Midwifery (2010) **26**, 88–100

ELSEVIER

midwifery

www.elsevier.com/locate/midw

Effect of an extended midwifery postnatal support programme on the duration of breast feeding: A randomised controlled trial

Susan J. McDonald, RM, PhD (Professor)[a,b,*], Jennifer J. Henderson, RM, MPH, PhD (Research Midwife)[b,c], Shani Faulkner, RM, IBCLC (Midwife Unit Manager)[d], Sharon F. Evans, PhD (Biostatistician)[b,d], Ronald Hagan, MB BCh, MBA, MSc (Neonatal Paediatrician)[b,c,d]

[a]*La Trobe University, Vic., Australia*
[b]*Women and Infants Research Foundation, WA, Australia*
[c]*School of Women's and Infants' Health, The University of Western Australia, Australia*
[d]*King Edward Memorial Hospital, WA, Australia*
*Corresponding author at: Level 4, Room 4.01, Mercy Hospital for Women, 163 Studley Road, Heidelberg 3081, Australia.
E-mail address: s.mcdonald@latrobe.edu.au (S.J. McDonald).

Received 4 August 2007; received in revised form 23 January 2008; accepted 8 March 2008

Abstract
Objective: to evaluate the effects of an extended midwifery support (EMS) programme on the proportion of women who breast feed fully to six months.
Design: randomised controlled trial.
Setting: large public teaching hospital in Australia.
Participants: 849 women who had given birth to a healthy, term, singleton baby and who wished to breast feed.
Intervention: participants were allocated at random to EMS, in which they were offered a one-to-one postnatal educational session and weekly home visits with additional telephone contact by a midwife until their baby was six weeks old; or standard postnatal midwifery support (SMS). Participants were stratified for parity and tertiary education.
Measurements: the main outcome measures were prevalence of full and any breast feeding at six months postpartum.
Findings: there was no difference between the groups at six months postpartum for either full breast feeding [EMS 43.3% versus SMS 42.5%, relative risk (RR) 1.02, 95% confidence interval (CI) 0.87–1.19] or any breast feeding (EMS 63.9% versus SMS 67.9%, RR 0.94, 95%CI 0.85–1.04).
Conclusions: the EMS programme did not succeed in improving breast-feeding rates in a setting where there was high initiation of breast feeding. Breast-feeding rates were high but still fell short of national goals.
Implications for practice: continuing research of programmes designed to promote breast feeding is required in view of the advantages of breast feeding for all mothers and babies.

Keywords Midwifery; Breast feeding; Randomised controlled trial; Postnatal support

0266-6138/$ - see front matter © 2008 Elsevier Ltd. All rights reserved.
doi:10.1016/j.midw.2008.03.001

Introduction

Breast feeding is recognised as the optimal method of neonatal nutrition. Exclusive breast feeding is currently promoted for the first six months after birth, with breast milk as the major nutrient source for at least the first 12 months of life (World Health Organization, 1998, 2002; Binns and Davidson, 2003; Gartner et al., 2005). There is evidence that human milk has many nutritional, immunological, psychological and maternal advantages that benefit both disadvantaged socio-economic communities as well as relatively advantaged communities (Raisler et al., 1999; Gartner et al., 2005; Coulibaly et al., 2006).

Australian guidelines currently aim for a breast-feeding initiation rate of 90%, and for 80% of babies to be breast fed at six months of age (50% exclusively) (Binns and Davidson, 2003). While the majority of Australian centres are approaching the goal for initiation, continuation of breast feeding after discharge from hospital remains below desired levels. Recent Australian studies have found rates of breast feeding, whether exclusive (no artificial milk substitute is introduced to the baby's diet) or partial (supplementary artificial milk feeds given in addition to breast feeds), at six months to be between 50% and 60% (Scott et al., 1999; Henderson A.M. et al., 2001; Henderson J.J. et al., 2003; Forster et al., 2006). In contrast, there is a wide variation in the duration of breast feeding in other developed countries. Rates of any breast feeding at six months have been reported recently as 32–40% in the USA (Ryan et al., 2002; Bonuck et al., 2005), 62% in New Zealand (only three per cent exclusively) (Heath et al., 2002), 80% in Norway (only seven per cent exclusively) (Lande et al., 2003), and 13% in the UK (Morrell et al., 2000). A more recent UK survey of 9416 mothers indicated that 25% were breast feeding at six months. While this represents an increase from earlier reports, the rates of exclusive breast feeding remain negligible with less than one per cent of mothers choosing to feed with breast milk alone (Bolling et al., 2007).

The factors that influence early cessation of breast feeding have been studied extensively. Sociodemographic factors such as social disadvantage, lower levels of education and younger maternal age have been shown to be strongly associated with reduced duration of breast feeding (Redman et al., 1992; Ford et al., 1994; Michaelsen et al., 1994; Piper and Parks, 1996; Barber et al., 1997; Bourgoin et al., 1997; Evers et al., 1998; Scott et al., 1999; Donath and Amir, 2000). Insufficient support for breast feeding, particularly from women's social networks, also reduces breast-feeding success (Barber et al., 1997; Raj and Plichta, 1998; Tarkka et al., 1999).

A large variety of interventions to increase the duration of breast feeding have been tested in different settings with varied effectiveness. The Baby-Friendly Hospitals Initiative (BFHI) is an internationally recognised initiative that utilises '10 Steps to Successful Breastfeeding' (World Health Organization/United Nations Children's Fund Joint Statement, 1989; Hofvander, 2005, p. 1013) to guide specific practices in maternity wards aimed at supporting and promoting breast feeding (Luzia et al., 2003; Hofvander, 2005). The BFHI has been instrumental in increasing breast-feeding initiation rates, but has been shown to be inconsistent in increasing the duration of breast feeding. A large UK prospective study showed no benefits of BFHI accreditation for breast feeding at one month postpartum after statistical adjustment for social factors (Bartington et al., 2006). In contrast, a large cluster randomised controlled trial (RCT) in Belarus found significant improvements in both exclusive and any breast feeding in sites randomised for BFHI implementation (Kramer et al., 2001).

