Economics of home vs. hospital breastfeeding support for newborns

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Aim. This paper presents the findings of research comparing the incremental costs associated with the provision of home-based vs. hospital-based support for breastfeeding by nurse lactation consultants for term and near-term neonates during the first week of life.

Background. A consequence of both consumer demands and increasing health resource constraints is that alternative care delivery models for safe, efficacious and cost-effective breastfeeding programmes have steadily evolved. To date, the economic impact of the setting (home or hospital) where lactation support is delivered has received little research attention.

Methods. Mother–infant dyads were stratified by gestational age as term (> 37 weeks gestational age; $n = 101$) or near term (35–37 weeks gestational age; $n = 37$) and randomized to standard hospital care and postpartum follow-up (standard care), or to standard hospital care plus home support from certified nurse lactation consultants (experimental). Data collection occurred at study entry, hospital discharge and at a seventh day postpartum follow-up session. Costs to the family (out-of-pocket and time costs) and to the healthcare system (during hospitalization and after hospital discharge) were measured. Total societal costs were defined as the sum of both family and healthcare system costs.

Results. Compared with standard hospital-based care, home support by nurse lactation consultants showed no statistically significant differences in either time costs to the family or total societal costs. Term infants who received home support had statistically significantly greater postdischarge system costs ($P < 0{\cdot}0001$), with a trend towards lower out-of-pocket expenses to their families ($P = 0{\cdot}12$). There were no statistically significant differences between the two groups in overall combined family and healthcare system costs.

Conclusions. These results suggest that the cost of home lactation support programmes were comparable with the costs of hospital-based standard care. Breastfeeding support at home by lactation consultants should be considered as an option as it was no more costly than support from lactation consultants in the hospital setting. The findings for near-term infants need to be interpreted with caution, given the small sample size.

Keywords: breastfeeding, economics, home, hospital, midwifery, newborns

Introduction

This paper reports the findings of a study that aimed to contribute to the sparse economic literature on breastfeeding by examining incremental costs to the family *and* to the healthcare system that are associated with home-based breastfeeding support.

Breastfeeding confers significant nutritional and immunological advantages to term and preterm infants, as well as physiological, psychological and social gains to mothers (American Academy of Pediatrics Working Group on Breast-feeding 1997, British Columbia Reproductive Care Program 1997, 2001). Breastfeeding has been associated with important economic advantages for families and potential savings to the health and social care systems (Salisbury & Blackwell 1981, Facione 1990, Weimer 2001). Despite these merits, the establishment of breastfeeding in term, and especially preterm, newborns has been found to be time- and resource-consuming under traditional hospital-based models of care (Pascale *et al.* 1996, Patton *et al.* 1996, British Columbia Reproductive Care Program 2001).

Preterm infants are much less likely to be breastfed. Although mothers may express breastmilk during infants' hospitalizations, many discontinue breastfeeding once discharged home (British Columbia Reproductive Care Program 2001). Furthermore, because of increasingly shortened postpartum stays, mothers may leave hospital before the establishment of full milk production, or without adequate opportunity for clinical assessment or the teaching of efficient breastfeeding techniques and early signs of breastfeeding failure (Patton *et al.* 1996, American Academy of Pediatrics Working Group on Breast-feeding 1997). Consequently, postdischarge breastfeeding support by professionals should be an important adjunct to routine care (McKeever *et al.* 2002, Sikorski *et al.* 2004).

Home-based support for breastfeeding has been shown to produce comparable clinical outcomes for infants (McKeever *et al.* 2002, Petrou *et al.* 2004), as well as to increase the length of time that mothers breastfeed (Sjolin *et al.* 1979, Jones & West 1986, Barros *et al.* 1994, Haider *et al.* 1996). Professional support at home is associated with maternal satisfaction and improved confidence with breastfeeding (Jones & West 1986, Darj & Stalnacke 2000, Lieu *et al.* 2000, Escobar *et al.* 2001, McKeever *et al.* 2002). When compared with lactation support in other settings, it is the home visit, in particular, that is viewed most positively by nursing mothers (Jones & West 1986, Locklin & Jansson 1999, Gunn *et al.* 2000, Lieu *et al.* 2000, Escobar *et al.* 2001).

