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Breastfeeding Support Interventions by International Board Certified Lactation Consultants: A Systemic Review and Meta-Analysis

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Abstract

Background: International Board Certified Lactation Consultants (IBCLC) are healthcare professionals who are highly trained in lactation science; however, little is known about the efficacy of IBCLC-specific support on breastfeeding outcomes.
Research aims: This systematic review and meta-analysis aimed to describe interventions containing direct support by IBCLCs during the postpartum period and to analyze the association between study characteristics and the prevalence breastfeeding outcomes.
Methods: Electronic databases were searched for studies published between January 2001 and December 2018. Meta-analysis and meta-regression were performed on studies containing breastfeeding prevalence data at 3 or 6 months postpartum.
Results: Seventeen interventions met all inclusion and exclusion criteria and eight research teams reported the prevalence of any or exclusive breastfeeding at 3 and/or 6 months. For any breastfeeding at 6 months, the pooled difference was 0.08 [0.04, 0.12] meaning we'd expect to observe 1 additional case of any breastfeeding at 6 months postpartum for every 12 women who received an IBCLC intervention, 95% CI [8, 25] rather than control conditions. Results differed depending on which outcome variable was used to measure breastfeeding and the timing of that measurement.
Conclusions: Breastfeeding interventions that include IBCLC support in the postpartum period have potential for improving breastfeeding outcomes; however, when designing interventions, the timing and method of data collection for measures of breastfeeding are instrumental to study sensitivity and need to be based on the aims of the intervention itself.

Keywords

breastfeeding, breastfeeding support, International Board Certified Lactation Consultant, lactation education, lactation management

Background

Human milk is recognized as the ideal food for human infants (Victora et al., 2016; World Health Organization, 2009; Eidelman et al., 2012); however in order for human milk to get to human babies, breastfeeding, which is a health behavior, needs to be initiated and managed. To successfully reach recommended breastfeeding goals, parents often turn to the support of the healthcare system (McFadden et al., 2017). There is a broad cadre of health care providers who support breastfeeding parents. They can be roughly categorized as: (1) primary care providers; (2) peer counselors; and (3) lactation-specific healthcare providers with varying degrees of training (US Department of Health and Human Services, 2011). All of these types of healthcare providers can provide successful breastfeeding support, but their

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training, areas of expertise, and practice patterns differ in significant ways (Patnode, Henninger, Senger, Purdue, Whitlock, 2016; Joanna Briggs Institute, 2012). Being aware of how to best utilize each type of lactation support in the health care system is important to designing effective breastfeeding interventions.

Primary care providers ideally receive some level of breastfeeding education during their general training programs (Taylor & Bell, 2017; Webber & Serowoky, 2017). Peer counselors typically have experience nursing their own children, and receive further training in lactation support to provide guidance to breastfeeding parents in their community, within a limited scope of practice (Kaunonen, Hannula, & Tarkka, 2012). Lactation specific healthcare providers have received focused training in breastfeeding management and support in programs of varying lengths and intensities, meant to qualify them to identify and treat breastfeeding problems, as well as providing generalized support and education to breastfeeding parents and other healthcare providers. These training programs can be directed at different healthcare specialties (e.g., nurses, physicians, or doulas), but can also be intended as a stand-alone credential (United States Lactation Consultant Association, n.d.). Of the various educational programs qualified to train lactation counselors, specialists, or consultants, the International Board of Lactation Consultant Examiners, which certifies International Board Certified Lactation Consultants (IBCLC), require the greatest number of hours in education and training (https://iblce.org/), and are recognized as the "only health care professionals certified in lactation care" by the *United States Surgeon General's Call to Action to Support Breastfeeding* (2011, p. 48). Researchers conducting breastfeeding interventions often treat providers of lactation support indiscriminately, without regard to pairing intervention modalities with the most appropriate scopes of practice and areas of expertise.

For example, primary care providers typically see breastfeeding parents and children in a fast-paced clinical setting that allows for brief educational messages and screening tools that can identify patients who need a referral for additional support or lactation-specific treatment (American College of Obstetricians and Gynecologists [ACOG], 2016). Peer counselors generally do not practice within a scope that allows for treatment of complex breastfeeding problems, but focus, instead, on the social and emotional support that can be delivered in the postpartum period, on the phone, or in group settings, as well as during individual counseling and support sessions. IBCLCs have a scope and practice pattern that includes the time and/or expertise to manage and treat complex breastfeeding difficulties. Their expertise is best paired with interventions that include both time and face-to-face contact with breastfeeding women during the postpartum period, when problems are occurring.

Systematic reviews and meta-analyses of lactation support often combine dissimilar types of lactation support providers, or group dissimilar intervention strategies within a single outcome statement (Kim, Park, Oh, Kim & Ahn, 2018; Patnode et al., 2016; Wouk et al., 2016; Sinha et al., 2015; Ibanez et al., 2011; McFadden et al., 2017). For example, the recent Cochrane review of breastfeeding support (McFadden et al., 2017) excludes support that is only prenatal or only provides educational sessions, but includes all types of professional, lay, trained, and untrained providers in their primary outcome. Secondary outcomes include an analysis of professional versus lay support, but professional support could be provided by nutritionists, lactations consultants, or researchers, among other specialists, and broadly defined "lactation consultants" take part in only 10 of the 58 studies considered to provide professional support.

In another meta-analysis, Patel and Patel (2016) analyzed the "Effectiveness of lactation consultants and lactation counselors on breastfeeding outcomes," limiting their study sample to lactation-specific support providers. However, they included a broad range of intervention strategies including counseling and structured education or support of the maternal-infant, as well as interventions that were directed at the healthcare team or system of care. Studies in their meta-analysis included interventions that occurred in the antepartum, intrapartum, or postpartum period, suggesting interventionists may or may not have had access to the breastfeeding couplet. They also defined several types of lactation support providers, but did not report which studies fell into each category, nor did they provide secondary outcomes differentiating between these categories of lactation-specific support (Patel & Patel, 2016).

Key Messages

- International Board Certified Lactation Consultants (IBCLCs) are trained to provide management and treatment of complex breastfeeding problems using comprehensive examinations and interventions in face-to-face encounters; however, systematic reviews and meta-analyses of lactation support have not isolated IBCLCs from other professionals in situations in which face-to-face encounters in the postpartum period are ensured.
- There was an overall increase in breastfeeding at 6 months in study participants exposed to IBCLC interventions that included at least one face-to-face intervention.
- Design and timing of breastfeeding measures lacked consistency and may have influenced the study outcomes.
- Interventions that included free breast pumps and staff education in their breastfeeding support were often associated with a lower breastfeeding prevalence.

The purpose of this systematic review and meta-analysis is to isolate support provided specifically by IBCLCs in interventions in which they are given face-to-face access to study participants during the postpartum period. Our aim was to analyze the association between this particular category of professional lactation support and the prevalence of any and exclusive breastfeeding at 3 and 6 months postpartum.

Methods

Design

We performed a systematic review of the existing literature on IBCLC-specific breastfeeding interventions and a meta-analysis of the subset of studies using similar breastfeeding outcome measures. The protocol outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgens & Green, 2011) guided the selection and appraisal of studies. The manuscript was prepared consistently with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher, Liberati, Tetzlaff, Altman, & Group, 2009) for randomized trials and the Meta-analysis of Observational Studies in Epidemiology (MOOSE) guideline for observational studies (Stroup et al., 2000).