Single interventions, either antenatal or postnatal, have generally been ineffective in populations with high initiation rates (Britton et al., 2007). Interventions tested vary in timing (antenatal or postnatal), provider (lactation consultant, midwife, community nurse or peer counsellor), and whether their principal objective is to increase knowledge or provide support.

Antenatal education sessions have been shown to improve breast-feeding initiation rates and duration in settings where few women initiate breast feeding (Mattar et al., 2007) but not where initiation rates are relatively high (Redman et al., 1995; Forster et al., 2004). A large Australian RCT compared two different mid-pregnancy education programmes, one skill-based and the other addressing attitudes towards breast feeding, with usual care. Initiation rates were uniformly high (96%); however, no differences were found between groups for breast feeding at six months postpartum (Forster et al., 2004).

Single postnatal breast-feeding educational sessions were found to have no effect on the duration of breast feeding (Schy et al., 1996; Henderson A.M. et al., 2001; Labere et al., 2003). However, a small RCT conducted by Schy et al. in 1996 indicated that the duration of breast feeding was statistically correlated with mothers' perceived level of satisfaction, education level and expected duration of breast feeding. Schy et al. (1996)

recommended that further research is required into women's individual breast-feeding experiences and their determinants for breast-feeding continuation.

Postnatal telephone-based support alone provided inconsistent findings. This was demonstrated by an Australian study of rural women receiving telephone support from a lactation consultant. It showed a small reduction in early cessation of exclusive breast feeding in women who attended a private hospital compared with similar women who gave birth prior to the introduction of this support service. However, no such difference was in evidence for women who attended a public hospital (Fallon et al., 2005).

The recently updated Cochrane systematic review of RCTs found no differences in the duration of breast feeding for either telephone support alone or combined with home visiting (Britton et al., 2007). However, home visiting without other measures was found to be beneficial for breast-feeding continuation.

Overall, the Cochrane systematic review of all forms of extra postnatal support found a decrease in breast-feeding cessation before six months, although there was considerable variation in the subgroup analyses (Britton et al., 2007). The review was inconclusive in relation to support given by professional providers (midwives or lactation consultants). There were slight beneficial effects for exclusive breast feeding but no differences for any breast feeding up to six months. Furthermore, no beneficial effects of postnatal support were demonstrated in settings where there were high breast-feeding initiation rates (over 80%) compared with areas of moderate initiation (Britton et al., 2007).

Hence, there remains uncertainty about the most effective 'package' of interventions to promote breast feeding. Previous research has shown that individual interventions, such as telephone contact and home visiting, provide some success for breast-feeding continuation. However, such support programmes have been time limited and largely restricted to either antenatal or postnatal interventions. No research has endeavoured to encourage continuity by combining promising interventions into one package of support.

The aim of the present study was to develop and test a package of postnatal support measures that would prolong breast feeding effectively in a setting where initiation is high. This package consisted of a one-on-one postnatal education session and up to six weeks of midwifery home visiting with telephone contact.

Methods

The aims of this study were:

- to test, by means of an RCT, whether an extended midwifery support (EMS) programme, consisting of up to six weeks of midwifery home visiting, would increase the proportion of women who breast feed fully to six months;
- to evaluate the psychological well-being of women; and
- to undertake an economic evaluation of the programme.

This paper only reports on the first aim; the evaluation of the midwifery support programme. Other outcomes from this study will be the subject of future papers and will include a six-month profile of maternal and baby health and well-being, and women's individual views of breast feeding.

Participants

Women who had given birth at King Edward Memorial Hospital (KEMH), Perth, Western Australia and who intended to breast feed were eligible for entry into the trial. The recruitment hospital is the largest public teaching hospital in Western Australia, having approximately 5000 births per year. Exclusion criteria were: gestational age less than 36 completed weeks; multiple pregnancy; maternal age less than 18 years; and insufficient English to complete questionnaires. Women who lived outside the Perth metropolitan area or who were not contactable by telephone were also excluded.

The recruitment hospital observed the principles of the '10 Steps to Successful Breastfeeding' (World Health Organization, 1998), and at the time of the trial was working towards BFHI accreditation, which was subsequently achieved in 2004. The KEMH achieved a high breast-feeding initiation rate with 87.1% of mothers of term babies only feeding their babies their own milk on discharge during the study period (breast fed or expressed breast milk, personal communication from M. Hutchinson, KEMH).

All women received breast-feeding promotional literature and had access to an in-house video system on which they were able to view videos giving current information about establishing breast feeding.

As per hospital policy, the majority of women received one or more domiciliary visits by a hospital-based midwife after discharge and before their baby was seven days old. The purpose of these

visits was to provide health checks of mothers and babies, although breast-feeding problems were addressed. All women had access to lactation consultants at outpatient clinics at the Breastfeeding Centre of Western Australia, based at KEMH.

Protocol

Recruitment was conducted between March 2000 and October 2001. Eligible women on the postnatal wards were approached when their babies were at least 24 hours old. A research midwife explained the study, provided an information sheet and obtained written consent once the women were satisfied with all aspects of participation in the trial. Ethical approval was granted by the institutional ethics committee.

The women completed questionnaires giving demographic details as well as past breast-feeding experience, perceived support for breast feeding and breast-feeding intentions. Extensive obstetric information was also collected.

Assignment

Based on the demographic information supplied, randomisation was conducted after 2×2 stratification for parity (primiparous or multiparous) and level of education completed (tertiary education or less than tertiary education). Women were asked to select an envelope from a group of at least six sealed, opaque envelopes, replenished in blocks of 12. The envelopes contained the allocation to either the intervention (EMS) or the control [standard midwifery support (SMS)] group.

EMS group

Mothers allocated to the EMS group received a package of interventions in addition to the routine midwifery care given to all women. The package included a comprehensive individual educational session in their hospital room and follow-up support at home. This was provided by one of four experienced registered midwives who had received the standard breast-feeding education curriculum for Australian midwives, augmented with ongoing professional development, but without lactation consultant certification.

The aim of the postnatal educational session was to complement information available in the promotional literature or on the in-house video. The session reinforced advice about positioning and attachment, and reviewed common breast-feeding problems, growth and development, crying patterns and settling techniques.

