



# The Effect of Interactive Web-Based Monitoring on Breastfeeding Exclusivity, Intensity, and Duration in Healthy, Term Infants After Hospital Discharge

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## ABSTRACT

**Objective:** To determine whether a Web-based interactive breastfeeding monitoring system increased breastfeeding duration, exclusivity, and intensity as primary outcomes and decreased symptoms of postpartum depression as a secondary outcome.

**Design:** Two-arm, randomized controlled trial.

**Setting:** Three hospitals in the Midwestern United States.

**Participants:** One hundred forty one (141) mother–newborn dyads were recruited before discharge.

**Methods:** Postpartum women were randomly assigned to the control or intervention groups. Women in the control group ( $n = 57$ ) followed the standard hospital protocol, whereas women in the intervention group ( $n = 49$ ) were given access to an online interactive breastfeeding monitoring system and were prompted to record breastfeeding and infant output data for 30 days. A follow-up online survey was sent to both groups at 1, 2, and 3 months to assess breastfeeding outcomes and postpartum depression.

**Results:** For mothers and infants, there were no significant differences in demographics between groups. No significant differences in breastfeeding outcomes were found between groups at discharge ( $p = .707$ ). A significant difference in breastfeeding outcomes was found between groups at 1, 2, and 3 months ( $p = .027$ ,  $p < .001$ , and  $p = .002$ , respectively). Members of the intervention group had greater exclusive breastfeeding rates at 1, 2, and 3 months. By the end of the third month, 84% of the intervention group was breastfeeding compared with 66% of the control group. Postpartum depression symptom scores decreased for both groups at 1, 2, and 3 months (control group:  $4.9 \pm 3.9$ ,  $4.3 \pm 4.9$ , and  $3.2 \pm 3.9$ , respectively; intervention group:  $4.7 \pm 4.5$ ,  $3.0 \pm 3.4$ , and  $2.8 \pm 3.6$ , respectively). However, there was no significant difference between groups at 1, 2, and 3 months ( $p = .389$ ,  $.170$ , and  $.920$ , respectively) for depression.

**Conclusion:** The Web-based interactive breastfeeding monitoring system may be a promising intervention to improve breastfeeding duration, exclusivity, and intensity.

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The benefits of breastfeeding and the risks associated with formula feeding are well known. Infants who are not breastfed are at increased risk for otitis media, diarrhea, childhood obesity, type 1 and type 2 diabetes mellitus, leukemia, and sudden infant death syndrome (Dieterich, Felice, O'Sullivan, & Rasmussen, 2013; F. R. Hauck, Thompson, Tanabe, Moon, & Vennemann, 2011; Horta, de Mola, & Victora, 2015; Ip et al., 2007; Johnston, Landers, Noble, Szucs, & Viehmann, 2012; Stuebe, 2009;

Yan, Liu, Zhu, Huang, & Wang, 2014). Exclusively breastfed infants experience lower hospitalization rates than formula-fed infants (Ajetunmobi et al., 2015). Women who do not breastfeed have a greater incidence of premenopausal breast cancer, ovarian cancer, retained gestational weight gain, type 2 diabetes, myocardial infarction, and metabolic syndrome (Stuebe, 2009).

Improvements to breastfeeding continuation and exclusivity after hospital discharge were stressed

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**Breastfeeding support during the first month after discharge is associated with improved breastfeeding exclusivity and duration.**

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in the Surgeon General's *Call to Action to Promote Breastfeeding*, and postdischarge home monitoring and lactation counseling are critical to ensure that adequate breastfeeding is established during the first month (Office of the Surgeon General, 2011). Despite efforts to improve breastfeeding duration, the breastfeeding rate in the United States is still 49.4% at 3 months and 26.7% at 12 months, with 40.7% exclusive breastfeeding at 3 months and 18.8% at 6 months (Centers for Disease Control and Prevention [CDC], 2014).

Researchers have documented that early postpartum breastfeeding challenges may negatively affect breastfeeding success. Breastfeeding concerns, including difficulty with latching, nipple pain, and perceived insufficient milk supply during the first week postpartum, were prevalent and were associated with as much as a ninefold greater risk of discontinuation earlier than intended among primiparous mothers (Wagner, Chantray, Dewey, & Nommsen-Rivers, 2013). Lack of lactation support and breastfeeding problems were among the main reasons for breastfeeding cessation after hospital discharge among new lactating mothers with gestational diabetes (Gerd, Bergman, Dahlgren, Roswall, & Alm 2012; Morrison, Collins, Lowe, & Giglia, 2015). Paper-and-pencil diaries may improve breastfeeding exclusivity; however, breastfeeding diaries may not foster communication between lactation specialists and mothers after discharge (Pollard, 2011). Given the proven value of breastfeeding and the challenge of supporting women after discharge, there is a need for innovative and improved strategies to foster longer-term communication between mothers and lactation specialists after discharge to ensure successful breastfeeding.

One potential way to foster long-term communication is to incorporate Web and mobile health interventions; the use of these interventions is becoming an integral component of daily activities of national and global populations (World Health Organization [WHO], 2011). In recent years, many researchers have used mobile phones as tools for symptom management and monitoring for patients with heart disease, diabetes, and a range

of different health problems (Huang et al., 2007; Klasnja & Pratt, 2012). Current Web-based breastfeeding interventions are focused mainly on providing education for mothers and providers or on providing lactation support by e-mail and social media (Thomas & Shaikh, 2012). In another example, Web-based breastfeeding education and support improved breastfeeding exclusivity at 6 months among Australian mothers (Giglia, Cox, Zhao, & Binns, 2014). A Web-based intervention for breastfeeding mothers could provide continuous monitoring after discharge to maintain communication between mothers and lactation specialists. Such continuity of care can optimize the newborn's intake and minimize the risk of dehydration, hypoglycemia, jaundice, weight loss, and rehospitalization within the first 30 days after discharge in case of breastfeeding problems (Seagraves, Brulte, McNeely, & Pritham, 2013). In an attempt to address this communication gap, our interdisciplinary research team developed an interactive Web-based breastfeeding monitoring system that was feasible, usable, and acceptable among breastfeeding mothers. This intervention was based on a self-regulation model from Bandura's Social Cognitive Theory as explained in our previous work (Ahmed & Ouzzani, 2012; Ahmed & Ouzzani, 2013). Authors of previous studies showed the effect of education and lactation support by phone and peer counseling in improving breastfeeding outcomes for term and preterm infants (Chapman, Morel, Anderson, Damio, & Pérez-Escamilla, 2010; Reeder, Joyce, Sibley, Arnold, & Altindag, 2014). To our knowledge, however, no researchers have tested the effect of online Web-based breastfeeding monitoring with tailored education on breastfeeding outcomes.

One factor that may negatively affect breastfeeding outcomes is postpartum depression (PPD). Postpartum depression is defined as a major depressive disorder in the *Diagnostic and Statistical Manual of Mental Disorders*, with a specifier of postpartum onset within four weeks of childbirth (American Psychiatric Association, 2013). The effect of breastfeeding on the risk of PPD is not clear. The association between longer breastfeeding duration and lower prevalence of PPD has been reported. In contrast, authors of other studies suggested no association with breastfeeding mothers or an increased risk of PPD (Annagür, Annagür, Şahin, Örs, & Kara, 2013; Dennis & McQueen, 2007).

The purpose of this study was to determine whether an interactive Web-based breastfeeding

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