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Los Angeles

Expression of Breast Milk in the Workplace: An Analysis Among Registered Nurses, Nurse Managers, and
Hospital Representatives in Acute Care Hospitals

A dissertation submitted in partial satisfaction of the requirements for the degree of

Doctor of Philosophy in Nursing

by

Anne Frances Gelber

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ABSTRACT OF THE DISSERTATION

Expression of Breast Milk in the Workplace: An Analysis Among Registered Nurses, Nurse Managers, and
Hospital Representatives in Acute Care Hospitals

by

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Doctor of Philosophy in Nursing

University of California, Los Angeles, 2021

Professor Wendie A. Robbins, Chair

This dissertation features the three manuscript option.

Background: More than half of women return to the workforce within one year following the birth of their child. To continue offering breast milk to their infants and follow AAP and WHO recommendations for breastfeeding, these women often need to express breast milk in the workplace. Registered Nurses who work in bedside roles do not traditionally have access to private office spaces or personal control over their work schedule, making them uniquely susceptible to workplace barriers for expression of breast milk. Currently, the CDC recommends cleaning a breast pump with soap and water and leaving it to air dry after each use. It is unknown what the current knowledge and adherence levels to these recommendations are within a working population or how knowledge and adherence may affect breastfeeding practice outcomes.

Objectives: The study was conducted: 1) To determine relationships between employee perceptions of workplace support for expression of breast milk in the workplace (EBMW) and duration of breastfeeding, duration of EBMW, and other infant feeding practices, 2) To describe knowledge of CDC recommendations for cleaning of a breast pump across Registered Nurse (RN), Nurse Manager (NM), and Hospital Representative (HR) groups, 3) To determine if RN knowledge was associated with RN

adherence to CDC recommendations for cleaning of a breast pump, 4) To describe relationships between RN breastfeeding practices and: RN knowledge and adherence, NM knowledge, and HR Knowledge, and 5) To learn about the experiences of working RNs who have expressed breast milk in the workplace and provide recommendations to employers for improving employee lactation experiences.

Methods: This was a cross sectional research study. Registered Nurse participants who had given birth within the past three years (n=199), Nurse Managers (n = 36), and Hospital Representatives (n = 6) were recruited from 10 hospitals within the county of Los Angeles. Registered Nurses completed four questionnaires online: The Employee Perceptions of Breastfeeding Support Questionnaire (EPBS-Q); the Duration of Breastfeeding, Duration of EBMW, and Infant Feeding Practices Questionnaire (BEIF-Q); the Knowledge of CDC Recommendations for Use and Cleaning of a Breast Pump Questionnaire (KBP-Q); and the Adherence for Use and Cleaning of a Breast Pump according to CDC Recommendations Questionnaire (ABP-Q). Nurse Managers completed two online questionnaires: The Managers' Attitude Toward Breastfeeding Support Questionnaire (MATBS-Q) and the Knowledge of CDC Recommendations for Use and Cleaning of a Breast Pump Questionnaire (KBP-Q). Hospital Representatives completed two online questionnaires: Company Support for Breastfeeding Questionnaire (CBS-Q) and Knowledge of CDC Recommendations for Use and Cleaning of a Breast Pump Questionnaire (KBP-Q). Demographic information was collected from all participants via an online questionnaire.

Pearson's correlation coefficient was used to determine significant associations. Linear regression models were used to determine the relationships between workplace breastfeeding support constructs and breastfeeding and infant practice outcomes; and to explain relationships between knowledge of and adherence to CDC guidelines and breastfeeding and infant feeding practices. Qualitative responses from the open-ended question of the EPBS-Q were analyzed for categories using Strauss and Corbin's Grounded Theory approach. Open coding, axial coding, and selective coding was used to develop the

underlying codes and a conceptual description. Workplace recommendations were then created based upon the analysis.

Results: Using the EPBS-Q, increased perceived time and frequency of lactation breaks was associated with an increased duration of feeding solids and breastmilk to the infant, and a decreased duration of solids and formula. Increased communication among coworkers was associated with a decrease in the duration of feeding solids, breastmilk, and formula combined. Among RNs knowledge scores of CDC recommendations for cleaning a breast pump were high, but adherence scores to those recommendations was not as high. There was an association between increased RN adherence to CDC recommendations for cleaning a pump and an increase in the duration of feeding solids and formula to an infant. At the manager level among the hospitals, there was an increase in duration of solids and formula with increased manager knowledge of CDC recommendations for cleaning a pump. Qualitative responses to the open-ended question of the EPBS-Q showed that experiences demonstrating a lack of support for EBMW continue to exist among RNs who expressed breast milk upon return to work.

The dissertation of Anne Frances Gelber is approved.

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2021

DEDICATION

All moms are working moms.

This dissertation is dedicated to my mom, Pam.

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LIST OF ACRONYMS

ABP-Q	Adherence for Use and Cleaning of a Breast Pump according to CDC Recommendations Questionnaire
BEIF-Q	Duration of Breastfeeding, Duration of EBMW, and Infant Feeding Practices Questionnaire
BES	Breastfeeding and Employment Study
CBS-Q	Company Support for Breastfeeding Questionnaire
CDC	Centers for Disease Control and Prevention
EBMW	Expression of breast milk in the workplace
EPBS-Q	Employee Perceptions of Breastfeeding Support Questionnaire
FLSA	Fair Labor Standards Act
HR	Hospital Representative
KBP-Q	Knowledge of CDC Recommendations for Use and Cleaning of a Breast Pump Questionnaire
MATBS-Q	Managers' Attitude Toward Breastfeeding Support Questionnaire
NM	Nurse Manager
RN	Registered Nurse
SEM	Social Ecological Model

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Author Contributions

Anne Frances Gelber was the Principal Investigator for this dissertation research. Wendie A. Robbins served as the Committee Chair. Dissertation committee members contributed to research design, data analysis, and revisions of manuscript drafts.

Manuscript One

Employee Breastfeeding Practices and Their Perceptions of Workplace Lactation Support: An analysis among Registered Nurses working in Acute Care Hospitals.

This manuscript is intended for submission to *Breastfeeding Medicine*.

Manuscript Two

Knowledge and Adherence of Cleaning a Breast Pump in the Workplace and Employee Breastfeeding Practice Outcomes in Acute Care Hospitals.

This manuscript is intended for submission to *Workplace Safety and Health*.

Manuscript Three

Expression of Breast Milk in the Workplace: A Qualitative Analysis of Registered Nurse Experiences in Acute Care Hospitals.

This manuscript is intended for submission to *Healthcare Management*.

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INTRODUCTION TO DISSERTATION

Significance

The World Health Organization (WHO) recommends that all infants be breastfed for the first six months of life, and that if possible, infants continue to be breastfed until they have reached two years of age or longer (WHO, 2017). The American Academy of Pediatrics (AAP) recommends that infants be breastfed exclusively for the first six months, and then continued to be breastfed with complementary foods for the first year or longer (Eidelman & Schanler, 2012). These recommendations are based upon the well documented health benefits of breastfeeding for the infant.

A report citing the health benefits of breastfeeding conducted by the Agency for Healthcare Research and Quality (Ip et al., 2007) lists reduction in acute otitis media, atopic dermatitis, gastrointestinal infections, lower respiratory infections, asthma, obesity, diabetes, and sudden infant death syndrome among the health benefits for infants who are breastfed (Ip et al., 2007). Health benefits to breastfeeding are not limited only to an infant or child but have also been demonstrated among mothers who breastfeed and include an improvement in the return to pre-pregnancy weight, as well as a reduction for the risk of onset of type 2 diabetes, postpartum depression, osteoporosis, breast cancer, and ovarian cancer (Ip et al., 2007).

In addition to improved health outcomes, breastfeeding can also reduce health care costs. A cost analysis conducted by Bartick and Reinhold (2010) showed that if 90% of mothers breastfed for the first six months of their infants lives exclusively, there would be a cost savings of \$13 billion dollars per year. At the employer level, data shows that a reduction in rates of absences among breastfeeding mothers (Cohen et al., 1995) and an increase in employee retention (Mutual of Omaha, 2001).

More than half of mothers with an infant under the age of one participate in the United States workforce, and the participation rates continue to increase. The participation rate of mothers in the workforce with an infant under one year of age was 55.8% in 2011, 57.8% in 2018, and 59.9% in 2019

(United States Bureau of Labor Statistics, 2020). These mothers often rely on expression of breastmilk in the workplace (EBMW) to continue breastfeeding their children according to recommended guidelines.

Despite efforts to improve lactation support in the workforce, there are barriers to EBMW which persist such as lack of time or pressure to maintain work productivity (Chow et al., 2015, Dinour et al., 2015, Dixit et al., 2015, and Majee et al., 2016). The Healthy People 2030 goals aim to increase the percent of infants exclusively breastfed for the first six months of life from current rate of 25.6% to 42.4% and to increase the percent of infants breastfed at one year from the current rate of 35.3% to 54.1% (Centers for Disease Control and Prevention, 2021).

Provisions to protect the ability to express breastmilk in the workplace exist under Federal and California state laws. The federal law under the Fair Labor Standards Act (FLSA) was amended in 2010 (United States Department of Labor, 2017) to include provisions for lactation accommodations in the workplace. However, it does not include guidelines for the quality of the lactation space, the seating provided, lighting, access to running water, access to electricity, or access to a refrigerator. In 2019, California updated their labor code Chapter 3.8. 1030-1034, with a more comprehensive approach to protecting and promoting a mother's ability to express breast milk in the workplace. Included are guidelines for agricultural employers, specifications for contents of the lactation accommodation space, and information on policy implantation within the workplace. Federal and California labor codes do not specify the duration of a lactation break or the necessary frequency of lactation breaks beyond the terms "reasonable" and "as needed".

Not only do women need time to get to the lactation accommodation room and then to prepare to express breast milk, but they also need to maintain and clean their pump and pump parts, which requires additional time. There is little research into how mothers in the workplace are cleaning their pumps and pumps parts while working. In 2017, the Centers for Disease Control and Prevention (CDC) issued recommendations for cleaning breast pump parts after each use. The recommendations provide a thorough explanation of proper cleaning of a pump including, washing hands before use, cleaning the

pump if it is a shared pump, cleaning the surrounding countertop, cleaning the pumping area after use of the pump, cleaning all the parts of a breast pump with soap and running water after each use and allowing them to air dry, and then cleaning the wash basin and bottle brush. If these recommendations were to be followed in the workplace, this would add additional time needed for lactation breaks, as well as the availability of a sink and a place to air dry pump parts.

The Purpose of this Study

Given the CDC recommendations for cleaning a breast pump, the current Federal and California labor codes for lactation accommodations in the workplace, Healthy People 2030 goals to increase breastfeeding rates, and the benefits of breastfeeding, this study was conducted to analyze workplace factors affecting breastfeeding and infant feeding practices among mothers in the workplace.

Specific Aims

Using a workplace setting of acute care hospitals within Los Angeles County and an employee sample of Registered Nurses (RN), Nurse Managers (NM), and Hospital representatives (HR) the study was conducted:

1. To determine relationships between employee perceptions of workplace support for EBMW and duration of breastfeeding, duration of EBMW, and other infant feeding practices.
2. To describe knowledge of CDC recommendations for cleaning of a breast pump across RN, NM and HR groups.
3. To determine if RN knowledge was associated with RN adherence to CDC recommendations for cleaning of a breast pump.
4. To describe relationships between RN breastfeeding practices and: RN knowledge and adherence, NM knowledge, and HR Knowledge.
5. To learn about the experiences of working RNs who have expressed breast milk in the workplace and provide recommendations to employers for improving employee lactation experiences.

Theoretical Framework

This dissertation was guided by the Social Ecological Model (SEM) developed by McLeroy, Bibeau, Steckler, & Glanz (1988). The model was developed to address individual and social environmental determinants of health behavior and focuses on the influences of interpersonal, organizational, community, and public policy relationships on a health behavior from a health promotion perspective. The SEM operates under the principles that alterations in the social environment will affect change in individuals, and that environmental change relies upon support from individuals within the population.

In the SEM, the outcome of interest is a health behavior. Determinants of a health behavior include intrapersonal factors, interpersonal processes and primary groups, institutional factors, community factors, and public policy. Intrapersonal factors are defined as individual characteristics including knowledge, behavior, skills, and sociodemographic factors. Interpersonal processes and primary groups are defined as “formal and informal social network and support systems, including family, work group, and friendship networks” (McLeroy et al., 1988 p. 355). Institutional factors are defined as organizations and their official and unofficial rules for operation. Community factors are defined as the relationships between “organizations, institutions, and informal networks within defined boundaries” (McLeroy et al., 1988 p. 355). Public policy is defined as the “local, state, and national laws and policies” (McLeroy et al., 1988, p. 355).

The Social Ecological Model can be used to reveal determinants of EBMW among RNs in hospital settings in the Los Angeles area. The behavioral outcome of interest is EBMW. The decision to express breast milk in the workplace is proximally based on intrapersonal factors of knowledge, attitudes, beliefs and skill of expressing breast milk in the workplace. Interpersonal factors include friendships, family relationships, and coworker relationships. Organizational characteristics of a hospital workplace include hospital size, hospital type, magnet status, the presence and substance of lactation accommodation policies, engineering controls, and communication within the workplace. Community characteristics

include the affiliation of the hospital with a nursing union and the networks between hospitals. Policy characteristics include the federal and state law policies on expressing breast milk within the workplace.