On discharge from hospital, women in the EMS group were telephoned twice weekly and offered weekly home visits by a research midwife until their baby was six weeks old. Where possible, women were contacted by the same midwife in order to maintain consistency of care.

The intention of the telephone calls and home visits was not to provide clinical care per se, but to provide women with access to an informed source of breast-feeding support. There was no predetermined structure for the home visits; this support intervention served to identify perceived or actual social support difficulties at home or in the community which might create barriers to breast feeding, and to monitor breast-feeding progress and identify potential problems. Advice was given regarding common breast-feeding or early parenting problems. If necessary, women were referred to their general practitioner, child health nurse or lactation consultants at the Breastfeeding Centre. Women were encouraged to access their local community support services including maternal and child health nurses, peer support via the Australian Breastfeeding Association, lactation consultants and mothers' groups.

SMS group

Women allocated to the control group received standard midwifery postnatal care, including one or more domiciliary visits by a hospital-based midwife after discharge and before the baby was seven days old, and access to outpatient lactation clinics. As part of the pragmatic approach to the trial, there was no attempt to control information sought or provided by other sources. All women received breast-feeding promotional literature and had access to an in-house video system on which they were able to view videos giving current information about establishing breast feeding.

Participant flow and follow-up

Self-report postal questionnaires were completed at two and six months postpartum, including questions about breast-feeding status, time of commencement of artificial milk supplementation or cessation of breast feeding, reasons for cessation of breast feeding, breast-feeding problems and perception of support. The breast-feeding measures were modified from those used previously (Henderson J.J. et al., 2003).

Breast-feeding diaries were also completed weekly until two months and then monthly until six months. At each entry, women recorded a day's baby feeding (breast milk, artificial milk or mixed), date of cessation of breast feeding if recent, breast-feeding problems experienced and visits to health practitioners. The reported date of first supplementation of breast milk feeds was verified using data from both diaries and questionnaires.

Women who failed to return questionnaires or diaries were telephoned up to three times. Modified questionnaires were conducted by telephone for women who were unwilling or unable to complete questionnaires.

Outcomes

The primary outcome was full breast feeding at six months postpartum. Full breast feeding was defined as the baby receiving breast milk alone with no additional fluids or solids apart from infrequent vitamins, water, juice or ritualistic feeds, as described previously (Labbok and Krasovec, 1990). A secondary outcome was breast feeding to any degree at six months.

Sample size

From previous research, the prevalence of full breast feeding at six months in a similar population was 30% (Henderson J.J. et al., 2003). In order to have an 80% chance of detecting an increase from 30% to 50% at the 0.05 level of significance, 850 women were required, while adjusting for stratification factors.

Analysis

Data analysis was conducted on an 'intention to treat' basis using SAS Version 8.2 (SAS Institute Inc., 1989). Baseline comparisons were made using Student's *t*-test, the Wilcoxon rank sum test or Fisher's exact test as appropriate. Relative risks (RRs) were calculated with the corresponding confidence interval (CI). These were adjusted for the stratification variables, and tested using the Cochrane-Mantel-Haenszel statistic. Logistic regression analysis was used to identify factors influencing the decision to stop breast feeding, full or any, by six months.

Findings

In total, 849 women were recruited with 425 allocated to the EMS group and 424 allocated to the SMS group. Participant flow through the study is shown in Figure 1. The majority of women who declined to take part tended to do so for reasons of feeling unable to commit to the study requirements. Ninety-three per cent of the women in the EMS group received the in-hospital education session. The majority of women (74%) received between two and four home visits, 8% only received one visit and 7% received no home visits. The return rate for the follow-up questionnaires was high (Figure 1). Although fewer women in the SMS group returned the two-month questionnaires, there was no difference between groups in the return rate at six months. Further abbreviated outcome data were obtained by telephone for women who did not return questionnaires (EMS 11% and 3%, SMS 16% and 5% at two and six months, respectively). Only 1.9% (EMS) and 0.9% (SMS) of recruits had no outcome data available.

Background characteristics

Demographic characteristics were similar for both groups, with 58% being aged between 25 and 35 years of age and 28% having a tertiary level of education (Table 1). Approximately 22% of women in each group continued to smoke during pregnancy. The majority (76%) of women in both groups stated an intention to breast feed for longer than six months.

Pregnancy, birth and postnatal characteristics were also similar between groups (Table 2). Half of the women were primiparous and 56% had a spontaneous vaginal birth. In total, 60% received epidural analgesia during labour and birth. The majority of women were discharged home from hospital at least 48 hours after the birth.

There were no significant differences between groups for early breast-feeding events in hospital with the potential to impact on breast-feeding success (Table 3). Although the first feed was a breast feed in nearly 92% of cases, over one-third did not have a successful breast feed until at least four hours after the birth. Furthermore, almost 30% of babies were introduced to at least one artificial milk feed while in hospital. Approximately 91% of mothers and babies roomed together with no separation, with 8% being separated at some stage during their hospitalisation.

Breast-feeding outcomes

There were no significant differences between groups at six months postpartum for any breast feeding [EMS 63.9% versus SMS 67.9%, RR 0.94,