The vast majority of randomized controlled trials with breastfeeding outcomes have focused on clinical rather than economic outcomes (for a review see Brown *et al.* 2002, Sikorski *et al.* 2004). This lack of evidence on the economic impact of supplementary breastfeeding support prompted a call for trials to be accompanied by prospective economic analyses (Sikorski *et al.* 2004). Two randomized clinical trials were identified which report on economic evaluation of home-based postpartum support (Pugh *et al.* 2002, Petrou *et al.* 2004). Pugh *et al.* (2002) assessed costs associated with a community health nurse/peer counselor team. However, to assess costs to the system, only time spent by nurses delivering the intervention was measured and no other services such as visits to a physician or an emergency department were included. Consequently, system costs were higher for mothers who received the intervention. Costs incurred by families included only time spent by mothers or other family members feeding the infant, and did not include their out-of-pocket costs. Although the time costs in the intervention group were higher, it was not reported whether or not this difference was statistically significant, nor was it reported how often babies in either group were breast-fed or bottle-fed. Although Petrou *et al.* (2004) conducted a comprehensive assessment of all relevant system, time and out-of-pocket costs related to an early discharge intervention, their study did not focus specifically on home-based breastfeeding support.

The study

Aim

The aim of this study was to compare the incremental costs associated with the provision of home-based vs. hospital-based support by nurse lactation consultants for breastfeeding for term and near term neonates during the first week of life.

Conceptual framework

Under the Canada Health Act, five principles define the healthcare system and these are that it is publicly administered, comprehensive, universal, portable and accessible. These principles also underlie the conditions that the federal government has placed on its transfer of funds to provinces and territories. As outlined in the Romanow Report (Romanow 2002), to sustain such a publicly-funded healthcare system, Canada relies almost entirely on taxes to fund hospital and physician services. Although taxes do fund a range of additional services (e.g. prescription drug plan, home care, continuing care and long-term care), coverage for these services comes with notable restrictions and does not necessarily include the full array of costs associated with illnesses. The costs of all home visits by the lactation consultants were considered to be costs covered by the provincial healthcare system and were not out-of-pocket expenses.

Costs incurred by both families and the healthcare system were assessed using a societal perspective, which considers all costs regardless of who incurs them (Gold *et al.* 1996, Drummond *et al.* 1997, Yates 1997). Costs to families included out-of-pocket costs as well as time costs. Time lost to care provision or receipt by care recipients and their family caregivers was measured through the assignment of a monetary value. The importance placed on caregiving time was based on the premise that the time diverted from market labour, leisure or household work represented foregone opportunities (Yates 1997).

Design

A randomized controlled trial with prognostic stratification for gestational age (GA) was conducted at a tertiary-level

university-affiliated hospital in a metropolitan centre in central Canada from July 1999 to December 2000.

The sample was constructed to address the major research question: 'What are the family and system cost differences associated with providing lactation support to mothers and infants in the home vs. hospital setting?' Sample size estimates were computed based on an analysis to detect differences between two means. A sample of 40 home-based mother–newborn pairs and 40 hospital-based mother–infant pairs would allow for the detection of a $340 (Canadian dollars) difference in cost with a power of 84% at the 0·05 level of significance (1 Canadian dollar = 0·83 US dollars/ 0·44 UK sterling, 22 March 2005, Bank of Canada).

Healthcare professionals and administrators participated in a focus group that developed the template representing the types of hospital-based costs associated with caring for a 'typical' mother–infant pair on day 2 of hospitalization. Day 2 was chosen to minimize the differences in delivery costs between the groups. Prior to the start of the study, the project director familiarized all hospital-based and community-based research personnel with the study protocol. An independent data monitoring committee, comprised of a neonatologist, clinical nurse specialist/neonatal nurse practitioner and a community nurse met every 3 months to evaluate the data for safety and procedural compliance.