Sample

We sought studies that included professional interventions to increase breastfeeding (exposure) and a quantitative outcome inclusive of "any" breastfeeding or "exclusive" breastfeeding. Study designs included pre-post (time series), quasi-experimental, and randomized control trials. Intervention locations included hospitals, pediatric clinics, and other community settings such as clinics administering the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Key search terms included (lactation consultant OR IBCLC OR health professional) AND (postpartum OR postnatal, OR intervention OR support) AND (lactation OR breastfeeding) AND (duration OR exclusivity). Studies were excluded if they did not involve an IBCLC intervention, lacked face-to-face contact with an IBCLC in the post-partum period, had poor study validity, or unclear results.

A list of 205 abstracts was compiled and reviewed (Figure 1). Of these, 123 abstracts were excluded, and 82 full-text articles were retrieved. Upon full-text review, an additional 65 studies were excluded, primarily because they lacked an IBCLC intervention that met inclusion criteria. Seventeen interventions met all inclusion and exclusion criteria. Eight of the 17 interventions reported the prevalence of any or exclusive breastfeeding at 3 and/or 6 months and were included in the meta-analysis.

Data Collection

One researcher (EC) performed a broad English language search in PubMed, Web of Science, and CINAHL, for articles published between January 2001 and December 2018. Reference lists of key systemic reviews, meta-analyses, and study interventions were manually checked for further publications not identified in the computerized search. Irrelevant abstracts (e.g., non-English, no intervention) were removed at this stage. Full-text articles were retrieved and separately reviewed by EC and HW. First, both authors reviewed full-text manuscripts to ensure consistent application of inclusion/exclusion criteria. Subsequently, manuscripts were reviewed by either researcher for inclusion, with any manuscripts in question reviewed and discussed by both researchers in order to reach consensus.

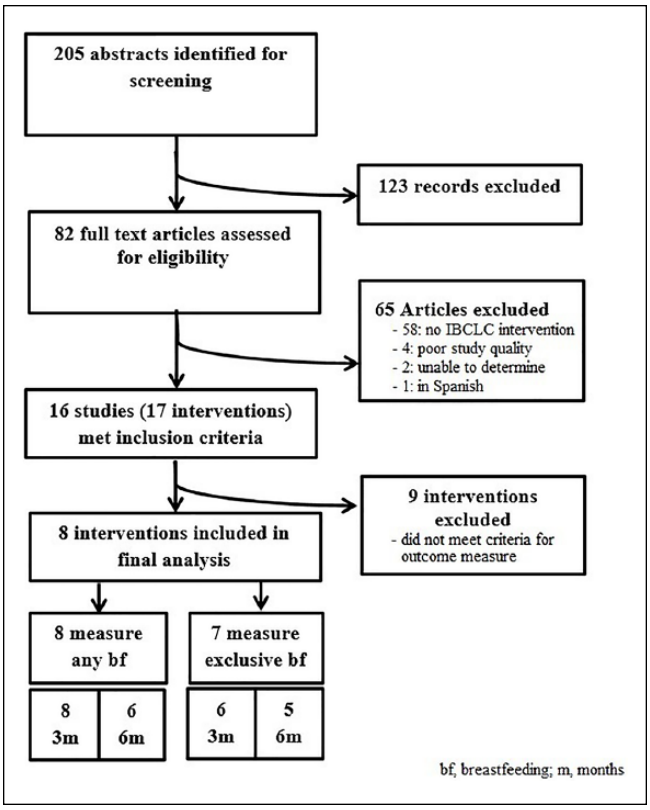

Figure 1. Study selection.

Measurement

All included studies were described by either researcher in terms of the sample and study setting, study design, intervention groups, type(s) of breastfeeding outcomes, and results. Dichotomous variables for selected study characteristics were created, including study design (randomized control trial vs. other), timing of IBCLC intervention (inclusive of pregnancy vs. only postpartum), whether facility staff received lactation education, whether breastfeeding supplies were provided to participants, the location of the intervention (clinic, hospital—inclusive of the intensive care nursery, home visit, and telephone calls), and whether the intervention was proactive (visits scheduled at prescribed time

points) or included a responsive, problem-based component in which participants could independently reach out to the research IBCLCs to address particular problems as they occurred. Facets of design validity were also assessed and included whether the IBCLC intervention was isolated from other interventions and providers of breastfeeding support, whether the study was likely to have contamination (failure to ensure limited contact with IBCLCs in the control arm), and whether measures of study fidelity (successful delivery of IBCLC intervention) were collected.

Data Analysis

For the meta-analysis, results were divided into two time points for outcome data (3 and 6 months), as these were the most commonly reported time points. Researchers publishing two of the studies reported outcomes at 4 months that were included with 3-month breastfeeding outcomes. Differences in breastfeeding prevalence between treatment and control arms at the designated time points were created from abstracted raw data for each study in the meta-analysis. Standard error estimates and 95% confidence intervals for each measure were obtained, based on techniques described by Deeks and Higgins (2010). Four separate meta-analyses were conducted: (1) 3-month any breastfeeding; (2) 3-month exclusive breastfeeding; (3) 6-month any breastfeeding; and (4) 6-month exclusive breastfeeding. Overall heterogeneity was assessed with *p*-values from the Cochran *Q* statistic. For each outcome (e.g., any breastfeeding at 3 months), a series of meta-regressions were run, with each model containing a single study characteristic (e.g., study design) as the independent variable. Funnel plots relating the risk difference estimates (abscissa) to the inverse-variance weights (ordinate) were examined visually for asymmetry, as well as statistically with *p*-values from the tests of Begg and Mazumdar (1994; and Egger, Davey Smith, Schneider, & Minder, 1997), and with the trim-and-fill imputation method of Duval and Tweedie (2000). All analyses were conducted in STATA version 12 (Statacorp, 2011).

Results

Study characteristics are presented in Tables 1 and 2. There were eight studies representing seven randomized control trials, one quasi-experimental study, and eight studies with a pre-post design. Eleven studies were conducted in the United States, three in Canada, and one each in the Netherlands, Israel, and Italy. Across studies, the sample size ranged from 99 to 781 dyads. Thirteen studies took place in the hospital setting and four specifically in the NICU. Half of the studies isolated the IBCLC intervention from other intervention components (e.g., staff education, breastfeeding support from CLCs). Five studies were rated as likely to contain contamination, with one study missing the information needed to make a determination. A measure of intervention fidelity was reported in the majority of studies ($n = 13$).

Breastfeeding outcomes and data collection time points were highly variable across studies (Table 1). Outcomes included the proportion of infants who were fed any human milk or who were fed human milk exclusively, as well as breastfeeding intensity, defined as the proportion of total feedings that included human milk. The definition for exclusive breastfeeding (EBF) was not always provided and differed between studies. Only studies occurring in the NICU differentiated the provision of expressed human milk from those feedings occurring at the breast. Data collection time points included breastfeeding during hospital stay, at discharge, and at various times throughout the first year (e.g., 2 weeks; 1, 3, 4, 6, or 12 months postpartum). The most common outcomes included the proportion of infants who were fed any human milk or who were fed human milk exclusively at 3 and/or 6 months (Table 2). As considerable evidence of heterogeneity was present among the study-specific effect estimates for 3 of the 4 outcomes ($p < .01$), summary estimates are not shown on the forest plots (Figure 2). The sole exception was any breastfeeding at 6 months (homogeneity $p = .39$), for which the fixed-effect summary *RD* was 0.08 [0.04, 0.13], meaning we'd expect to observe 1 additional case of any breastfeeding at 6 months postpartum for every 12 women who received an IBCLC intervention [95% CI, 8–25 women] rather than control conditions.

