

A Hospital-Based Doula Program and Childbirth Outcomes in an Urban, Multicultural Setting

Julie Mottl-Santiago · Catherine Walker ·
Jean Ewan · Olivera Vragovic · Suzanne Winder ·
Phillip Stubblefield

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Abstract

Objectives The objective of this study is to determine whether there are differences in birth and breastfeeding outcomes for women who received labor support through a hospital-based doula program, compared with those who did not receive doula support in labor.

Methods We conducted a retrospective program evaluation to compare differences in birth outcomes between births at 37 weeks or greater with doula support and births at 37 weeks or greater without doula support through the first seven years of a hospital-based doula support program. Log-binomial regression models were used to compare differences in cesarean delivery rates, epidural use, operative vaginal delivery, Apgar scores, breastfeeding intent and early breastfeeding initiation after controlling for demographic and medical risk factors. The propensity score was included as an additional covariate in our regression model to minimize issues of selection bias. Analyses were conducted for the whole cohort of 11,471 women and by parity and provider service in subgroup analyses. Cochran-Mantel-Haenszel test was performed to detect differences in effects over time.

Results For the whole cohort, women with doula support had significantly higher rates of breastfeeding intent and early initiation. Subgroup analysis showed that having doula support was significantly related to: (a) higher rates

of breastfeeding intent and early initiation rates for all women regardless of parity or provider with the exception of multiparous women with physician providers; (b) lower rates of cesarean deliveries for primiparous women with midwife providers.

Conclusion A hospital-based doula support program is strongly related to improved breastfeeding outcomes in an urban, multicultural setting.

Keywords Doula · Labor support · Midwifery · Breastfeeding · Cesarean birth

Introduction

Previous randomized controlled trials have demonstrated that social support by lay women (or “doulas”) during childbirth has a positive impact on perinatal outcomes [1–6]. Although the trials vary greatly in clinical settings and populations served, most have documented a decrease in the need for pain medication [3, 4, 6], cesarean deliveries [1–3, 6], and operative vaginal delivery [3, 6], as well as improved maternal satisfaction with the childbirth experience [4, 5]. Labor support has also been correlated with improved breastfeeding rates [5, 7, 8] and a decrease in postpartum depression [9]. The results are particularly striking for labor support that is continuous throughout active labor and birth [7, 10, 11] and for labor support provided by lay women rather than those trained in the medical professions [7, 12]. The strong evidence provided by these trials suggests that lay labor support may be a valuable addition to modern maternity care [7, 13].

The Birth SistersSM program at Boston Medical Center (BMC) is a multicultural doula support program that offers all childbearing families Birth Sister support throughout

J. Mottl-Santiago (✉) · C. Walker · J. Ewan ·
O. Vragovic · P. Stubblefield
Department of Obstetrics and Gynecology, Boston University
School of Medicine/Boston Medical Center, 91 East Concord
Street, Rm 4113, Boston, MA 02118, USA
e-mail: Julie.MottlSantiago@bmc.org

S. Winder
Boston Medical Center, Boston, MA 02118, USA

childbirth and the postpartum period. Overall program objectives include increasing breastfeeding rates, decreasing rates of unnecessary intrapartum interventions, decreasing maternal isolation, improving satisfaction with care, and increasing utilization of needed health care and social services. Program services include prenatal contact, continuous emotional and physical support throughout labor and birth, assistance with breastfeeding, and up to 8 h of in-home postpartum social support. Over the seven years included in this analysis, the program has become an increasingly integral part of the maternity care model at BMC, growing from an attendance at 3% of all births in 1999 to 25% in 2005.

We conducted a retrospective program evaluation to examine the hypothesis that our hospital-based program produces intrapartum and breastfeeding outcomes similar to those shown in prior study settings, including increases in breastfeeding rates and reductions in cesarean deliveries, operative vaginal deliveries, and use of pain medication.