Participants

Study participants were recruited over an 18-month period, on weekdays during the day and evening. Mothers were eligible to participate if they had delivered a live, singleton infant within the preceding 12 hours, were at least 21 years of age, resided in the defined metropolitan area, spoke sufficient English, had a telephone, and if their newborns were delivered at 35 weeks GA or greater, were breastfeeding at discharge, and did not have major known congenital anomalies or morbidities including hyperbilirubinaemia, blood group incompatibility or sepsis. Women with caesarean births, postpartum complications and/or morbidities, and chronic illnesses or disabilities were excluded.

Consenting mother–newborn pairs were stratified as term (> 37 weeks GA at birth) or near term (35–37 weeks GA at birth). Following baseline data collection, participants were randomly allocated to the hospital-based care group (standard care; SC) or home-based group (experimental; EXP). Randomization tables were computer-generated in advance and the allocation of each participant was centrally controlled by a neutral recruitment nurse from the setting using opaque, sealed envelopes. Blinding was not possible for the mothers or nurses as the experimental treatment (i.e. discharge to the home-based lactation support) was known.

Mother–newborn pairs randomized to the SC group were discharged using existing hospital criteria at approximately 48–60 hours postpartum. As a matter of standard hospital care, these mothers were seen by the in-hospital lactation consultant, and made aware of the pre-existing outpatient breastfeeding clinic and a 24-hour telephone help line. Mother–newborn pairs randomized to the EXP group were assessed at 24–36 hours postpartum, discharged using the same hospital criteria as the SC group, seen by the in-hospital lactation consultant and given routine information about the outpatient breastfeeding clinic and 24-hour telephone help line. In addition, a certified nurse lactation consultant visited women in the experimental group at home during the first 7 days postpartum. Following the initial visit within the first 24-hours postdischarge, the exact determination of frequency and intervals between visits was mutually determined by the lactation nurse and the mother in order to best meet mother–infant needs.

Mothers of term newborns

Of 156 eligible mothers of term newborns, 101 agreed to participate and were randomly assigned to the EXP ($n = 53$) or SC ($n = 48$) group. Those who refused ($n = 55$) stated that they anticipated being too busy to participate in the study ($n = 32$), were unwilling to be randomized because of strong preferences about the site of postpartum care ($n = 18$), or did not anticipate any difficulties in breastfeeding ($n = 5$). Sample representativeness was determined by comparing the demographic and clinical characteristics of those who agreed to participate with those who did not. They differed statistically significantly only on GA of the infant: the median GA for term infants who participated in the study was 39 weeks, while for those who did not participate it was 40 weeks ($P = 0·04$). The difference was not considered clinically important.

Thirteen mothers withdrew prior to study completion or were lost to follow-up. More mother–newborn dyads in the term SC group ($n = 8$) withdrew or were lost to follow-up compared with the EXP ($n = 5$) group. Reasons for withdrawal were not stated. Eighty-eight term mother–newborn pairs remained in the study for the analyses: 48 in the EXP group and 40 in the SC group (Figure 1).

Mothers of near-term infants

Of 58 eligible mothers, 37 agreed to participate and were randomly assigned to the EXP ($n = 19$) or SC ($n = 18$) group. There were no differences between those who refused