Results of stratification and meta-regression by study characteristics are presented in Tables 3 and 4 for breastfeeding outcomes at 3 and 6 months, respectively. For the outcomes of any breastfeeding, study characteristics yielding the largest difference of differences at 3 months were contamination and staff education and, at 6 months, were any clinic visits, home visits, and responsive clinic visits. None of these were statistically significant and the direction of the effect, except for provision of home visits, was not in favor of improved breastfeeding.

For the outcomes of EBF, the use of a randomized design yielded larger difference of differences at both 3 and 6 months. Trials with randomized designs had smaller effects than those with quasi-experimental or pre-post designs. Additional characteristics yielding larger or significant difference of differences for EBF at 6 months were contamination, provision of breastfeeding supplies, home visits, and responsive clinic visits; all in the direction of less EBF.

Visual inspection of the sparsely populated funnel plots did not indicate the presence of asymmetry in any outcome except any breastfeeding at 3 months (data not shown). Eggers *p*-values for any breastfeeding at 3 and 6 months were .06 and .20, respectively, and *p*-values for exclusive breastfeeding at 3 and 6 months were 1.00 and .21, respectively. For any breastfeeding at 3 months, a trim-and-fill analysis imputed four trials to counteract publication bias, reducing the effect estimate from .04 to –.002.

Table 1. Summary of Studies ($n = 17$).

Author (Year)	Sample & Setting	Intervention Groups	Breastfeeding Measures	Breastfeeding Outcomes	Comments, Limitations
Randomized Controlled Trials					
Bonuck (2005)	**New York, US:** 364 prenatal women from 2 hospital-affiliated health centers.	**Int:** IBCLC provided 2 prenatal visits, 1 hospital visit or home visit, and continued follow-up phone calls and visits as needed. **Control** No explicit BF promotion or support at prenatal clinic **Fidelity**: IBCLCs kept logs recording dates and sites of all attempted and actual visits, telephone calls, and the content of each contact. Report table of intervention 'dose' reported. Overall mean IBCLC contact 143.2 min. 81% received any intervention, 64% received prenatal intervention, 63% postnatal intervention, and 47% had both prenatal and postnatal intervention.	**EXC:** Every week until weaning; no formula or solids. Intake of water, juice, or vitamins not assessed. **ANY** represented graphically. **BI** BF intensity score (7-level) summed over 52 W. Dichotomized at medians.	**% & *OR* (95% CI)** EXC: 2 W: INT: 20%, 2 W: CON: 19%, p = NS 52 W: INT: 6%, 52 W: CON: 5 %, p = NS ANY BI 4.47 [2.13, 9.36] $p < .05$.	1. Graphic measurement of breastfeeding.
Bonuck (2014a) BINGO	**New York, US:** 666 primarily low income women seen in 1 medical center-affiliated prenatal care clinic.	Study 2: BINGO **Int. (3 arms LC, EP, LC+EP)**. LC = IBCLC provided 2 prenatal visits, 1 hospital visit, a 1-week PP clinic visit, plus 8 or more follow-up phone calls, and optional home visits as needed. EP = electronically prompted guidance from prenatal care providers with standard care PP. LC+EP included both LC and EP interventions with LC interventions PP. **Control.** No explicit BF. promotion or support at prenatal clinic, but 1 IBCLC available weekdays at hospital. Hospital L&D staff began attending 20-hour Certified Lactation Counselor (CLC) training course midway through trial. **Fidelity**: All visits by LCs documented.. Overall mean IBCLC contact 174 + 104 minutes. 93% received 1 or more prenatal visit, 84% received 1 or more hospital visit and 85% received one or more PP contact.	**EXC** 1 M, 3 M, & 6 M; only breast milk or vitamin supplements, with no water, juice, formula, or solid foods (unadjusted) **ANY** 1 M, 3 M, & 6 M (unadjusted) **BI*** 1 M, 3 M, & 6 M; 3-level variable: low < 20% medium 20–80% high > 80%.	***OR* (95% CI)** **EXC** LC 1 M: 1.50 [0.54, 4.14] 3 M: 4.40 [0.83, 43.92] 6 M: 1.00 [0.01, 49.56] LC+EP 1 M: 1.50 [0.63, 3.56] 3 M: 4.24 [1.01, 37.94] 6 M: 1.94 [0.23, 90.75] **ANY** LC 1 M: 1.87 [0.93, 3.87] 3 M: 1.69 [0.88, 3.26] 6 M: 1.84 [0.92, 3.68] LC + EP 1 M: 2.10 [1.20, 3.67] 3 M: 2.10 [1.23, 3.61] 6 M: 1.43 [0.80, 2.56].	1. Contamination with IBCLC staff at each hospital and L & D staff BF education. 2. IBCLC paired with EP in PAIRINGS study *Breastfeeding intensity data not shown.

(continued)

Table 1. (continued)

Author (Year)	Sample & Setting	Intervention Groups	Breastfeeding Measures	Breastfeeding Outcomes	Comments, Limitations
Bonuck (2014b) PAIRINGS	**New York, US:** 275 economically diverse women seen in 1 medical center-affiliated prenatal care clinic.	Study 1: PAIRINGS **Int. (1 arm = LC + EP)** IBCLC provided 2 prenatal visits, 1 hospital visit, plus 8 or more follow-up phone calls and optional home visits as needed (PP clinic visit not available at this site), plus electronically prompted guidance from prenatal care providers. **Control**. Women received standard care; no explicit BF. promotion or support at prenatal clinic, but 1 IBCLC available weekdays at hospital. Hospital L&D staff began attending 20-hour Certified Lactation Consultant (CLC) training course midway through trial. **Fidelity**: All visits by LCs documented. Overall mean IBCLC contact 178 + 88 minutes. 98% received 1 or more prenatal visit, 70% received 1 or more hospital visit and 91% received one or more PP contact.	**EXC** 1 M, 3 M, & 6 M (same as **BINGO**) at **ANY** 1 M, 3 M, & 6 M **BI*** 1 M, 3 M, & 6 M; 3-level variable: low < 20% medium 20–80% high > 80%.	***OR* (95% CI)** **EXC** LC + EP 4.29 [1.94, 9.47] 2.86 [1.21, 6.76] 1.00 [0.07, 14.00] **ANY** LC + EP 1 M: 2.79 [1.46, 5.32] 3 M: 1.93 [1.17, 3.19] 6 M: 1.77 [1.03, 3.07].	1. Contamination with IBCLC staff at each hospital and L & D staff BF education. 2. No isolation of IBCLC component in PAIRINGS study *Also gave intensity data.
Kools* (2005)	**Netherlands**: 781 women who chose supplemental home visit service (10 centers, cluster randomized).	**Int.** Community IBCLC care was provided without cost and the referral system streamlined (fax to IBCLC for problems). Care providers received 4 hr of training on support for BF & 2 hr on role & use of IBCLCs. Two refresher classes. **Standard Care**: Mothers received BF booklets that utilized Health Counseling principles and home visits by nurses. **Fidelity**: 16% received IBCLC care in intervention group. IBCLC contact not reported for control group.	**EXC** 3 M; no formula or complementary feeds. **ANY** 3 M.	***OR* (95% CI)** **EXC** 3 M: 0.79 [0.57, 1.10] **ANY** 3 M: 0.79 [0.58, 1.08].	1. Limited differentiation between intervention & control.
McKeever (2002)	**Canada:** 138 women from 1 hospital. Infants term or near-term (35–37 weeks).	**Int.** Women were assessed at 24–36 hr postpartum and sent home if they met standard discharge criteria. IBCLC provided up to 3 home visits. **Control**. Women were discharged using standard hospital criteria at approximately 48–60 hr PP, with no home IBCLC contact **Fidelity**: 2 or 3 IBCLC visits considered a completed intervention.	**EXC (at breast)** 5–12 days; % of feeds in past 24 hr that were *at breast.* **EXC (human milk)** 5–12 days; % fed without supplementation in past 24 hr *(feeding own milk by breast and/or by supplementing)* **ANY** not reported	**MEAN (range)** **At Breast** **EXC** (5–12 D) INT 0.98 (0.5, 1.0) CON 0.87 (0.0, 1.0) $p = .01$ **(95% CI)** **Human milk** **EXC** (5–12 D) INT 95.1% [84, 99] CON 73.5% [58, 86] $p = .2$	1. Discharge timing same in both groups, thus outcomes reflect impact of home IBCLC services. 2. Standard care mothers were made aware of outpatient BF clinic & encouraged to use a 24-hr help line. 3. Not standard definition of EXC BF.