Materials and Methods

This retrospective cohort analysis compared differences in cesarean deliveries, epidural use, operative vaginal deliveries, Apgar scores, breastfeeding intent and early breastfeeding initiation between women assisted by Birth Sisters during labor and women who did not have Birth Sisters from the inception of the Birth SistersSM program at BMC in 1999 through its first seven years. The study was approved by the Institutional Review Board of the Boston University Medical Campus and Boston Medical Center and was conducted in accord with prevailing ethical principles. BMC is an urban, academic, tertiary care center serving a diverse multicultural population of approximately 2000 childbearing families per year. It is the largest safety net hospital in New England, with 85–88% of maternity service deliveries paid for by public sources [14]. The diversity of cultures served by the hospital is reflected in the staff of the Birth SistersSM program recruited to meet the needs of the maternity service patient population. They represent thirty different ethnic groups and speak twenty different languages. Prenatal and intrapartum care is provided by both physicians and midwives. Women with physician prenatal providers receive intrapartum physician care. Women with midwife prenatal providers receive intrapartum midwifery care unless their labor requires medical management by a physician.

The Birth SistersSM program intervention is defined as social support by lay-women initiated in the prenatal period and continuing throughout labor, delivery and the early postpartum period. All women delivering at BMC are eligible for Birth Sister services free of charge. The prenatal

care provider is primarily responsible for making the referral, which generally occurs at the beginning of the third trimester. A referral coordinator matches the mother with an individual Birth Sister according to the language and cultural preference of the woman. Those who choose to enter the program are offered a prenatal meeting with the Birth Sister in the home or place of the woman's choosing to establish a relationship, communicate individual social support needs, and receive childbirth and breastfeeding education. The Birth Sister is then on-call to provide emotional and physical comfort to the woman throughout active labor, birth, and the first several hours postpartum. Birth Sister labor support interventions are similar to those described in the doula-trial literature [1–6]. They focus on provision of verbal encouragement and physical comfort measures, including comforting touch and assistance with relaxation techniques. In addition, the Birth Sister provides assistance during labor with translation, advocacy, and breastfeeding support immediately postpartum. The study population of 11,471 women giving birth to singleton, live infants at 37 weeks or greater between January 1, 1999 and December 31, 2005 was identified from a previously existing computerized obstetric database at BMC. Demographic data included maternal age, race, estimated gestational age at delivery, obstetrical history, and provider service (nurse-midwife or physician service) and were analyzed for the two groups' comparability. Provider service was defined as prenatal provider, regardless of delivering provider.

The risk factors most likely to impact on outcome measures were also examined, including breech and malposition, placenta previa, abruption and induction of labor. They did not vary between the two groups and hence the women with these risks were not excluded from the analysis. Women choosing elective repeat cesarean deliveries were not excluded because some chose to have a Birth Sister for emotional support during surgery. 20 records were excluded due to missing or incorrect data, resulting in an analysis of 2,174 mothers in the Birth Sister group and 9,297 mothers in the comparison group.

Statistical analysis was carried out with SAS (Version 8.2, SAS Institute, Inc., Cary, NC). The distribution of outcomes was examined with Chi-square test for discrete and Student *t*-test and Wilcoxon rank sum test for continuous data. Cochran-Mantel-Haenszel test (trend analysis) was performed when appropriate. Because many of the outcome variables are common, log-binomial regression models were chosen as the method to evaluate the relationship between variables while controlling for confounders [15, 16]. Additionally, log binomial models were used to compute relative risk in order to compare women who were not in the Birth Sister Group with women who were in the Birth Sister Group. To address the concern

inherent in our retrospective study design that preexisting differences in women who choose to have Birth Sisters and those who do not account for differential rates in outcomes, the propensity score was included as an additional covariate in our regression model. The propensity score can theoretically eliminate confounders for observed covariates by examining the probability that a study subject receives the treatment rather than the comparison condition. Conditioning on this quantity can provide an unbiased estimate of treatment effects and minimizes the influence of selection bias on the results. Reported *P*-values are two tailed and a *P*-value of less than 0.05 indicates statistical significance. Power analysis was performed using nQuery Advisor 4.0 and there was >90% power for each statistical test.