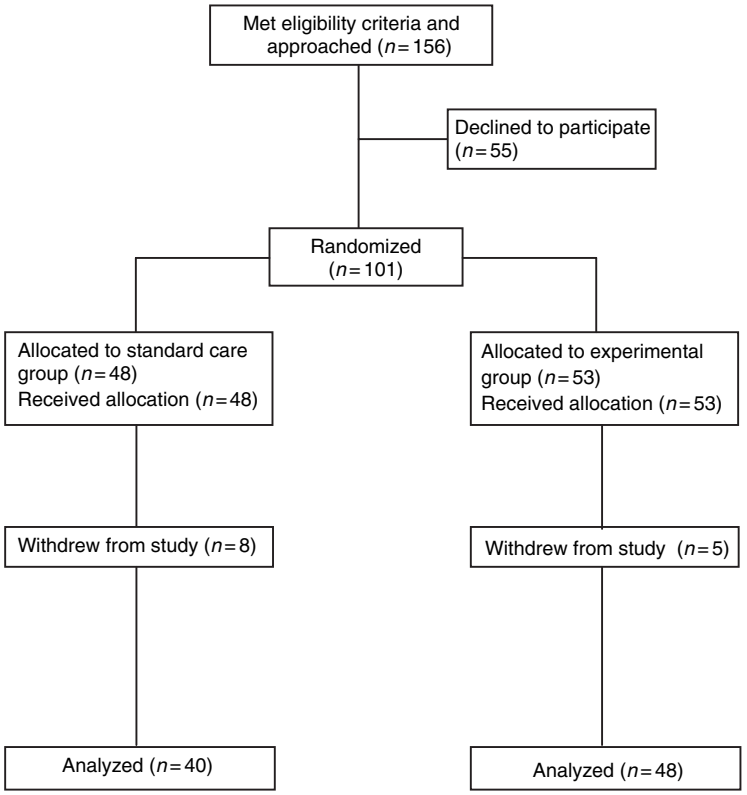

Figure 1 Trial profile for mothers of term newborns.

and those who participated. Six mothers in the EXP group and five in the SC group were lost to follow-up, and one mother and one infant in the SC group did not meet the unit discharge criteria. Otherwise, reasons for withdrawal were not stated in either group. The final sample size consisted of 24 mothers (Figure 2).

Outcomes

Clinical outcomes

Data on infant clinical outcomes (e.g. jaundice, dehydration, hospital readmission) and psychosocial outcomes for mothers (e.g. maternal satisfaction) were collected. Results of these outcomes have been separately published (McKeever *et al.* 2002).

Economic outcomes

Economic outcomes were measured using the Ambulatory and Home Care Record (AHCR) (© Guerriere & Coyte, 1998, unpublished manuscript), a self-administered data collection instrument that measures costs related to the provision and receipt of ambulatory and home-based services. It was developed based on a societal perspective (Gold *et al.* 1996, Drummond *et al.* 1997, Yates 1997) using concepts from the economic literature and through direct examination of existing home-based services. The AHCR has previously been used in several countries across a range of studies with varied client ages, clinical conditions, and care settings. Three categories of cost incurred by families and the healthcare system were assessed by the AHCR: (a) out-of-pocket costs; (b) time costs; and (c) health system costs. Out-of-pocket costs included privately-financed caregivers and household caretakers, travel expenses, non-prescription and prescription medications, and supplies and equipment. Time costs included the time devoted by any unpaid caregivers (family members and friends) to seeking, receiving, and providing care. Time costs were not included for mothers since it was assumed that all breastfeeding mothers in both the SC and EXP groups would spend comparable amounts of time caring for their infants during their first week of life. In order to assess healthcare system costs associated with posthospitalization care, mothers also reported healthcare system costs, which included any ambulatory and home-based appointments with healthcare professionals, medication costs covered by insurance, laboratory tests, and equipment and supplies provided by the hospital. Also included were emergency visits, telephone calls to the 24-hour help line, visits and telephone calls to the breastfeeding clinic, and visits and

