographic areas combined was the bottle at 31%. The most common reason for supplementation among all the groups combined was for infant medical reasons 74% of the time.

There was a significant association between IBCLC practice setting and whether the bottle was chosen as the supplemental chosen of last resort, $X^2(8, N = 2282) = 78.059$, $p < .001$. When supplementation was offered, the bottle was "always" offered as the last resort method by 26% of all respondents. Therefore, the bottle was used as "last resort" only about a quarter of the time. There was also a significant association between practice setting and whether advice on SFTD was offered, X^2 (8, N= 2284) =21.716, p = .005. The IBCLC's that practiced in the hospital were the most likely to give SFTD advice (N= 105 "Always" gave SFTD advice). A chi-square test for independence indicated a significant association between having a facility protocol on supplementation and using the bottle as a last resort, X^2 (4, N= 2256)=30.796, p<.001.

There was no significant association between the type of professional license an IBCLC had and having a preferred method of supplementation X^2 (16, N=2212)= 24.72,p=.075.

Geographic Region related to practice

An analysis of geographic region and supplemental practices was performed. There were differences in the supplementation method used. For example, in the United States, the most frequently used supplementation type used was the bottle at 30%. The next most commonly used type was finger feeding and SFTD (both at 20% each). Asia and Africa respondents preferred cup feeding each at 50% and South America was the only country where respondents preferred the SFTD (60%) over other methods.

Kruskal-Wallis tests were performed on ranking questions for comparison of preferred supplements devices questions by geographic region. Clustered barplots were constructed for

the rankings of most preferred supplementary device by geographic region (Figure 3). The analysis showed that all geographic locations were statistically significant in relation to preferred supplemental method at an alpha level of .05 (Table 3).

Kruskal-Wallis tests were also performed for comparison of reasons for supplemental choice by geographic region (Table 4). Clustered barplots were constructed for the rankings of most common reasons for prescribing the devices by geographic region (Figure 4). In all geographic areas, infant medical reasons (such as weight loss, hyperbilirubemia, dehydration, etc.) were listed as the number one reason for choosing an alternative feeding method. However, only rankings related to sore nipple pain, father wanting to feed baby and mother needing to go back to work, were significantly related to geographic region ($p<.05$).

Discussion

To our knowledge this is the first study designed to describe supplementation recommendation practices of IBCLCs. These results indicate that IBCLC supplementation practices vary more than might be expected. A very important result was that supplementation decisions are not always driven by the IBCLC, interestingly supplementation practices most often are driven by providers and mothers. Only 17% of the time was the decision guided by the IBCLC. Mothers should take into account all recommendations and make an informed decision. Further research is necessary in understanding the factors that drive the recommendations of non-IBCLC providers in recommending supplemental devices. Given the wide variety that we report with regard to supplemental feeding, standardized efforts would be helpful to IBCLCs and non-IBCLC providers.

An important finding was that the bottle was the device most often used in four geographic areas as well as the area listed as “other”. This was in direct conflict with the results

on the most preferred method and the results on which method preserves the breastfeeding relationship the best. The SFTD was listed as the most preferred (32.1%) and as the device that preserves the breastfeeding relationship the best (53%). The bottle was seen as preserving the breastfeeding relationship only 4.9% of the time and preferred only 12.4 % of the time. The bottle was listed as the most often used supplemental device in United States, South America, Australia, and Canada. Yet, the bottle was seen as a method of last resort only 25% of the time, implying that it is used other than a method of last resort. The high percentage of bottle use is in conflict with the results of the preferred and best supplemental method of the SFTD. With the majority of respondents coming from the United States, where the bottle was found to be the most often used device, this is especially concerning. Confidence on all four methods of supplementation was very high. This indicates that consultants do not question their ability consult on use of any of the supplemental devices.

These results would suggest that there may be other factors that influence the type of supplemental method that is used. The results show that the provider and the mother make the decision on supplemental method. The high use of the bottle is in direct conflict with Step 9 of the Baby Friendly Initiative (Baby-Friendly USA, Inc., 2010). This would appear to show that this Step is not being considered by those making the supplemental method decisions as well as what other contributing factors may inform the supplemental method decision making process. There are 152 countries that have hospitals that have a facility that is designated as Baby Friendly and there are 434 Baby Friendly hospitals in the United States alone (WHO, 2017)

The results of this study have the potential of furthering our understanding of the supplementation practices of IBCLCs on breastfed infants who are receiving supplemental feeding. Such results illustrate where our research efforts need to be concentrated in terms of

supplementation methods for breastfed infants and how to best preserve the breastfeeding relationship when supplementation is used. It is important to note that the IBCLCs are an important member of a team dedicated professionals that promote and educate mothers on breastfeeding IBCLC's work in conjunction with providers and nurses to help provide detailed knowledge to breastfeeding mothers. It would also be extremely helpful to understand the opinions, confidence and practices of supplemental methods of both postpartum nurses and providers. There are many potential influential factors related to continued breastfeeding. Breastfeeding practices that are encouraged by health professionals in the hospital are strongly related to the cessation of breastfeeding in the first week (Taveras et al., 2004) Because supplementation has been found to be a factor in early breastfeeding cessation, it is important that practitioners promote other methods of supplementation other than the bottle (Declercq, Labbok, Sakala &O'Hara, 2008). Facilities with IBCLCs on staff with established protocols on supplementation are most likely to offer the SFTD. This may show that having a protocol may offset influences that promote the bottle. In order to reach the breastfeeding goals of WHO and Healthy People 2020, we must understand how to best promote continued breastfeeding, inclusive of supplemental feeding methods. Further understanding the factors that influence supplementation practices that effect breastfeeding outcomes will help reach these goals.

Limitations

We recognize that this study has several limitations. Although it is an international study, because the study was conducted in English, the geographic diversity was limited. With 105 countries where IBCLCs reside, a translated survey may have increased the response rate. Only 11.5% of the consultants on the email list responded limiting generalizability of the results. Lastly, the data reported herein are based on self-reported practices therefore may not reflect the

actual practices of the IBCLC respondents, lending themselves to potential social desirability biases. Survey data could have been enhanced with an open-ended question on use of supplementation devices. Several respondents used the survey cover page phone contact and left unsolicited phone and text messages. For example, one IBCLC stated "it is not up to me as a Lactation Consultant, to make any supplemental method decisions. I must do what I am told by the doctors". Another IBCLC sent a text message "I am bound by what the docs tell us. Occasionally there is an SNS (a type of SFTD) but, by no means is a mother allowed to go home with it. Bottles are all they may go home with". An added open-ended question for qualitative data might capture information that was not included in the survey.

Conclusions

These findings are an important step to understanding the supplementation practices of IBCLCs. In order to avoid discontinuation of breastfeeding, supplementation could help preserve the breastfeeding relationship, by extending the duration of receiving mother's milk , and thus allowing for increased adherence to the Healthy People 2020 goals. The results of this survey illustrate that in the US where the bottle is the preferred method of supplementation, education efforts, policies and protocols need to better address this practice.

The lack of research needed to guide evidence-based practices on the use of the SFTD as an alternative method of supplementation is likely to explain the variability and standardization in use of this method. It is imperative that research be conducted to provide concrete evidence to aid IBCLCs, providers and nurses in supplementation advice as to which supplementation methods are best.

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Figure 1. Diagram of a Supplemental Feeding Tube Device, Copy right 2017, Marcia Harstock

Figure 2- Geographic representation of respondents

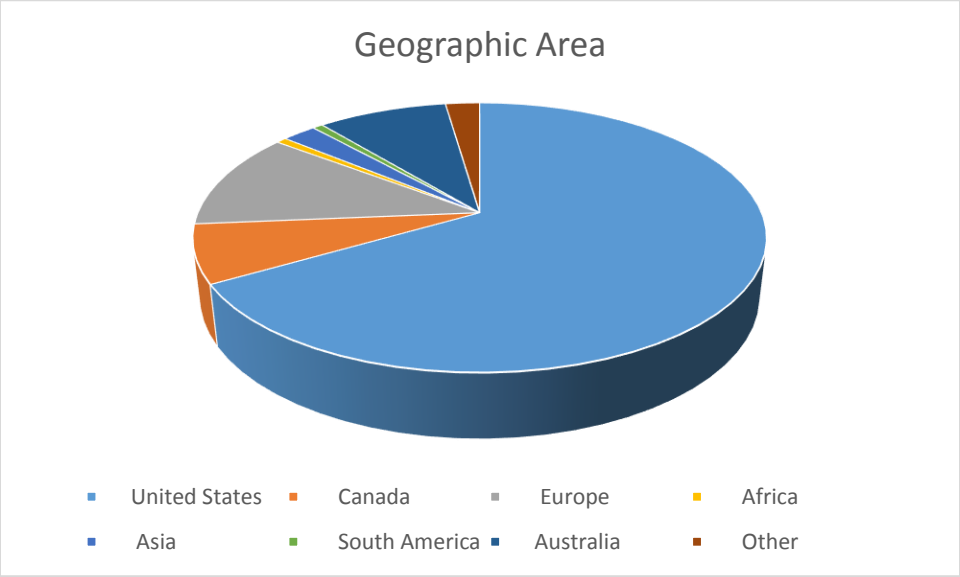
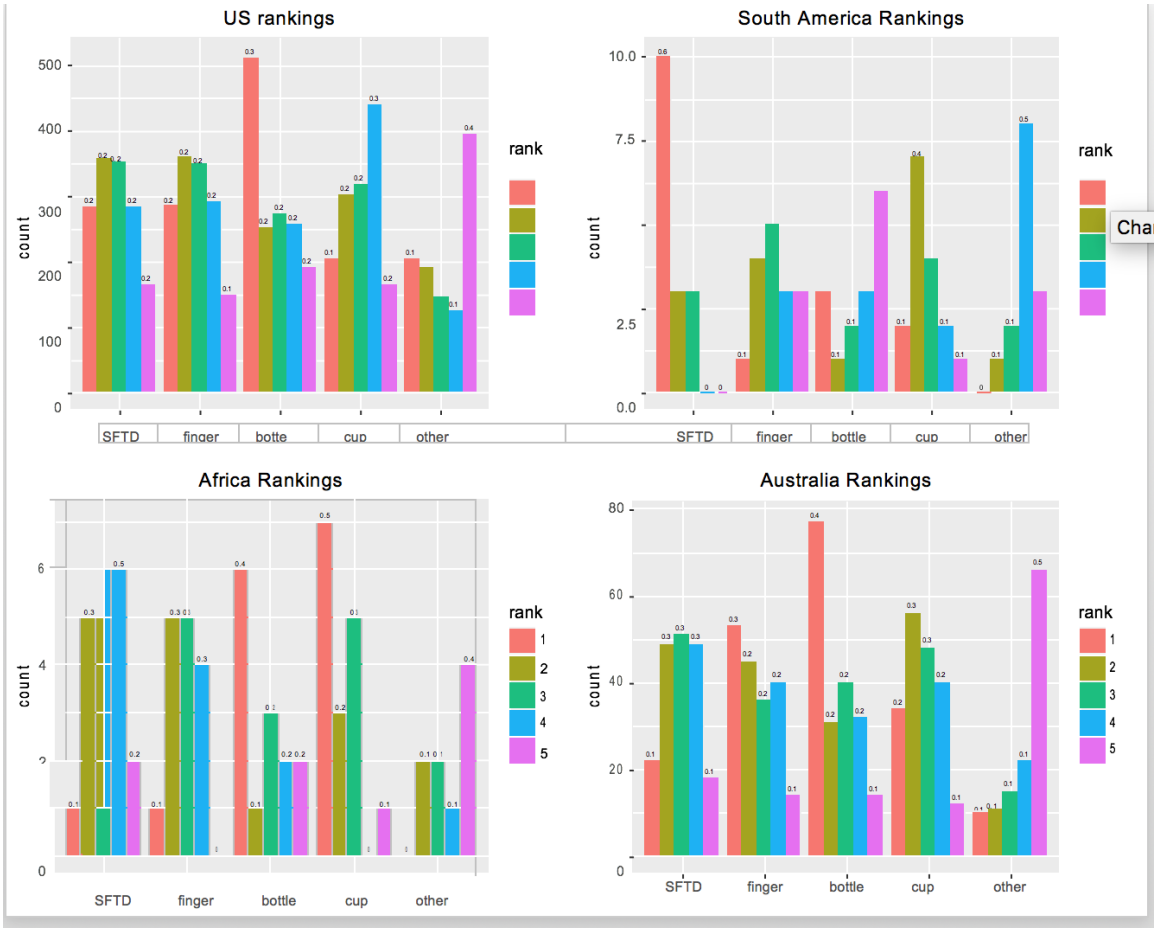