Results

Analysis of the demographic variables showed the two groups differed significantly in several areas (Table 1). Women with Birth Sisters were more likely to be younger, nulliparous, receive care with a midwife, and be of Hispanic ethnicity. The group without Birth Sisters had a larger proportion of Black women.

Results for the entire cohort are presented in Table 2. Women with Birth Sisters were significantly more likely to

Table 1 Demographic characteristics of women with Birth Sisters and without Birth Sisters at delivery

Variable	Women with Birth Sisters (<i>N</i> = 2174)	Others (<i>N</i> = 9297)	<i>P</i> -value
Age ^a	27 ± 6	28 ± 6	<.0001
Gestational age at delivery (weeks) ^a	39 ± 1	39 ± 1	1.00
Parity (%)			
Nulliparous	1181 (55%)	3695 (40%)	<.0001
Multiparous	989 (45%)	5576 (60%)	
Race/Ethnicity (%)			
Black	569 (26%)	3719 (40%)	<.0001
White	116 (6%)	1222 (13%)	
Hispanic	960 (44%)	2022 (22%)	
Haitian	192 (9%)	1113 (12%)	
Asian ^b	152 (7%)	380 (4%)	
Cape Verdean ^b	103 (5%)	304 (3%)	
Other ^b	77 (3%)	461 (5%)	
Provider (%)			
Midwife	1515 (70%)	3292 (35%)	<.0001
MD	659 (30%)	5997 (65%)	

^a Continuous outcomes are reported as mean and standard deviation;

^b outcome analysis was conducted by collapsing Asian, Cape Verdean and Other into one category

intend to breastfeed and to initiate breastfeeding in the immediate postpartum period (within 1 h of delivery). In the adjusted model, there were no significant differences between Birth Sister attended and non-Birth Sister attended births in total or primary cesarean births performed, epidural rates, operative vaginal deliveries or Apgar scores.

An analysis over time for the whole cohort was performed because we suspected that both Birth Sister skills and the expertise of nurses and providers in incorporating the Birth Sisters into the existing model of maternity care increased over time. Intent to breastfeed among Birth Sister-supported women rose from 50% in 1999 to 83% in 2005. Birth Sister-supported women who initiated breastfeeding within 1 h of delivery rose from 11% in 1999 to 40% in 2005. Intent to breastfeed and early initiation for women without Birth Sisters also increased over this time period from 43% and 5% in 1999 to 66% and 19% respectively in 2005. There was no change over time in total cesarean deliveries, primary cesarean deliveries, epidurals with vaginal delivery, operative vaginal deliveries or Apgar scores for Birth Sister supported births as compared with non-Birth Sister supported births.

Because the literature on lay labor support consists primarily of randomized trials of low-risk, primiparous women, we also analyzed the data by subgroups of primiparous and multiparous women by provider service (Table 3). For primiparous women with a midwife provider, generally a lower risk population than primiparous women cared for by physicians, having a Birth Sister was significantly related to lower rates of cesarean deliveries, as well as higher rates of intent to breastfeed and early breastfeeding initiation. For multiparous women with a midwife provider, having a Birth Sister was related to higher rates of breastfeeding intent and early breastfeeding initiation. For primiparous women with a physician provider, having a Birth Sister was significantly related to higher rates of breastfeeding intent and early breastfeeding. Rates of cesarean deliveries were not significantly different between women with Birth Sisters and those without Birth Sisters for women whose care was provided by physicians. Epidural use, operative vaginal delivery and Apgar scores (data not shown) were not related to either parity or provider service.