The nested structures of intrapersonal, interpersonal, organizational, community, and policy levels allow for multidirectional indirect and direct influence on the health behavior of EBMW.

Content of this Dissertation

Chapter One reviews the significance, specific aims and the theoretical framework of this study. Chapter Two, Three, and Four provide the research background, methods, results, and discussion related to the specific aims of the research. Chapter Five provides a summary conclusion of the research findings, including guidance for applying the findings in the workplace and future research implications.

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Employee Breastfeeding Practices and Their Perceptions of Workplace Lactation Support: An analysis
among Registered Nurses working in Acute Care Hospitals

This manuscript is intended for submission to *Breastfeeding Medicine*

Abstract

Objectives: Breast milk, combined with solids when appropriate, is the recommended form of nutrition for healthy infants. Artificial milk substitutes are recommended for certain medical conditions. Mothers in the workplace who want to continue providing breast milk to their infants often must express breast milk in the workplace (EBMW). There are barriers for Registered Nurses who care for patients to breastfeed since they do not have access to private office spaces or personal control over their work schedule. This study was conducted to describe perceived support for EBMW among RNs working in acute care hospitals, and to explore relationships between perceived support and infant feeding practices.

Materials and Methods: A cross sectional study was conducted with a sample of 199 RNs recruited from 10 acute care hospitals in Los Angeles County. Two online questionnaires were used to collect data on their perceptions of employer support for breastfeeding, duration of breastfeeding, duration of EBMW and infant feeding practices.

Results: RNs who reported their breaks were frequent enough and long enough for EBMW also reported a longer duration of feeding infants with breastmilk and decreased feeding with formula. Coworkers' positive communication about breastfeeding reduced feeding infants' solid foods combined with breast milk and formula.

Conclusions: Employers can support working mothers to meet optimal infant feeding recommendations with policies that protect the amount of time needed for EBMW upon return to work and by fostering a workplace culture that promotes positive coworker communication about breastfeeding.

Background

More than half of mothers with an infant under the age of one year work in the United States, and the workforce participation rates continue to increase. According to data from the Current Population Survey reported by the Bureau of Labor Statistics, the participation rate of mothers in the workforce with an infant under the age of one year was 55.8% in 2011, 57.8% in 2018, and 59.9% in 2019 (United States Bureau of Labor Statistics Current Population Survey 2012,2019, 2020). Mothers who want to breastfeed after returning to work must be able to express milk in the workplace (EBMW).

The American Academy of Pediatrics (AAP) recommends that infants be breastfed exclusively for the first six months, and then continue to be breastfed with complementary foods for the first year or longer (Eidelman & Schanler, 2012). The World Health Organization (WHO) recommends exclusive breastfeeding for all infants for the first six months of life and continued breastfeeding with appropriate complementary foods until they have reached two years of age or older (WHO, 2017). Formula is not recommended for healthy infants (American Academy of Pediatrics, 2012) (Chantry et al., 2015). Some medical contraindications to providing breast milk according to the American Academy of Family Physicians (AAFP) (Montgomery et al., 2014) include breastfeeding among HIV positive women in the United States (CDC, 2020); mothers with human T-cell lymphotropic virus type I or type II or infants with type I galactosemia (WHO, 2009); and mothers with substance use disorders or who require chemotherapeutic agents (AAP, 2012).

The recommendations for breastfeeding are based upon the well documented health benefits of breastfeeding for the infant. A report on the health benefits of breastfeeding conducted by the Agency for Healthcare Research and Quality (Ip et al., 2007) lists reduction in acute otitis media, atopic dermatitis, gastrointestinal infections, lower respiratory infections, asthma, obesity, diabetes, and sudden infant death syndrome among the health benefits in infants who are breastfed (Ip et al., 2007). Health benefits to breastfeeding have also been shown among women who breastfeed and include a

return to pre-pregnancy weight, as well as a reduction for the risk of onset of type 2 diabetes, postpartum depression, osteoporosis, breast cancer, and ovarian cancer (Ip et al., 2007).

Novel therapeutic uses of breast milk continue to be studied. Recent research has demonstrated the presence of Immunoglobulin A to SARS CoV-2 in breast milk, with potential for use as a superior treatment for Covid-19 compared to plasma immunoglobulin (Fox et al., 2020). Lactoferrin has been researched for its antibacterial effects and is studied for its therapeutic benefits in preterm infants (Embleton et al., 2013). The unique composition of breast milk includes molecules which assist with the immune system (Goldman, 2000) and gastrointestinal maturation (Chang & Chao, 2002).

There is significant financial benefit to breastfeeding, due to improved health for the mother and infant. A cost analysis conducted by Bartick and Reinhold (2010) showed a cost savings of \$13 billion dollars per year if 90% of mothers followed recommendations to breastfeed exclusively for the first 6 months of their infant's life. At the employer level, absences have been shown to decrease among mothers who are breastfeeding (Cohen et al., 1995) and employee retention rates increase (Mutual of Omaha 2001).

The federal law under the Fair Labor Standards Act (FLSA) was amended in 2010 (United States Department of Labor, 2017) to include the Federal Breaktime for Nursing Mother's Provision. Notably, the provision uses the term "reasonable break time" to describe the duration of breaks and states that the mother can express breast milk each time she has the need, without further clarification. An updated version of California Labor Code on Lactation Accommodations (California Labor Code Chapter 3.8, 2019) for protection of expression of breast milk in the workplace was instituted in January of 2020 and retains the same initial introductory paragraph from California's Labor Code of 2002 with vague descriptions of break times mirroring the Federal Standard. The duration of breaktime is described as "reasonable". It is recommended that the breaks coincide with usual break times if possible.

This study was conducted based upon the known benefits of breastfeeding, increasing number of working mothers with infants under a year old and current lactation accommodation policy in

California. The study population consisted of Registered Nurses working at acute care hospitals within Los Angeles County. The aim of this study was to determine relationships between employee perceptions of workplace support for EBMW and duration of breastfeeding, duration of EBMW, and other infant feeding practices.

Materials and Methods

Design, Sample, Setting

This was a cross sectional research design. Registered Nurses (RNs) were recruited from 10 acute care hospitals in Los Angeles County. Hospital administrators within the county were contacted by telephone and/or email to participate. All hospitals had IRB committees within their facilities that gave approval to participate. The RNs were then recruited through a combination of electronic emails sent via a champion at the hospital facility, through word of mouth within the hospital, in person presentations by the PI, and/or by hospital champion presentations at manager meetings. The emails contained a link to study information, informed consent information sheets, and instruments. The RNs at seven of the hospitals had the option of providing their email address to receive a \$20.00 electronic gift (e-gift) card for participating. The first 15 to respond from each hospital were eligible for the e-gift cards. Three hospitals did not allow incentives for research participation. Hospital administrators and managers did not have access to review individual responses from the RNs to facilitate responses without fear of reprisal. The RNs were recruited from September 2019 through October 2020.

The RNs were eligible to participate if they had given birth to a child within the past three years, returned to work at that hospital within one year following childbirth, expressed breast milk for any length of time in the workplace when they returned to work, and returned to work in a direct patient care role.

The Employee Perceptions of Breastfeeding Support Questionnaire (EPBS-Q)

The Employee Perceptions of Breastfeeding Support Questionnaire (EPBS-Q), one of three scales within the Breastfeeding and Employment Study (BESt) tool was developed and validated by Greene et al. (2008). The BESt was designed to measure employee, manager, and company perceptions of support for breastfeeding in the workplace.

This research study reports upon *employee* perceptions of support. The EPBS-Q measures support within five constructs: Organizational Support, Manager Support; Coworker Support, Employee Time (the employee perception of the amount of time and breaks available to express breast milk); and Physical Environment (quality of lactation accommodations). The EPBS-Q has a 41 Likert scale with forced choice items, and one additional open-ended question. Validity for the EPBS-Q was based upon a study of 117 working women in various job industries in Michigan (Greene et al., 2008). Since research has indicated that communication is an important component in EBMW (Anderson, 2015), two additional variables of Manager Communication and Coworker Communication were extracted from the EPBS-Q for this research study.

Duration of Breastfeeding, Duration of EBMW, and Infant Feeding Practices Questionnaire (BEIF-Q)

Duration of breastfeeding, duration of EBMW and infant feeding practices were measured in a single questionnaire that included seven forced choice questions and nine open ended questions. The Principal Investigator (PI) developed a self-report questionnaire after reviewing published papers on lactation accommodations in the workplace and breastfeeding among employees. Questions addressed exclusive breastfeeding, exclusive formula feeding, combination feeding of formula and breast milk, feeding of solids and breast milk, solids and breast milk and formula, and solids and formula, expression of breast milk in the workplace, use of donor milk, and breastfeeding onsite. Each response was voluntary. Figure 1 summarizes the outcome variables and the independent variables.

Demographic Data

Demographic data was collected on age, sex, marital status, annual (combined) income level, race/ethnicity, current employment position, duration of employment, the age of the child when the

mother returned to work after leave, full time/part time status upon return to work, maternity leave benefits, and amount of time off following childbirth provided by the employer.

Data Analysis

SPSS Software Version 25 (2017) was used for data analysis. Reliability of the EPBS-Q was assessed using Cronbach's Alpha for each construct score. Construct scores which did not show sufficient reliability were omitted. Data for variables contributing to each of seven constructs of the EPBS-Q were averaged to create an overall construct score for each participant. The Physical Environment constructs were separated into two groups: Physical Environment yes Space (those who had a designated lactation room) and Physical Environment no Space (those who did not have a designated lactation room).

The BEIF-Q was operationalized by converting the values of the reported various durations of time provided by the participants into months.

Descriptive statistics for population demographics and factors of interest were summarized as the mean, standard deviation (SD), range or relative frequency. Exploratory analysis of relationships between duration of breastfeeding, EBMW, and other infant feeding practices was conducted using Pearson's correlation coefficient. The two tailed level of significance was set at .05.

Bivariate and multivariable analyses using linear regression with a 95% confidence interval and a significance of $p \leq 0.05$ was used to analyze relationships between the employee perceptions of breastfeeding support constructs and the duration of breastfeeding and other infant feeding practices. Regression models were analyzed unadjusted and adjusted with potential confounders chosen based on the literature: age, current breastfeeding and number of hours worked when returned to work (Kozhimannil et al., 2016; Spatz et al., 2014; Fein & Roe, 1996).

Four models were created. M1 adjusted for current breastfeeding. M2 adjusted for current breastfeeding under the definition used in M1, as well as age and number of hours worked when

returned to work following maternity leave. M3 adjusted for women currently breastfeeding children 11 months and younger. M4 used the modified subset of M3 and adjusted for age and number of hours worked when returned to work. Adjusting for mothers who were breastfeeding younger versus older children addressed the potential effect that these breastfeeding relationships could have on the associations between the workplace factors and the breastfeeding outcomes.

Results

Demographics

Demographic data is summarized in Table 1. Registered Nurses (n=199) had mean age of 34.7 years with a SD of 3.9 and range of 26-48 years. All RNs were female, and most were married (93%). Income was reported as combined if the RN was married, and 76% reported income greater than \$100,000 per year. About 40% identified as White, 32% as Asian or Pacific Islander, 17% as Latinx or Latina, 5% as combined ethnicities or races, and 4% as African American. Average years of employment at their current hospital was 7 with a SD of 5.2, and a range of 1-18 years. Upon return to work, more than two thirds (70.6%) returned to full time work and more than a quarter (28.2%) returned to part time work. Over a third (34.9%) reported receiving Paid Maternity Leave from their employer, over half (57.4%) used disability, and less than a tenth (7.7%) reported using neither Paid Maternity Leave or Disability. Participants reported a mean of 4.47 months off from work following the birth of their child with a SD of 1.90 months. Age of the child at return to work was mean of 4.64 months with a SD of 1.69.

Duration of Breastfeeding, Duration of EBMW, and Infant Feeding Practices Questionnaire (BEIF-Q):

The BEIF-Q yielded 199 case responses. Of those, 7 women provided response data for 2 children under the age of three (Table 2).

The mean current age of the child for all participants was almost 1 1/2 years (17.8 months SD 8.3). 91% (n = 182) of RNs reported “yes” to exclusive breastfeeding for any duration of time. Among these, 78% (n =156) of participants opted to report a duration of exclusive breastfeeding, with a mean

9.72 and SD 5.965 months. More than half (63.3%, n = 126) reported breastfeeding exclusively for a minimum of 6 months. Five participants reported the use of donor milk. 26% of participants were currently breastfeeding. 37.6% (n= 75) of participants reported using a combination of formula and breastmilk for feeding their child, with a mean duration of 5.88 months SD 4.32. 7.5% of participants reported providing formula only to their child for a mean duration of 3.71 months SD 2.90.

Among 81% of participants, the mean age for starting foods was 5.86 months SD 1.26. 70.3% (n=140) respondents reported a mean duration of solids and breastmilk of 9.09 months SD 6.48. 37.6% (n=75) participants reported a mean duration for solids and breast milk and formula for 6.81 months SD 5.06. 20% (n= 40) of participants reported a mean duration of solids and formula only of 5.04 months SD 4.34. Almost all participants (n=196) reported expressing breast milk in the workplace; only two participants responded that they did not EBMW. The mean duration of EBMW was 7.16 months with a SD 4.63. 6% of participants reported directly feeding their infant child at work.