Figure 3- Barplot of Ranking of Most Often Used Supplemental Method by Geographic Location


US rankings
South America Rankings
Africa Rankings
Australia Rankings
count
rank
1
2
3
4
5
SFTD
finger
bottle
cup
other

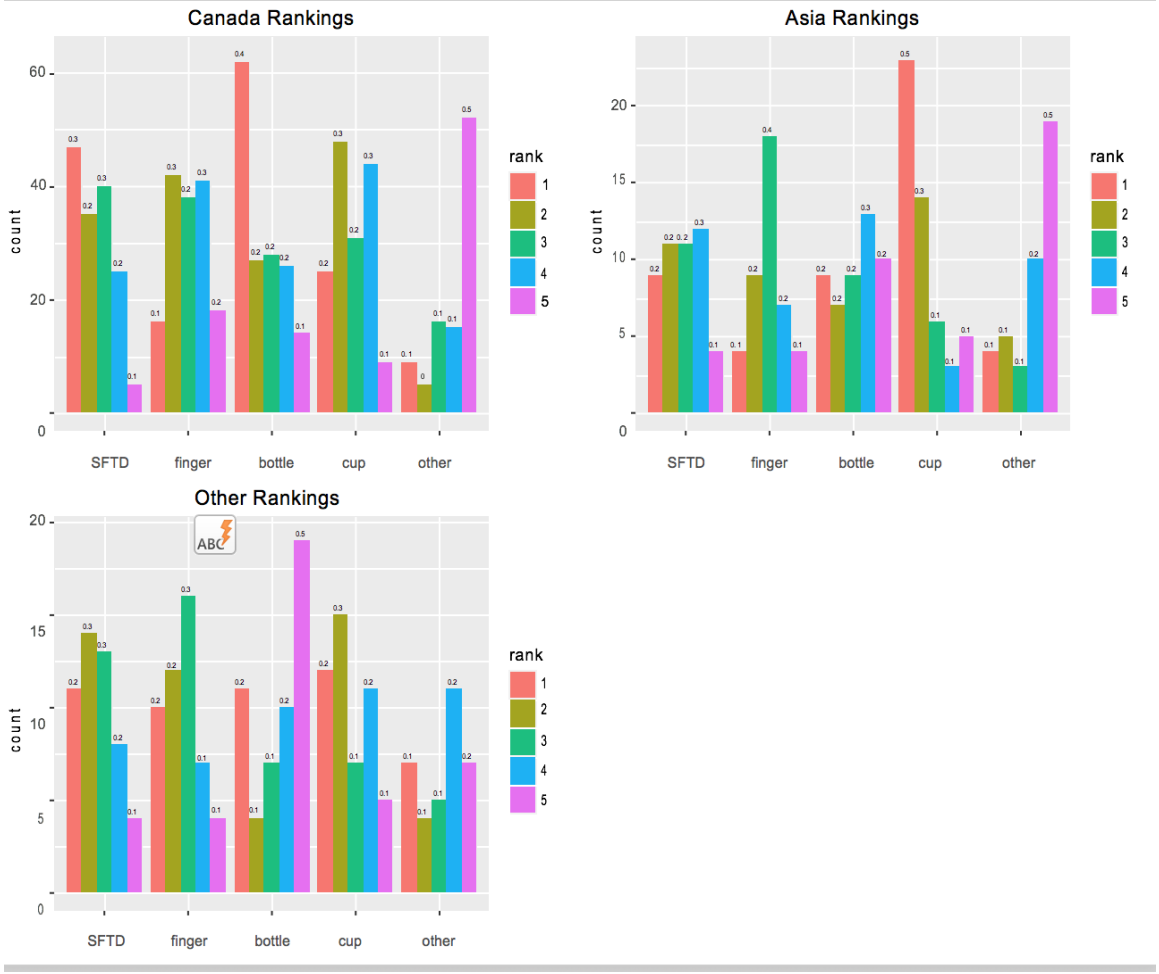
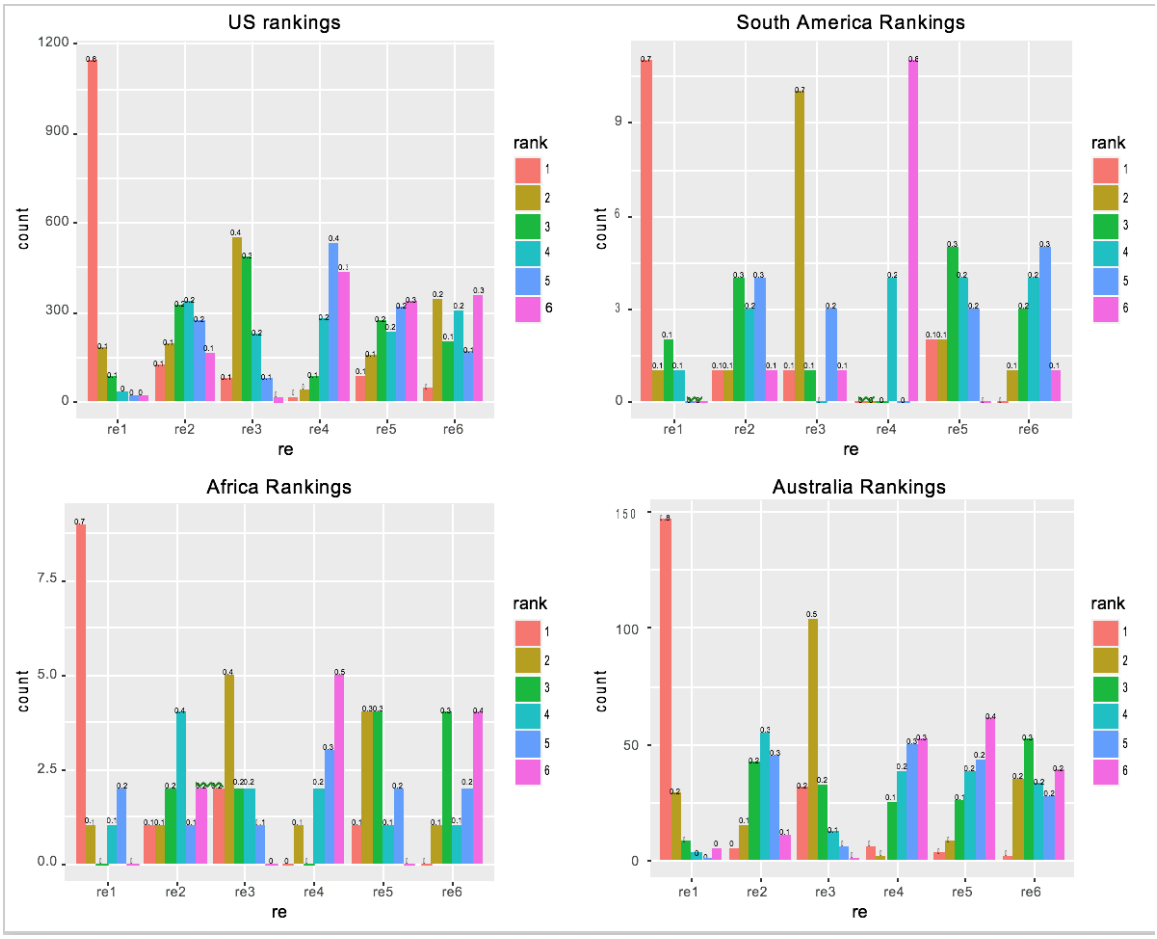

Canada Rankings
count
rank
1
2
3
4
5
SFTD
finger
bottle
cup
other
Asia Rankings
Other Rankings

Figure 4- Bar Plot of Ranking of Reasons for Supplementation by Geographic Reason