Discussion

Our program evaluation shows the Birth Sister Program is strongly related to higher rates of intent to breastfeed and early breastfeeding initiation, an important contributor to long-term breastfeeding success and improved infant health outcomes. Breastfeeding initiation within 1 h of delivery is correlated with more successful long-term

Table 2 Selected perinatal outcomes for Birth Sister and non-Birth Sister attended births

Variable ^a	With birth sisters ^b	Without birth sisters ^b	Unadjusted RR with 95% CI ^c	Adjusted RR with 95% CI ^c
Total cesarean delivery	310 (16%)	1635 (19%)	0.78 (0.62–0.76)	1.08 (0.96–1.21)
Primary cesarean delivery	281 (13%)	1356 (16%)	0.83 (0.74–0.94)	0.96 (0.85–1.08)
Epidural with vaginal delivery	651 (36%)	3185 (46%)	0.80 (0.74–0.85)	0.96 (0.86–1.079)
Operative vaginal delivery	88 (5%)	428 (6%)	0.80 (0.64–0.99)	0.94 (0.74–1.19)
5-min Apgar scores <7	33 (1.5%)	112 (1.2%)	0.79 (0.54–1.17)	0.75 (0.50–1.13)
Intent to breastfeed	1831 (85%)	6351 (68%)	2.13 (1.92–2.24)	1.73 (1.55–1.92)
Early breastfeeding initiation	1011 (46%)	2229 (23%)	1.42 (1.36–1.48)	1.12 (1.08–1.16)

^a adjusted for infant birth weight, provider service, maternal age, race, and parity; ^bMissing data were excluded when computing percent distributions; ^cLog-Binomial Regression

breastfeeding practices and is considered an essential element in breastfeeding promotion strategies [17]. Because our program includes prenatal breastfeeding education by the Birth Sister, it is not clear whether differences in breastfeeding outcomes are due to education, labor support, or some combination of these factors.

It is important to note that, beginning in 1999, BMC also became a WHO/UNICEF-designated Baby-Friendly hospital through implementation of breastfeeding promotion strategies. Baby-friendly breastfeeding interventions have been described elsewhere [18] and target all women delivering at BMC. This initiative may be partially responsible for increasing early breastfeeding initiation trends among both those with Birth Sisters and those without Birth Sisters [19, 20]. However, striking differences in breastfeeding intent and initiation between women with Birth Sisters and those without Birth Sisters in both our model for the entire large cohort and in our stratified analysis by parity and provider service suggest that the Birth Sisters are an important force in the promotion of early breastfeeding initiation, as well. The power of the Birth Sister to influence early breastfeeding initiation makes intuitive sense. She not only shares the mother's language and culture, but also bonds with her through provision of emotional support during the often challenging and vulnerable period of labor and birth.

The results of our study add further questions to the literature on the role of the doula in breastfeeding promotion. Only one other trial of lay labor support evaluated the impact on breastfeeding and found that exclusive breastfeeding rates at six weeks postpartum were significantly affected [5]. This trial suggested that the difference is due to the labor support alone, since the woman did not meet the doula until labor began and postpartum breastfeeding education was not an included intervention. The authors speculate that a greater sense of competence during labor and birth improves women's confidence needed to breastfeed successfully. Another trial of labor support primarily by retired nurses also found improvements in exclusive breastfeeding at one month postpartum, although the

intervention included labor support and one hour of postpartum breastfeeding education, again making it unclear whether the outcome was due to labor support, breastfeeding education, or both [8]. Further investigation into the effects of prenatal education and labor support on breastfeeding practice is needed.

Our program evaluation also showed a statistically significant reduction in cesarean births for primiparous women cared for by midwives, although the clinical significance of the reduction was small (18–15%). However, it is interesting to note that in all of the randomized controlled trials taking place in low-income, urban settings, the presence of continuous lay labor support consistently reduced the cesarean delivery rate for low-risk primiparous women [2, 3, 6]. Studies of non-continuous support by lay women [5, 11] and of lay labor support for a sample inclusive of primarily white, middle class women [4] did not find similar reductions in cesarean delivery rates. Additionally, continuous support by those trained in the medical professions (i.e. nurses and retired nurses) has not been associated with lower cesarean delivery rates [8, 21]. Studies of the effects of maternal stress on uterine contractility and fetal heart rate patterns are often cited as an explanation for the mechanisms by which labor support affects mode of delivery [22–25].