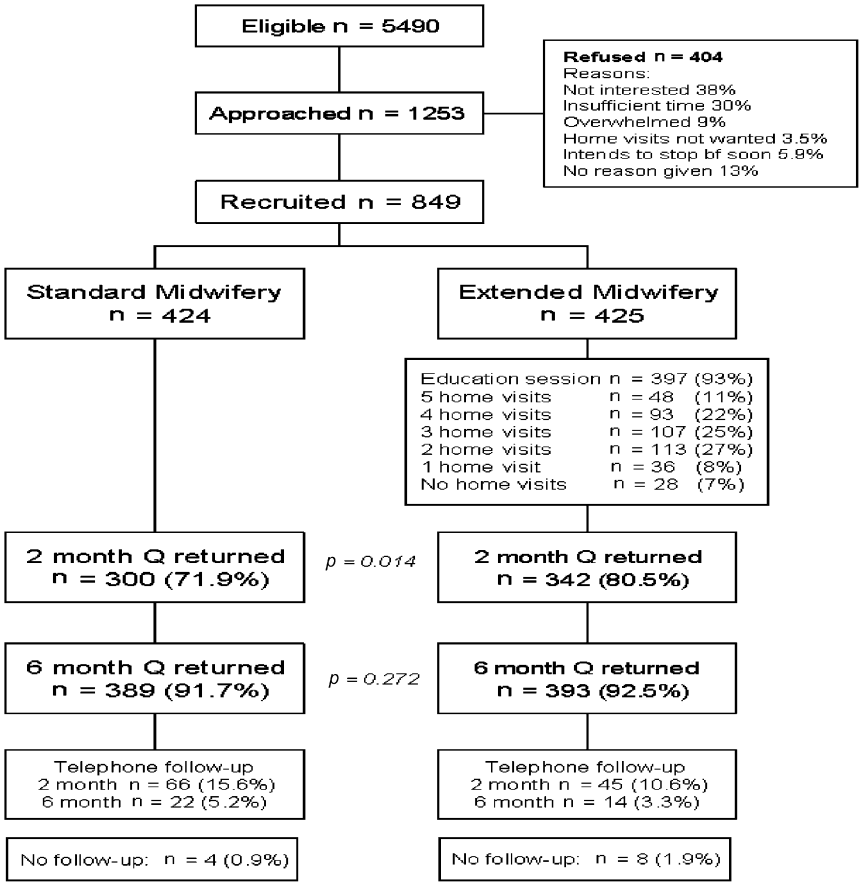

Figure 1 Participant flow through trial.

Table 1 Demographic characteristics.

	EMS (n = 425)		SMS (n = 424)		*p*-value
	n	%	n	%	
Maternal age (years)					
<25	94	22.1	94	22.2	1.000
25–34	246	57.9	245	57.8	
35+	85	20.0	86	20.1	
Tertiary education (mother)	122	28.7	116	27.4	0.703
Tertiary education (father)	102	24.0	105	24.8	0.811
Low socio-economic status	137	34.3	148	37.0	0.417
Married or with partner	379	89.2	363	85.6	0.122
Smoked during pregnancy	95	22.4	91	21.5	0.804
Intended to return to work before 6 months	77	18.1	87	20.5	0.386
Intended to breast feed >6 months	326	76.7	322	75.9	0.809

EMS, extended midwifery support; SMS, standard midwifery support.

95%CI 0.85–1.04], full breast feeding (EMS 43.3% versus SMS 42.5%, RR 1.02, 95%CI 0.87–1.19) or exclusive breast feeding (EMS 17.5% versus SMS 16.6%, RR 1.05, 95%CI 0.78–1.42). These findings persisted after adjustment for the stratification variables (Table 4). They were also unchanged when adjusted for all variables associated with cessation of breast feeding by six months. In addition, there was no difference between the groups in those mothers who had stopped breast

Table 2 Birth and postnatal characteristics.

	EMS (n = 425)		SMS (n = 424)		*p*-value
	n	%	n	%	
Primiparous	213	50.1	215	50.7	0.891
Mode of delivery					
Spontaneous vaginal	241	56.7	238	56.1	0.334
Assisted vaginal	78	18.4	65	15.3	
Caesarean section	106	24.9	121	28.5	
Analgesia during labour and birth					
None	121	28.5	103	24.3	0.298
Narcotic	45	10.6	57	13.4	
Epidural	255	60.0	257	60.6	
GA	4	0.9	7	1.7	
Postnatal analgesia					
No analgesia	293	68.9	294	69.3	0.377
Narcotic	28	6.6	19	4.5	
Epidural	104	24.5	111	25.2	
Gestational age (weeks)*	39.0	37.0–42.0	40.0	37.0–43.0	
Birth weight (g)*	3470	3520–5170	3483	2500–5000	
Baby SCBU admission	71	16.7	48	11.3	0.029
Baby SCBU admission >24 hours	25	5.9	11	2.6	0.026
Hospital discharge <48 hours	17	4.0	16	3.8	1.000

EMS, extended midwifery support; GA, general anaesthetic; SCBU, special care baby unit; SMS, standard midwifery support.
*Median (range).

Table 3 Early breast-feeding experience.

	EMS (n = 425)		SMS (n = 424)		*p*-value
	n	%	n	%	
First feed was breast feed	389	91.5	388	91.5	1.000
First breast feed >4 hours after birth	149	35.1	176	41.5	0.057
Baby received any artificial milk in hospital	122	28.7	124	29.25	0.880
Mother separated from baby in hospital					
None	389	91.5	385	90.8	0.563
Short period	18	4.2	15	3.5	
Extended period	18	4.2	24	5.7	
Previous successful breast feeding	205	48.2	193	45.5	0.450
Maternal grandmother breast fed	310	72.9	301	71.0	0.542
Returned to work before 6 months	87	21.3	104	25.2	0.188

EMS, extended midwifery support; SMS, standard midwifery support.

feeding by six months in the age at which complementary feeds were started [EMS median 8 weeks, interquartile range (IQR) 3–14 versus SMS 6 weeks, IQR 3–14] or the age at which breast feeding stopped (EMS 11 weeks, IQR 6–16 versus SMS 10 weeks, IQR 4–17).

Cessation of breast feeding

The data for both groups were combined to examine factors associated with cessation of breast feeding, either full or any, before six months. Maternal age younger than 25 years, smoking during

Table 4 Breast-feeding outcomes at six months.

	EMS (n = 418)		SMS (n = 421)		RR		Adj. RR	
	n	%	n	%	RR	95%CI	Adj. RR	95%CI
Any breast feeding	267	63.9	286	67.9	0.94	0.85–1.04	0.96	0.87–1.04
Full breast feeding	181	43.3	179	42.5	1.02	0.87–1.19	0.98	0.86–1.13
Exclusive breast feeding	73	17.5	70	16.6	1.05	0.78–1.42	1.04	0.78–1.40

Adj. RR, adjusted relative risk; CI, confidence interval; EMS, extended midwifery support; RR, relative risk; SMS, standard midwifery support.
Data missing for 10 women, n = 7 (EMS), n = 3 (SMS).
Definitions of breast feeding according to Labbok and Krasovec (1990): exclusive breast feeding, where breast feeding is the only source of baby nutrition, and no other liquids or solids are added to the baby's diet; full breast feeding, where the baby only receives breast milk with no additional fluids or solids apart from infrequent vitamins, water, juice or ritualistic feeds; and partial breast feeding, where supplementary artificial milk feeds are given as well as breast feeds.