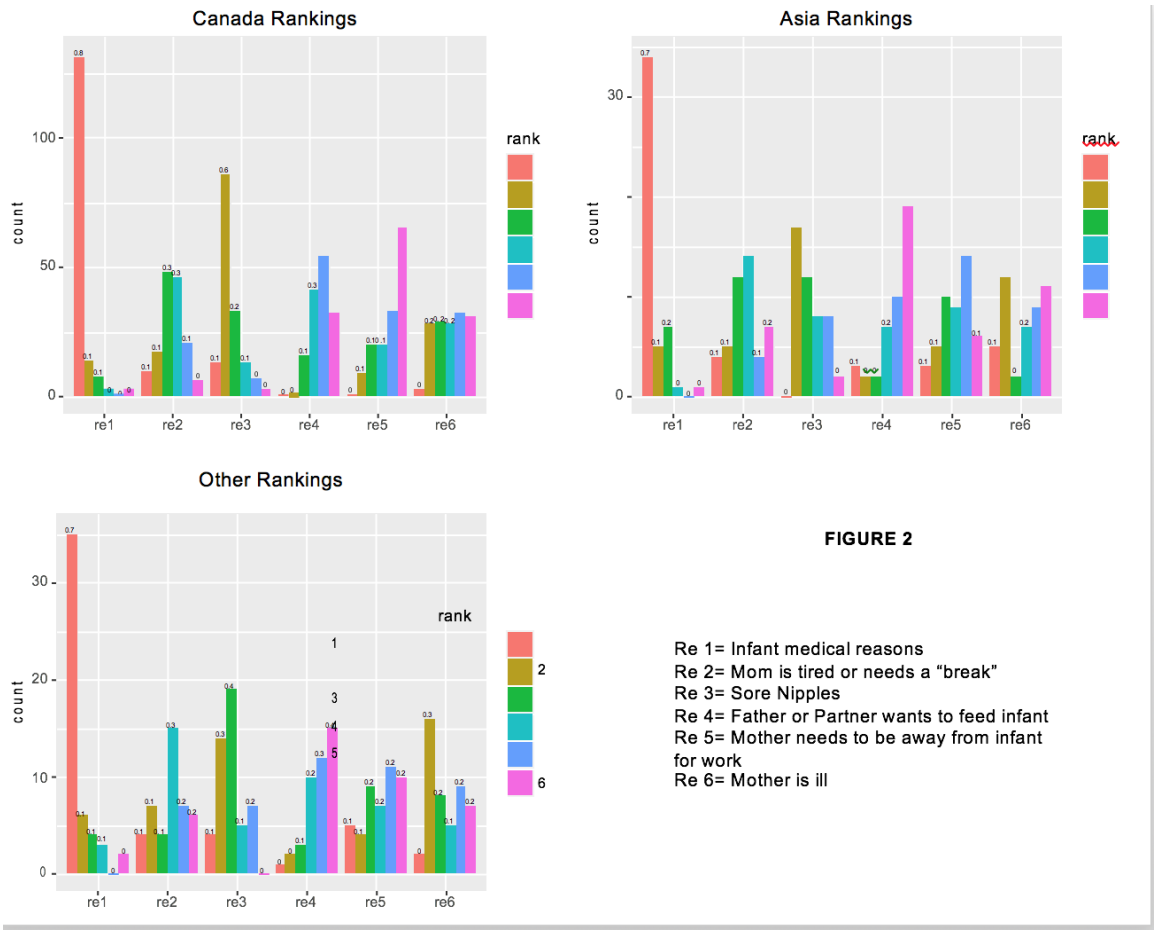


FIGURE 2

Re 1= Infant medical reasons
Re 2= Mom is tired or needs a "break"
Re 3= Sore Nipples
Re 4= Father or Partner wants to feed infant
Re 5= Mother needs to be away from infant for work
Re 6= Mother is ill

Table 1

Demographics

1. Where do you practice?

   clinic home based practice hospital

2. Do you work with premature infants, term infants or both?

   Premature Term Both

3. Does your facility have protocols regarding supplemental feeding?

   Yes No

4. Does the protocol apply to all infants?

   Yes No

5. Who determines what type of supplemental feeding is used?

   Mother Provider IBCLC Other

6. How long have you been a practicing IBCLC?

   < 1 year 0-5 years 6-10 years Over 10 years

7. What is your age?

   22-30 31-40 41-50 51-60

8. What professional license do you hold?

   Registered Nurse MD Registered Dietician Advanced Practice Registered Nurse Other

9. What is your highest level of education?

Associate College Graduate

10. What geographic area do you practice in?

United States Canada Europe Africa Asia South America Australia Other

Supplementation Questions

	Always	Very often	Sometimes	Rarely	Never
11. Mothers ask me for advice on supplementing their breast fed baby					
12. I have a preferred method of supplementation					
13. I offer the bottle as a last resort method of supplementation					
14. I offer advice and education on finger feeding as a method of supplementation					
15. I offer advice and education on the use of a Supplemental Feeding Tube Device as a method of supplementation					
16. I feel offer advice and education on cup feeding as a method of supplementation					
17. I feel confident providing advice and education on supplementing with a cup					
18. I feel confident providing advice and education on supplementing with finger feeding					
19. I feel confident providing advice and education on supplementing with a SFTD					
20. It is always clear to me what method of supplementation is best					

21. I include the mother in the decision of which supplementation method to use					
22. Mothers express to me which supplementation method they prefer					
23. The use of finger feeding is overwhelming to the mother					
24. The use of the SFTD is overwhelming to the mother					
25. The use of cup feeding is overwhelming to the mother					
26. The use of the bottle is overwhelming to the mother					

27. In ranking order list the most often used Supplemental Feeding Device

SFTD Finger feeding Bottle Cup Other

28. What is your most preferred method of supplementation?

SFTD Finger feeding Bottle Cup Other

29. Which supplementation method that you feel preserves the breastfeeding relationship the most

SFTD Finger feeding Bottle Cup Other

30. In ranking order, rank the most common reasons for supplementation in your practice area (from most to least)

Infant Medical reasons (Such as weight loss, hyperbilirubina, dehydration)
Mom is tired or needs a break
Sore nipples
Father/Partner wants to feed the baby
Mother needs to go to work
Mother is ill

TABLE 2. Demographics of Questionnaire Participants

Participants	**N= 2308**	**Percent**
Practice area	**Total- 2296**	
Hospital	1413.	61.2
Health Clinic	468.	20.4
Home Based Practice	415	18.0
Work with what type of infants	**Total-2300**	
Premature	22	1.0
Term	370	16.0
Both	1908	82.7
Age	**Total-2302**	
22-30	55	2.4
31-40	459	19.9
41-50	556	24.2
51-60	789	34.4
Over 60	443	19.2
Education	**Total- 2238**	
Associates Degree	340	15.2
College Degree	1009	45.1
Graduate Degree	889	39.7
Years practicing as IBCLC	**Total- 2301**	
<1 year	47	2.0
1-5 years	721	31.3
6-10 years	573	24.9
Over 10 years	960	41.7
Geographic Area	**Total- 2304**	
United States	1536	66.6
Canada	161	7.0
Europe	268	11.6
Africa	16	.7
Asia	53	2.3
South America	16	.7
Australia	201	8.7

Other	53	2.3
Professional License	**Total-2221**	
Registered Nurse	1376	62.0
MD	89	4.0
Registered Dietician	63	2.8
Advanced Practice Nurse	156	7.0
Other	537	24.2

Table 3- Table of Comparison of Supplemental Choice and Geographic Region

Kruskal-Wallis Tests for Supplement Questions			
Supplemental method	Kruskal-Wallis chi-squared	df	p-value
1.SFTD	36.531	7	5.755e-06*
2.Finger Feed	17.152	7	0.01644*
3.Bottle	48.236	7	3.201e-08*
4.Cup	87.62	7	3.81e-16*
5.Other	41.357	7	6.914e-07*

Kruskal-Wallis results, all the tests were statisticaly significant

Table 4- Comparison of Reason for Supplement and Geographic Region

Kruskal-Wallis Tests for Reasons Questions			
Reason	Kruskal-Wallis chi- squared	df	p-value
1.Infant medical	6.5111	7	0.4815
2.Mom tired	11.957	7	0.102
3.Sore nipples	79.324	7	1.892e-14*
4.Partner wants to feed	18.722	7	0.009104*
5.Mother needs to go to work	66.947	7	6.102e-12*
6.Mother is ill	7.3434	7	0.394

Kruskal-Wallis results, reasons 3-5 were statistically significant

Chapter 4

Frances Penny

University of Connecticut

Breastfeeding Mothers' use of a Supplemental Feeding Tube Device

Frances Penny

University of Connecticut

Frances Penny, RN, BSN, MPH, IBCLC[a, b]
Michelle Judge, PhD[b]
Elizabeth A. Brownell, PhD[c, d]
Mary Marshall-Crim MSN, FNP-BC, IBCLC[e]
Jacqueline M. McGrath, RN, PhD, FNAP, FAAN[b, c]

Corresponding Author:
Frances Penny
12 Acorn Drive
Old Saybrook, CT
06475
860-575-3449

[a] Southern Connecticut State University, School of Nursing, New Haven, CT
[b] University of Connecticut, School of Nursing, Storrs, CT
[c] Connecticut Children's Medical Center, Hartford, CT
[d] University of Connecticut, School of Medicine, Farmington, CT
[e] Hartford Hospital, Hartford, CT

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ABSTRACT

Objective: To describe the use of a Supplemental Feeding Tube Device by breastfeeding mothers as an alternative feeding method through exploring its relationship to continued breastfeeding. Also, to explore the relationship between LATCH scores at 2-3 days of life, the use of the SFTD, other feeding methods and mothers' breastfeeding satisfaction using the Maternal Breastfeeding Evaluation Scale (MBFES) at 4 weeks of age.

Design: A descriptive exploratory design with quantitative analysis augmented by qualitative questions and responses.

Setting: Data collection began in the post partum unit at a medium-sized hospital, in northeast America and continued in the home setting.

Participants: Forty breastfeeding mothers who had already chosen to use a SFTD to supplement their breastfed babies.

Methods: Mothers were enrolled at the hospital and a LATCH score was obtained by observation by the first author and Lactation Consultant. At one month, the MBFES was administered over the phone and participants answered questions regarding SFTD use, pumping, bottle use, and breastfeeding duration status.

Results: Breastfeeding outcomes at 4 weeks were independent of LATCH scores during the hospital stay. Maternal breastfeeding satisfaction did not reach high levels for mothers supplementing with either the SFTD or bottles. Use of the SFTD had no relationship to breastfeeding outcomes at 4 weeks, however, for every bottle use, a mother was 30% less likely to breastfeed at a medium/high/exclusive level (OR=.67, CI .510-8.98; p=.007).

Conclusion: When a mother is supplementing, the SFTD method that may help preserve the breastfeeding relationship by acting as a substitute for bottles, which can inhibit continued breastfeeding.

Introduction

The universal understanding that breast milk is the ideal and optimal source of nutrition has been well established by health care professionals (American Academy of Pediatrics, 2009; World Health Organization, 2003).