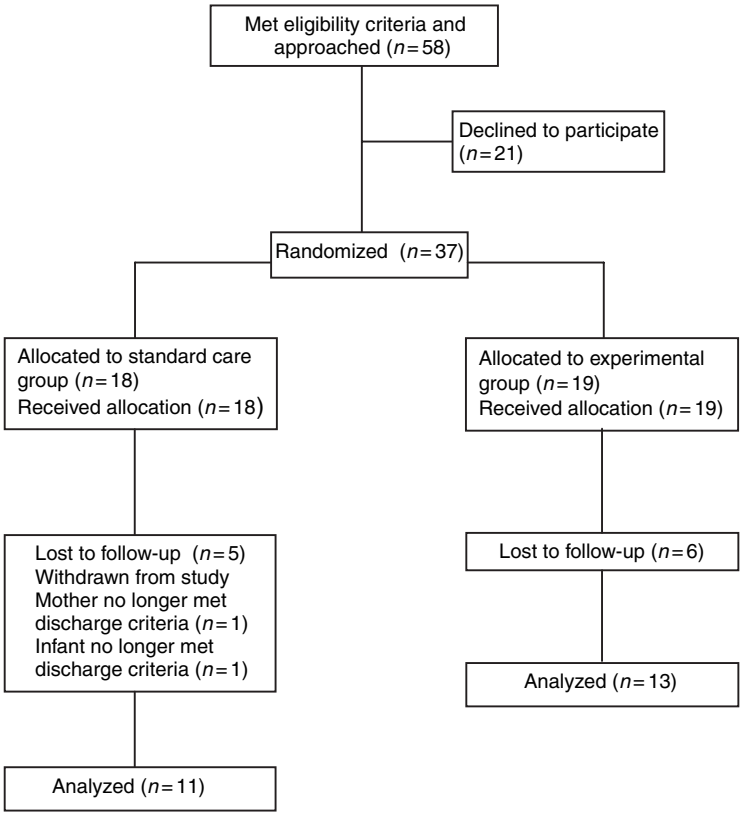

Figure 2 Trial profile for mothers of near-term newborns.

telephone calls to community practitioners in the 7 days following birth.

Assessment of the healthcare system costs associated with mother–infant in-hospital stays for the birth and subsequent readmissions included fully-allocated institutional costs; the method for obtaining these costs is described below.

Data collection

Mothers were asked to complete the AHCR on a daily basis for 7 days. Those in the SC and EXP groups began to fill out the AHCR on the day of discharge, once they had arrived home. Completed questionnaires were obtained from the mothers during the day 7 follow-up visit or mailed to the research coordinator, who was also available to clarify mothers' questions or concerns about the AHCR.

Ethical considerations

Ethical approval for the study was obtained from the joint university and hospital research ethics boards. Informed written consent was obtained from all mothers. Mothers were informed that their decision to participate in the study was voluntary and that they could withdraw at any time. Choosing not to participate would not affect the quality of their postpartum care.

Data analysis

All data were checked for completeness, double entered, logic checked and corrected for data entry errors. The cost of hospitalization was determined using a standardized case costing methodology from the Ontario Case Costing Initiative (Ontario Case Cost Project 1999). Healthcare system usage following discharge, up to day 7 following birth, was based on information recorded in each participant's AHCR record. The cost of an emergency department visit was estimated based on the methods used by Coyte *et al.* (2001). Family out-of-pocket and time costs were estimated using information provided in each participant's AHCR. Out-of-pocket costs were calculating by summing the amounts reported and subtracting any reimbursements received from drug cost reimbursement schemes or medical insurance. Time lost from employment was valued based on the human capital approach (Rice & MacKenzie 1989, Torgerson *et al.* 1994) that applies current average hourly earnings by age and sex to lost market time. Average wages by age and sex reported by the 1996 Canadian Census (Statistics Canada 1996) were adjusted for social security benefits received and

for annual wage increases. Time lost from leisure or household work was valued using a replacement cost (Drummond *et al.* 1997). The average hourly earnings of individuals providing domestic services as reported by the 1996 Canadian Census were adjusted for benefits and for annual wage increases.

A total cost for each participant was obtained by summing healthcare system costs, out-of-pocket costs and time costs. Analysis was performed on an intention-to-treat basis. Two-sample *t*-tests were used to compare normally distributed variables, non-parametric Wilcoxon rank sum tests were used to compare ordinal and skewed variables, and proportions were compared using Fisher's Exact tests. The level of statistical significance for all tests was 0·05, and all tests were two-tailed. Data were analysed using the SAS statistical package (SAS Institute Inc. 2001).

Results

The findings for mothers of term and near-term newborns were analysed independently, and will be discussed separately.

Mothers of term infants

There were no differences in age, parity or GA at birth for mothers in the two groups (Table 1). Length of hospitalization was calculated as the time of discharge minus the time of the infant's birth, and is reported in hours. For term infants, the average difference (SC – EXP) was 6·6 hours, which was not statistically significant ($P = 0{\cdot}22$). The average difference in patient costs associated with birth in 2000 Canadian dollars was $101 (Table 2), but this was not statistically significant. Overall, the groups did not differ statistically significantly in total societal costs. However, the EXP group had statistically significantly greater postdischarge system costs (Wilcoxon statistic = 1050; $P < 0{\cdot}0001$), with a trend towards lower out-of-pocket expenses (Wilcoxon statistic = 1592; $P = 0{\cdot}12$). The greater postdischarge system costs in the EXP group were attributable to the costs of the nursing visits to deliver the breastfeeding intervention, while the lower out-of-pocket expenses were associated with less travelling and time away from employment. The groups did not differ statistically significantly in family time costs or in system costs associated with birth.