Table 5 Factors associated with cessation of breast feeding before six months (logistic regression).

	Full breast feeding		Any breast feeding	
	Adj. OR	95%CI	Adj. OR	95%CI
Maternal age <25 years	1.37	1.08–1.74	1.48	1.13–1.95
Tertiary education (mother)	0.57	0.40–0.80	0.43	0.27–0.68
Tertiary education (father)			0.62	0.39–0.98
Primiparous			2.60	1.12–6.38
Breast fed older sibling			0.34	0.14–0.79
Intended to breast feed for >6 months	0.38	0.26–0.56	0.29	0.20–0.41
Smoked during pregnancy	1.83	1.25–2.70	1.77	1.20–2.59
Artificial milk introduced in hospital	1.52	1.09–2.12	1.64	1.14–2.35
Returned to work before 6 months	2.00	1.39–2.90	1.81	1.23–2.66
Epidural or narcotic analgesia in labour	1.29	1.09–1.53		

Adj. OR, odds ratio adjusted for other factors in table; CI, confidence interval.

pregnancy, the introduction of artificial milk in hospital, the mother's return to work before six months, and use of epidural or narcotic analgesia in labour were associated with increased odds of stopping full breast feeding before six months. Maternal tertiary education and intention to breast feed for more than six months were associated with decreased odds of stopping full breast feeding. Similar findings were found in relation to cessation of any breast feeding at six months (Table 5).

Breast-feeding problems

Breast-feeding problems reported by women in the two groups were compared at two and six months postpartum (Figure 2). Although there were no statistically significant differences between groups, the problems experienced changed over time. At two months, engorgement, unsettled baby, nipple soreness and attachment difficulty were reported more frequently. At six months, low milk supply and unsettled baby were the main problems reported.

The association between breast-feeding problems reported at two and six months postpartum and the rate of full breast feeding at six months was examined in the entire cohort using the combined data. Women who reported a low milk supply at two months were less likely to be breast feeding fully at six months compared with women reporting an adequate milk supply (28% versus 50%; $p<0.001$). Interestingly, those women who reported nipple problems or engorgement at two months were more likely to be breast feeding fully at six months than women without these early problems (50% versus 41%, $p = 0.02$; 50% versus 38%, $p = 0.002$, respectively).

A similar pattern was seen when breast-feeding problems at two months were compared with any breast feeding at six months. Furthermore, women who reported having an unsettled baby at two months were more likely to be breast feeding to

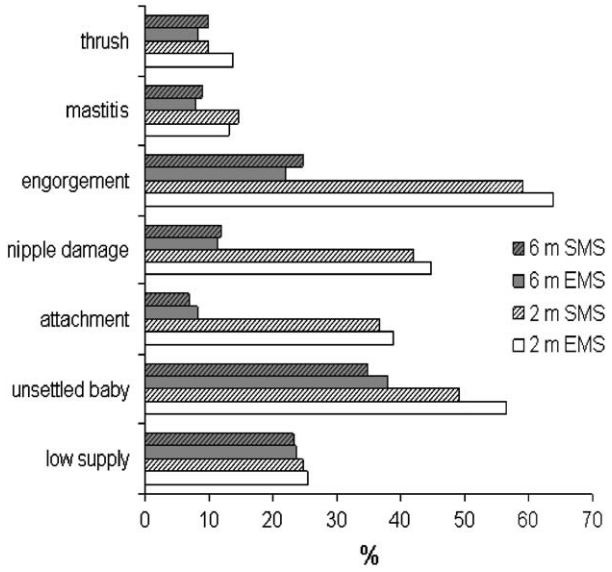

Figure 2 Breast-feeding problems reported by women at two and six months postpartum in the extended midwifery support (EMS) and standard midwifery support (SMS) groups.

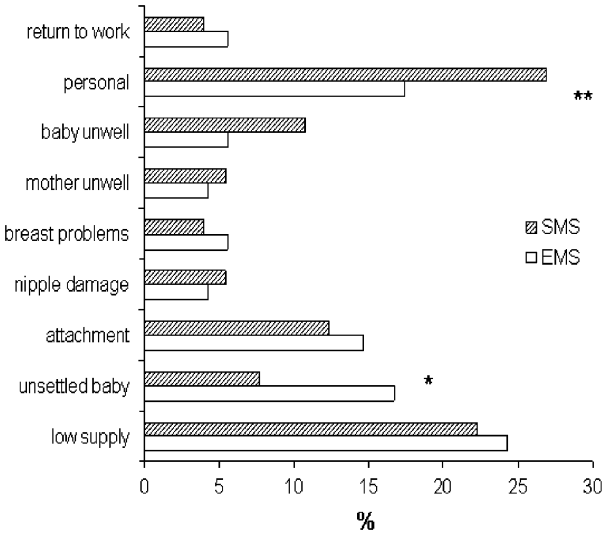

Figure 3 Main reason given for breast-feeding cessation by women in the extended midwifery support (EMS) and standard midwifery support (SMS) groups.

any degree at six months compared with mothers with more easily settled babies (73% versus 63%; $p = 0.008$).

Reasons for breast-feeding cessation

Women were asked to give their main reason for stopping breast feeding (Figure 3). Actual or perceived low milk supply was the major reason given for cessation of breast feeding before six months in both groups, and there was no difference between groups. Compared with the SMS group, women in the EMS group were significantly more likely to cite stopping because of problems settling the baby ($p = 0.012$). Women in the SMS group were more likely to cite personal reasons such as not enjoying breast feeding or finding it inconvenient, although this did not reach significance ($p = 0.059$).