As a recognized health priority, the United States Department of Health and Human Services (2012) identified breastfeeding goals, through its Health People 2020. The recommendation for breastfeeding initiation in the U.S; to be 81% by 2020 with a current rate 79% for breastfeeding initiation. The goal for exclusive breastfeeding at 3 months and 6 months is to reach 46% and 25% respectively, with the current rates at only 44% and 22%. The goal for any type of breastfeeding at 6 months is 60%. Of infants born in 2011, 49% were still breastfeeding at 6 months and only 27% at 12 months (CDC, 2014). These statistics provide helpful data to illustrate that we are still far from reaching our 2020 goals (CDC, 2011; Office of Disease Prevention and Health Promotion, 2016)

The World Health Organization's development of the Baby-Friendly Hospital Initiative (1991) and its Ten Steps has emphasized the importance of providing breastfeeding support and implementing policies within the hospital to facilitate increased breastfeeding rates. The World Health Organization (WHO) and the United Nation's Children's Fund (UNICEF) launched the Baby Friendly Initiative's program in 1991 as a global effort to encourage and offer recognition to hospitals and birthing centers that offer the highest level of support for breastfeeding mothers. Step Nine of these Ten Steps states: "Give no pacifiers or artificial nipples to breastfeeding infants" (Baby-Friendly USA Inc., 2010). Supportive initiatives related to this step have led to the use of feeding devices that are alternatives to bottles and artificial nipples. When breastfeeding mothers are having difficulty breastfeeding, but still wish for the infants to receive human milk, mothers may turn to the use of feeding devices with the intent of preserving the breastfeeding relationship. These feeding devices include cups, syringes and supplemental feeding tube devices (SFTD). The SFTD is a device that has a container with a small tube, much like a feeding tube, attached. The tube is taped to the mother's nipple and the container is attached to her shirt or garment at a level above the breast (See Figure 1).

Figure 1. Diagram of a Supplemental Feeding Tube Device, Copy right 2017, Marcia Harstock

Though there have been many studies on the use of cups as an alternative feeding method, there have been very few studies on the use of SFTD as an alternative method and yet, in the clinical setting, these devices continue to be commonly used to assist breastfeeding mothers (Abouelfettoh, Dowling, Dabash, Elguindy, & Seoud, 2008; Dowling, Meier, DiFiore, Blatz, & Martin, 2002). There is onlyonly one published study in the literature that was performed examining the use of a SFTD as the main focus of the research. This qualitative study, published in 2005, is a naturalistic inquiry that examines the mothers' experiences with the use of SFTD. The study used purposive sampling of 22 breastfeeding or partially breastfeeding mothers. The data were gathered through interactive structured and semi-structured interviews. The results of the study showed mothers had both positive and negative experiences with the SFTD. This is the only study found in the literature dedicated specifically to examining the use of SFTDs (Borucki, 2005). The study did not explore the outcomes of SFTDs use in terms of breastfeeding length or duration. The SFTD is a very common device that is used by lactation consultants and nurses to aid mothers who wish to continue breastfeeding but are having difficulty either with transition to breastfeeding or continuation of breastfeeding. With the promoted use of this device by nurses and lactation consultants, it is important to understand its relationship to continued breastfeeding, especially in Baby-Friendly hospitals. Alternative feeding methods are recommended when a mother is having difficulty breastfeeding. It is important to establish a baseline understanding of the baby's breastfeeding progress. The LATCH assessment tool is common tool used in the hospital setting to assess an infants' breastfeeding ability by looking at the infant's latch, audible swallow, nipple type, comfort, and assistance with holding infant. There are other breastfeeding assessment tools that can be used,

however this is the tool used at the study facility. Mothers who would like to breastfeed their babies but require supplemental feedings, need an alternative feeding method that will best preserve the breastfeeding relationship and allow the most positive breastfeeding experience.

The purpose of this study is to describe the use of a SFTD by breastfeeding mothers as an alternative feeding method through exploring its relationship to continued breastfeeding. This study will also examine mothers' satisfaction with breastfeeding when using the SFTD using the Maternal Breastfeeding Evaluation Scale (MBFES). Maternal Satisfaction, through the MBFES, has been shown to have an effect on breastfeeding cessation, with low scores related to early cessation (Cooke & Schmied, 2005; Cooke & Schmied, 2003).

Aim 1: Explore the relationship of the LATCH score from the first 2-3 days of life, SFTD use and continuation of breastfeeding through 4 weeks of age.

Aim 2: Explore the relationship between the MBFES score as well as the scores of the subscales at four weeks and continued breastfeeding at 4 weeks.

Aim 3: Explore the relationship of the use of the SFTD and continued breastfeeding at 4 weeks.

Background/Significance

Breastfeeding is associated with a multitude of infant and maternal benefits and is promoted throughout the world as the best source of infant nutrition. The American Academy of Pediatrics [AAP] considers breast milk to be the optimal source for infant nutrition, recommending exclusive breastfeeding for the first 6 months of life, followed by breastfeeding along with the introduction of other forms of nutrition, for the remainder of the first year or longer (2009). The Institute of Medicine (IOM) and the World Health Organization (WHO)

support this position statement. (Eidelman & Schanler, 2012; WHO, 2003). Yet, even with this emphasis on the importance of breastfeeding, US breastfeeding rates have yet to reach the goals of Healthy People 2020.

The WHO's Baby-Friendly Hospital Initiative (1991) and its Ten Steps has emphasized the importance of providing breastfeeding support and enforcing policies within the hospital and birthing setting to facilitate increased breastfeeding rates. Currently, there are 434 hospitals in the United States that are designated as Baby-Friendly with 12% of births occurring at Baby Friendly hospitals (Baby Friendly-USA, 2010). To be awarded Baby Friendly status, hospitals must adopt the Ten Steps of Successful Breastfeeding. These Ten Steps are as follows:

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 half an hour of birth.
5. Show mothers how to breastfeed, and how to 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.

The Ten Steps to Successful Breastfeeding were developed by a group of experts around the globe and consist of evidence-based practices that have been shown to increase breastfeeding initiation and duration (Baby Friendly USA Inc., 2010). Hospitals that implement the Ten Steps exhibit an increase in breastfeeding rates (Merewood, Mehta, Chamberlain, Philipp & Bauchner, 2005). Step Nine of the Ten Steps states: "Give no pacifiers or artificial nipples to breastfeeding infants" (Baby Friendly USA Inc., 2010). The AAP, UNICEF and Academy of Breastfeeding Medicine (ABM) all recommend that supplementation for breastfed infants be performed using methods other than the bottle (AAP, 2010). Often to avoid the use of artificial nipples, lactation consultants and nurses utilize various alternative methods of feeding to avoid using bottles. These alternative methods of feeding include cup feeding, finger feeding and the use of a lactation aid or supplemental feeding tube device (SFTD). The standardized use of a SFTD enables a hospital to adhere to Step Nine of the BFI by allowing the avoidance of bottle use to help meet the goals of this step.

Many hospitals throughout the world use supplemental feeding methods other than the bottle, with cup feeding being the most common strategy used outside the United States (Gupta, Khanna, & Chattree, 1999). Though there has been research conducted on cup feeding as an alternative feeding method for breastfed infants, there is very little research on the use of other supplemental feeding devices (Abouelfettoh, Dowling, Dabash, Elguindy, & Seoud, 2008; Eidelman & Schanler, 2012). Although a SFTD is a commonly used device, there are no statistics on how many women have used it, its efficacy to sustain breastfeeding and whether women find it beneficial for them and their babies. Though there is no clinical evidence cited, the use of such a device is recommended by the American Academy of Family Physicians, United

States Breastfeeding Committee and many state health departments such as in Indiana and California (USbreastfeeding.org, 2014, AAFP, 2014). It is also recommended that nurses who care for newborns be familiar with the use of SFTD (Spatz, 2005).

The SFTD is used when mothers wish to breastfeed their babies but they need or choose to supplement without using a bottle. There are many reasons that mothers are unable to successfully breastfeed. These factors associated with a maternal decision of early cessation of breastfeeding include inadequate milk supply/perception of inadequate milk supply, latching difficulty, and pain (Brand, Kothari, & Stark, 2011; Gatti, 2008; Kirkland and Fein, 2003).

When breastfeeding mothers are having difficulty breastfeeding, but wish for their babies to still receive breast milk, they turn to other methods for feeding their babies. These methods include a bottle, syringe, a cup or a supplemental feeding device (SFTD). Medical reasons for supplementation include hyperbilirubemia, insufficient milk intake, delayed bowel movements, and hypoglycemia unresponsive to breastfeeding (Chantry, 2009). The reasons for supplementation without a medical indication, include not understanding their babies' needs, or feedings cues or generally not understanding the demands of the baby, maternal fatigue, and other general breastfeeding problems (DaMota, et al, 2012).

Alternative Supplemental Feeding Methods

There has been much debate on the use of bottles to supplement breastfed infants. Many practitioners do not believe that use of the bottle can have negative effects on breastfeeding outcomes (Al-Sahab, Feldman, Macpherson, Ohlsson, & Tamim, 2010).

A survey in Canada explored the opinions of practitioners on supplementation practices. Only 44% of the nurses surveyed and 56% of pediatricians believed that nipple confusion is an issue (Al-Sahab, Feldman, Macpherson, Ohlsson, & Tamim, 2010).

Three studies conducted with preterm infants showed that breastfeeding outcomes were better among the cup fed infants. One study showed that infants in the cup fed group were more likely to be exclusively breastfed at discharge and one week after discharge (Albouelfettoh, Dowling, Dabash, El Gundy & Seoud, 2008; Collins et all, 2004; Gilkes and Watkinson, 2004; Yilmaz et al, 2014). A non-randomized Taiwanese quantitative study compared 67 cup fed-only infants, 62 bottle fed-only infants and 76 exclusively breastfed infants. This study concluded that the bottle-fed group had problems with the ability to latch at three days of age as well as a decreased perception of milk supply by the mothers. These results led the authors to conclude that bottle-feeding is not the optimal choice for supplementation in breastfed infants (Huang, Gau, Haung & Lee, 2009). Evidence for the Ten Steps to Successful Breastfeeding, included evidence that supplementation with a bottle led to more weaning and less exclusive breastfeeding (Lang, Lawrence, Orme, 1994; Cronenwett et all, 1992; WHO, 1998).