Correlations Between Duration of Breastfeeding, Duration of EBMW, Infant Feeding Practices and Return to Work Characteristics

Duration of EBMW was moderately associated with duration of exclusive breastfeeding ($r = 0.56$, $p < .001$), duration of feeding a combination of solids and breast milk and formula among only participants who reported this type of feeding ($r = 0.66$, $p < .001$), and duration of solids and breastmilk only ($r = 0.58$, $p < .001$).

Correlations Between Workplace Support and Breastfeeding, EBMW, Infant Feeding Practices and Predictors

Cronbach's alpha determined that all outcomes except for Physical Environment no space had a minimum alpha of 0.6. Physical Environment no Space construct was omitted from the analysis.

Employee perception of the amount of time and breaks available to express breast milk was significantly associated with current breastfeeding ($r = 0.29$, $p \leq 0.001$), duration of combination

feeding of breast milk and formula ($r = 0.44, p \leq 0.001$), feeding formula only Y/N ($r = -0.18, p = 0.020$), and duration of solids and formula only ($r = -0.22, p \leq 0.015$). Associations of interest, with $p < 0.20$, were found among employee time and duration of only breastmilk and solids, $r = 0.14, p = 0.098$; physical environment for employees with access to a lactation space and age of starting solid foods, $r = 0.018, p = 0.052$; and employee coworker communication and duration of solids and breast milk and formula, $r = -0.16, p = 0.064$.

Linear Regression:

In the models including women currently breastfeeding children 11 months and younger, employee perception of amount of time for EBMW was related to duration of only breastmilk and solids, M3 β 0.67 (0.07, 1.27) $p \leq .05$, and M4 β 0.71 (0.10, 1.32) $p \leq .05$. Employee time had an inverse relationship with duration of feeding solids and formula under all the models, β -0.36 (-0.66, -0.07) $p \leq .05$ unadjusted, M1 β -0.39 (-0.72, -0.07) $p \leq .05$, M2 β -0.41 (-0.75, -0.06) $p \leq .05$, M3 β -0.37 (-0.68, -0.06) $p \leq .05$, M4 β -0.37 (-0.70, -0.04) $p \leq .05$.

Physical Environment with access to a pumping room demonstrated a relationship to the age when solid foods are started under models adjusted for covariates, M2 β 0.01 (0.00, 0.03) $p \leq .05$, and M4 β 0.01 (0.00, 0.03) $p \leq .05$.

Positive employee coworker communication was inversely related to the duration of solids and breastmilk and formula in all the adjusted models, M1 β -0.62 (-1.16, -0.08) $p \leq .05$, M2 β -0.59 (-1.14, -0.03) $p \leq .05$, M3 β -0.62 (-1.15, -0.09) $p \leq .05$, and M4 β -0.59 (-1.13, -0.05) $p \leq .05$. Significant linear regressions are summarized in Table 3.

Discussion

The BEIF-Q used in this study provides a comprehensive overview of breastfeeding practices among RNs who return to work including detailed information about durations for breast milk, formula, solids, and the combinations of these three categories of infant nutrition.

Based upon responses to the questionnaire, it was determined that almost two thirds (63.3%) of participants reported exclusively breastfeeding for up to a duration of six months, and thus represent the percentage of working mothers in this study who fulfilled the AAP and WHO recommendations. The two thirds far exceeds the current national estimations for exclusive breastfeeding at six months where it is estimated that only a quarter (25.6%) of women exclusively breastfeed up to six months (CDC, 2021).

The outcome of exclusive breastfeeding up to 6 months did not show significant correlation to BEIF-Q workplace constructs. Most participants spent a few months at home with their infant prior to return to work with an average return to work age of child being 4.64 months, and therefore the women only had to continue exclusive breastfeeding while working for around 1.4 more months to reach the 6-month goal. These results suggest that special attention be paid to breastfeeding RNs beyond six months, and that the workplace may have a higher impact on breastfeeding after six months.

More than one third of RNs (n = 75, 37.6%) reported the use of formula and breast milk combined to nourish their child prior to the introduction of solids, meaning likely less than six months of age for the child. Although this question was intended to measure nutrition prior to initiation of solids, it is possible that participants interpreted the question to indicate a combination of breast milk and formula at any time in the infant's life. Fifteen (7.5% of participants) reported feeding their infant only formula for any duration of time. These percentages of either exclusive use or combined use of breastmilk and formula indicate that more than a third of the participants used formula at some point in time.

Age of starting solid foods was around 5.84 months which is close to the current recommendation of six months. The average time of feeding solids and breastmilk and formula combined (n = 75, 37.6%) was 6.81 months SD 5.06. A fifth of the RNs (n=40, 20.1%) reported giving solid foods and formula. With almost two thirds (n = 126, 63.3%) of participants meeting the 6-month

goal of exclusive breastfeeding, the data suggests that after 6 months, there was an introduction of formula.

The average duration of EBMW was 7.15 months and the average age of the child when the mother returned to work was 4.64 months. These data suggests that on average, mothers expressed breast milk in the workplace up until infants were one year of age. This aligns with current AAP recommendations to provide breastmilk up to one year of age.

Findings from the research showed that employee perceptions of workplace support particularly around break time for EBMW and coworker support were associated with breastfeeding outcomes. Increased perception of employee time for EBMW might reduce the amount of time that a mother in the workplace provides solids and formula only to her infant by 11-12 days for every 10-percentage point score increase on the EPBS-Q employee perception of time score. For mothers currently breastfeeding an infant 11 months and younger, increased time available during the workday to pump breastmilk can increase the amount of time that an infant receives solids and breastmilk only by 21 days for every 10-percentage point score increase on the EPBS-Q employee perception of time score.

Increased perceived coworker communication might reduce the amount of time feeding solids and breastmilk and formula among employees by 18 days for every 10-percentage point score increase on the EPBS-Q perceived coworker communication score. According to WHO and AAP guidelines, an older infant would receive solids and breast milk only without use of formula. Within the relationship between coworker communication and the outcome of feeding solids, breastmilk and formula, the specific effect on either solids, breastmilk, or formula is unknown. Future research is recommended to determine if increased coworker communication reduces the time needed for a mother in the workplace to supplement solids and breastmilk with formula, which would align with WHO and AAP guidelines.

Limitations:

This was a cross-sectional study; therefore causality can't be inferred. However, interesting associations were uncovered that warrant future research, such as the relationship between time for lactation breaks and increased duration of feeding breastmilk and solids. Data was collected by self-report. Participants may not have been familiar with the specific questions in the BEIF-Q and this may have affected their responses. For example, the question on duration of exclusive breastfeeding yielded a high number of responses greater than 1 year, which suggests that the question should be revised. There were limited references for the PI to draw from in creating the questionnaire and the questionnaire created for this study can be improved upon in the future.

All RNs in this study needed to have previously expressed breast milk in the workplace. Therefore, the findings from this study are not generalizable beyond women who EBMW and do not represent all women with infants in the workplace. The study population consisted of multiple races and ethnicities, including 40% White Non-Hispanic nurses, and therefore may not be generalizable to all RNs. The results were aggregated across hospitals and therefore do not account for individual hospital characteristics affecting each employee's individual scores.

Conclusion

Close to a third (30%) of working mothers in this sample population reported the use of formula to feed their infant. Focusing upon improving time for and number of breaks for working mothers who wish to breastfeed may result in increased time that infants receive breastmilk inclusive of solids, and less time that formula is given. Federal and California state policies should be amended to further protect time and frequency of lactation breaks. Improving employee coworker communication can result in a decrease in duration of feeding solids and breastmilk and formula. This relationship needs to be further examined to determine which type of feeding specifically is reduced. Improving the perceived quality of lactation accommodations might also increase the age when solid foods are started.

These improvements may help working mothers to achieve their breastfeeding goals and meet recommendations from the AAP and WHO.

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Figure 3. Outcomes and Independent Variables

BEIF-Q Variables: Infant Feeding Practices	EPBS-Q Construct Variables
Current Age of Child	<p data-bbox="932 302 1243 333">Employee Perceptions of:</p> <ul data-bbox="980 371 1414 730" style="list-style-type: none"> • Organization Support • Manager Support • Coworker Support • Employee Time (amount of time and frequency of breaks available to express breast milk) • Physical Environment with Lactation Space • Physical Environment without Lactation Space <p data-bbox="932 774 1243 846">Manager Communication Coworker Communication</p>
Exclusive Breastfeeding (Y/N, Did you exclusively breastfeed for any period of time?)	
Duration of Exclusive Breastfeeding	
Donor Milk (Y/N)	
Currently Breastfeeding (Y/N)	
Breastmilk and Formula (Y/N, Before the introduction of solids did you provide breast milk and formula for any period of time?)	
Duration of Breastmilk and Formula (Before the introduction of solids)	
Formula Only (Y/N, Before the introduction of solids, did you provide formula only for any period of time?)	
Duration of Formula Only	
Age of Starting Solid Foods	
Duration of Solids and Breastmilk	
Duration of Solids and Breastmilk and Formula	
Duration of Solids and Formula	
EBMW (Y/N, Did you EBMW in the workplace?)	
Duration of EBMW	
Breastfeeding Onsite (Y/N)	
Age of Child at Return to Work	
Months off before Return to Work	

Table 1. Demographics of Registered Nurse Participants (n=199)	
Registered Nurses	
Age (years), (N) Mean \pm SD, Range	(169) 34.7 \pm 3.9, 26-48
Sex, (N) %	
Female	(170) 100.0%
Male	
Marital Status, (N) %	
Single	(11) 6.4%
Married	(159) 93.0%
Separated	
Divorced	(1) 0.6%
Income, (N) %	
60-70k	(5) 3.0%
70-80k	(4) 2.4%
80-90k	(9) 5.4%
90-100k	(22) 13.2%
> 100k	(127) 76.0%
Race, (N) %	
African American	(7) 4.2%
Asian/Pac Island	(54) 32.3%
White	(68) 40.7%
Latina or Latinx	(29) 17.4%
Combined Ethnicity or Race(s)	(9) 5.4%

Employment Duration (years), (N) Mean ± SD, Range	(169) 7.11 ± 4.42, 1-18
Age of Child when Returned (Months), (N) Mean ± SD	(166) 4.64 ± 1.69
Status When Returned, (N) %	
Part Time	(48) 28.2%
Full Time	(120) 70.6%
Other	(2) 1.2%
Maternity Leave Type, (N) %	
Paid Maternity	(59) 34.9%
Disability	(97) 57.4%
None of the Above	(13) 7.7%
Time off from Work (months), (N) Mean ± SD	(140) 4.47 ± 1.90

Demographic data voluntarily provided by Registered Nurse Participants. Participants were informed that they could skip questions that made them uncomfortable or that they did not want to answer. The total who answered is indicated within the table.

Table 2. Summary of Breastfeeding and Infant Feeding Practices n= 199

	All Combined		Not Currently Breastfeeding or Currently Breastfeeding with Age Child \geq 12 months		Currently Breastfeeding and Age Child < 12 months	
	(N) Mean \pm SD	(N) Mean \pm SD	(N) Mean \pm SD	Median [IQR]	(N) Mean \pm SD	(N) Mean \pm SD
	or (N) %	or (N) %	or (N) %		or (N) %	or (N) %
Current age of child (<i>months</i>)	(173) 17.8 \pm 8.3	17.0 [11.0, 24.0]	(133) 19.7 \pm 7.8	19.0 [13.0, 24.0]	(23) 7.74 \pm 2.24	8.0 [6.0, 10.0]
Exclusive Breastfeeding						
No	(17) 8.5%		(145) 100.0%		(34) 100.0%	
Yes	(182) 91.5%					
Duration of Exclusive Breastfeeding (<i>months</i>)	(156) 9.72 \pm 5.96	8.0 [6.0, 12.0]	(128) 10.1 \pm 6.4	9.0 [6.0, 12.0]	(25) 7.56 \pm 2.24	7.0 [6.0, 9.0]
Duration of Exclusive Breastfeeding up to 6 months	(126) 11.2 \pm 5.6	10.0 [7.0, 13.0]	(102) 11.8 \pm 5.9	11.0 [7.0, 14.0]	(21) 8.19 \pm 1.81	8.0 [7.0, 10.0]
Donor Milk						

No	(176) 97.2%	(140) 97.2%	(33) 97.1%
Yes	(5) 2.8%	(4) 2.8%	(1) 2.9%
Currently Breastfeeding			
No	(127) 70.9%	(127) 87.6%	
Yes	(52) 29.1%	(18) 12.4%	(34) 100.0%
Combination Feeding: Breastmilk and Formula			
No	(119) 61.3%	(81) 57.9%	(32) 94.1%
Yes	(75) 38.7%	(59) 42.1%	(2) 5.9%
Duration of time for Combination Feeding: Breast milk and Formula (<i>months</i>)	(61) 5.88 ± 4.32 6.0 [3.0, 8.0]	(47) 5.11 ± 3.69 4.0 [2.0, 7.5]	
Formula Only			
No	(183) 92.4%	(133) 92.4%	(33) 97.1%
Yes	(15) 7.6%	(11) 7.6%	(1) 2.9%
Duration of time Formula Only (<i>months</i>)	(12) 3.71 ± 2.90 3.0 [1.8, 6.0]	(11) 4.05 ± 2.78 3.0 [2.0, 6.0]	

Age of starting solid foods (<i>months</i>)	(163) 5.86 ± 1.26	6.0 [5.0, 6.0]	(126) 5.87 ± 1.18	6.0 [5.0, 6.0]	(21) 5.62 ± 1.52	6.0 [5.0, 6.0]
Duration of time for solids and breast milk only (<i>months</i>)	(140) 9.09 ± 6.48	8.0 [4.0, 12.0]	(110) 10.1 ± 6.5	9.5 [5.0, 12.0]	(21) 5.05 ± 3.53	5.0 [1.5, 8.0]
Duration of time for solids and breast milk and formula (<i>months</i>)	(75) 6.81 ± 5.06	6.0 [3.0, 10.0]	(58) 6.72 ± 5.38	6.0 [3.0, 9.0]		
Duration of time for solids and formula only (<i>months</i>)	(40) 5.04 ± 3.80	4.0 [3.0, 6.0]	(33) 5.36 ± 4.06	4.0 [3.0, 6.0]		
Express Breast Milk in the Workplace (EBMW)						
No	(2) 1.0%		(1) 0.7%			
Yes	(196) 99.0%		(144) 99.3%		(34) 100.0%	
Duration of EBMW (<i>months</i>)	(166) 7.16 ± 4.63	6.3 [4.0, 9.0]	(126) 7.96 ± 4.78	7.5 [4.0, 10.0]	(23) 3.98 ± 2.40	4.0 [1.8, 6.0]
Breastfeeding Onsite						
No	(187) 94.0%		(138) 95.2%		(30) 88.2%	
Yes	(12) 6.0%		(7) 4.8%		(4) 11.8%	

Descriptive statistics for Registered Nurses' breastfeeding and infant feeding outcomes. Participants were informed that they could skip questions that made them uncomfortable or that they did not wish to answer. The total who answered is indicated within the table.