(continued)

Table 1. (continued)

Author (Year)	Sample & Setting	Intervention Groups	Breastfeeding Measures	Breastfeeding Outcomes	Comments, Limitations
Pinelli (2001)	**Ontario**: 128 NICU mothers & fathers from 1 hospital. Infants < 1500 grams.	**Int.** IBCLC provided counseling at intake and weekly visits during hospitalization. Video on BF shown at intake. Post discharge IBCLC provided frequent contact x 1 year or until weaned. Formal clinic visits at due date, 3 M, 6 M, & 12 M **Standard Care** Staff support during hospitalization (limited BF training) **Fidelity:** Not reported.	**BI:** due date, 3 M, 6 M, & 12 M; % of intake that is human milk intake. 4 categories: > 80%, 50–80%, Up to 50% none. **ANY** Mean duration measured until 1 yr.	**BI** (> 80%) **% human milk, (*p*)** 6 M: INT 22% 6 M: CON 14%, ($p < .05$) **DUR** **MEAN (W) (95% CI)** INT 26.2 [21.0, 31,5] CON 24.2 [19.0, 29.4].	1. Limited differentiation between intervention & control. 2. Descriptive results without comparative statistics.
Pound (2015)	**Ontario:** 99 women mothers of infants < 4 weeks hospitalized for jaundice	**Int.** Two IBCLCs provided counselling in the hospital and an additional half hour consult 1–3 times post discharge. Breast pumps were provided for up to 6 weeks. **Standard Care** No standardized breastfeeding support in the hospital or post discharge, but control mothers could consult IBCLCs privately. **Fidelity** IBCLC not related to the study reviewed. 10% of files to insure advice provided met standard of care.	**EXC** 3 M, 6 M No milk other than breast milk **ANY** 3 M, 6 M.	**RR (95% CI)** **EXC** 3 M: 0.84 [0.56, 1.24] 6 M: 1.15 [0.44, 3.02] **ANY** 3 M: 1.00 [0.91, 1.10] 6 M: 1.03 [0.85, 1.26].	1. Qualitative results described greater sense of encouragement and reassurance than controls.
Wambach (2011)	**Midwestern US:** 390 teens aged 15–18 from prenatal clinics & schools.	**Int.** IBCLC and peer counselor provided 2 prenatal classes, a hospital visit, and 5 follow-up phone calls over 4 weeks. Calls terminated with weaning. **Attention Control (ATT)** Nurse practitioner & peer counselor provided 2 prenatal classes, peer support in hospital and 5 follow-up phone calls over 4 weeks. **Standard care** Multiple sites; clinics affiliated with WIC, delivering hospitals not Baby Friendly, **Fidelity:** 55–67% received full intervention. Dropped from study if they did not attend at least 1 prenatal class.	**EXC** In hospital and 3 week; no formula. **ANY** In hospital 3 W, 6 W, 3 M, & 6 M, calculated using Kaplan-Meier curves.	**EXC** % = **EXC/any BF** 3 W: INT 31% 3 W: ATT 30% 3 W: CON 18% **DUR** MEAN (D) INT 74.2 SE 7.6 ATT 67.6 SE 9.1 CON 127 SE 10.6.	1. Uses multiple denominators. Not always clear which is being used. 2. 390 enrolled. 289 provided analyzable data. No data on missing. 3. No *p*-values
Quasi-Experimental Interventions					
Gill (2007)	**Texas, US:** 200 Hispanic women from 2 public health departments.	**Int.** IBCLC provided 2 individual prenatal visits. 9 postpartum phone calls to 6 months PP. Problem-based home visits by team member with follow-up phone call from IBCLC. **Standard Care**: Optional BF classes and education available through WIC. **Fidelity**: All women received at least one home visit.	**ANY**: 30 D, 60 D, 90 D, 120 D, 150 D, & 180 D. Bayesian posterior means reported in survival curves and duration probabilities.	**Prob Ratio:** **ANY** 30 D: 1.19 60 D: 1.42 90 D: 1.61 120 D: 1.79 150 D: 1.94 180 D: 2.08	1. Non-random assignment of study arm (2 clinics, 1 given intervention).

(continued)

Table 1. (continued)

Author (Year)	Sample & Setting	Intervention Groups	Breastfeeding Measures	Breastfeeding Outcomes	Comments, Limitations
Pre-post Interventions (Time Series)					
Chertok (2004)	**Israel:** 570 women delivering via uncomplicated cesarean in 1 hospital pre- and post- intervention.	**Int.** IBCLC and her team of nursing and medical students provided BF education prior to scheduled cesarean section (unscheduled cesarean section mothers did not receive this), brought infant to recovery room for support with positioning & latch, and continued support through hospital stay. **Control**. Standard care prior to implementation of protocol was not described. **Fidelity**: Not recorded. .	**EXC:** 10 W & 16 W; no nutritional food supplements or liquids except for vitamin or mineral supplements in last 24 hr. Reported separately for Jewish & Muslim women. **ANY** 10 W & 16 W.	***OR, p*-value** **EXC** Jewish 16 W: 2.3, $p = .002$ Muslim 16 W: 6.1, $p = .001$ **ANY** Jewish 16 W: 2, $p = .002$ Muslim NS.	1. Intervention not isolated to IBCLC 2. No confidence intervals. Non-significant *OR* missing.
Chiurco (2015)	**Italy:** 402 women delivering healthy term newborns in 1 hospital.	**Int.** Dedicated IBCLC hired for 5 days a week, 5 hr a day. IBCLC provided individualized counseling to mothers during hospitalization and prepared them to continue BF post discharge. Mothers could directly request/call IBCLC for consultation. **Control.** Standard care prior to hiring IBCLC. Hospital was working toward Baby-Friendly status and nurses were all trained in WHO 18–20 hr breastfeeding course. **Fidelity:** Approximately half of women surveyed after intervention reported receiving help from the IBCLC (22% IBCLC only, 29% IBCLC and hospital staff).	**EXC:** At D/C and 2 W.	***OR* (95% CI), *p*-value** D/C: 0.8 [0.5–1.4], NS 2 W: 0.8 [0.5–1.5], NS.	All data collected by IBCLC, who was also the interventionist.
Corriveau (2013)	**Virginia, US:** 757 women receiving services in 2 locations of a single pediatric primary care practice, pre- and post-intervention.	**Int**. IBCLC provided staff training using AAP/WHO-approved BF curricula for training medical staff, developed written policies, and provided direct support for all BF dyads, community outreach, and data tracking. **Control**. Standard care prior to implementation of protocol. Description not provided **Fidelity**: A committee of nurse practitioners who were also IBCLCs monitored staff training, audited charts for protocol adherence, tracked newborn scheduling to maintain consistency, and ensured integrity of data collection. Results not reported.	**EXC:** In hospital, at newborn visit and at 2 M, 4 M, & 6 M; breast milk (including milk expressed) and any drops, vitamins or medicines (may include solids at 6 M time point). **ANY** In hospital, at newborn visit and at 2 M, 4 M, & 6 M.	***OR* & *p*-value** **EXC** Varied between 1.67 and 2.66 Hospital: $p < .001$ Newborn: $p < .001$ 2 M: $p < .01$ 4 M: $p < .01$ 6 M: $p < .01$ **ANY** Varied between 1.10–1.77 Hospital: NS Newborn: $p = .021$ 2 M: NS 4 M: NS 6 M: NS.	1. 6 M time point is NFF rather than exclusive as defined previously. 2. *OR* or % change not reported separately for each time point, no confidence intervals.