Of the limited research that has been conducted involving women who use a SFTD, women reported that the use of SFTD was helpful in keeping the baby at the breast and allowed stimulation of the breast to increase milk supply (Cheales-Siebenales, 1999). A study completed with 366 mothers attempting to re-lactate for various reasons, concluded that the SFTD was reported as the optimal method of supplementation in the mother's opinion (Auerbach & Avery, 1980). In another report of three case studies involving mothers who experienced lactation failure, all three used the Lact-aid device for supplementation and had babies that nursed for 6 months to a year, using this device. For these mothers normal breastfeeding was not resolved due to lack of glandular development. Other studies involve adoptive mothers and re-lactating after lactation failure (Bose, et al., 1981; Bryant, 2006). One study examined breastfeeding patterns of low birth weight infants in Finland. In this study, 16 mothers used the Lact-aid

system and 8 reported that it was beneficial (Verronen, 1985). As previously mentioned, there is only one study that was performed examining the use of a SFTD as the main focus of the research. This qualitative study published in 2005 is a naturalistic inquiry explores mothers' experiences with the use of this device.

In commentary articles, authors have advised that more research should be conducted on this type of supplemental feeding (Bandara, Nyqvist, Musmar, Procaccini & Wang, 2012). In a recently published commentary article, there was a round table discussion on this topic with physicians from 5 hospitals in Palestine, Shri Lanka, Sweden, Taiwan and the United States (Bandara, Nyqvis, Musmar, Procaccini & Wang, 2012). In this round table discussion, members discuss their opinions and reasons for alternative feeding methods. All members agree that methods other than the bottle are best for preserving breastfeeding. One member from the US (an IBCLC from New Jersey) discussed the use of a SFTD and stated "we don't think this method is user friendly" (Bandara et al, 2012, p. 123).

Methods

Design

This study used descriptive exploratory design with quantitative analysis augmented by open-ended qualitative questions and responses.

Sample

Data were collected by purposeful sampling from the post-partum unit at Hartford Hospital, a medium-sized hospital, in Hartford, Connecticut. This hospital has approximately 4000 births per year or slightly over 330 births per month. The Lactation Department at the

hospital has been using the SFTD for over 10 years as a method of supplementation for breastfeeding mothers. The inclusion criteria were breastfeeding mothers who had already chosen to use a SFTD to supplement their breastfed term babies, mothers, 18 years or older and who read and spoke English. Any mothers that were under age 18 or had babies that were born less than 37 weeks gestation, or had any major health problems that would inhibit breastfeeding, such as cleft lip or palate, were excluded from the study.

Study Procedure

After the mother provided consent, the principal investigator (PI) performed an initial LATCH breastfeeding assessment score while observing a breastfeeding session prior to hospital discharge. Study participants were contacted by the first author at one month of age to complete the MBFES (Maternal Breastfeeding Evaluation Scale) questionnaire by phone. During this phone call, the mother was also asked how often she used the SFTD and the answers were recorded. In addition, participants were asked to answer five open-ended questions regarding perception of SFTD and related benefits and/or challenges and one question to define how much they are breastfeeding using definitions of Labbok and Krasovec (1990).

Study Instruments:

Two standardized instruments were used in this study: the LATCH breastfeeding assessment tool and the Maternal Breastfeeding Evaluation Scale (MBFES).

LATCH assessment tool: The LATCH assessment tool was developed by Jensen and colleagues to provide a systematic assessment for the mother/infant breastfeeding dyad (Jensen, Wallace & Kelsay, 1994). It is commonly used in the hospital setting for communication

between staff. This first published article did not discuss an alpha reliability or interrater reliability scores. There are conflicting results related to reliability and validity of the LATCH tool. One study tested validity of this tool by using Spearman correlation coefficients among raters' scores, among scores on other assessment tools (IBFAT and the Mother-Baby Assessment tool) and between test-retest among raters for the items on the tools (Riordan & Koehn, 1997). The authors discuss the fact that the three tools measure the same construct (effective breastfeeding) therefore a high correlation between the scores on each would represent construct validity. For the LATCH tool, this study found only a correlation of 0.11, 0.46 and 0.48 among three postpartum nurse raters. Spearman correlation coefficients to related scores among the three breastfeeding tools ranged from .68 to .78. However, a more recent article, also by one of the same authors, found a significant correlation between mothers' and nurses' assessment scores ($r= 0.58$, $p<0.05$) and both were positively correlated with the breastfeeding duration. The authors concluded that the LATCH tool was considered at valid tool (Riordan, Bibb, Miller & Rawlins, 2001). Another study also found it to be valid tool with a 94% professional interrater agreement of LATCH scoring (Adams & Howell, 1997). In the most recent study, the authors examined three different breastfeeding assessment tools and found positive and significant correlations with reported correlation coefficients that ranged between 0.85 and 0.91 for the total LATCH score between the three raters (Altunas, et al., 2014).

The LATCH assessment is usually performed at least once a shift by the nurse or lactation consultant. The assessor assigns a score of 0, 1, or 2 to five different components of breastfeeding. The five components are: latch (L); audible swallowing (A); nipple type (T); mother's comfort level (C); and amount of help mother needs to hold baby to the breast (H). Scores can range between zero and 10 with higher scores representing more successful

breastfeeding. In this study the LATCH assessment was completed once by the author at 2-3 days of age just prior to discharge.

Maternal Breastfeeding Evaluation Tool (MBFES): The MBFES is a reliable and valid measure of maternal evaluation of the breastfeeding experience (Leff, Jefferis, Gagne, 1994; Riordan, Woodley, & Heaton, 1994). The MBFES was developed "to evaluate a different aspect of breastfeeding-the mothers perception of success, based on criteria identified as important by breastfeeding women" (Leff, Jefferies & Gagne, 1994, p. 106). It contains 3 sub scales: Maternal Enjoyment/Role Attainment (14 items with a score between 14 and 70), Infant Satisfaction/Growth (8 items with a score between 8-40) and Lifestyle/Maternal body image 8 items with a score between 8 and 40). The MBFES consists of a 5-point Likert scale with 30 questions and a possible score range of 30 to150. A higher score exhibits higher satisfaction perceived by the mother. The total score of the MBFES, as well as the subscales of the MBFES, have been shown to have a positive relationship with the initiation and duration of breastfeeding (Leff et al., 1994; Riordan et al., 1994). Permission to use this tool was granted by its author Ellen Leff in February, 2015.

The MBFES has been the focus of many breastfeeding research studies. One study examined the relationship of LATCH scores at 12 hours and 1 week postpartum with maternal satisfaction using the MBFES (Schlomer, Kemmerer, Twiss, 1999). This study demonstrated a positive, but not significant, correlation between the LATCH scores and the scores on the MBFES suggesting that maternal satisfaction with breastfeeding may be independent of breast feeding problems. Another study in Australia used the subscale of maternal role attainment of the MBFES to examine how maternal role attainment related to maternal distress, breastfeeding

cessation and breastfeeding problems (Cooke & Schmied, 2005). The results of this study showed that women who breastfed longer had a higher score on the maternal role attainment subscale.

Another study examined the relationship between weaning in the first 3 months and maternal breastfeeding satisfaction as measured by the MBFES (Cooke, Sheehan & Schmied, 2003). This study demonstrated that having breastfeeding problems significantly decreased the unadjusted mean satisfaction scores of all the subscales. Women with low maternal breastfeeding satisfaction scores, compared to medium or high satisfaction scores were more likely to have weaned at 6 weeks or 3 months

The MBFES has been used in United States, Canada, Australia and Scotland. The instrument was used in a study to examine the effect of peer support on breastfeeding duration and maternal satisfaction (Dennis, Hodnett, Gallop, & Chalmers, 2002). It was also used to determine the influences of socio-demographic, psychosocial, and perinatal factors on the subscales of the MBFES, infant satisfaction and growth (Seminic, Loiselle & Gottlieb, 2008).

Analysis

To characterize the sample, Demographic information was reported using descriptive analyses that used means, standard deviations, ranges, and percentages. A Chi-square test of independence was performed to examine the relation between demographics and continued breastfeeding at 4 weeks. Logistic regression was performed for each demographic variable to assess the impact breastfeeding at 4 weeks (age, race, parity, breastfeeding experience and birth type). Additionally, we reported descriptive data on MBFES scores as well as Independent t-test to examine the means between the scores of the none/low breast feeders and the medium/high/exclusive breast feeders. The category none/low breastfeeders was defined as none

to less than 20% of feeds as breastfeeds. Medium/high/exclusive was defined as greater than 20% breastfeeding to all feeds were breastfeeds.

Answers to open ended questions were analyzed through content analysis. Content analysis is "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use" (Krippendorf, p. 24). The method involved inductive content analysis and included open coding, creating categories, and abstraction. Open coding means that notes and headings are written in the text while reading participants' responses. Categories were created in order to describe a common phenomenon. Abstraction formulates a general description of the topic through the generated categories. (Polit & Beck, 2004). Dendograms, which are tree-like diagrams, were created to help organized data into groups of themes. Missing demographic data was coded as a "99". Any missing data involved list-wise deletion, or complete case.

Results

Demographics and breastfeeding outcomes.

There were 43 mothers that were approached to take part in the study. The study had a very high rate of consent with all 43 (100%) agreed to participate. Three of the mothers that agreed to be part of the study dropped out at the 4-week phone call; of these two women were lost to follow-up, and one mother refused to answer any further questions. Therefore, a total of 40 mothers completed the study.

The age range of the mothers was between 25 and 40 with a mean age of 30.9 and a SD =3.8. The majority of the mothers, 52.5%, were Caucasian. Latino mothers made up the next largest racial group at 25%. The parity of the mothers ranged between 1 and 6 with the majority

of mothers in the study having this be their first infant. The birth types were almost equal with vaginal births making up 47.5% of the population and C-sections making up 52.5 % of the population. Of the 40 mothers enrolled in the study, 72.5% had never breastfed before (Table 1).

At four weeks, only one mother was still exclusively breastfeeding. Only 17.5% of the mothers were breastfeeding at a high level (n= 7). There were 27.5% (n=11) of mothers that were breastfeeding at the partial medium level and 30% (n=12) were in the partial low and 22.5% (n=9) had stopped breastfeeding(Table 2). Demographic variables were broken down into categories in a cross tabulation of none/low breast feeders and medium/high/exclusive breast feeders (Table 3).

Statistical tests were run to determine if the demographic variable had any association with the breastfeeding outcomes. Race was broken into three groups; Asians and Indians were in Group 1, African Americans and Latinos were in Group 2 and Caucasians were in group 3. A Chi-Square test showed that Asians and Indians were more likely to be breast feeders in the medium/high/exclusive group, however, the result was not significant (X^2=2.26, p=.343) Binary logistic regression was performed to assess the impact of race on breastfeeding outcomes at 4 weeks. The result showed that Asians were 2.2 times as likely to breastfeed than whites (Odds ratio 2.2; CI 3. 29-14.76; p=.416) and that blacks were less likely to breastfeed than whites but it was not significant (OR .49; CI .11-2.1; p=.335).