Table 3. Significant Linear Regressions between Employee Support Constructs and Breastfeeding and Infant Feeding Practices

		Unadjusted	p	M1	p	M2	p	M3	p	M4	p
Organization Support	Duration of Breastmilk and Formula	-0.37 (-1.58, 0.85)	0.548	-1.36 (-2.48, -0.24)	0.019	-1.04 (-2.29, 0.21)	0.098	-1.40 (-2.50, -0.30)	0.014	-1.02 (-2.26, 0.23)	0.105
Organization Support	Duration of Solids and Breastmilk and Formula	-0.76 (-1.63, 0.10)	0.082	-1.14 (-2.01, -0.27)	0.010	-0.79 (-1.71, 0.14)	0.094	-1.19 (-2.05, -0.34)	0.006	-0.85 (-1.76, 0.06)	0.068
Employee Time	Combination Breastmilk and Formula	1.36 (0.58, 2.13)	<.001	0.59 (-0.24, 1.42)	0.159	0.67 (-0.20, 1.53)	0.127	0.64 (-0.16, 1.44)	0.112	0.71 (-0.14, 1.56)	0.098
Employee Time	Duration of Breast Milk and Solids	0.51 (-0.10, 1.12)	0.098	0.49 (-0.16, 1.14)	0.136	0.52 (-0.14, 1.17)	0.121	0.67 (0.07, 1.27)	0.028	-0.27 (-0.70, 0.16)	0.220
Employee Time	Duration of Solids and Breastmilk	0.51 (-0.10, 1.12)	0.098	0.49 (-0.16, 1.14)	0.136	0.52 (-0.14, 1.17)	0.121	0.67 (0.07, 1.27)	0.028	0.71 (0.10, 1.32)	0.022
Employee Time	Solids and Formula	-0.36 (-0.66, -0.07)	0.015	-0.39 (-0.72, -0.07)	0.018	-0.41 (-0.75, -0.06)	0.021	-0.37 (-0.68, -0.06)	0.021	-0.37 (-0.70, -0.04)	0.027
Physical Environment Yes Space	Age of Starting Solid Foods	0.01 (-0.00, 0.03)	0.052	0.01 (-0.00, 0.02)	0.095	0.01 (0.00, 0.03)	0.046	0.01 (-0.00, 0.02)	0.080	0.01 (0.00, 0.03)	0.036

Coworker Communication	Solids and Breastmilk and Formula	-0.51 (-1.05, 0.03)	0.06 4	-0.62 (-1.16, - 0.08)	0.024	-0.59 (- 1.14, - 0.03)	0.039	-0.62 (-1.15, - 0.09)	0.021	-0.59 (-1.13, - 0.05)	0.033
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M1 is adjusted for current breastfeeding. M2 is adjusted for current breastfeeding, age and number of hours worked when returned to work following maternity leave. M3 is adjusted for women currently breastfeeding children 11 months and younger. M4 is adjusted for women currently breastfeeding children 11 months and younger, age and number of hours worked when returned to work.

Knowledge and Adherence of Cleaning a Breast Pump in the Workplace and Employee Breastfeeding Practice Outcomes in Acute Care Hospitals

This manuscript is intended for submission to *Workplace Health & Safety*

Background: The CDC recommends cleaning a breast pump with soap and water and leaving it to air dry after each use. There is limited data published about the knowledge and adherence levels to these recommendations among a population of breastfeeding mothers in the workplace or how knowledge and adherence may affect their breastfeeding practices. The purpose of this study was to describe knowledge of the CDC recommendations among working Registered Nurses (RNs), Nurse Managers (NMs) and Hospital Representatives (HRs), and to identify the relationship to employee breastfeeding practices and adherence to the guidelines.

Methods: RNs (n=199), NMs (n = 33), and HRs (n = 6) were recruited. RNs completed a knowledge and adherence questionnaire for cleaning a breast pump, and a breastfeeding practices questionnaire. NMs and HRs completed the knowledge questionnaire. Relationships were explored using correlation coefficients and linear regression.

Findings: Knowledge of CDC recommendations was high among all three groups, 96.9% for RNs, 98.35% for NMs and 100% for HRs. RN knowledge did not correlate with adherence to the CDC recommendations. However, NM knowledge of CDC recommendations was related to a longer duration of exclusive breastfeeding up to six months for RN employees, $\beta = 4.22$, $p = .042$. It was also inversely related to duration of feeding formula and solids, $\beta = -4.64$, $p = .016$.

Conclusions: Nurse Manager knowledge of current CDC guidelines for cleaning of a breast pump has the potential of promoting exclusive breastfeeding up to six months and breastfeeding up to one year as recommended by the American Academy of Pediatrics.

Keywords: Breastfeeding, Workplace, Breast Pump, Mothers in the Workplace

Background:

More than half of mothers in the United States with an infant under the age of one year work; and this rate continues to increase. According to Current Population Survey data reported by the Bureau of Labor Statistics, in 2011 over half (55.8 %) of mothers with an infant under the age of one year worked, with subsequent increases in 2018 (57.8%) and 2019 (59.9%). Mothers in the workplace who continue offering their infants breast milk upon return to the workforce most likely rely upon expression of breast milk in the workplace (EBMW).

The American Academy of Pediatrics (AAP) recommends that infants be breastfed exclusively for the first six months, and then continue to be breastfed with complementary foods for the first year or longer (Eidelman & Schanler, 2012). The World Health Organization (WHO) recommends exclusive breastfeeding for all infants for the first six months of life and continued breastfeeding with appropriate complementary foods until they have reached two years of age or longer (WHO, 2017). These recommendations are based upon the well documented health benefits of breastfeeding for the infants.

A report on the health benefits of breastfeeding infants conducted by the Agency for Healthcare Research and Quality (Ip et al., 2007) lists reduction in rates of acute otitis media, atopic dermatitis, gastrointestinal infections, lower respiratory infections, asthma, obesity, diabetes, and sudden infant death syndrome.

Health benefits to breastfeeding have also been demonstrated for mothers who breastfeed and include an improvement in the return to pre-pregnancy weight, as well as a reduction for the risk of onset of type 2 diabetes, postpartum depression, osteoporosis, breast cancer, and ovarian cancer (Ip et al., 2007).

Novel therapeutic uses of breast milk continue to be studied. Recent research has demonstrated the presence of Immunoglobulin A to SARS CoV-2 in breast milk, with potential for use as a superior treatment for Covid-19 compared to plasma immunoglobulin (Fox et al., 2020). Lactoferrin has been studied for its antibacterial effects and therapeutic benefits among preterm infants (Embleton

et al., 2013). The unique composition of breast milk includes molecules which assist with the immune system (Goldman, 2000) and gastrointestinal maturation (Chang & Chao, 2002).

There is significant financial benefit to breastfeeding based upon the health benefits for mothers and infants. According to a cost analysis (Bartick and Reinhold, 2010) there would be a cost savings of \$13 billion dollars per year if 90% of mothers breastfed exclusively for the first 6 months of their infants' lives. Additionally, there would be cost saving benefits to organizations based upon reduced rates of absences (Cohen et.al., 1995), as well as increased retention rates of breastfeeding mothers (Mutual of Omaha 2001).

Because current federal and state workplace laws and protections in the United States do not enable all mothers to stay home with their infants for six months following birth, working mothers who wish to follow AAP or WHO guidelines for breastfeeding often must express milk in the workplace to provide their infants with breast milk. The federal law under the Fair Labor Standards Act (FLSA) was amended in 2010 (United States Department of Labor, 2017) to include the Federal Breaktime for Nursing Mother's Provision. Notably, the provision uses the term "reasonable break time" to describe the duration of breaks and provides that the mother can express breast milk each time she has the need, without further clarification. Break times are not required to be paid.

An updated version of California Labor Code on Lactation Accommodations (California Labor Code Chapter 3.8 2019) for protection of expression of breast milk in the workplace was instituted in January of 2020 and adds more specific provisions including that the lactation room is close to the work area and that the employee has access to a sink and running water. However, it retains the same initial introductory paragraph from California's Labor Code of 2002 and mirrors the Federal Standard of using the term "reasonable" to describe duration of lactation breaks. Frequency of breaks is described as each time the employee has the need to express milk. It recommends that the breaks coincide with usual break times if possible. If the break time occurs outside of legally mandated paid break times, then it does not need to be paid.

In addition to time needed to access the lactation room, women also need to clean their pump and pump parts to ensure safety and the health of infants. The CDC released recommendations for cleaning a pump and pump parts on August 15, 2017 (CDC, 2017) including: 1) Instructions for proper cleaning including washing hands before use; 2) Cleaning the pump if it is a shared pump; 3) Cleaning the surrounding countertop; 4) Cleaning the pumping area after use of the pump; 5) Cleaning all the parts of a breast pump with soap and running water after each use and allowing them to air dry; and 6) Cleaning the wash basin and bottle brush.

There is limited published data to determine if employees, managers, and organizational level staff (hospital representatives) know these recommendations and if RNs are following them. Based upon the results, appropriate modifications to lactation accommodation policies could be made to assist working mothers to ensure safety and health of their infants.

This study was conducted based upon the benefits of breastfeeding, increasing numbers of working mothers with infants under a year old, current lactation accommodation policy in California, and release of guidelines for thorough cleaning of a pump and pump parts after each use. The study population included Registered Nurses (RNs), Nurse Managers (NMs), and Hospital Representatives (HRs) working at acute care hospitals within Los Angeles County. The study aims were to:

1. Describe knowledge of CDC recommendations for cleaning of a breast pump across RN, NM and HR groups.
2. Determine if RN knowledge was associated with RN adherence to CDC recommendations for cleaning of a breast pump.
3. Describe relationships between RN breastfeeding and infant feeding practices and: RN knowledge and adherence, NM knowledge, and HR Knowledge.

Materials and Methods

Design, Sample, Setting

This was a cross sectional research design. RNs, NMs, and HRs (Human Resources employees and Executive Nursing Administration) were recruited from 10 acute care hospitals in Los Angeles County. Hospital administrators were contacted by telephone and/or email to participate. All hospitals acquired IRB approval within their facilities. Participants were then recruited through a combination of electronic emails sent via a champion at the hospital facility, through word of mouth within the hospital, through in person presentations by the PI, and/or through hospital champion presentations at manager meetings. The email contained a link to study information, informed consent information sheet and questionnaires. Participants at seven of the hospitals had the option of providing their email address to receive a \$20.00 electronic gift card (e- gift card) for participating. The first 15 Registered Nurses (RNs), 15 Nurse Managers (NMs), and 2 Hospital Representatives (HRs) to respond from each hospital were eligible for the e-gift cards. Three hospitals did not allow incentives for research participation. Hospital administrators did not have access to individual employee responses to encourage freedom in answers without fear of reprisal. Participants were recruited from September 2019 through October 2020.

Registered Nurses were eligible to participate if they had given birth to a child within the past 3 years, returned to work at that hospital within 1 year following childbirth, expressed breast milk for any length of time in the workplace when they returned to work, and returned to work in a direct patient care role. The duration of time of three years for RNs was chosen to allow sufficient sample size collection while providing a limit to the length of time since childbirth occurred to promote the most accurate responses possible. Nurse Managers were eligible to participate if they had worked in their role for a minimum of three years and worked in a managerial capacity. Nurse Managers included unit directors and assistant unit directors with specific titles varying per hospital. Charge nurses were ineligible to participate as NMs. Hospital Representatives, included Human Resources employees, as well as, Executive Nursing Administration, were eligible to participate if they had worked in their role for a minimum of 6 months and were familiar with maternity leave policies and lactation accommodation resources within the hospital.