Forty-seven (97·9%) of the 48 full-term experimental group mothers received at least one home visit from a nurse lactation specialist; one (2·1%) had no visits; 17 (35·4%) had one visit; 21 (43·8%) had two visits; seven (14·6%) had three visits; and two (4·2%) had four visits.

Mothers of near-term newborns

Maternal demographic characteristics and length of hospital stay were similar between the SC and EXP groups (Table 1). There were no statistically significant differences between the two groups in total costs or in any of the cost categories (Table 3). In addition, the two groups did not differ statistically significantly in length of stay (0·4 hours; $P = 0{\cdot}73$).

All mothers in the EXP group received at least one visit from the lactation nurse specialist. Four (30·8%) had only one visit,

Table 1 Baseline demographics of participants and length of hospitalization

	Full-term mothers			Near-term mothers		
	EXP ($n = 53$)	SC ($n = 48$)	*P* value	EXP ($n = 19$)	SC ($n = 18$)	*P* value
Maternal age at delivery, Mean (SD)	32·0 (4·2)	33·1 (4·4)	0·22	32·1 (2·9)	32·1 (4·4)	0·96
Parity (%)	G1 = 36 G2 = 38	G1 = 33 G2 = 25	0·21	G1 = 47 G2 = 26	G1 = 39 G2 = 28	0·64
Gestational length (%)	38–40 weeks = 92 41 weeks = 8	38–40 weeks = 81 41 weeks = 19	0·20	35 weeks = 10·5 36 weeks = 42·1 37 weeks = 47·4	35 weeks = 5·6 36 weeks = 33·3 37 weeks = 61·1	0·40
Hospitalization (hours)						
Mean (SD)	37·3 (7·5)	43·9 (18·1)	0·22	47·3 (18·0)	46·9 (11·5)	0·73
Median	35·3	37·3		41·9	45·8	
Range	23·4–61·2	15·2–107·0		28·1–85·8	27·5–66·7	
25th, 75th percentiles	33·8, 38·1	32·4, 56·1		38·3, 49·5	37·1, 55·5	
Breastfeeding status at discharge: % feeding effectively (95% CI)	87% (75–95)	83% (70–93)	0·37	68% (43–87)	72% (47–90)	1·00

CI, confidence interval; SD, standard deviation; EXP, experimental group; SC, standard care group.

Table 2 Summary of costs for term newborns by group

Cost	Experimental group ($n = 48$)	Standard care group ($n = 40$)	P value
Family			
Out-of-pocket			
Mean (SD)	143 (114)	255 (536)	0·12
Range	59–711	0–3092	
Time			
Mean (SD)	2121 (1618)	1908 (1280)	0·92
Range	418–8539	125–5487	
System			
Hospitalization for giving birth			
Mean (SD)	2529 (122)	2630 (308)	0·22
Range	2301–2937	1903–3603	
Postdischarge			
Mean	179 (111)	61 (66)	< 0·0001
Range	0–588	0–319	
Total			
Mean (SD)	4973 (1652)	4854 (1321)	1·00
Range	3336–11533	2946–8254	

Table 3 Summary of costs for near term newborns by group

Cost	Experimental group ($n = 13$)	Standard care group ($n = 11$)	P value
Family			
Out-of-pocket			
Mean (SD)	120 (109)	118 (141)	0·73
Range	23–374	0–474	
Time			
Mean (SD)	1779 (726)	1645 (1099)	0·61
Range	720–2769	95–3507	
System			
Hospitalization for giving birth			
Mean (SD)	2692 (299)	2686 (193)	0·73
Range	2391–3327	2383–3044	
Postdischarge			
Mean	223 (210)	538 (829)	0·57
Range	27–763	0–2518	
Total			
Mean (SD)	4814 (853)	3462–5968	0·95
Range	3462–5968	2478–8710	

six (46·2%) had two visits, two (15·4%) had three visits, two (15·4%) had four visits, and one (7·7%) had five visits.