A binary logistic regression was performed on the impact of age on whether mothers would be none/low or medium/high/exclusive breastfeeding group. The results showed that for every year that is added of age, women were 2.8 % times more likely to breast feed at a medium or high amount however these results were not significant (OR 1.03; CI .87-1.21;p=.75) (Table

4).

As indicated through a Chi-square test for independence there was also no significant association between birth type and breastfeeding at 4 weeks, (X^2 =.123, p=.726). Logistic regression was performed to assess the impact of birth type on breastfeeding at 4 weeks. No significance was indicated (OR=1.25; CI .358-4.363; p=.726).

The number of mothers that had more than one child (parity of 2 or more) also had no significant association with breastfeeding at 4 weeks, (X^2 =1.32, p=.25). Binary logistic analysis revealed that a mother is 2.2 times more likely to breastfeed at the medium/high/exclusive rate than primiparous women, however, difference between was not significant (OR 2.2, p=.254)

Lastly, past breastfeeding experience was also found to have no significant association through Chi-square analysis, (X^2 =457, p=.499) and Binary logistic analysis showed that mothers who had breastfed before were 1.6 times more likely to breastfeed at a medium/high/exclusive level but there was no statistical significance of association of breastfeeding experience and breastfeeding outcomes (OR=1.7; CI .147-2.55; p=.50). Binary logistic regression results are illustrated in Table 4.

MBFES and LATCH scores

LATCH score was grouped into low (0-5), medium (6-8), and high (9-10).
Using binary logistic regression, there was no significant predictive relationship between LATCH score and breastfeeding outcomes at any of the LATCH score levels (p=.495, p=.7 and p=.6). The MBFES scores in this group ranged from 86-120 with a mean score of 101 (Table 5) and a SD of 8.25. The MBFES was categorized into three groups, high (>126), medium (110-126) and low (<110). These categories have used in other research articles where the MBFES

was studied in relation to continued breastfeeding (Cooke, Sheehan & Schmied, 2003). Mothers in the none/low breastfeeding group had a mean score of MBFES total of 99.6 whereas mothers in the medium/high/exclusive groups had a mean score of 104.5. There was a total 56.3 % of mothers in the none/low breastfeeding group scored low on the MBFES, whereas 43.8% of mothers in the medium/high/exclusive group scored low on the MBFES. Those scoring in the medium level on the MBFES was equivocal between none/low breast feeders (50%) and medium/high/exclusive breast feeders (Figure 3). There were not any mothers that scored in the high level on the MBFES. Binary logistic regression revealed that though there was no significance for relationship of MBFES and breastfeeding outcome (OR= 1.29; CI .272-6.069; p=.751), the odds ratio showed that mothers in the medium scoring MBFES group were 28% more likely to breastfeed at a medium/high/exclusive rate at four weeks (Table 5).

MBFES subscales

The mean for the Maternal Enjoyment subscale was higher in the medium/high/exclusive group (M=60.39, SD=8.34) than the none/low breastfeeding group (M=51.64, SD=9.24). Infant Satisfaction mean was the same for both none/low and medium/high/exclusive breast feeders (M=24.32, SD=3.5; and M=24.28, SD=3.20). The Lifestyle subscale mean was higher for the none/low group (M=24.18, SD=5.38) compared to medium/ high/exclusive (M=21.67, SD=4.22) (Figure 3).

An independent T-test was performed on MBFES and all three scales to examine differences between none/low group and the medium/high/exclusive group. There was a significant difference in the mean for Maternal Enjoyment (p=.004) and for Lifestyle (p=.024).

Use of SFTD and breastfeeding

Through binary logistic regression, analysis failed to demonstrate an increase in the odds of breastfeeding at a medium/high/exclusive by the use of the SFTD total times used (OR 1.0; CI .967-1.009; p=.68). However, the more bottles used per day, the less likely a mother would be breastfeeding at a medium/high/exclusive rate. As bottle use per day increased, the odds of breastfeeding at a medium/high/exclusive rate decreased (OR=.67, CI .510-8.98; p=.007). Therefore, a mother was about 30% less likely to breastfeed at a medium/high/exclusive rate with every bottle use per day. Also, by adding SFTD use to the model, analysis revealed that the bottle use per day has a statistical significance that is independent of SFTD uses per day (OR=.67; CI .491-.906; p=.01) (Table 6). A Pearson's correlation coefficient revealed a statistically significant correlation between bottle use and SFDT use (r= -.377, p=.018). As bottle use increases, the SFTD use decreases (Figure 2). There was a negative association of the number of bottles used per day and odds of breastfeeding at a medium, high, or exclusive amount.

The adjusted model containing both predictors was statistically significant, X^2 (N=40)=9.40, p=.009 indicates that the model was able to distinguish between none/low and medium/high/exclusive breast feeders. The model as a whole explained between 21.4% (Cox and Snell R square) and 28.7% (Nagle Kerke R squared) of the variance in breast feeding status and correctly classified 71.8% of cases. Only "bottle use per day" made a significant contribution to the model (p=.002).

The use of both methods (bottle usage and SFTD usage) together decreased an outcome of breastfeeding at 4 weeks (OR=.77; CI .597-.992; p=.04). As previously stated, there was a relationship between bottle use and SFTD. For every time the SFTD is used, bottle use decreases

(p=.01). Additionally, analysis using ANOVA revealed that there was a significant effect of the SFTD use per day on bottle use per day (F=6.142, p=.018).

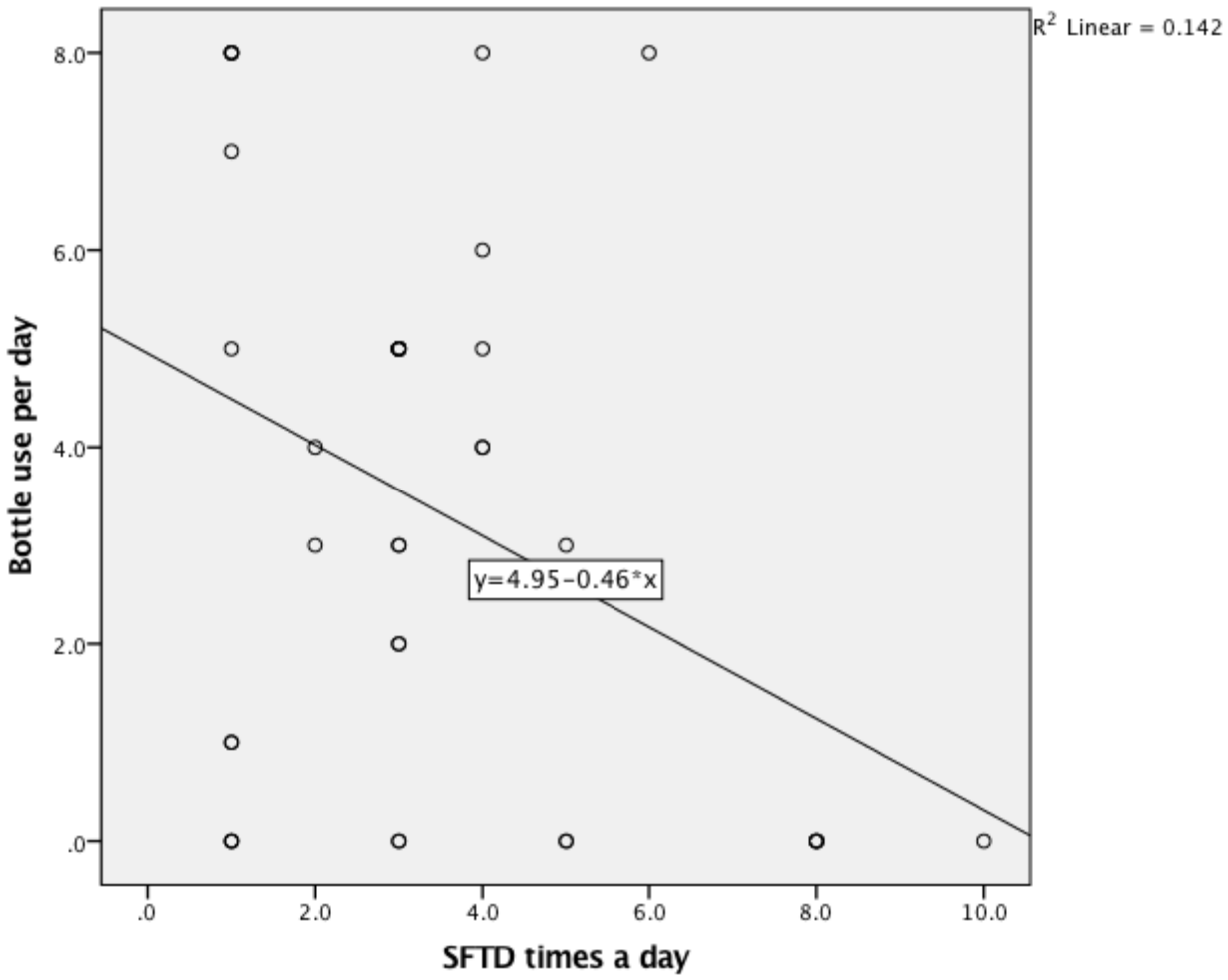

Figure 2 Unadjusted Relationship Between Bottle Use Per Day and SFTD Use Per Day

Open Ended Questions

At the four-week phone call each mother was asked 5 open-ended questions related to the use of the SFTD. Answers were analyzed through content analysis. Categories were created in order to describe common observations and themes. There were several themes that arose from

the analysis. As a positive influence, mothers felt that the SFTD allowed the infant to breastfeed while receiving a supplement. Many mothers felt that this helped their baby learn to breastfeed. One mother stated *"Nothing was coming out so my baby needed milk, this tube made my baby breastfeed and he wasn't starving"*. Another mother said *"my baby lost too much weight and needed to get formula. This let him get it while she still was able to be on my breast"*. When mothers discussed the negatives of the SFTD the common theme was that it required a lot of help. One mother stated "*this is a two- man job. I needed my husband to help set me up every time. When the tube slipped out of the baby's mouth, I needed help getting it back in"*. Another mother said *"it just took too long, by the time I got it set up the baby was screaming"*. Together the short answer questions revealed both positive and negative qualitative aspects of using the SFTD.