Instruments

Knowledge of CDC Recommendations for Use and Cleaning of a Breast Pump Questionnaire (KBP-Q)

The Principal Investigator (PI) developed a questionnaire based upon CDC recommendations for breast pump cleaning that was administered to RNs, NMs, and HRs. The questionnaire included items assessing knowledge about current CDC recommendations for clean use of a breast pump and cleaning a breast pump. It consisted of nine true or false items that reflected the most relevant content of the recommendations. High scores represented a better knowledge of CDC recommendations. Two separate scores were derived from this questionnaire. The first score (Knowledge Score 1) had items 1–5 and represented knowledge of direct recommendations made by the CDC. Items 1-5 were combined and averaged to create Knowledge Score 1 for RN, NM, and HR. The second score (Knowledge Score 2) had items 6-9 and represented techniques for use and cleaning of a breast pump that may be practiced by the general population but are not specifically recommended by the CDC. Items 6-9 were combined and averaged to create Knowledge Score 2 for RN, NM, and HR.

Adherence for Use and Cleaning of a Breast Pump according to CDC Recommendations Questionnaire (ABP-Q)

RN adherence to CDC recommendations for use and cleaning of a breast pump was assessed using an adherence questionnaire based on current CDC recommendations for clean use and cleaning of a breast pump. This adherence questionnaire consisted of 9 items answered with always, sometimes, or never. High scores represented a higher level of adherence to the CDC recommendations. There were two separate scores derived from this questionnaire. The first score items 1-5 represented adherence to direct recommendations made by the CDC and were combined and averaged to create RN Adherence Score 1. The second score items 6-9 represented practices of cleaning a breast pump that are not specifically recommended but may be commonly practiced and were combined to create RN Adherence Score 2. Participants were asked to report their practices on cleaning a breast pump in the workplace only, not at home.

Duration of Breastfeeding, Duration of EBMW and Infant Feeding Practices Questionnaire (BEIF-Q)

The *BEIF-Q* measured duration of breastfeeding, duration of EBMW, and infant feeding practices among the RNs. The 16-item questionnaire included seven forced choice options and nine open ended questions. The PI developed the questionnaire after reviewing published articles on lactation accommodations in the workplace and breastfeeding among employees. The items asked specific questions about infant feeding practices to collect the most accurate description of these practices. Questions addressed exclusive breastfeeding, exclusive formula feeding, feeding of solids and breast milk, solids and breastmilk and formula, solids and formula, expression of breast milk in the workplace, use of donor milk, and breastfeeding onsite. They included feeding practices before and after the introduction of solid foods. Figure 1 summarizes variables included in the *BEIF-Q*, *KBP-Q* and *ABP-Q* questionnaires.

Data Analysis:

SPSS Software Version 25 (2017) was used for data analysis. Descriptive statistics are summarized and reported as the mean and the standard deviation (SD) or frequency (%). Relationships between scores on the knowledge/adherence questionnaires and breastfeeding/infant feeding practices were examined using Pearson's Correlation Coefficient to determine strength and direction of pairwise associations. The two tailed level of significance was set at .05. Bivariate and multivariable linear regression with a 95% confidence interval and a significance of $p \leq 0.05$ was used to further analyze relationships between the knowledge/adherence scores and breastfeeding /infant feeding outcomes.

Multivariable analysis included the three groups of participants: RNs, NMs, and HRs. There was collinearity between Nurse Managers and Hospital Representatives so final models include RNs and NMs only. Composite scores for NMs and HRs knowledge were created by averaging the individual scores of NMs and HRs for their respective categories.

Regression models were analyzed unadjusted and adjusted with potential confounders chosen based upon the literature: age, current breastfeeding and number of hours worked when returned to

work (Kozhimannil et al., 2016; Spatz et al 2014; Fein and Roe, 1996). Four sets of adjusted models were analyzed labeled M1, M2, M3 and M4. M1 includes only participants who were currently breastfeeding. M2 is based on participants who were currently breastfeeding and includes age and number of hours worked when returned to work following maternity leave. M3 is based on a subset of participants currently breastfeeding children 1 year and older. M4 used the modified subset of currently breastfeeding participants under M3 and adjusted for age and number of hours worked when returned to work. BEIF-Q outcomes and independent variables are shown in Figure 1.

Results

Descriptive Statistics

The average age of RNs was 34.7 years with a SD 3.9 years. All were female, most married (93%) and three fourths (76%) had a combined annual income greater than \$100,000. Less than half (40%) identified as White, almost a third (32%) as Asian or Pacific Islander, and less than a fifth (17%) as Latinx or Latina, 5% as combined ethnicities or races, and 4% as African American. Mean duration of employment at their current hospital was 7 years with a SD of 5.2 years, and a range of 1-18 years. Upon return to work, more than two thirds (70.6%) returned to full time work and more than a quarter (28.2%) returned to part time work. Paid Maternity Leave from their employer was reported by over a third (34.9%), more than half (57.4%) used disability, and less than a tenth (7.7%) reported using neither Paid Maternity Leave or Disability. Registered Nurses reported a mean of 4.47 months off from work following the birth of their child with a SD of 1.90 months and the reported age of their child at return to work had a mean of 4.64 months with a SD of 1.69 months.

The mean age of NMs was 49.4 years with a SD 8.2 years. They were all female, most (87.9%) were married, and 93.8% had a combined annual income greater than \$100,000. More than half (62%) identified as White, less than a fifth (15%) as combined ethnicities or races, less than a tenth (9%) African American, less than a tenth (9%) as Asian/Pacific Islander, and 3% as Latina or Latinx. Mean duration of employment was 11.7 years with a SD 8.97 years.

The mean age of HRs was 49.2 years with a SD 13.8 years. They were two thirds (66%) female and one third (34%) male. A (combined) annual income greater than \$100,000 was reported by 66.7%. More than half (66%) identified as White, 16% as Asian/Pacific Islander, and 16% as combined ethnicities. Mean duration of employment was 14.33 years with a range of 2-40 years. Descriptive statistics are summarized in Table 1.

Average RN Knowledge Score 1 was 96.9%, average RN Knowledge Score 2 was 48.8%, average NM Knowledge Score 1 was 98.3%, average NM Knowledge Score 2 was 68.3%, average HR Knowledge Score 1 was 100%, and average HR Knowledge Score 2 was 58%. Average RN Adherence Score 1 was 72.9% and average RN Adherence Score 2 was 57.8%. Average Knowledge and Adherence Scores of Registered Nurses, Nurse Managers, and Hospital Representatives are summarized in Table 2.

Associations between RN Knowledge and Adherence Scores

RN knowledge of the recommendations specifically outlined by the CDC for cleaning a breast pump (Score 1) was not significantly associated with RN adherence to these specified recommendations ($r = -.002$, $p = 0.979$). Statistically significant associations between knowledge and adherence scores were found for RN knowledge of techniques for use and cleaning of a breast pump that may be practiced by the general population but are not specifically recommended by the CDC (Score 2) and RN Adherence Score 1, $r = .16$, $p = 0.031$.

Associations between Knowledge Scores, Adherence Scores and Breastfeeding or Other Infant Feeding

Practices

Registered Nurses

For Registered Nurses, a moderate to strong correlation was found between RN adherence score 1 and duration of time only formula was provided prior to the introduction of solids, ($r = 0.75$, $p = .033$). The adherence to CDC guidelines (score 1) was also associated with duration of feeding solids and formula without breastmilk, ($r = 0.22$, $p = .017$). This relationship remained significant in bivariate linear

regression modeling, $\beta = 0.31$, $p = 0.009$ unadjusted, M1 $\beta = 0.31$, $p = 0.015$; M2 $\beta = 0.33$, $p = .014$; M3 $\beta = 0.30$, $p = 0.017$ and M4 $\beta = 0.32$, $p = 0.016$. In multivariable linear regression models that included both RNs and NMs, RN adherence score 1 was significantly associated with duration of feeding only solids and formula across all models: $\beta = 0.31$, $p = 0.013$ unadjusted, M1 $\beta = 0.30$, $p = .025$, M2 $\beta = 0.33$, $p = 0.017$, M3 $\beta = 0.28$, $p = .032$, M4 $\beta = 0.31$, $p = 0.023$.

Nurse Managers

For Nurse Managers, statistically significant inverse correlations were found between the duration of feeding solids and formula without breastmilk and NM Knowledge Score 1 ($r = -0.21$, $p = .024$); and the duration of time for providing only breastmilk and NM Knowledge Score 2 ($r = -0.27$, $p = .002$). The inverse relationship between knowledge of CDC pump cleaning recommendations and the duration of feeding solids and formula without breastmilk was significant in bivariate linear regression modelling, $\beta = -3.76$, $p = .023$ unadjusted, M1 $\beta = -4.69$, $p = 0.007$, M2 $\beta = -5.71$, $p = .002$, M3 $\beta = -5.44$, $p = 0.002$, and M4 $\beta = -6.24$, $p < .001$, and remained significant in multivariable modeling $\beta = -3.84$, $p = 0.020$ unadjusted, M1 $\beta = -4.69$, $p = 0.011$, M2 $\beta = -4.64$, $p = 0.016$, M3 $\beta = -5.41$, $p = 0.003$, and M4 $\beta = -5.38$, $p = 0.005$.

The inverse relationship between Nurse Managers' knowledge of pump cleaning techniques commonly used but not specified in the CDC recommendations and the duration of time providing only breastmilk was significant in bivariate linear regression modeling, $\beta = -0.88$, $p = .002$ in the unadjusted model, M1 $\beta = -0.90$, $p = 0.001$, M2 $\beta = -0.71$, $p = .018$, M3 $\beta = -0.89$, $p = 0.002$, and M4 $\beta = -0.74$, $p = 0.014$, and remained significant in multivariable modeling, $\beta = -0.89$, $p = 0.004$ unadjusted, M1 $\beta = -0.88$, $p = 0.004$, M2 $\beta = -0.68$, $p = 0.028$, M3 $\beta = -0.90$, $p = 0.003$, and M4 $\beta = -0.70$, $p = 0.024$.

In the bivariate modelling with Nurse Managers only, there was no association between nurse managers' knowledge score 1 and duration of providing only breastmilk for up to six months, however in multivariable modelling adjusting for confounders, there was a significant relationship across three of

the adjusted models, M1 $\beta = 4.11$ $p = 0.032$, M2 $\beta = 4.22$ $p = 0.042$, and M3 $\beta = 3.84$ $p = 0.047$.

Significant multivariable linear regressions are summarized in Table 3.

Hospital Representatives

HR Knowledge Score 1 was not used in regression analysis for Hospital Representatives because there was no variation across the sample with all respondents scoring 100%.

Discussion

RNs, NMs, and HRs all scored well for Knowledge Score 1. These questions tested knowledge about the specific CDC recommendations. Knowledge Score 2 scores were lower suggesting that there was less familiarity with items related to commonly practiced cleaning techniques which are not explicitly recommended by the CDC. Of interest for RNs is the lack of significant association between RN Knowledge Score 1 and RN Adherence Score 1. The adherence items 1-5 directly reflected the practice of the knowledge about the CDC recommendations. The average RN Knowledge Score 1 was 96.9 % demonstrating good knowledge, but the average RN Adherence Score 1 of 72.9% suggested that despite high knowledge, adherence was lower. RN Knowledge Score 2 did not have a high average score and RN Adherence Score 2 did not have a high average score, suggesting that there was less knowledge and less adherence for items not specifically recommended by CDC. There was a statistically significant association between RN knowledge of pump cleaning and care techniques not specifically included in CDC's recommendations and adherence to both CDC recommendations ($r = .16$, $p < .05$) and also other pump cleaning and care techniques ($r = .35$, $p < .001$).

The analysis of the combined group modelling of Nurse Managers and Registered Nurses revealed that individual and institutional knowledge can influence outcomes in a realistic scenario where these variables are occurring simultaneously. Under this model, increased RN adherence to CDC recommendations for cleaning a breast pump resulted in an increase of feeding solids with formula. Increased NM knowledge of CDC recommendations for cleaning a breast pump resulted in a decrease in

the duration for feeding only solids and formula and increase in the duration of exclusive breastfeeding up to 6 months.

These findings are interesting. Increased RN adherence to the specified CDC guidelines resulted in longer duration of feeding formula with solids, that is, negatively affected breastfeeding practice outcomes. This suggests that RNs who properly followed guidelines experienced negative effects to their breastfeeding. Future research is recommended to determine if the levels of adherence impact the practice of EBMW related to either time restrictions or other resource restrictions such as access to an office, sink, etc. Increased RN Knowledge (score 1) prolonged feeding of solids and formula and breastmilk but it is unknown whether breastmilk or formula specifically was impacted due to this being a combined outcome of solids and breast milk and formula.

NM scores suggest that their increased knowledge of the specified CDC guidelines was associated with increased duration of breastfeeding in RN employees, and as would be expected, decrease in time of feeding formula. This is supportive of RN employees achieving the American Academy of Pediatrics and WHO health recommendations for mothers and infants.

Limitations

This was a cross-sectional study; therefore causality can't be inferred. However, interesting findings were identified that may be the basis for future research on the relationship between NM knowledge of CDC recommendations for cleaning a breast pump and infant feeding practices among employees. Data were collected by self-report which could contribute to information bias. To enhance accuracy of recall, breastfeeding and infant feeding outcomes were limited to the past three years.