(continued)

Table 1. (continued)

Author (Year)	Sample & Setting	Intervention Groups	Breastfeeding Measures	Breastfeeding Outcomes	Comments, Limitations
Dweck (2008)	**US:** 406 women with newborns in 1 hospital NICU pre- and at 2 time points post- intervention.	**Int** IBCLC contacted all mothers within 24 hr of NICU admission to discuss feeding options and the opportunity to provide human milk, provided resources during NICU stay, plus provided in-service training for NICU, well-baby nursery and L & D staff. **Control**. NICU staff provided all care. No dedicated NICU IBCLC. **Fidelity**: IBCLC contact at Time 2 = 71%, at Time 3 = 72%.	**ANY**: Human Milk (HM) in NICU and at DC, stratified by inborn (born in hospital) and outborn (transferred to NICU from outside hospital).	***OR* (95% CI)** **ANY** (HM) Inborn NICU: 1.07 [0.77, 1.48] At DC: 1.11 [0.81, 1.53] Outborn NICU: 1.95 [1.25, 3.04] At DC: 1.65 [1.06, 2.57].	1. Non-LC nursing staff (trained by the LC) discussed feeding options with mothers 2. OMM not differentiated from HM.
Gharib (2018)	**US:** 422 women with newborns < 30 weeks gestation in 1 hospital NICU pre- and at 2 time points post- intervention.	**Int.** Dedicated team of IBCLCs and CLC in the NICU whose sole role was to provide lactation support to NICU dyads. Number of consults provided were measured at 2 time points post implementation of lactation support team. IBCLC educated nursing and medical staff, improved documentation and communication around BF, and started a NICU BF task force. **Control**. Standard care prior to dedicated lactation support in NICU, i.e., lactation support was pulled from healthy term newborn nursery. **Fidelity**: Mean IBCLC contacts at T1 = 0.05, T2 = 0.32, and T3 = 1.28, $p = .0001$; mean CLC contacts at T1 = 0.09, T2 = 0.48, T3 =2 .16, $p = .0001$.	**ANY:** No. of days the infant received expressed HM, no. of days and times infant BF, any HM in NICU, and at D/C. **BI**: Volume and % (compared with formula) of total expressed HM during hospitalization.	***OR/RR* (95% CI)** **ANY**: Any expressed HM in NICU: T2 vs. T1 *OR* = 3.09 [1.12, 8.53]; T3 vs. T1 = 3.26 [1.04, 10.16]; No. days BF in NICU: T2 vs. T1 *RR* = 0.64 [0.04, 0.92], T3 vs. T1 = 0.64 [0.04, 0.94]; all others NS. **BI**: All NS.	Cannot isolate IBCLC from CLC contacts. Difficult to determine amount of dedicated lactation support available during T2 and T3. Text says 40 hr in T2 and 56 hr in T3, while Tables list 16 hr in T2 and 56 hr in T3.
Gonzalez (2003)	**Virginia, US**: 350 NICU infants from 1 hospital admitted pre- and post- intervention.	**Int.** IBCLC advocated use of mother's milk at intake and established a feeding plan, provided 2 daily visits in NICU or scheduled appointments at mother's convenience and responded to after-hours warm line. **Standard Care**: No IBCLC available in NICU. **Fidelity**: Not reported.	**ANY**: Own mother's milk (OMM) at discharge from NICU. Could be given by breast, bottle or nasogastric tube.	***OR* (95% CI)** **ANY** (OMM) At DC: 2.0 [1.2, 3.2].	None.

(continued)

Table 1. (continued)

Author (Year)	Sample & Setting	Intervention Groups	Breastfeeding Measures	Breastfeeding Outcomes	Comments, Limitations
Murphy (2014)	**North Carolina, US** 103 inborn infants < 1500 grams.	**Int** Standard care as well as single RN IBCLC taken out of nursing duty each week to work in NCCC exclusively as IBCLC. Goal was LC care for all mothers. At the end of Phase 1 IBCLCs and physicians received education on the importance of early expression of maternal breast milk. **Standard Care:** Neonatologist counseled all mothers to provide breast milk. Nurses tracked daily total milk expressed and type of enteral feeding. A QI team ran focus groups with former non-nursing mothers to explore ways to help overcome challenges of providing expressed breast milk. Hospital was staffed by 8.2 full-time and 4 per diem IBCLCs who could assist NCCC only when not otherwise busy. Pumps available. **Fidelity:** Not reported.	**TYPE OF ENTERAL FEEDING** **EXC:** 28 D, D/C Amount of maternal breast milk that made up enteral feeding **ANY:** 28 D, D/C Some maternal breast milk.	**% $p < .05$** **EXC** (ENTERAL): 28 D – Phase 1: 64 – Phase 2: 72 $p > .05$ D/C – Phase 1: 37 – Phase 2: 59 $p < .05$ **ANY** (ENTERAL): 28 D – Phase 1: 5 – Phase 2: 13 $p > .05$ D/C – Phase 1: 13 –Phase 2: 22 $p > .05$.	1. Large amount of missing data in feeding outcomes. 2. Pronounced contamination: provider teaching occurred during phase 1 (control), RN IBCLCs provided patient care in both phases, & no wash out period between control and intervention.
Witt (2012)	**Ohio, US:** 350 infants from 1 pediatric clinic pre- and post-intervention.	**Int** IBCLC provided 45–60 min intake visit by 3–5 day PP with MD team and ongoing clinic-based support as needed thereafter (dedicated IBCLC availability 20 hr/week) **Standard Care**: IBCLC with RN responsibilities available by phone or visit 3 days/week. Breastfeeding-friendly clinic. First visit by 2 weeks. Earlier if problem identified. **Fidelity:** 80.4% of newborns seen at least once (vs. 20% prior to intervention).	**NON-FORMULA FEEDING (NFF)** 2 M, 4 M, 6 M, & 9 M; No formula reported in presence of BF. Calculated using logistic growth curve analysis. **ANY** 6 M Some BF noted on chart.	**% Difference NFF** 2 M: +10.5% $p = .05$ 4 M: +15.1% $p = .01$ 6 M: +10.6 % $p = .06$ 9 M: +9.4 % $p = .07$ **ANY** % 6 M – Pre 54% Post 61% $p = .25$.	1. *P*-values, but not actual BF rates. 2. IBCLC present in pre & post groups. 3. should be NFF rather than exclusive BF.

Note. AAP = American Academy of Pediatrics; ANY = any breastfeeding; BF = breastfed/breastfeeding; BI = breastfeeding intention; CI = Confidence Interval; CLC = Certified Lactation Counselor; D = day; D/C = discharge; DUR = duration of breastfeeding; EXC = exclusive breastfeeding; HM = human milk; Int = intervention; LC = International Board Certified Lactation Consultant; L & D = labor and delivery; M = month; NFF = non-formula feeding; NICU = neonatal intensive care unit; no. = number; NS = non-significant; OMM = own mother's milk; OR = odds ratio; PP = postpartum; QI = quality improvement; RR = relative risk; W = week; WHO = World Health Organization; WIC = Special Supplemental Nutrition Program for Women Infants and Children.