Discussion

This is the first known study to examine the use of the SFTD, a supplemental feeding device, and continued breastfeeding. It also examined whether the LATCH score, at 2-3 days of age has any relationship to breastfeeding outcomes at 4 weeks. The results of the current study showed no association between the LATCH score and breastfeeding at 4 weeks. These results are not consistent with the only previous study which reported that infants with LATCH score of 9 or greater were more likely to be breastfeeding at 6 weeks (Kumar, Mooney, Wieser, & Havstad, 2006).

The current study also describes the relationship of Maternal Breastfeeding Satisfaction using the MBFES for mothers who are using the SFTD. Though MBFES scores had no statistically significant relationship to breastfeeding at four weeks, there was a higher percentage

of mothers in the none/low breastfeeding that scored low on the total MBFES. This is consistent with other studies where a low mean on the total MBFES was associated with a higher chance of weaning (Cooke, Sheehan & Schmied, 2003). This lack of high MBFES scores may be due to this self-selecting population that are supplementing. These findings suggest that women who are using supplementation, already may be having breastfeeding problems that would lower their satisfaction with breastfeeding.

The MBFES subscale results reveal that there was a significant difference between the means of mothers in the none/low breastfeeding group and the medium/high/exclusive breastfeeding group for Maternal Enjoyment and Lifestyle subscales with the mothers in the medium/high/exclusive group having a higher mean for Maternal Enjoyment but lower for Lifestyle. This finding suggests that mothers in the medium/high/exclusive breastfeeding group experience more enjoyment with breastfeeding. It also suggests that mothers in the medium/high/exclusive breastfeeding group may have lower satisfaction with their lifestyle. This may indicate that as maternal enjoyment with breastfeeding goes up as satisfaction with lifestyle decreases.

SFTD, bottles and breastfeeding at 4 weeks

At four weeks, of the 40 mothers enrolled in the current study, only one mother was exclusively breastfeeding (2.5%). In total, 68% of mothers in the study were breastfeeding some amount. Both of these figures are lower than the percentages in the United States. In 2013, at 4 weeks, there were 57% of mothers that were exclusively breastfeeding and 76% that were doing "any" type of breastfeeding (CDC, Immunization Report Card, 2016). This national percentage is much closer to the breastfeeding results in our study. The large discrepancy with the exclusive

rates between this study and national rates may have been due to the uniqueness of this population. These were mothers who needed or wanted to supplement their infants, which in itself puts mothers at a higher risk of early weaning (Parry, Ip, Chau, Wu & Tarrant, 2013).

Demographic variables of age, race, birth type, parity and breast feeding experience had no impact on breastfeeding outcomes of mothers using the SFTD. When outcomes of using the SFTD were examined, it was found that the SFTD itself does not have a significant impact, either negatively or positively, on breastfeeding at 4 weeks. However, a very important finding was that bottle use had a detrimental effect on breast feeding outcomes. This result is consistent with previous research (Schwartz, D'Arcy, Gillespie, Bobo, Longeway & Foxman, 2002; Chantry, Dewey, Peerson, Wagner & Nommsen-Rivers, 2011). An important result that supports the use of the SFTD, was that for every bottle that is used, the chance that breastfeeding at the medium/high/exclusive rate at four weeks is reduced by 30%. The study findings indicate that the less bottles are used, the more chance of breast feeding at a higher level at 4 weeks. If the supplemental bottle feeds can be replaced by SFTD, then breast feeding duration may not be reduced. For every SFTD use the bottle use decreased. If bottle supplemental feedings are replaced by the SFTD, breastfeeding chances at the medium/high/exclusive rates may be higher. This is a very important finding for lactation consultants, nurses and providers. Supplementation may be a choice for breastfeeding mothers or may be necessary because of insufficient milk supply, infant illness, poor latch, maternal fatigue(Chantry, Dewey, Peerson, Wagner & Nommsen-Rivers, 2011; Gagnon, Leduc, Waghorn, Yang, & Platt, 2005). If supplementation is to occur, especially in the first few days or weeks, mothers should be offered the method that best preserves the breastfeeding relationship. This research suggests that bottles can be replaced by the SFTD and therefore increase the likelihood of breastfeeding at a higher rate at 4 weeks.

The qualitative analysis revealed themes that demonstrated that the SFTD has value with helping to maintain continued breastfeeding however, in some instances, there may be a learning curve and assistance and instruction was needed from a professional along with help at times of use.

Limitations

The sample size of only 40 was a limitation for analysis. With a sample size of only 40 a full model multivariate analysis was not performed. Breastfeeding, bottle usage, and SFTD use was based on recall at the 4-week phone call. For most mothers, SFTD usage only lasted a few days, however, the data were only as good as the mother's ability to recall correctly. Also, the MBFES has not been studied as a questionnaire administered by phone. This may have had an effect on how participants responded to the questions. In the general breastfeeding population, supplementation occurs for many reasons. Though infants with major health issues that would impact breastfeeding were excluded from the study, other reasons for supplementation may effect breastfeeding outcomes; for example, we did not collect data on maternal return to work status. Therefore, data on reasons for supplementation should have been collected and quantified. Also, studies have shown that breastfeeding intent can also have an effect on breastfeeding outcomes (Stuebe & Bonuck, 2011), and this data was not collected.

Conclusion

This study provides important information on the use of a Supplemental Feeding Tube Device (SFTD) as a method of a supplemental feeding method for breastfed infants. Mothers should be offered supplementation methods that best preserve the breast feeding relationship. The SFTD is a method that could minimize exposure to bottle feeding, at least in the first few

days or weeks to help avoid the detrimental effect of bottles on continued breastfeeding. Further research with a larger sample size, and a more diverse population could aid in providing further evidence for this supplemental method. Lactation Consultants, nurses and providers should be using evidence based practice to best promote breastfeeding practices and provide mothers the support they need for continued breastfeeding even when supplementation occurs.

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TABLE 1
Participants Demographics

Age	n	%
<25	2	5%
26-28	9	22.5%
29-31	15	37.5%
32-34	7	17.5%
35-38	5	12.5%
39-40	2	5%
Race		
Caucasian	21	52.5
Latino	10	25
Black	3	7.5
Indian	5	12.5
Asian	1	2.5
Parity		
1	25	62.5
2	9	22.5
3	5	12.5
6	1	2.5
Type of Birth		
c-section	21	47.5
Vaginal	19	52.5
Breastfeeding experience		
Yes	11	27.5
No	29	72.5

Table 2

Breast Feeding at 4 weeks

Amount of breastfeeding	**N**	**Percent**
No Breastfeeding	**9**	**22.5**
Partial Low	**12**	**30**
Partial Medium	**11**	**27.5**
Partial High	**7**	**17.5**
Exclusive or Exclusive with	**1**	**2.5**
Total	**40**	**100**

Table 3

Association Between Variables and Breastfeeding at Four weeks

Variable	**None/low Breastfeeding**		**Medium/High/Exclusive Breastfeeding**		Total	
Race	N	%	N	%		
Caucasian	11	52.4%	10	47.6%	21	
Latino/African American	9	69.2%	4	30.8%	13	
Asian/Indian	2	33.3%	4	66.7	6	
Parity						
1	12	48%	13	52%	25	
>1	10	66%	5	33.3%	15	
Birth						
Vaginal	11	57.9%	8	42.1%	19	
C-section	11	52.4%	10	47.6%	21	
LATCH						
Low score	7	77.8%	2	22.2%	9	
High score	15	48.8%	16	51.6%	31	

None/Partial Low- none and <20% feeds are breastfeeds
Medium/High/Exclusive- > 20% to 100% of all feeds are breastfeeds

Table 4

Logistic Regression for Relationship of Demographics to Breastfeeding at 4 Weeks

Variable	B	S.E	P-Value	Odds Ratio
Age	.027	.085	.748	1.028
Race (white reference Asian Black	.788 -.716	.97 .743	.416 .335	2.2 .489
Parity	.773	.678	.25	2.12
Birth	.223	.638	.726	.8
Breastfeeding Experience	.491	.729	.501	1.63

Table 5 LATCH and MBFES Total Score and Relationship to Continued Breastfeeding

Variable	OR (95% CI)	p-value (Binary logistic)
LATCH		
Low		.495
Medium	.667 (.082-5.40)	.7
High	2.0 (.15-26.734)	.6
MBFES Total (none in high) (low reference)		
Medium	1.29 (.272-6.069)	.751

Table 6 SFTD and Bottle use and Relationship to Continued Breastfeeding

Supplemental Method	OR (95% CI)	p-value (Binary logistic)
SFTD use per day	1.0 (.967-1.00)	.68
Bottle use per day	.67 (.510-8.98)	.007*
Bottle use + SFTD use per day	.67 (.491-.906)	.01*

*= Statistically Significant

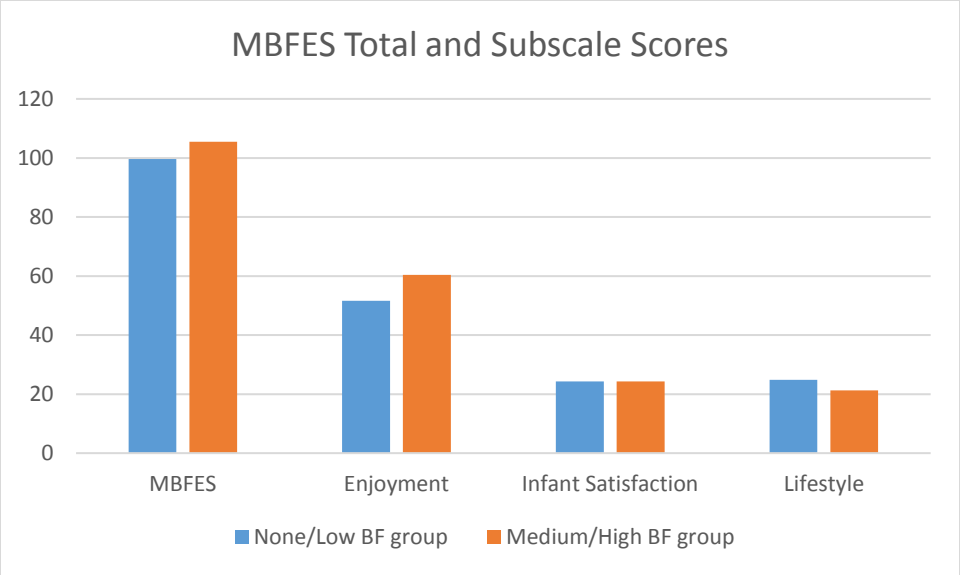

Figure 3 MBFES Results Total and Subscales

Chapter 5

Frances Penny

University of Connecticut

Introduction

The goal of this dissertation was to add to the knowledge and understanding of the use of the supplemental feeding tube device (SFTD) as an alternative method of supplementation for breastfed infants. The implementation of the Baby Friendly Initiative has improved national and international awareness on the goal of increased breastfeeding rates (Merewood, Mehta, Chamberlain, Philipp, & Bauchner, 2005). The study conducted in Chapter 2 examined current research that exists on the use of the SFTD as a supplemental feeding method. Chapter 3, through a survey, examined the current use of supplemental feeding methods and practices by Internationally Board Certified Lactation Consultants. The study in Chapter 4, through a descriptive exploratory design, examined the use of the Supplemental Nursing System (SNS), a type of SFTD, and its relationship to continued breastfeeding at 4 weeks and measured satisfaction with breastfeeding through the MBFES.