Discussion

Breastfeeding is an interactive and learned activity and hence it is often 'initiated but not perfected' in hospital (British Columbia Reproductive Care Program 1997, 2001, Inch & Fisher 1999, Hall *et al.* 2000). Therefore, the development of safe, efficacious and cost-effective breastfeeding programmes that can be delivered in the home setting is of particular importance. This study showed that this support can be provided with no economic differences in total societal costs. Results from the larger study (McKeever *et al.* 2002) indicated that more term newborns in the EXP group were fed exclusively by breast ($P = 0·01$), or were fed only by breast or with expressed breast milk ($P = 0·02$) in the 24 hours preceding the day 7 follow-up interview. Furthermore, almost all ($n = 45$, 96%) of the mothers giving birth at term in the EXP group expressed satisfaction with the care received from the lactation consultants. In particular, they cited assistance with latching on, assessment of their at-home care of the newborn, and nurse flexibility in scheduling and practical knowledge of breastfeeding. Fourteen mothers (93%) of near-term infants in the EXP group reported satisfaction with postpartum care. Three benefits were reported: the familiar and comfortable environment of the home; one-to-one assistance with breastfeeding; and visits that focused on the infant's feeding, weight and overall health. Taken in combination, these results suggest that home visits from nurses with specialized lactation preparation facilitates positive clinical outcomes for term infants, is very well received by mothers, and does not give rise to any overall greater costs.

The importance of this study lay in the use of a societal perspective to evaluate breastfeeding support across a range of system costs, as well as non-medical costs (e.g. travel and child care costs), and time costs (forgone opportunity costs) for families and the healthcare system using a standardized measure (i.e. AHCR). The studies by Pugh *et al.* (2002) and Petrou *et al.* (2004) included important correctives to the focus on direct system costs generally seen in the economic literature (for a review see Weimer 2001), Petrou measured costs associated with a home-based postpartum intervention and did not focus specifically on breastfeeding support and Pugh did not consider the broad range of system and family costs evaluated here. Consequently, our study aimed to obtain a comprehensive reliable basis for estimating the full range of economic implications of breastfeeding support in home and in hospital for term newborns.

Similar to Petrou *et al.* (2004), the term EXP group in our trial had higher postdischarge system costs that were attributable to the intervention. Petrou *et al.* (2004) found that the EXP group had shorter hospital stays compared with their SC group. Unlike that study, however, the higher postdischarge costs in our study were not offset by savings in hospitalization, since discharge times did not differ statistically significantly between the two groups. Although infants in the EXP group were ready for discharge earlier, they often spent several hours waiting to see the lactation consultant (as a requirement for discharge) and therefore did not actually

What is already known about this topic

- Home-based support for breastfeeding is associated with maternal satisfaction and confidence with breastfeeding.
- Home-based support for breastfeeding results in increased breastfeeding duration.
- Little is known about the economic outcomes associated with providing lactation support in different settings.

What this paper adds

- Home lactation support programmes are comparable in overall costs to hospital-based standard postpartum care (including a lactation consultation).
- Term infants who received home support had greater postdischarge system costs with a trend towards lower out-of-pocket expenses to their families.
- Future lactation support programmes should incorporate preferences for mothers with regard to the setting for receiving breastfeeding support.

leave the hospital as early as was anticipated in the study design. Nonetheless, our results showed no differences in overall costs between the two groups when a societal perspective was taken. We demonstrated comparable overall costs, suggesting no differences in cost between the two groups when a societal perspective is taken.

Further research is needed to determine the generalizability of our findings beyond this study population. Nonetheless, given the suggestion that most breastfeeding literature concerns working class mothers, since those from the middle classes are presumed 'natural breastfeeders' who encounter few problems and require little support (Mahon-Daly & Andrews 2002), our data contributes to the knowledge-base of an under-researched breastfeeding population.