Table 2. Intervention Characteristics ($N = 17$).

	BF Measure Used				Study Quality					IBCLC Contacts							
Author (year)	3 month any	3 month exclusive	6 month any	6 month exclusive	IBCLC Isolated	No Contamination	IBCLC Accessible	IBCLC Integrated	Fidelity Measured	Prenatal	Hospital	Telephone after D/C	Contact Type: Telephone	Home Visit after D/C	Contact Type: Home Visit	Clinic Visit after D/C	Contact Type: Clinic Visit
Bonuck (2014a)	•	•	•	•	•	•	•		•	•	•	•	S	•	R		
Bonuck (2014b)	•	•	•	•	•	•	•	•	•	•	•	•	S	•	R	•	S
Chertok (2004)	•	•				•	m	m			•						
Corriveau (2013)	•	•	•	•			•	•	•	•	•	•	R			•	B
Gill (2007)	•		•			•	•		•	•		•	B	•	R		
Kools (2004)	•	•				m			•	•		•	R	•	R		
Pound (2015)	•	•	•	•	•	•	•		•		•					•	B
Witt (2012)	•		•	•			•	•	•			•	R			•	B
Bonuck (2005)					•	•	•		•	•	•	•	B	•	R		
Chiurco (2015)						•	•	•	•		•						
Dweck (2008)					•	•	•	•	•		•						
Gharib (2018)						•	m	•	•		•						
Gonzalez (2003)					•	•	•	•			•						
McKeever (2002)					•		m		•					•	B		
Murphy (2014)							•	•			•						
Pinelli (2001)					•		•				•	•	m	m	m	•	S
Wambach (2011)						•	•		•	•	•	•	S				

Note. • = present; m = missing; S = Scheduled; R = "Responsive;" B = Both.
Abbreviations: D/C = discharge; IBCLC = International Board Certified Lactation Consultant; BF = breastfeeding. Definitions: IBCLC isolated = design-measure impact of IBCLC isolated from other interventions and providers of breastfeeding support; contamination = contact with IBCLC in the control arm minimal IBCLC; accessible = intervention allowed for direct contact between IBCLC and breastfeeding mothers, independent of third party referral; IBCLC integrated = intervention allowed for integration of IBCLC into the primary care system; fidelity = IBCLC succeeded in making contact with breastfeeding mother at specified time points.

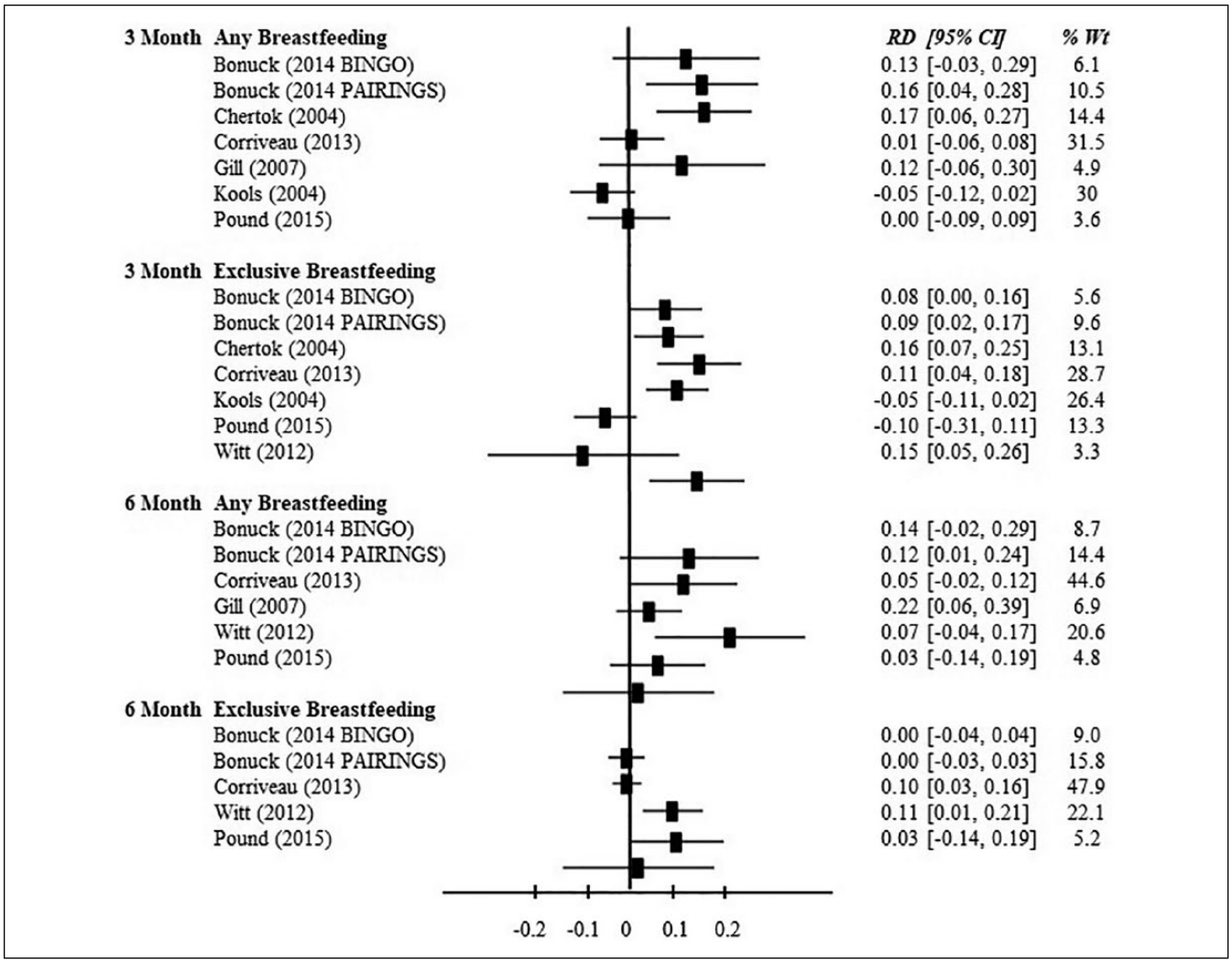

Figure 2. Summary of risk differences of breastfeeding interventions for breastfeeding at 3 and 6 months

Discussion

IBCLCs are considered an important source of support to breastfeeding families and are being integrated into the healthcare system at all levels of care. We sought to describe the current status of interventions containing at least one face-to-face encounter with an IBCLC during the postpartum period. Through meta-analysis and meta-regression, we also sought to determine the extent to which IBCLC interventions, as a whole, as well as individual study characteristics, were associated with any or exclusive breastfeeding at 3 and 6 months postpartum.

Our pooled outcomes were limited in this analysis by the lack of studies, which have tested the efficacy of interventions containing IBCLCs. We identified only 17 studies that tested interventions in which IBCLC care was provided in the postpartum period and included a face-to-face encounter, which is typically how many parents access full IBCLC support. Of these studies, half did not include an outcome of any or exclusive breastfeeding at 3 or 6 months postpartum and were therefore not included in the meta-analysis. Due to heterogeneity among the study-specific effect estimates, we were unable to present pooled results for breastfeeding outcomes other than any breastfeeding at 6 months, but, among these studies, pooled outcomes demonstrated a positive association between study interventions and any breastfeeding.