Major Findings from Chapter 2

Research studies that included the use of a supplemental feeding tube with breastfed infants in the study were systematically reviewed. The main objective of the study was to assess what was reported in the literature on the use of the SFTD as a method of supplementation for breastfed infants.

A review, in the form of an evidence based brief, suggests that though the evidence is extremely limited, the use of a supplemental feeding tube device, may help to retain or attain the breastfeeding relationship and the SFTD could be a beneficial tool to breastfeeding mothers. Nurses and lactation consultants need to be knowledgeable and confident in assisting

breastfeeding mothers with the use of the SFTD as well as other methods of supplementation. The Baby-Friendly policy stipulates that alternatives other than artificial nipples should be used.

This study highlighted that the SFTD is an acceptable method, however, more research needs to be conducted on the efficacy of this method. It was suggested that the device is not always user-friendly and is time consuming. This issue might be resolved with better support and education for the mothers, lactation consultants and nurses.

The lack of data and research targeted at supplemental methods highlights the need for consistency in practice guidelines for practitioners and providers caring for breastfeeding mothers that are supplementing their babies. The Baby-Friendly Steps (specifically #9) recommend supplementation without the use of a nipple, however more evidence and guidelines are needed for providers to best follow this step to help improve overall breastfeeding rates.

Major Findings from Chapter 3

An exploratory, descriptive, cross sectional survey was sent to over 20,000 Internationally Board Certified Lactation Consultants through International Board of Lactation Consultant Examiners via email. The questionnaire assessed what types of supplemental methods were being used by the IBCLC community and what were their recommendations and practices. The results from 2,308 respondents showed that supplemental practices and preferences vary among IBCLCs. Only 17% of the time was the decision guided by the IBCLC. Mothers should take into account all recommendations and make an informed decision. Further research is necessary in understanding the factor that drive the recommendations of non-IBCLC providers in recommending supplemental devices. Given the wide variety that we report with

regard to supplemental feeding, standardized efforts would be helpful to IBCLCs and non-IBCLC providers.

An important finding was that the bottle was the device most often used in four geographic areas as well as the area listed as "other". This was in direct conflict with the results on the most preferred method and the results on which method preserves the breastfeeding relationship the best. The SFTD was listed as the most preferred (32.1%) and as the device that preserves the breastfeeding relationship the best (53%). The bottle was seen as preserving the breastfeeding relationship only 4.9% of the time and only preferred 12.4 % of the time. The bottle was listed as the most often used supplemental device in United States, South America, Australia, and Canada. Yet, the bottle was seen as a method of last resort only 25% of the time, implying that it is used other than a method of last resort. The high percentage of bottle use is in conflict with the results of the preferred and best supplemental method of the SFTD. With the majority of respondents coming from the United States, where the bottle was found to be the most often used device, this is especially concerning. Confidence on all four methods of supplementation was very high. This indicates that consultants do not question their ability consult on use of any of the supplemental devices.

The high use of the bottle is in direct conflict with Step 9 of the Baby Friendly Initiative. This would appear to show that this Step is not being considered by those making the supplemental method decisions as well as what other factors may be effecting the supplemental decisions.

It is important that research be conducted to provide concrete evidence to aid lactation consultants, providers and nurses in their supplementation practices. This research needs

disseminated throughout the IBCLC and maternal and child health community to address supplementation issues to best support breastfeeding mothers.

Major Findings from Chapter 4

This is the first known study to examine the use of the SFTD, a supplemental feeding device, and continued breastfeeding. This study examined the relationship of LATCH score, at 2-3 days of age, and breastfeeding outcomes at 4 weeks. In addition, the study described the relationship of a mother's breastfeeding satisfaction with using the SFTD, using the Maternal Breastfeeding Evaluation Scale (MBFES). The results report differences in the MBFES results and subscale results between the none/low breastfeeding group and the medium/high/exclusive breastfeeding group.

Breastfeeding outcomes at four weeks, showed that of the 40 mothers enrolled in the study, only one mother was exclusively breastfeeding (2.5%). In total, 68% of mothers in the study were breastfeeding some amount at four weeks. The demographics that were included had no impact on breastfeeding outcomes of mothers using the SFTD. When outcomes were examined, it was found that the SFTD itself does not have a significant impact, either negatively or positively, on breastfeeding at 4 weeks. However, a very important finding was that bottle use has a detrimental effect on breast feeding outcomes. An important result that advocates for the use of the SFTD, was that for every bottle that is used, the chance that breastfeeding at the medium/high/exclusive rate at four weeks is reduced by 30%. The study findings may implicate that the less bottles are used, there may be a higher chance tof breast feeding at a higher level at 4 weeks. If bottle supplemental feedings are replaced by the SFTD, breastfeeding chances at the medium/high/exclusive rates will be higher. This is a very important finding for Lactation

Consultants, nurses and providers. This research suggests that bottles can be replaced by the SFTD and therefore increase the likelihood of breastfeeding at a higher rate at 4 weeks.

Limitations

The studies within this dissertation have several limitations. The study conducted in Chapter 2 was based only on research articles reported in English. Because only one of the studies had the SFTD as its central focus, information and data on the SFTD had to be extracted from individual research studies where SFTD was not always the focus and that may have detracted from the study findings. This limited the quality of data on the SFTD but was necessary due to the scarcity of research on the SFTD.

Secondly, the international survey only had a 10% response rate. The response rate could have been larger if a reminder email had been sent and the time to respond had been left open longer such as four weeks instead of only 2 weeks. Also, the responses were limited to only those IBCLCs that could read and respond in English. This enabled a much higher percentage of representation from the United States. Also, it was suggested by a few participants that it would have been helpful to include a question with a qualitative response regarding the benefits or disadvantages of SFTD or other supplemental methods. This might have captured information that was not included in the survey. Lastly, the data reported were based on self-reported practices, therefore may not have reflect the actual practices of the IBCLC respondents. In addition, item changes could have included additional responses to the question on supplementation reasons. Based on supplementation research, insufficient milk supply or, perceived insufficient milk supply, could have been added to the choice for reasons for supplementation (Gatti, 2008; Scott & Colin, 2002).

The major limitation of Chapter 4 was the small sample size of 40 mothers. Though this was appropriate for a pilot study, a larger sample size might had shown statistical significance for some of the results. Also, data collected at the 4-week phone call was based on a mother's feeding schedule recall. There is a chance that data were not accurate because of incorrect recall. In the general breastfeeding population, supplementation occurs for many reasons. Though infants with major health issues were excluded from the study, other reasons for supplementation may effect breastfeeding outcomes. Therefore, data on reasons for supplementation could have been included. Also, studies have shown that breastfeeding intent can also have an effect on breastfeeding outcomes (Stuebe & Bonuck, 2011). A questionnaire on breastfeeding intent would could have been added as an independent variable.

Implications for Policy and Practice

These research findings emphasize the lack of data and practice consistency with regard to the use of the SFTD as an alternative method of supplementation. With a worldwide emphasis on improving breastfeeding rates, supplementation methods that best preserve the breastfeeding relationship should be preserved. These findings add to the understanding that supplementation practices can make a difference in terms of breastfeeding outcomes. The use of the bottle should be avoided, if possible, when supplementation is needed. The SFTD offers a viable alternative to bottle use. Protocols that emphasize preserving the breastfeeding relationship and are in compliance with the Baby-Friendly guidelines are imperative. Ideally, an understanding of why supplementation occurs by breastfeeding professionals would help decrease the need for supplementation. When it must occur, lactation consultants, providers and nurses should be trained and adept at using alternative methods of supplementation.

Implications for Research

Considering this dissertations findings, there are two areas for future research. There is a strong need for further research and the use of the SFTD as an alternative method of supplemental feeding. Experimental research with a larger sample size examining breastfeeding outcomes with mothers using supplementation, would aid in the understanding of how to use these devices. Mothers with low maternal satisfaction scores have been shown to be more likely to wean by three months (Cooke, Sheehan & Schmied, 2003). This dissertation presented data that maternal breastfeeding satisfaction using the MBFES, for mothers who used the SFTD, did not reach a high level. Research to examine if interventions to improve satisfaction could be implemented for mothers using this device and thus lead to decreased rates of weaning.

The survey of lactation consultants on supplemental practices identified practices and confidence on use of alternative methods of supplementation. Since providers and nurses are also on the front lines of breastfeeding assistance, a survey of practices of both providers and nurses would be helpful to understand opinions and practices on the use of supplemental methods. Also, with the survey findings that the bottle is the most used supplemental method in the United States, research on education and training programs on the use of the SFTD for lactation consultants could be conducted. With the understanding that use of the bottle has a negative effect on breastfeeding, an understanding of how improve practices to decrease bottle use would help hospitals meet the Baby-Friendly requirements (AAP, 2010; Baby Friendly USA Inc., 2010; Yilmaz, Caylan, Karacan, Bodur, & Gokcay, 2014). Reducing the need for bottles for supplementation as well as improving satisfaction with alternative methods will help towards practice goals of increasing breastfeeding rates both in the United States and internationally.

Conclusion

With the current school of thought that bottle use is detrimental to successful breastfeeding and to adhere to Baby Friendly policies, it is important that efforts be made reduce the use of the bottle for supplementation. Alternative methods for supplementation should be introduced to breastfeeding mothers that are supplementing. Lactation Consultants, providers and nurses that counsel these mothers should be trained and educated on the use of the SFTD. Understanding a mother's reaction and adjustment to alternative methods of supplementation are key to adherence to protocols. Additional research needs to be conducted to add to an evidence-based practice model for breastfeeding protocols in health care facilities. Proper education and training of breastfeeding professionals on the best supplemental practices are an integral part of achieving breastfeeding goals both nationally and internationally to improve health of infants worldwide.

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