Discussion

The present study is the largest to compare the effectiveness of additional professional support with standard midwifery care on breast feeding. The assumption that additional postnatal support, in the form of telephone calls and home visits by a midwife, would be beneficial for the duration of breast feeding was tested. This was based on the belief that early identification of breast-feeding problems and early intervention would prevent early cessation of breast feeding. It was hypothesised that additional social support by a midwife who was an informed source of breast-feeding information would encourage women to persist with breast feeding. This study, conducted in a population of women with high breast-feeding initiation rates, showed no improvement in breast-feeding rates at six months postpartum associated with the extended postnatal support programme.

There are several possible explanations for this lack of effect. Firstly, the majority of women were already motivated to breast feed for longer than six months (76%). Intention to breast feed for prolonged periods emerged as a potent predictor of breast-feeding success and this is consistent with the literature (Bloom et al., 1982; Kloeblen et al., 1999; Henderson J.J. et al., 2003; Kronborg and Vaeth, 2004).

This was also seen in the relatively high number of women in the control group who continued to breast feed fully at six months (42.5%, Table 4). Based on previous findings in a similar population (Henderson J.J. et al., 2003), the sample size of 850 women was sufficient to detect an increase of 30–50% in full breast feeding. The increased rate of full breast feeding in the control group may be due to changes in breast-feeding practice over time; however, a Hawthorne effect cannot be excluded in women who were not allocated to the intervention group but for whom general participation in the trial was beneficial (Holden, 2001).

Midwives were engaged as the professional support group in this study. Lactation professionals have been used in other trials of postnatal home

support which found improved breast-feeding outcomes (Jones and West, 1985; Porteous et al., 2000; McKeever et al., 2002; Bonuck et al., 2005). A small Canadian RCT of home support, given by lactation consultants, found that mothers of term babies were more likely to breast feed exclusively in the week after birth than women who did not receive any professional support at home (McKeever et al., 2002). However, this study did not assess longer-term outcomes, and conclusions were limited by a large loss to follow-up. In another small Canadian trial of women identified as having no breast-feeding support, home visiting and telephone contact from a community midwife were associated with an improved breast-feeding rate at four weeks postpartum (Porteous et al., 2000).

Similarly, a programme of antenatal and postnatal visits with a lactation consultant, and prolonged telephone follow-up to 12 months, increased the incidence of any breast feeding up to four months postpartum (53% versus 39%). However, almost non-existent rates of exclusive breast feeding were found in both experimental and control groups (Bonuck et al., 2005). An earlier, quasi-experimental trial in the UK found that practical support in the postnatal ward and at home for two weeks, provided by a 'lactation nurse', was associated with an increased breast-feeding rate at four weeks postpartum. The most striking benefits occurred in women of low socioeconomic status (Jones and West, 1985). Midwives provide the bulk of education and support to mothers wishing to breast feed and, in this pragmatic trial, the authors wished to test interventions that could be introduced in routine clinical practice. Additionally, all the midwives used in this study were experienced and had additional training in relation to breast-feeding support. It is therefore highly unlikely that any lack of effect in this study was related to the use of midwives.

The analysis was by intention-to-treat as is appropriate for RCTs. It is also unlikely that low uptake of home visiting was responsible for the observed lack of benefit of the intervention, as relatively few women declined to be visited at home.

The authors were unable to recruit sufficient numbers of women with tertiary education in the study time period at KEMH. As women with higher education are known to have better breast-feeding outcomes (Michaelsen et al., 1994; Bourgoin et al., 1997; Evers et al., 1998; Henderson J.J. et al., 2003; Taylor et al., 2006), the authors decided to accept that there would be insufficient power to detect a difference in this group of women. However, no benefits of the support intervention were found in the subgroups of women with less than tertiary education, suggesting a real lack of effect for women of all educational levels.

This study was unable to improve breast-feeding outcomes using this particular package of interventions. This is consistent with the findings of several RCTs which found no benefits of postnatal visiting and/or telephone contacts by professionally trained providers (Lynch et al., 1986; Quinlivan et al., 2003; Di Napoli et al., 2004). An RCT, conducted at the same institution as the present study, was unable to demonstrate an improvement in breast-feeding outcomes for adolescent mothers allocated a midwifery-led home visiting intervention (Quinlivan et al., 2003). A large Italian RCT found no benefit associated with a postnatal home visit and telephone-based counselling session by a lactation-trained midwife (Di Napoli et al., 2004). There was very low continuity of breast feeding in both the intervention and control groups in that study.

The intervention tested midwifery-led support in the postnatal period alone, augmented with a brief educational session in hospital after birth. Other authors have found no beneficial effects of antenatal breast-feeding education on the duration of breast feeding in similar settings with high background initiation (Forster et al., 2004). In this study, women in both groups had equal access to antenatal education and parenting classes. Approximately 79% of nulliparous women and 43% of multiparous women across both groups attended antenatal classes, indicating that there was information available to women regarding breast feeding and its health benefits should they choose to access it. This suggests that social factors relating to other pressures in a mother's life, such as the need to return to work, determine the duration and continuation of breast feeding.

Although authorities recommend exclusive breast feeding until six months of age (World Health Organization, 2002), the reality in developed countries such as Australia is that many women choose to commence supplementation with solids before their babies reach six months of age. Hence, the principal objectives of the present study were either full breast feeding (no artificial milk supplementation but other fluids and/or solids given) or breast feeding to any degree.

The authors found that 66% of women were breast feeding to any degree at six months, with 43% breast feeding fully. Only 17% were still breast feeding exclusively. These rates of breast feeding are favourable when compared with studies in Australia and other developed nations (32–60%) (Scott et al., 1999; Henderson A.M. et al., 2001;

Henderson J.J. et al., 2003; Ryan et al., 2002; Forster et al., 2004; Bonuck et al., 2005). While these findings were better than expected, they still fell short of Australian and international goals, and were less than the anticipated self-reported targets given by women at the time of recruitment (Table 1).

The factors associated with continuation of breast feeding in the present study are consistent with the existing literature. Sociodemographic factors such as younger maternal age and less education have been reported previously (Scott et al., 1999; Bertini et al., 2003; Henderson J.J. et al., 2003; Lande et al., 2003; Taylor et al., 2006). The adverse effects of maternal smoking and returning to work before six months postpartum on breast feeding have been well described (Bertini et al., 2003; Henderson J.J. et al., 2003; Lande et al., 2003). Effects of intention to breast feed for prolonged periods and routine hospital practices have also been reported (Scott et al., 1999; Forster et al., 2006).