Birth Sister clients are overwhelmingly midwifery clients, although the percent of physician referrals has grown from 21% in 1999 to 33% in 2005. It is not surprising that midwives would be likely to refer to the program, since labor support is traditionally a valued part of midwifery care. Our program evaluation may suggest that midwives and Birth Sisters together achieve excellent outcomes, particularly for first-time mothers who do not require medical management during their pregnancy. Midwives have been known to achieve excellent outcomes for those with low- and moderate-risk pregnancies [26, 27] and have traditionally provided labor support themselves. As the health care environment changes, there is less time to provide labor support as midwives care for more than one woman in labor.

Table 3 Significant differences in outcomes for Birth Sister and Non-Birth Sister attended births by parity and provider service^{a,b}

	Primiparous women						Multiparous women					
	Midwife service			Physician service			Midwife service			Physician service		
	With Birth Sister	Without Birth Sister	Adjusted P-value	With Birth Sister	Without Birth Sister	Adjusted P-value	With Birth Sister	Without Birth Sister	Adjusted P-value	With Birth Sister	Without Birth Sister	Adjusted P-value
Total N	886	1142		299	2263		637	1735		273	2970	
Primary cesarean delivery	129 (15%)	260 (18%)	0.05 ^c	74 (25%)	600 (27%)	.57	36 (6%)	110 (6%)	.84	42 (15%)	389 (13%)	.22
Intent to breastfeed	764 (86%)	1079 (74%)	0.0001 ^d	242 (81%)	1572 (69%)	0.0001 ^d	579 (87%)	1343 (73%)	0.0001 ^d	268 (81%)	2364 (63%)	0.0001 ^d
Early breastfeed initiation	471 (53%)	560 (39%)	0.0001 ^e	75 (28%)	398 (17%)	0.001 ^e	414 (62%)	708 (38%)	0.0001 ^e	52 (16%)	566 (15%)	.76

^a Log binomial regression; ^bMissing data were excluded when computing percent distributions; ^c Adjusted by race and gestational age; ^d Adjusted by maternal age and race; ^e Adjusted by race

Also, in a multicultural environment, the provider may not always be able to provide culturally competent support in the language of the laboring woman. Indeed, provision of culturally competent social support that complements the teaching and care of the physicians and midwives is one of the goals of the Birth SistersSM model. Birth Sisters bring expertise not only in providing labor and breastfeeding support, but also are uniquely positioned to form a trusting relationship that empowers new mothers to make healthy decisions for themselves and their babies.

There are some limitations to this study. First, as with all retrospective cohort studies, there is the possibility of bias in the experimental group. As our analysis demonstrates, there are large differences between the population of women served by the Birth Sisters and those not served by the program. We attempted to address this issue by controlling for confounders using a log binomial regression model as well as through the use of the Propensity Score Model to minimize selection bias. Also, because we used a pre-existing obstetrical database that was designed for general obstetrical purposes rather than evaluation of the labor support program, we were not able to control for some variables, including some medical risk factors, the presence of family and friends, or the labor and breastfeeding preparation practices of the woman's prenatal provider. We were also limited in our demographic analysis to the pre-existing racial categories that do not distinguish between ethnic groups within racial categories. This is especially relevant for the growing population at BMC of foreign-born black women and the diversity of Hispanic cultures represented at our institution that, as the literature suggests, may have a range of birth outcomes as diverse as the cultures represented [28, 29]. Lastly, our results are specific to urban, low-income, multicultural populations and are not necessarily generalizable to other groups of women.

The Birth SistersSM program evaluation suggests that culturally competent, lay perinatal social support is an important component of care for multicultural populations of childbearing women. Breastfeeding results are consistent with the literature on continuous lay labor support for low-risk, primiparous women and reaffirm the importance of the emotional and social aspects of birth. Prospective studies that address the issues and limitations noted in our program evaluation are needed to fully understand the effect of hospital-based doula support programs in improving intrapartum and breastfeeding outcomes for diverse populations. Our intensive program of support may also offer other benefits that require further data collection methods beyond our routine pregnancy outcome data sets, including potential reductions in rates of maternal isolation and maternal depression, increased utilization of health care and social services, and improved satisfaction with care.

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