Not only were the number of studies on this topic limited, but also our sample contained few randomized controlled trials (RCTs) with minimal contamination. We identified 8 studies for meta-analysis, but only half of them were RCTs. The RCTs reported smaller effects on breastfeeding prevalence than studies utilizing a quasi-experimental or pre-post design, and the difference-of-differences was negative, or very near zero, across all breastfeeding outcomes. Similarly, for all outcomes except EBF at 6 months, the presence of study contamination favored less breastfeeding. One would expect the results to be attenuated if participants in the control group also had access to IBCLC services. The disparate finding for the effect of study contamination on EBF at 6 months is

Table 3. Stratified Results for Experimental Studies ($n = 8$) Related to the Association Between IBCLC Interventions and any and Exclusive Breastfeeding at 3 Months.

	Any Breastfeeding			Exclusive Breastfeeding		
Study Characteristics	n	Random effects difference (95% CI)	Difference of difference (95% CI)	n	Random effects difference (95% CI)	Difference of difference (95% CI)
Study Quality						
Randomized design						
Yes	4	0.05 [–0.05, 0.15]		4	0.03 [–0.06, 0.11]	
No	3	0.09 [–0.02, 0.21]	−0.04 [–0.24, 0.15]	3	0.13 [0.08, 0.18]	−0.11 [–0.24, 0.02]
Contamination present						
Yes	2	−0.02 [–0.08, 0.04]		3	0.07 [–0.05, 0.19]	
No	5	0.11 [0.04, 0.18]	−0.13 [–0.27, 0.02]	4	0.09 [0.03, 0.16]	−0.02 [–0.20, 0.17]
Study Intervention Included						
Prenatal contact						
Yes	5	0.06 [–0.03, 0.14]		4	0.06 [–0.02, 0.13]	
No	2	0.08 [–0.08, 0.24]	−0.02 [–0.24, 0.19]	3	0.11 [–0.01, 0.22]	−0.06 [–0.24, 0.13]
Education for staff						
Yes	2	−0.02 [–0.08, 0.04]		2	0.03 [–0.12, 0.18]	
No	5	0.11 [0.04, 0.18]	−0.13 [–0.27, 0.02]	5	0.10 [0.05, 0.16]	−0.07 [–0.24, 0.11]
Breastfeeding supplies						
Yes	4	0.09 [0.01, 0.18]		3	0.07 [0.00, 0.14]	
No	3	0.04 [–0.08, 0.15]	0.06 [–0.13, 0.25]	4	0.09 [–0.01, 0.19]	−0.03 [–0.22, 0.15]
Where IBCLC Support was Delivered						
Hospital						
Yes	5	0.08 [0.01, 0.16]		5	0.10 [0.05, 0.14]	
No	2	0.01 [–0.15, 0.18]	0.08 [–0.12, 0.28]	2	0.05 [–0.15, 0.24]	0.05 [–0.14, 0.24]
Clinic						
Yes	3	0.05 [–0.04, 0.13]		4	0.10 [0.04, 0.16]	
No	4	0.08 [–0.05, 0.21]	−0.03 [–0.23, 0.18]	3	0.06 [–0.06, 0.18]	0.03 [–0.15, 0.21]
Home visit						
Yes	4	0.08 [–0.05, 0.21]		3	0.04 [–0.05, 0.13]	
No	3	0.06 [–0.04, 0.15]	0.02 [–0.19, 0.22]	4	0.12 [0.05, 0.18]	−0.07 [–0.23, 0.09]
Telephone						
Yes	5	0.06 [–0.03, 0.14]		5	0.07 [0.01, 0.14]	
No	2	0.08 [–0.08, 0.24]	−0.02 [–0.24, 0.19]	2	0.05 [–0.20, 0.29]	−0.00 [–0.23, 0.22]
Scheduled vs. Responsive Care						
Responsive Clinic						
Yes	2	0.01 [–0.05, 0.06]		3	0.09 [–0.00, 0.19]	
No	5	0.10 [–0.01, 0.21]	−0.09 [–0.28, 0.11]	4	0.07 [–0.02, 0.16]	0.02 [–0.17, 0.21]
Responsive Telephone						
Yes	4	0.02 [–0.06, 0.10]		4	0.07 [–0.02, 0.16]	
No	3	0.11 [–0.01, 0.22]	−0.08 [–0.25, 0.10]	3	0.09 [–0.01, 0.19]	−0.01 [–0.20, 0.18]

Note. CI = Confidence Interval; IBCLC= International Board Certified Lactation Consultant.

unclear and likely due to the studies included in the meta-regressions for EBF at 6 months. Despite these limitations, there are some general patterns among the meta-regression results that are informative.

First, it is evident that any and exclusive breastfeeding respond differently as outcome measures depending on the intervention designs. Any and exclusive breastfeeding are both dichotomous variables, representing two ends of the spectrum of breastfeeding behaviors. The cessation of exclusive breastfeeding captures the very first use of formula and complementary foods/beverages, even as breastfeeding may continue, while the cessation of any

Table 4. Stratified Results for Experimental Studies ($n = 8$) Related to the Association Between IBCLC Interventions and any and Exclusive Breastfeeding at 6 Months.

	Any Breastfeeding			Exclusive Breastfeeding		
Study Characteristics	*n*	Random effects difference (95% CI)	Difference of difference (95% CI)	*n*	Random effects difference (95% CI)	Difference of difference (95% CI)
Study Quality						
Randomized design						
Yes	3	0.10 [0.02, 0.18]		3	0.00 [–0.02, 0.03]	
No	3	0.09 [0.01, 0.17]	0.03 [–0.12, 0.18]	2	0.10 [0.05, 0.16]	−0.10 [–0.20, –0.00]
Contamination present						
Yes	2	0.06 [–0.00, 0.11]		2	0.10 [0.05, 0.16]	
No	4	0.13 [0.06, 0.20]	−0.07 [–0.20, 0.06]	3	0.00 [–0.02, 0.03]	0.10 [0.00, 0.20]
Study Intervention Included						
Prenatal contact						
Yes	4	0.11 [0.04, 0.18]		3	0.03 [–0.02, 0.07]	
No	2	0.06 [–0.03, 0.14]	0.05 [–0.12, 0.22]	2	0.08 [–0.00, 0.17]	−0.05 [–0.25, 0.14]
Education for staff						
Yes	1	0.05 [–0.02, 0.12]		1	0.10 [0.03, 0.16]	
No	5	0.11 [0.05, 0.17]	−0.06 [–0.19, 0.07]	4	0.01 [–0.02, 0.04]	0.09 [–0.04, 0.22]
Breastfeeding supplies						
Yes	4	0.13 [0.06, 0.20]		3	0.00 [–0.02, 0.03]	
No	2	0.06 [–0.00, 0.11]	0.07 [–0.06, 0.20]	2	0.10 [0.05, 0.16]	−0.10 [–0.20, –0.00]
Where IBCLC Support was Delivered						
Hospital						
Yes	4	0.07 [0.02, 0.13]		4	0.02 [–0.02, 0.07]	
No	2	0.13 [–0.02, 0.28]	−0.04 [–0.20, 0.12]	1	0.11 [0.01, 0.21]	−0.08 [–0.31, 0.15]
Clinic						
Yes	4	0.07 [0.02, 0.11]		4	0.06 [–0.01, 0.12]	
No	2	0.18 [0.07, 0.29]	−0.11 [–0.28, 0.06]	1	0.00 [–0.04, 0.04]	0.05 [–0.14, 0.25]
Home visit						
Yes	3	0.15 [0.07, 0.23]		2	0.00 [–0.02, 0.02]	
No	3	0.05 [–0.00, 0.11]	0.10 [–0.04, 0.24]	3	0.09 [0.04, 0.15]	−0.09 [–0.19, –0.00]
Telephone						
Yes	5	0.09 [0.04, 0.15]		4	0.04 [–0.01, 0.09]	
No	1	0.03 [–0.14, 0.19]	0.07 [–0.19, 0.32]	1	0.03 [–0.14, 0.19]	0.02 [–0.31, 0.34]
Scheduled vs. Responsive Care						
Responsive Clinic						
Yes	3	0.05 [–0.00, 0.11]		3	0.09 [0.04, 0.15]	
No	3	0.15 [0.07, 0.23]	−0.10 [–0.24, 0.04]	2	0.00 [–0.02, 0.02]	0.09 [0.00, 0.19]
Responsive Telephone						
Yes	4	0.09 [0.03, 0.16]		3	0.06 [–0.02, 0.14]	
No	2	0.09 [–0.00, 0.19]	0.00 [–0.18, 0.18]	2	0.00 [–0.03, 0.03]	0.05 [–0.12, 0.23]