This study was limited by including only RNs who had expressed breast milk in the workplace, and therefore does not provide the perspective of working mothers who did not choose or were unable to express breast milk in the workplace. Registered Nurses were 40% White Non-Hispanic; therefore results may not be generalizable to all races or ethnicities. In addition, the scores were aggregated across local hospitals and therefore do not account for possible variations within each hospital site

affecting those scores individually. Finally, results are limited to a representation of an urban setting in California and therefore may not be generalizable to a rural working population.

Implications for Occupational Health Nursing Practice or Implications for Occupational Health Practice

In the workplace, knowledge and adherence of the CDC Guidelines for cleaning a breast pump provides an interesting potential for predicting breastfeeding practice outcomes among RNs. Further research is recommended to explore this relationship and understand the directions and influences of the knowledge and adherence on breastfeeding practice outcomes. It would strengthen institutional interventions aimed at improving the breastfeeding practice outcomes and potentially result in modified policies to increase time and resources available for lactation accommodations.

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Figure 1. Variables included in the Duration of Breastfeeding, Duration of EBMW and Infant Feeding Practices Questionnaire (BEIF-Q); Knowledge of CDC Recommendations for Use and Cleaning of a Breast Pump Questionnaire (KBP-Q); and Adherence for Use and Cleaning of a Breast Pump according to CDC Recommendations Questionnaire (ABP-Q)

BEIF-Q Variables: Feeding Practices	KBP-Q and ABP-Q Variables: Knowledge of CDC Recommendations and RN Adherence
Current Age of Child	Score 1 = knowledge of specific CDC recommendations for cleaning of a breast pump Score 2 = general knowledge related to cleaning a breast pump
Exclusive Breastfeeding (Y/N, Did you exclusively breastfeed for any period of time?)	
Duration of Exclusive Breastfeeding	
Donor Milk (Y/N)	<ul style="list-style-type: none"> • RN Knowledge Score 1 • RN Knowledge Score 2 • RN Adherence Score 1 • RN Adherence Score 2 • NM Knowledge Score 1 • NM Knowledge Score 2 • HR Knowledge Score 1 • HR Knowledge Score 2
Currently Breastfeeding (Y/N)	
Breastmilk and Formula (Y/N, Before the introduction of solids did you provide breast milk and formula for any period of time?)	
Duration of Breastmilk and Formula (Before the introduction of solids)	
Formula Only (Y/N, Before the introduction of solids, did you provide formula only for any period of time?)	
Duration of Formula Only	
Age of Starting Solid Foods	
Duration of Solids and Breastmilk	
Duration of Solids and Breastmilk and Formula	
Duration of Solids and Formula	
EBMW (Y/N, Did you EBMW in the workplace?)	
Duration of EBMW	
Breastfeeding Onsite (Y/N)	
Age of Child at Return to Work	
Months off before Return to Work	

Table 1. Demographics of Registered Nurse (n= 199), Nurse Manager (n = 33), and Hospital Representative (n= 6) Participants

	Registered Nurses	Nurse Managers	Hospital Representatives
Age (years), (N) Mean \pm SD, Range	(169) 34.7 \pm 3.9, 26-48	(33) 49.4 \pm 8.2, 35-64	(6) 49.2 \pm 13.8, 31-65
Sex, (N) %			
Female	(170) 100.0%	(33) 100.0%	(4) 66.7%
Male			(2) 33.3%
Marital Status, (N) %			
Single	(11) 6.4%	(2) 6.1%	
Married	(159) 93.0%	(29) 87.9%	(5) 83.3%
Separated		(1) 3.0%	(1) 16.7%
Divorced	(1) 0.6%	(1) 3.0%	
Income, (N) %			
< 60k			(1) 16.7%
60-70k	(5) 3.0%		
70-80k	(4) 2.4%		(1) 16.7%
80-90k	(9) 5.4%		
90-100k	(22) 13.2%	(2) 6.3%	
> 100k	(127) 76.0%	(30) 93.8%	(4) 66.7%
Race, (N) %			
African American	(7) 4.2%	(3) 9.4%	
Asian/Pac Island	(54) 32.3%	(3) 9.4%	(1) 16.7%
White	(68) 40.7%	(20) 62.5%	(4) 66.7%
Latina or Latinx	(29) 17.4%	(1) 3.1%	

Combined ethnicity or race(s)	(9) 5.4%	(5) 15.6%	(1) 16.7%
Employment Duration (years), (N) Mean ± SD, Range	(169) 7.11 ± 4.42, 1- 18	(33) 11.70 ± 8.97, 2-40	(6) 14.33 ± 14.32, 2-40
Age of Child when Returned (Weeks), (N) Mean ± SD	(166) 4.64 ± 1.69		
Status When Returned, (N) %			
Part Time	(48) 28.2%		
Full Time	(120) 70.6%		
Other	(2) 1.2%		
Maternity Leave Type, (N) %			
Paid Maternity	(59) 34.9%		
Disability	(97) 57.4%		
None of the Above	(13) 7.7%		
Time off from Work (months), (N) Mean ± SD	(140) 4.47 ± 1.90		

Demographic data voluntarily reported by Registered Nurses, Nurse Managers, and Hospital Representatives. Participants were informed that they could skip questions that made them uncomfortable or that they did not want to answer. The total who answered is indicated within the table.

Table 2. RN, NM, and HR Knowledge of CDC recommendations and RN Scores on Adherence to CDC Recommendations

	Registered Nurses (n=199)	Nurse Managers (n=33)	Hospital Representatives (n=6)
Knowledge Score 1	96.9% ± 0.010	98.3% ± 0.033	100%
Knowledge Score 2	48.8% ± 0.043	68.3% ± 0.120	58% ± 0.281
Adherence Score 1	72.9% ± 0.031		
Adherence Score 2	57.8% ± 0.021		

Scores represent average percent of total possible out of 100%. Knowledge Score 1 represents knowledge to specific CDC recommendations for cleaning and care of a breast pump. Knowledge Score 2 represents knowledge of techniques for use and cleaning of a breast pump that may be practiced by the general population but are not specifically recommended by the CDC. Adherence Score 1 represents RN adherence to specific CDC recommendations for cleaning and care of a breast pump. Adherence Score 2 represents RN adherence to knowledge of cleaning and care of a breast pump techniques that are not specifically recommended by the CDC. Knowledge Score 1 = T/F items 1-5, Knowledge Score 2 = T/F 6-9. Adherence Score 1 = items 1-5 scored as always (3), sometimes (2), and never (1), Adherence Score 2 = items 6-9 scored as always (1), sometimes (2), and never (3).

Table 3. Linear Regression Models Registered Nurses and Nurse Managers and Breastfeeding Outcomes

Outcome	Independent Variable	Unadjusted Model		Adjusted for Current Breastfeeding (M1)		Adjusted for Current Breastfeeding + Age + # Hours Worked (M2)		Adjusted for Current Breastfeeding of a child ≥ 1 year old (M3)		Adjusted for Current Breastfeeding of a child > 1 year old + Age + # Hours Worked (M4)	
		b (95% CI)	p	b (95% CI)	p	b (95% CI)	p	b (95% CI)	p	b (95% CI)	p
Duration of Exclusive Breastfeeding	Nurse Manager Knowledge Score 2	-0.89 (-1.50, -0.28)	0.004	-0.88 (-1.48, -0.29)	0.004	-0.68 (-1.29, -0.07)	0.028	-0.90 (-1.50, -0.30)	0.003	-0.70 (-1.31, -0.09)	0.024
Age of Starting Solid Foods	RN Adherence Score 2	-0.12 (-0.25, 0.01)	0.060	-0.15 (-0.28, -0.03)	0.017	-0.15 (-0.27, -0.02)	0.019	-0.17 (-0.29, -0.04)	0.009	-0.16 (-0.28, -0.03)	0.013
Age of Starting Solid Foods	Nurse Manager Knowledge Score 2	0.10 (-0.04, 0.23)	0.150	0.08 (-0.05, 0.21)	0.239	0.11 (-0.02, 0.24)	0.086	0.09 (-0.04, 0.21)	0.183	0.12 (-0.01, 0.24)	0.071
Duration of Solids and Breast Milk Only	Nurse manager Knowledge Score 1	-5.04 (-11.45, 1.38)	0.122	-5.65 (-12.24, 0.94)	0.091	-4.51 (-11.63, 2.62)	0.212	-7.04 (-13.48, -0.60)	0.032	-6.45 (-13.44, 0.54)	0.070
Duration of Solids and Breast Milk and Formula	RN Knowledge Score 2	-0.25 (-0.60, 0.10)	0.158	-0.35 (-0.71, 0.01)	0.057	-0.41 (-0.78, -0.04)	0.029	-0.30 (-0.66, 0.06)	0.104	-0.37 (-0.74, 0.00)	0.051
Duration of Solids and Formula	RN Adherence Score 1	0.31 (0.07, 0.56)	0.013	0.30 (0.04, 0.57)	0.025	0.33 (0.06, 0.60)	0.017	0.28 (0.02, 0.54)	0.032	0.31 (0.04, 0.58)	0.023
Duration of Solids and Formula	Nurse Manager Knowledge Score 1	-3.84 (-7.06, -0.62)	0.020	-4.69 (-8.30, -1.07)	0.011	-4.64 (-8.43, -0.86)	0.016	-5.41 (-8.99, -1.83)	0.003	-5.38 (-9.12, -1.63)	0.005
Duration of Solids and Formula	Nurse manager Knowledge Score 2	0.31 (-0.02, 0.64)	0.063	0.28 (-0.06, 0.63)	0.103	0.40 (0.02, 0.77)	0.037	0.30 (-0.03, 0.64)	0.077	0.41 (0.04, 0.77)	0.030
Duration of EBMW	Nurse manager Knowledge Score 2	-0.41 (-0.88, 0.06)	0.089	-0.45 (-0.95, 0.04)	0.074	-0.32 (-0.84, 0.19)	0.213	-0.42 (-0.90, 0.06)	0.084	-0.30 (-0.80, 0.19)	0.228

Duration of Exclusive Breastfeeding up to 6 months	Nurse Manager Knowledge Score 1	2.90 (-0.75, 6.55)	0.115	4.11 (0.37, 7.84)	0.032	4.22 (0.16, 8.28)	0.042	3.84 (0.05, 7.63)	0.047	3.82 (-0.25, 7.88)	0.064
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Models with statistical significance were selected for this table. Knowledge Score 1 represents knowledge to specific CDC recommendations for cleaning and care of a breast pump. Knowledge Score 2 represents knowledge of techniques for use and cleaning of a breast pump that may be practiced by the general population but are not specifically recommended by the CDC. Adherence Score 1 represents RN adherence to specific CDC recommendations for cleaning and care of a breast pump. Adherence Score 2 represents RN adherence to knowledge of cleaning and care of a breast pump techniques that are not specifically recommended by the CDC.

Expression of Breast Milk in the Workplace: A Qualitative Analysis of Registered Nurse Experiences in Acute Care Hospitals

This manuscript is intended for submission to *Journal for Healthcare Management*

Executive Summary

More than half of women return to the workforce within one year following the birth of a child. To continue offering breast milk to their infants, these women often need to express breast milk in the workplace. Registered Nurses who work in bedside roles do not traditionally have access to private office spaces or personal control over their work schedule, making them uniquely susceptible to workplace barriers for expression of breast milk. Although lactation accommodations in the workplace have become more common, continued research is needed to illuminate any ongoing barriers. Employers can then make organizational modifications to mitigate these barriers and assist mothers in the workplace to achieve their breastfeeding goals.

The objectives for this study were to explore perceptions of support for expression of breast milk in the workplace among RNs. An online survey with quantitative and qualitative questions was completed by 58 RNs from 10 acute care hospitals in Los Angeles County. Qualitative data were explored using Strauss and Corbin's Grounded Theory approach. Responses demonstrated that hospitals could support employee breastfeeding goals by emphasizing adequate lactation rooms, sufficient lactation breaks, policy implementation, and effective communication.

Introduction

More than half of mothers with an infant under the age of one participate in the United States workforce, and the participation rates continue to increase. According to data from the Current Population Survey reported by the Bureau of Labor Statistics, the participation rate of mothers in the

workforce with an infant under the age of 1 was 55.8% in 2011, 57.8% in 2018, and 59.9% in 2019 (United States Bureau of Labor Statistics Current Population Survey, 2012,2019, 2020). Mothers who want to continue offering their infant breast milk upon return to the workforce are likely to rely on expression of breast milk in the workplace (EBMW).

The American Academy of Pediatrics recommends that infants be breastfed exclusively for the first six months, and then continue to be breastfed with complementary foods for the first year or longer (Eidelman & Schanler, 2012). The World Health Organization (WHO) recommends exclusive breastfeeding for all infants for the first six months of life and continued breastfeeding with appropriate complementary foods until they have reached two years of age or longer (WHO, 2017). These recommendations are based on the well documented health benefits of breastfeeding for the infant.

A report on the health benefits of breastfeeding conducted by the Agency for Healthcare Research and Quality (Ip et al., 2007) lists reduction in acute otitis media, atopic dermatitis, gastrointestinal infections, lower respiratory infections, asthma, obesity, diabetes, and sudden infant death syndrome among the health benefits in infants who are breastfed (Ip et al., 2007). Health benefits to breastfeeding have also been demonstrated among women who breastfeed and include an improvement in the return to pre-pregnancy weight as well as a reduction for the risk of onset of type 2 diabetes, postpartum depression, osteoporosis, breast cancer, and ovarian cancer (Ip et al., 2007).