There was no difference between the study groups in terms of breast-feeding problems experienced in the first six months postpartum. Furthermore, the perception of low milk supply was one of the most common reasons given for early cessation of breast feeding, consistent with other reports (Bourgoin et al., 1997; Henderson J.J. et al., 2003). Although the additional informed support offered by midwives in the present study aimed to assist women to have a better understanding of the physiology of lactation and hence reduce the incidence of perceived supply problems, there was no difference between groups. More women in the EMS group reported having an unsettled baby as the main reason for stopping breast feeding; no explanation for this is offered. In contrast, more women in the SMS group reported personal reasons, such as finding breast feeding inconvenient, suggesting that the support intervention may have been effective in increasing satisfaction with breast feeding while not assisting the resolution of breast-feeding or parenting problems, thus having no effect on the duration of breast feeding.

Recommendations for future research

Future studies need to continue to explore women's reasons for early cessation of breast feeding and whether the most commonly cited reasons, insufficient milk supply and unsettled babies, are surrogates for not wishing to continue. Another area requiring further exploration is whether women of Westernised cultures experience less anxiety in relation to the use of artificial milk feeding in terms of cost, nutritional value, access to clean water and sterilisation resources, and convenience, and thus may be more likely to substitute artificial milk as the predominant source of baby nutrition.

Conclusion

In conclusion, the EMS programme did not succeed in increasing the proportion of women performing full breast feeding or any breast feeding at six months postpartum in a setting with high initiation rates. Future research into programmes designed to promote breast feeding continues to be imperative in view of the advantages of breast feeding for all mothers and babies.

Acknowledgements

The authors wish to thank research midwives Jocelyn Bristol, Jenny Francis, Colleen Ball and Sheena McClery, and all the women who participated in this trial. This research was supported by grants from Healthway, Women and Infants Research Foundation, and King Edward Memorial Hospital, Perth, Western Australia.

References

Barber, C.M., Abernathy, T., Steinmetz, B., Charlebois, J., 1997. Using a breastfeeding prevalence survey to identify a population for targeted programs. Canadian Journal of Public Health 88, 242–245.

Bartington, S., Griffiths, L.J., Tate, A.R., Dezateux, C., 2006. Are breastfeeding rates higher among mothers delivering in baby friendly accredited maternity units in the UK? International Journal of Epidemiology 35, 1178–1186.

Bertini, G., Perugi, S., Dani, C., et al., 2003. Maternal education and the incidence and duration of breast feeding: a prospective study. Journal of Pediatric Gastroenterology and Nutrition 37, 447–452.

Binns, C., Davidson, G., 2003. Infant feeding guidelines for health workers. Dietary guidelines for children and adolescents in Australia. National Health and Medical Research Council, 291–443.

Bloom, K., Goldbloom, R.B., Robinson, S.C., Stevens, F., 1982. Factors affecting the continuance of breastfeeding. Acta Paediatrica Scandinavica Supplement 300, 9–14.

Bolling, K., Grant, C., Hamlyn, B., Thornton, A., 2007. Infant Feeding Survey 2005. NHS, London.

Bonuck, K.A., Trombley, M., Freeman, K., McKee, D., 2005. Randomized, controlled trial of a prenatal and postnatal lactation consultant intervention on duration and intensity of breastfeeding up to 12 months. Pediatrics 116, 1413–1426.

Bourgoin, G.L., Lahaie, N.R., Rheaume, B.A., et al., 1997. Factors influencing the duration of breastfeeding in the Sudbury region. Canadian Journal of Public Health 88, 238–241.

Britton, C., McCormick, F.M., Renfrew, M.J., et al., 2007. Support for breastfeeding mothers. Cochrane Database of Systematic Reviews 1, CD001141.

Coulibaly, R., Seguin, L., Zunzunegui, M.-V., Gauvin, L., 2006. Links between maternal breast-feeding duration and Quebec infants' health: a population-based study. Are the effects different for poor children? Maternal and Child Health Journal 10, 537–543.

Di Napoli, A., Di Lallo, D., Fortes, C., Franceschell, C., Armani, E., Guasticchi, G., 2004. Home breastfeeding support by health professionals: findings of a randomized controlled trial in a population of Italian women. Acta Paediatrica 93, 1108–1114.

Donath, S., Amir, L.H., 2000. Rates of breastfeeding in Australia by state and socio-economic status: evidence from the 1995 National Health Survey. Journal of Paediatric and Child Health 36, 164–168.

Evers, S., Doran, L., Schellenberg, K., 1998. Influences on breastfeeding rates in low income communities in Ontario. Canadian Journal of Public Health 89, 203–207.

Fallon, A., Hegney, D., O'Brien, M., Brodribb, W., Crepinsek, M., Doolan, J., 2005. An evaluation of a telephone-based postnatal support intervention for infant feeding in a regional Australian city. Birth 32, 291–298.

Ford, R.P., Mitchell, E.A., Scragg, R., Stewart, A.W., Taylor, B.J., Allen, E.M., 1994. Factors adversely associated with breast-feeding in New Zealand. Journal of Paediatric and Child Health 30, 483–489.

Forster, D., McLachlan, H., Lumley, J., Beanland, C., Waldenstrom, U., Amir, L., 2004. Two mid-pregnancy interventions to increase the initiation and duration of breastfeeding: a randomized controlled trial. Birth 31, 176–182.

Forster, D.A., McLachlan, H.L., Lumley, J., 2006. Factors associated with breastfeeding at six months postpartum in a group of Australian women. International Breastfeeding Journal 1, 18–29.

Gartner, L., Morton, J., Lawrence, R., et al., 2005. Breastfeeding and the use of human milk. Pediatrics 115, 496–506.

Heath, A.-L.M., Reeves Tuttle, C., Simons, M.S., Cleghorn, C.L., Parnell, W.R., 2002. A longitudinal study of breastfeeding and weaning practices during the first year of life in Dunedin, New Zealand. Journal of the American Dietetic Association 102, 937–943.