Note. CI = Confidence Interval; IBCLC = International Board Certified Lactation Consultant.

breastfeeding captures the very last time an infant was fed human milk. They also differ in terms of intensity, or frequency of breastfeeding. Any breastfeeding encompasses a broad band of breastfeeding behaviors, ranging from high-intensity (i.e., EBF) down to the lowest intensity, which is the final time the breast is given. The changes found in any breastfeeding could reflect more general assistance that is either emotionally or clinically supportive of breastfeeding, and has the potential to slow the decline from high-intensity breastfeeding through all the decreasing intensities of any breastfeeding, but without directly addressing breastfeeding problems when they occur. Therefore, it may be more difficult for interventions to have a measurable effect on EBF, which describes only one, very specific, breastfeeding intensity. This can be seen in our data, where responsive clinic support increased EBF rates, but did not increase any breastfeeding rates. Conversely, home visits, which likely include emotional support given the personal nature of the setting, increased any breastfeeding, but did not increase EBF.

The timing of measurement is also important. For example, hospital interventions trended toward having a positive association with the earlier measures of any and EBF at 3 months, but did not sustain these positive associations with the 6-month measures. On the other hand, studies that included clinic interventions, which typically occurred later in the postpartum period, did not appear to improve any breastfeeding rates. Standardized time points for data collection on breastfeeding behaviors throughout the full length of recommended breastfeeding duration would improve our ability to pool study results, and consideration of more sensitive measures of breastfeeding, such as breastfeeding intensity, could also expand our knowledge base.

Generally, the definitions of any or exclusive breastfeeding are asked in a way that includes all of the time that has passed up until the point of interest. Women in the exclusive breastfeeding "no" category are thus a highly heterogeneous group, ranging from women who introduced formula for a very short period of time and then continued to fully breastfeed, to women who never breastfed and may be feeding complementary foods at an early age. Similarly, the any breastfeeding "yes" category is highly heterogeneous, ranging in breastfeeding behaviors from women who exclusively breastfeed to women who mix feed (mother's milk and formula) and also feed complementary foods. In our clinical practice, we often see women who encounter difficulties in the early postpartum period and supplement with formula, but then regain full breastfeeding (no formula) after IBCLC consultation. The experience of these women is lost in a dichotomous exclusive breastfeeding variable because they cannot subsequently reside in the exclusive breastfeeding category. There are two alternative measurement strategies of any or exclusive breastfeeding, which could be helpful. Rather than asking about breastfeeding from birth to particular time points, researchers might assess breastfeeding behaviors in a period of time prior to the survey (McKeever, et al., 2002; Chertok, Shoham-Vardi, & Hallak, 2004), which could uncover variations in feeding behaviors over time as breastfeeding parents move from periods of exclusivity to non-exclusivity and back to exclusivity, but only if the question is repeated at multiple time points. The second option is to use a measure of breastfeeding intensity (Bonuck, Trombley, Freeman, & McKee, 2005; Bonuck et al., 2014; Pinelli, Atkinson, & Saigal, 2001; Gharib, Fletcher, Tucker, Vohr, & Lechner, 2017). Breastfeeding intensity captures the proportion of total feeds containing human milk, providing insight into which level of any breastfeeding participants occupy, and allowing the researcher to analyze changes in behavior within the broad category of any breastfeeding. There were too few studies reporting either of these measures for us to conduct a meta-analysis using them specifically, but we encourage researchers to consider breastfeeding intensity alongside measures of any and exclusive breastfeeding for a more sensitive analysis of breastfeeding behaviors.

Two additional trends in the examination of study characteristics include the provision of breastfeeding supplies and staff education. In all the interventions providing breastfeeding supplies, breast pumps were included. We see small positive associations with any breastfeeding among studies in which supplies were given, but negative associations with EBF. Although we do not have the data to understand causality, an association between pump use and early cessation of breastfeeding has been noted in the literature (Yourkavitch et al., 2018), and this may be particularly evident when measuring exclusive breastfeeding.

Staff education yielded one of the most consistent negative associations with breastfeeding, particularly for any breastfeeding at 3 months. It is possible that staff education increases health providers' sense of competence in providing breastfeeding support, while not providing enough education for them to function as a specialist in lactation care (Ramos, Sebastian, Sebesta, McConnell, & McKinney, 2019). Perhaps this reduces referrals which could affect women more strongly early in the postpartum period and/or if they have already introduced formula. Education should aim to increase health providers' confidence in supporting breastfeeding women and families while advocating for the direct services of IBCLCs, and breastfeeding supplies should be carefully considered to ensure they support breastfeeding efficacy.

Our findings support the existing literature on breastfeeding support interventions, while extending our knowledge in the area of IBCLC-specific care. Our broad search allowed inclusion across a range of study designs (randomized control trials, quasi-experimental trials, pre-post/time series studies), settings (hospital—inclusive of NICU, pediatric clinic, home), and gestational ages (pre-term and term infants). We were thus able to present a comprehensive overview and critique of the range of interventions containing an IBCLC in-person component and the outcome measures reported. We also focused on the practice patterns of IBCLCs, insuring that our inclusion criteria allowed for at least one face-to-face contact with an IBCLC during the postpartum period.

Limitations

Despite these strengths, there were several limitations to the current study. The number of studies that met our inclusion criteria limited our systematic review. Clearly, more studies are needed to assess the clinical attributes of IBCLCs, who are trained to provide hands-on lactation support in response to, or prevention of, breastfeeding difficulties. Given the broad lens with which we cast our search, the included studies were highly heterogeneous in terms of their study design, the IBCLC intervention design, and the types of breastfeeding outcomes they reported. Due to heterogeneity at most time points, we were unable to present pooled estimates of study effects except for those within any breastfeeding at 6 months.

We included all studies that listed an IBCLC as the interventionist, but the IBCLC profession can include providers with additional healthcare licenses. We were not able to distinguish between types of additional training that IBCLCs might have brought to the study intervention. Not all studies included measures of any or exclusive breastfeeding at 3 or 6 months, thus only a subset of the studies was included in the meta-analysis, giving us limited power to detect associations with individual study characteristics.

Conclusions

Our findings provide evidence that skilled interventions by IBCLCs support the breastfeeding relationship but highlight the importance of utilizing study designs that randomize study participants and minimize contamination when measuring this association. The existing research lacks consistency in measurement of breastfeeding outcomes. When designing interventions, the timing and method of data collection for measures of breastfeeding are instrumental to study sensitivity and need to be based on the aims of the intervention itself. Finally, continued integration of the IBCLC into the health care system remains an important means for reaching population-level breastfeeding goals.

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