There is significant financial benefit to breastfeeding, with health benefits for the mother and infant impacting health care costs. A cost analysis conducted by Bartick and Reinhold (2010) demonstrated that there would be a cost savings of \$13 billion dollars per year if 90% of mothers followed recommendations to breastfeed exclusively for the first 6 months of their infant's life. At the employer level, there is a reduced rate of absences among breastfeeding mothers (Cohen et al., 1995) and an increase in retention of the employee (Mutual of Omaha, 2001).

Research has demonstrated barriers to EBMW such as female to male communication (Anderson et al., 2015), a lack of awareness for potential lactation accommodation resources (Froh &

Spatz, 2016), or use of a bathroom or storage space to express breast milk (Turner & Norwood, 2014). Workplace environment and technical support has been shown to correlate with duration of exclusive breastfeeding (Bai & Wunderlich, 2013). These studies combined different occupations within the population sample, meaning employees may have had varying access to private lactation accommodation spaces, varying ability to control their work schedule for breaks, and different coworker and managerial systems for support. Studies focusing on Registered Nurses or other client-facing employee populations specifically are few.

Under the Fair Labor Standards Act (FLSA) (United States Department of Labor, 2017), the federal law mandates reasonable breaks for up to 1 year, prohibits the use of a bathroom as a lactation accommodation, and requires that the lactation accommodation space be out of the view of other employees and free from interruption. In 2020, California implemented an update to their existing Labor Code Chapter 3.8, which created a more comprehensive list of requirements to protect a mother's ability to express breastmilk in the workplace (California Legislative Information, 2019). Some improvements to the labor code include specifying that the lactation room is close to the work area, is clean, and that the employee has access to a sink and running water. Break time descriptions were not modified in the updated California labor code and still specify that employers provide a "reasonable" amount of break time which should coincide with originally scheduled breaks.

Given this background on benefits of breastfeeding and current lactation accommodation policies federally and in California, this study was conducted to learn about the experiences of working RNs who have expressed breast milk in the workplace and make recommendations to employers for improving employee lactation experiences.

Methods and Materials

Recruitment and Study Population

RNs (n=199) were recruited from 10 acute care hospitals within the Los Angeles county. All hospitals acquired IRB approval within their facilities to participate. Administrators at seven of the

hospitals allowed RNs to receive a \$20.00 electronic e-gift card for participating, the other RNs participated without gift care compensation. The first 15 Registered Nurses (RN) to respond from each hospital were eligible for the e-gift cards. RNs were eligible to participate if they had a child within the past 3 years, returned to work at that hospital within 1 year following childbirth, expressed breast milk for any length of time in the workplace when they returned to work, and returned to work in a direct patient care role. Participant responses were confidential and not shared with hospital administration. Participants were recruited from September 2019 through October 2020.

Instruments

The Employee Perceptions of Breastfeeding Support Questionnaire (EPBS-Q) which measures employee perceptions under constructs of Company Support, Manager Support, Coworker Support, Time, Physical Environment, and Communication was administered online. The EPBS-Q is a 41-item Likert scale questionnaire with one additional open-ended question: "Thank you for your time completing this survey. Please provide any other comments you may have." Answers from this open-ended question provided qualitative data for the current study. The EPBS-Q is part of the Breastfeeding and Employment Study (BEST) Questionnaires developed by Greene et al. (2008).

Demographic data was collected including questions on age, sex, marital status, annual (combined) income level, race/ethnicity, current employment position, duration of employment, the age of the child when she returned to work after leave, full time/part time status upon return to work, maternity leave benefits, and amount of time off following childbirth provided by employer.

Data Analysis

Strauss and Corbin's (1998) approach to Grounded Theory was used to explore the qualitative responses. Two reviewers conducted and agreed upon open coding, axial coding, and selective coding to analyze the responses. Open coding was conducted with line-by-line analysis of responses for codes. Axial coding was then conducted by rereading open codes to create linked categories and subcategories of codes. The final axial codes were assigned to the paradigm of conditions, actions-interactions, and

consequences or results. A central category was then identified through selective coding. A conceptual description of the central category was created based on the axial codes.

To generally summarize the content of the responses, the responses were evaluated for presence of supportive experiences or feedback, unsupportive experiences or feedback, a combination of supportive and unsupportive experiences and feedback, and neutral responses. A response was categorized as supportive if it included only comments indicating support. A response was categorized as unsupportive if it included only comments indicating a lack of support. A response was categorized as combined supportive and unsupportive if both elements were present. A neutral response was categorized if it provided a comment that did not connote support or lack of support.

Results

A total of 199 Registered Nurses completed the survey and 58 provided a response to the open-ended question: "Thank you for your time completing this survey. Please provide any other comments you may have." Among these 58, the mean age was 34.65 years \pm 3.95. Most participants were married (93.1). Over two thirds (70.7%) reported an annual (combined) income greater than \$100,000 per year. Race was identified as White by 47.3%, Latina or Latinx by 23.6%, 21.8% Asian/Pacific Islander, 3.6% as combined ethnicity or race, 1.8% Hispanic, and 1.8% other. Average employment duration at their current hospital was 6.86 years \pm 3.86. Upon return to work, more than half (63.8%) returned to full time work and almost a third (32.8%) returned to part time work. More than half (55.2%) received disability leave, 32.9% received Paid Maternity Leave, and 8.6% reported using neither paid maternity leave or disability. Participants reported a mean of 4.85 months \pm 2.24 off from work following the birth of their child. (Table 1).

The RNs who provided qualitative comments were not statistically significantly different on any demographic variables from those who did add comments except for race or ethnicity (Fisher's exact test, $p=0.04$). Racial and ethnic composition among those who provided comments was 21.40% Asian or Pacific Islander, 23.20% Latina or Latinx, 48.20% White, 3.6% combined ethnicity or race, 1.8% Hispanic

and 1.8% Other, compared to those who did not provide comments being 6.4% African American, 39.1% White, 36.4% Asian/Pacific Islander, 14.5% Latina or Latinx, and 3.6% combined ethnicity or race. The qualitative responses cumulatively provided a total of 4,142 words. Of the 58 responses, 2 were supportive experiences/feedback responses, 23 were unsupportive experiences/feedback, 32 were combined supportive and unsupportive experiences/feedback responses, and 1 was a neutral response.

Initial open coding resulted in a broad list of codes. Axial coding grouped these codes to create 11 categories. These 11 categories were assigned under the conditions, actions-interactions and consequences or results paradigm.

- Conditions: *Breaks, Lactation Room, Challenging Job and Coverage, Pumps and Storage*
- Actions-Interactions: *Communication, Manager Support, Coworker Support, Unit Support*
- Consequences or Results: *Breastfeeding Goals, Unsupportive Pumping Experiences, Lack of Privacy and Insecurity*

Unsupportive Feedback and Experiences Findings Summary:

Conditions

The category of *Breaks* included subcategories of Eating While Pumping, Insufficient Frequency of Breaks, Lack of Control over Break Schedule, and Insufficient Time for Breaks. Examples of wording in this category included:

“my break times are not adequate for a full pumping session...”

“the length of time allowed away from my assignment was only 10-15 min... definitely not enough time”

“the biggest challenge is having enough time to pump and eat during breaks”

“felt judged by some coworkers and leads for pumping at the wrong time”

The category of *Lactation Room* included Lack of Proximity of Lactation Room, Insufficient Number of Lactation Rooms, Occupied Lactation Room, Undersupplied and Unclean Location Room, Inadequate Seating in Lactation Room, Lack of Sink in Lactation Room, Unaesthetique Lactation Room, and Lack of Social Distancing in Lactation Room. Examples of wording in this category included:

“the breastfeeding area at work is often not clean and never has gloves, paper towels or saniwipes stocked.”

“the room designated for pumping is depressing, small... and often filthy”

“we have only one room as the designated breastfeeding place”

“I wish there was a sink in our lactation lounge”

“I have often had to wait while someone finished...”

The category of *Challenging Job and Coverage* included Lack of Coverage, Demanding Job Duties, and Difficulty Leaving Patients. Examples of wording in this category included:

“hard to have floor duties of patient care covered”

“it is stressful for the nurse needing to find coverage”

“often bring my phone with me and might have to step away during a pumping session”

“it was not easy to step away from my patients”

“pumping at work is difficult”

“it was hard at work”

The category of *Pumps and Storage* included Inadequate Refrigeration and Insufficient Time for Cleaning Pump Parts at Work. Examples of wording in this category included:

“the breakroom fridge is packed, dirty, and not at optimum temperatures”

“it takes an additional 5 mins to properly clean the equipment”

“I wash my parts in a different room, which makes pumping in 15 minutes difficult”

Actions-Interactions

The category of *Communication* included Communication Barrier Female to Male, Difficulty Requesting Breaks, Communication of Lactation Accommodation Policies. Examples of wording in this category included:

“...I had all male managers... I was not comfortable discussing this matter with them”

“I don't know of a designated breastfeeding place at work...”

“some charge nurses give you attitude when you take longer than 15 minutes to pump”

“all the information is passed casually as advice between some moms”

“...management does not prepare a new mother on breast pumping rights...”

The category of *Coworker Support* included Lack of Coworker Support, Negative Comments from Coworkers, and Coworker Conceptions of Pump Breaks. Examples of wording in this category included:

“I do feel support from some coworkers but not all of them are supportive”

“many have poor attitudes about pumping at work and make negative comments about pump breaks”
“I was aware of the toll that this took on my coworkers”

The category of *Unit Support* included Lack of Unit Support, Unit Support Variability, and

Dayshift/Nightshift Differences. Examples of wording in this category included:

“night shift the charge nurse allows nurse to pump in her/his office... in the day shift RNs complain there isn’t any place to do this”
“each unit has different accommodations and attitudes towards pumping...”

Consequences or Results

The category of *Breastfeeding Goals* included Affected Milk Supply, Early Cessation of Pumping,

Unable to achieve Breastfeeding Goals, and Formula Supplementation. Examples of wording in this category included:

“my milk supply dropped very quickly when I returned [to] work”
“the limited time to pump plus stress of work makes it hard to express enough milk for my child”
“I am only realistically able to leave the floor long enough for 2 pumping sessions...this cause problems with my milk supply”

The category of *Unsupportive Pumping Experiences* included Inappropriate Rooms for Pumping, Physical Responses, and Stress Responses. Examples of wording which fell in this category included:

“I often pumped in the restroom due to lack of space”
“went home engorged because of lack of support”
“I was always rushed to come back on the unit”
“it was extremely stressful and I cried”
“pumping at work was an incredibly stressful experience”
“I had a lot of anxiety about pumping at work”
“they start to shame you”
“allowing extra break times, as much time that is required...without retribution”
“new mothers are definitely scrutinized and even ostracized for their choice to breastfeed and pump”
“some units only have a supply closet to utilize”
“there is not always a chair so I often stand up while pumping”
“I have had to pump in a male staff bathroom”

The category of *Lack of Privacy and Insecurity* included Multipurpose Room, Unlocked Lactation Room, Pumping with Others Present, and Interrupted Pumping Sessions. Examples of wording in this category included:

“the room we were given to pump was a multipurpose room with no privacy or lock on the door”
“had to find an office on my unit to use instead and hope nobody would attempt to enter the room while pumping”
“the break room where people eat is where some RNs end up being forced to pump milk”

Supportive Feedback and Experiences Findings Summary:

Supportive comments were found among the four categories of *Manager Support*, *Coworker Support*, *Unit Support*, and *Lactation Room*.

The category of *Manager Support* included Manager Assistance. Examples of wording in this category included:

“my manager was able to provide a room closer than the designated pumping room”
“my manager and coworkers are great support for breast feeding mommas”
“manager provided office space in the unit and always flexible to use it”

The category of *Coworker Support* included coworker support. Examples of wording in this category included:

“hard to have time to pump, the only way I was able to do it was due to my coworkers support”
“I have amazing coworkers that have been very supportive of my breastfeeding journey”

The category of *Lactation Room* included Appropriate Accommodations. Examples of wording in this category included:

“pumping room is wonderful, quiet and provides the privacy and removal from work environment needed”

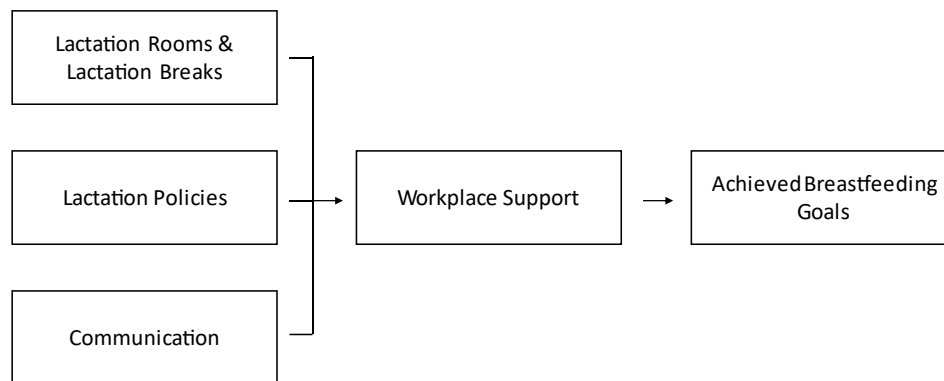
The category of *Unit Support* included Nightshift Support and Unit Support. Examples of wording in this category included:

“during nightshift the lactation room was available”

“my unit is very supportive of pumping”

Through selective coding it was determined that the central category was Expression of Breast Milk in the Workplace. A conceptual description of this central category included Lactation Rooms and Lactation Breaks, Policies, Communication, Workplace Support and Achieved Breastfeeding Goals (Figure 1).