Henderson, A.M., Stamp, G.E., Pincome, J., 2001. Postpartum positioning and attachment education for increasing breast-feeding: a randomized trial. Birth 28, 236–242.

Henderson, J.J., Straton, J.A., Priest, S., Hagan, R., 2003. Impact of postnatal depression on breastfeeding duration. Birth 30, 175–180.

Hofvander, Y., 2005. Breastfeeding and the baby-friendly hospital initiative: organisation, response and outcome in Sweden and other countries. Acta Paediatrica 94, 1012–1016.

Holden, J.D., 2001. Hawthorne effects and research into professional practice. Journal of Evaluation in Clinical Practice 7, 65–70.

Jones, D.A., West, R.R., 1985. Lactation nurse increases duration of breast feeding. Archives of Disease in Childhood 60, 772–774.

Kloeblen, A.S., Thompson, N.J., Miner, K.R., 1999. Predicting breast-feeding intention among low-income pregnant women: a comparison of two theoretical models. Health Education and Behavior 26, 675–688.

Kramer, M.S., Chalmers, B., Hodnett, E., et al., 2001. Promotion of Breastfeeding Intervention Trial (PROBIT): a randomized trial in the Republic of Belarus. Journal of the American Medical Association 285, 413–420.

Kronborg, H., Vaeth, M., 2004. The influence of psychosocial factors on the duration of breastfeeding. Scandinavian Journal of Public Health 32, 210–216.

Labbok, M., Krasovec, K., 1990. Toward consistency in breast-feeding definitions. Studies in Family Planning 21, 226–230.

Labere, J., Bellin, V., Fourny, M., Gaunarie, J.-C., Francois, P., Pons, J.-C., 2003. Assessment of a structured in-hospital educational intervention addressing breastfeeding: a prospective randomised open trial. British Journal of Obstetrics and Gynaecology 110, 847–852.

Lande, B., Anderson, L.F., Baerug, A., et al., 2003. Infant feeding practices and associated factors in the first six months of life: the Norwegian Infant Nutrition Survey. Acta Paediatrica 92, 152–161.

Luzia, M., Braun, E., Giugliani, E., et al., 2003. Evaluation of the impact of the baby-friendly hospital initiative on rates of breastfeeding. American Journal of Public Health 93, 1277–1279.

Lynch, S.A., Koch, A.M., Hislop, T.G., Coldman, A.J., 1986. Evaluating the effect of a breastfeeding consultant on the duration of breastfeeding. Canadian Journal of Public Health 77, 190–195.

Mattar, C.N., Chong, Y.-S., Chan, Y.-S., et al., 2007. Simple antenatal preparation to improve breastfeeding practice. Obstetrics and Gynecology 109, 73–80.

McKeever, P., Stevens, B., Miller, K.-L., et al., 2002. Home versus hospital breastfeeding support for newborns: a randomized controlled trial. Birth 29, 258–264.

Michaelsen, K.F., Larsen, P.S., Thomsen, B.L., Samualson, G., 1994. The Copenhagen cohort study on infant nutrition and growth: duration of breast feeding and influencing factors. Acta Paediatrica Scandinavica 83, 565–571.

Morrell, C.J., Spiby, H., Stewart, P., Walters, S., Morgan, A., 2000. Costs and effectiveness of community postnatal support workers: randomised controlled trial. BMJ 321, 593–598.

Piper, S., Parks, P.L., 1996. Predicting the duration of lactation: evidence from a national survey. Birth 23, 7–12.

Porteous, R., Kaufman, K., Rush, J., 2000. The effect of individualized professional support on duration of breast-feeding: a randomized controlled trial. Journal of Human Lactation 16, 303–308.

Quinlivan, J.A., Box, H., Evans, S.F., 2003. Postnatal home visits in teenage mothers: a randomised controlled trial. The Lancet 361, 893–900.

Raisler, J., Alexander, C., O'Campo, P., 1999. Breast-feeding and infant illness: a dose-response relationship? American Journal of Public Health 89, 25–30.

Raj, V.K., Plichta, S.B., 1998. The role of social support in breastfeeding promotion: a literature review. Journal of Human Lactation 14, 41–45.

Redman, S., Booth, P., Smyth, H., Paul, C., 1992. Preventive health behaviours among parents of infants aged four months. Australian Journal of Public Health 16, 175–181.

Redman, S., Watkins, J., Evans, L., Lloyd, D., 1995. Evaluation of an Australian intervention to encourage breastfeeding in primiparous women. Health Promotion International 10, 101–113.

Ryan, A.S., Wenjun, Z., Acosta, A., 2002. Breastfeeding continues to increase into the new millennium. Pediatrics 110, 1103–1109.

SAS Institute Inc., 1989. SAS/STAT User's Guide, Version 6. SAS Institute Inc., Cary, NC.

Schy, D.S., Folker Maglaya, C., Mendelson, S.G., Race, K., Ludwig-Beymer, P., 1996. Effects of in-hospital lactation education on breastfeeding practice. Journal of Human Lactation 12, 117–121.

Scott, J.A., Aitkin, I., Binns, C.W., Aroni, R.W., 1999. Factors associated with the duration of breastfeeding amongst women in Perth, Australia. Acta Paediatrica Scandinavica 88, 416–421.

Tarkka, M.T., Paunonen, M., Laippala, P., 1999. Factors related to successful breast feeding by first-time mothers when the child is 3 months old. Journal of Advanced Nursing 29, 113–118.

Taylor, J.S., Risica, P.M., Geller, L., Kirtania, U., Cabral, H., 2006. Duration of breastfeeding among first-time mothers in the United States: results of a national survey. Acta Paediatrica 95, 980–984.

World Health Organization, 1998. Evidence for the Ten Steps to Successful Breastfeeding. World Health Organization, Geneva.

World Health Organization, 2002. Infant and Young Child Nutrition. Global Strategy on Infant and Young Child Feeding. Assembly F-f W H. A55/15. World Health Organization, Geneva.

World Health Organization/United Nations Children's Fund Joint Statement, 1989. Protecting, Promoting and Supporting Breastfeeding: the Special Role of Maternity Services. World Health Organization, Geneva.