This study employed a human capital approach. The evaluation of all time using national market wages may overestimate or underestimate time costs (Yates 1997). Despite its deficiencies, which include the potential to undervalue some groups relative to others (Hodgson 1983), most studies evaluating productivity losses use this approach as it is more straightforward and less expensive than other methods to implement. The disadvantage to using a replacement cost is that care recipients' and informal care providers' actual time losses may have higher or lower personal value, and therefore the time costs may be overestimated or underestimated. For example, the time spent providing care to a breastfeeding mother–infant dyad may not be viewed by friends and family as 'lost leisure time' but as a highly valued activity. The advantage of this approach is that the time of all individuals is equally valued, regardless of sex, age, and occupation.

No statistically significant differences in self-reported family out-of-pocket or time costs were found. A potential limitation is the accuracy of participants' self-report data. However, a recent evaluation of the psychometric properties of the AHCR (Guerriere *et al.* 2003) tends to suggest otherwise. Guerriere and colleagues found moderate to almost perfect agreement between administrative data (hospital, pharmacy and physician records) and participants' responses on the AHCR (kappa = 0·041–1·00) (Guerriere *et al.* 2003). Consequently, in our study, it is likely that the self-report data reflected an accurate estimate of costs related to the provision and receipt of ambulatory and home-based services.

The study's strict eligibility criteria strongly contributed to the small sample size of the near-term group. In consequence, the lack of statistical power made it difficult to identify any differences pertaining to these infants. Another study limitation was failure to measure out-of-pocket family costs associated with the increased diets of breastfeeding mothers (Waring 1988) that may affect families differentially. For example, Raine (2003, p. 469) commented that, 'although breastfeeding would ostensibly appear to be a less expensive option than bottle-feeding, the type of healthy diet recommended for breastfeeding mothers is beyond the reach of many women living on welfare benefits'. Nonetheless, the estimated cost of powered powdered formula is four times that of the food cost of the increased caloric requirements of a breastfeeding woman (United States Breastfeeding Commitee 2002), and the economic burden associated with formula use by teenaged mothers in one study resulted in the introduction of solid foods to infants as young as 4 weeks of age (Morrow *et al.* 1999).

Raine (2003) argued that the monitoring of rates of breastfeeding should not be the sole measure of attainment for community-based programmes. Programmes may have empowerment and community capacity-building gains that are less easily quantifiable, but are no less valuable. These kinds of 'indirect' benefits to mothers and to society need to be more fully explored. Finally, further research is needed to determine the optimal sites, types and frequency of home assistance, including both pre- and postnatal visits, that breastfeeding mothers require (Morrow *et al.* 1999, Steel O'Connor *et al.* 2003).

Conclusion

A critical element of maternal infant nursing is to support mothers in breastfeeding their infants, and to incorporate,

where possible, their preferences about the place where such support should take place. This study has demonstrated that the cost of attending to maternal satisfaction relating to home-based supplementary support for breastfeeding was not associated with increased overall costs. Therefore, a potential option for ensuring maternal satisfaction and maternal–infant well-being would be to allow mothers to exercise their preferences in this regard. When drawing this conclusion, however, we need to be aware of the context and particular healthcare system and economic climate. These results are only generalizable within the context in which this study was conducted. Future research addressing breastfeeding support for mothers of term and near-term neonates in other contexts and between international contexts would be very enlightening and would contribute towards a more global perspective on healthcare delivery.

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Author contributions

SG AO and KR collected the data. BS, DG, PMcK, RC, JW-M, AO and PC performed the data analysis. BS, DG, PMcK, JW-M, SG, MD and PC were responsible for the study conception and design. BS, DG, PMcK, RC and KM drafted the manuscript. BS, DG, PMcK, RC, KM, JW-M, SG, MD, AO, KR and PC critically revised the paper. BS, DG, RC and PC provided statistical expertise. BS and PMcK obtained funding. RC, JW-M, SG and PC provided administrative, technical or material support. BS, DG, PMcK, RC, JW-M, SG, MD, AO and PC supervised.

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