Figure 4. Conceptual Description of Expression of Breast Milk in the Workplace



Discussion

There were 58 Registered Nurse responses to the open-ended question on the EPBS-Q. There were 2 brief responses that were entirely supportive comments and pertained to a feeling of strong support on the individual nurse’s units. One comment was neutral. The remaining 55 responses were either entirely unsupportive comments (n = 23) or unsupportive comments combined with positive comments (n = 32). All 58 RN responses came from the 7 hospitals who permitted participant incentives. Among participants who provided qualitative responses compared to those who did not, there was a higher percentage who identified as White and Latina or Latinx, a lower percentage who identified as Asian/Pacific Islander, and no RNs who identified as African American.

Similar categories appeared across all participating hospitals and findings are reported as aggregated data. This suggests that these experiences are not isolated to specific hospitals but rather a collective experience among RNs.

The specific excerpts of text cited in the results provide a representation of the responses as a whole. Comments in the specific examples were echoed repeatedly in individual responses. Evidence of supportive workplace environments was repeated as RNs commented on NMs providing a room to use for lactation which was closer than designated lactation rooms or coworkers providing support which enabled the RNs to take lactation breaks.

Overall, the responses demonstrated that there were challenges to expressing breast milk in the workplace for these employees. The word stress or a variation of stress was found 13 times within the responses. Unsupportive workplace experiences were repeated including that EBMW was difficult, breaks were too short, a lack of communication, a lack of perceived coworker support, a lack of proper lactation accommodation, physical and stress responses to workplace experiences, and ultimately in some cases a decline in milk production and breastfeeding goals were negatively impacted. The response categories can guide improvements in hospital employee lactation accommodations.

Many of the inadequacies described in the responses have been addressed through the California Labor Code Chapter 3.8 (2019), and employers need to implement the updated revisions to workplace lactation accommodations. However, break time was not revised in the updated Labor Code, and a lack of adequate duration and frequency of breaks was one of the most repeated themes. Some employees did not feel they received a true break during the day because their break time was designated for breastfeeding, which resulted in fatigue. Break times were too infrequent and too brief for participants to effectively remove enough breast milk as well as properly clean their pump parts. Current California Labor Code Chapter 3.8 (2019) recognizes that lactation accommodations are necessary, but because lactation breaks are unpaid and meant to synchronize with customary break times, they are viewed as an individual's choice rather than a medical need and priority. Although an employed mom cannot be there all day in person with her infant during work hours, with support from her workplace she can continue to provide her breast milk in her absence. For some mothers and infants, this may provide an emotional relief in addition to the physical health benefits. The concept of

employee lactation in the workplace needs to shift from an activity falling under breacktime to being recognized as a health necessity and human right.

Recommendations for Workplace Lactation Programs

Based on conceptual description and coding, the following list of recommendations can serve as a guide for employers to develop Lactation Accommodation Programs. It includes reinforcing compliance with current California Labor Code 3.8, as well as additional recommendations which can augment the California Labor Code 3.8.

Lactation Room: An adequate number of lactation rooms which are close to the workstation of the employee are needed. Lactation rooms should be private, clean, supplied with wipes, soap, running water, a sink, appropriate seating, appropriate lighting and a functioning refrigerator. If a designated lactation room is not feasible, then an alternative space for lactation accommodation needs to be appointed which still provides the amenities of a lactation room on every hospital floor. Use for lactation accommodation in a multipurpose room must take precedent, with other uses of the room terminating when an employee needs the room for lactation accommodation. Privacy for lactation accommodation is required meaning that other people should not be present within the multipurpose room while in use for lactation accommodation and locks are necessary.

Lactation Breaks: Lactation breaks need to be of sufficient length to fully express breast milk and properly clean all pump parts. Lactation breaks need to occur with sufficient frequency to maintain milk supply. Mothers should be granted the time and frequency that they need on an individual basis for lactation accommodations. According to many of the responses, this would be a minimum of 20 minutes, but more suitably 30 minutes, with a frequency of at least of every 4 hours, 3 times in a 12-hour shift, and more frequently if needed. Lactation breaks should not be considered a personal break or a meal break. Separate rest and meal breaks should be provided.

Lactation Policies: Lactation policies should include detailed duration and frequency of lactation breaks and coverage policies (for Registered Nurses include who will take care of their patients during their Lactation Break). Coverage policies need to include a formal arrangement for coverage within the nursing units and not rely on coworkers to determine amongst themselves. Lactation policies should be accessible for all employees.

Communication: Hospital lactation policies should be distributed to all employees upon hire and yearly thereafter. An explanation of lactation policies should be a part of annual required trainings for all employees regardless of gender. In addition to a briefing on the content of the policy, education on appropriate communication regarding lactation accommodations and breaks should be included. Instruction can contain specific information about refraining from judgmental or harassing language used by any employee towards another employee using lactation accommodations. When an employee requests maternity leave, an email should be sent explaining lactation accommodation resources available upon return to work. Confirmation of receipt of this information should be obtained. To eliminate any potential miscommunications between a manager and an employee, a third-party administrator should be available to all employees to help facilitate employee-manager communication regarding lactation accommodations. Specific training for nurse managers and charge nurses should be provided on appropriate language for conversations regarding lactation accommodations.

Support: Support is perceived from appropriate lactation accommodations, breaks, policies, and communication. Hospitals should include Registered Nurses on lactation accommodation committees to encourage employee participation and feedback. To prioritize the importance of supporting employees who wish to continue breastfeeding, an organizational position statement should be made

acknowledging the benefits of assisting mothers in the workplace to achieve their breastfeeding goals. A hospital should strive to achieve a designation of being Employee Breastfeeding Friendly.

Limitations

This was a cross sectional study. The total length of time to participate was about 25 minutes, and nurses completing the study on a break may not have felt that they had adequate time to provide a full comment. The study included RNs only, a group of employees who are client-facing and do not typically have access to a personal office space, and therefore the results may not be generalizable to other occupations who work under different settings. Responses were not provided among participants identifying as African American and therefore future studies need to be conducted to explore their experiences.

Conclusion

Some responses did demonstrate that there was a sense of workplace support, however policies were not always followed, and support was not always perceived. Hospital Administration, Managers, and Directors should be aware of the ongoing barriers in the workplace and use the described recommendations to support their employees who express breast milk in the workplace and comply with California Labor Code.

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Table 1: Demographics of Registered Nurse Participants (n=58)	
Registered Nurses	
Age (years), (N) Mean \pm SD, Range	(57) 34.65 \pm 3.9, 26-45
Sex, (N) %	
Female	(57) 100.0%
Male	
Marital Status, (N) %	
Single	(3) 5.2%
Married	(54) 93.1%
Income, (N) %	
70-80k	(1) 1.7%
80-90k	(2) 3.4%
90-100k	(11) 19%
> 100k	(41) 70.7%
Race, (N) %	
Asian/Pac Island	(12) 21.4%
White	(27) 48.2%
Latina or Latinx	(13) 23.2%
Hispanic	(1) 1.7%
Asian and White	(1) 1.7%
Combined Ethnicity	(1) 1.7%
Other	(1) 1.7%
Employment Duration (years), (N) Mean \pm SD, Range	(57) 6.86 \pm 3.86, 1-16

Age of Child when Returned to Work (Months), (N) Mean \pm SD	(56) 4.66 \pm 1.81
Status When Returned, (N) %	
Part Time	(19) 32.8%
Full Time	(37) 63.8%
Other	(1) 1.7%
Maternity Leave Type, (N) %	
Paid Maternity	(19) 32.8%
Disability	(32) 55.2%
None of the Above	(5) 8.6%
Time off from Work (months), (N) Mean \pm SD	(46) 4.85 \pm 2.24

Demographic data voluntarily reported among participants who provided a qualitative response to the EPBS-Q. Participants were informed that they could skip questions that made them uncomfortable or that they did not want to answer. The total who answered is indicated within the table.

Table 2. Summary of Recommendations for Workplace Lactation Programs	
Lactation Rooms	<p>Dedicated Lactation Room</p> <ul style="list-style-type: none"> · Sufficient number of rooms · Close to workstation · Private with functioning lock · Clean with adequate lighting · Sink and running water · Refrigerator · Comfortable seating · Supplied with soap, sanitizer, and wipes <p>Appointed Lactation Room/ Multipurpose Room</p> <ul style="list-style-type: none"> · Designate which room will be used for lactation breaks if a dedicated lactation room is not possible · Use for lactation breaks takes precedent · Other employees should not be present in the room while in use for a lactation break
Lactation Breaks	<p>Sufficient Duration of Break</p> <ul style="list-style-type: none"> · Includes time for accessing room, lactation, cleaning pump, and storing milk · 30-minute duration is reasonable · Longer duration if needed by the nursing mother <p>Sufficient Frequency</p> <ul style="list-style-type: none"> · Minimum of 3 lactation breaks per 12-hour shift · Greater frequency if needed by the nursing mother <p>Separate rest and meal breaks should be provided</p>
Lactation Policies	<p>Contents</p> <ul style="list-style-type: none"> · Detailed description of duration and frequency of lactation breaks · Detailed coverage policies for patient care during lactation break · Specify that support will be offered as long as the mother wishes to continue providing expressed breast milk
Communication	<p>Policy Dissemination</p> <ul style="list-style-type: none"> · Provided at hire to all employees · Provided via email upon request for use of maternity leave · Accessible for reference on employee web access portal · Required annual policy briefing for all employees

	<p>Communication Education</p> <ul style="list-style-type: none"> · Provide training on appropriate communication on employee lactation to all employees, including Charge Nurses, Managers, and Directors <p>Employee Lactation Liaison</p> <ul style="list-style-type: none"> · Person other than the Nurse Manager should be available to all employees to discuss questions or concerns
Support	<p>Hospital Position Statement</p> <ul style="list-style-type: none"> · Provide written statement of support and prioritization for employee lactation

Recommendations to improve workplace lactation programs including supplemental recommendations to existing California Labor Code Lactation Accommodation Policy.

DISSERTATION CONCLUSION

Collectively, the research findings represent the interwoven complexities embedded in the expression of breast milk in the workplace. Perceived workplace support, knowledge and adherence to CDC guidelines for cleaning of a breast pump, and recent lived experiences among mothers can inform employers and policy makers on how to improve conditions for workplace lactation.

The dissertation is noteworthy for its collection of data from ten hospitals within an urban area. As a result, the findings represent results that are not unique to one hospital only. In addition, the use of a one-time anonymous survey by an investigator from outside the hospitals and combining data across hospitals may have allowed individual participants to feel free to answer questions. The participants represented employee level, managerial level, and organizational level staff which provided representation of perspectives within each level of employment within an organization.

The research findings in Chapter Two determined that workplace support can affect breastfeeding and infant feeding outcomes favorably. Increased perceived time and frequency of lactation breaks was associated with an increased duration of feeding solids and breastmilk to the infant, and a decreased duration of solids and formula. These findings present evidence to support modifying state and federal policy to address specific and adequate duration and frequency of lactation breaks. Increased communication among coworkers was associated with a decrease in the duration of feeding solids, breastmilk, and formula. This relationship can be examined in the future to determine if formula supplementation specifically was reduced because of increased perceived coworker communication. The research results demonstrate that workplace support is relevant to breastfeeding and infant feeding outcomes and as such, the workplace should be organized to enhance breastfeeding outcomes among employees.

The research findings in Chapter Three addressed cleaning a breast pump at work, which was a new approach to how expression of breast milk in the workplace is studied. Knowledge and adherence scores showed that RN knowledge of cleaning a breast pump is high, but adherence to cleaning is not.

At the manager level, across the hospitals, there was an increase in duration of solids and formula with increased manager knowledge of CDC recommendations for cleaning a pump. These relationships require further investigation. The research findings suggest that knowledge and adherence to cleaning a breast pump at work may play a role in breastfeeding outcomes.

The research findings in Chapter Four demonstrated that a lack of support for EBMW still occurs among RNs who express breastmilk upon return to work. Supportive experiences were reported, but most responses centered upon areas in need of improvement. The conceptual description of Lactation Rooms & Lactation Breaks, Lactation Policies, Communication, Workplace Support and Achieved Breastfeeding Goals can be used to guide workplace lactation policies. Successful expression of breast milk in the workplace requires several components, all of which need to be addressed and acknowledged. A limitation of the qualitative research was that the sample of RNs who provided a written response did not include RNs who identified as African American. Future research can examine whether among RNs, more barriers to EBMW are encountered among specific races and ethnicities.

Arguably, policy changes are necessary to ensure that mothers have an increased amount of supported time off work following birth of a child. For those mothers who choose or must return to work, state and federal policies have an obligation to protect a mother's ability to continue breastfeeding their infants. The issue of expression of breast milk in the workplace should not be dismissed by redirecting efforts solely to emphasize that mothers should have the ability to stay at home longer with their infant. Some mothers will choose to return to work. Some mothers will not realistically be able to stay home. All mothers should have support. Therefore, it is critical that the workplace acknowledge the right to breastfeed among mothers in the workplace.