

Team Midwifery Care in a Tertiary Level Obstetric Service: A Randomized Controlled Trial

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ABSTRACT: Background: In 1996 a new model of maternity care characterized by continuity of midwifery care from early pregnancy through to the postpartum period was implemented for women attending Monash Medical Centre, a tertiary level obstetric service, in Melbourne, Australia. The objective of this study was to compare the new model of care with standard maternity care. **Methods:** In a randomized controlled trial, 1000 women who booked at the antenatal clinic and met the eligibility criteria were randomly allocated to receive continuity of midwifery care (team care) from a group of seven midwives in collaboration with obstetric staff, or care from a variety of midwives and obstetric staff (standard care). The primary outcome measures were procedures in labor, maternal outcomes, neonatal outcomes, and length of hospital stay. **Results:** Women assigned to the team care group experienced less augmentation of labor, less electronic fetal monitoring, less use of narcotic and epidural analgesia, and fewer episiotomies but more unsutured tears. Team care women stayed in hospital 7 hours less than women in standard care. More babies of standard care mothers were admitted to the special care nurseries for more than 5 days because of preterm birth, and more babies of team care mothers were admitted to the nurseries for more than 5 days with intrauterine growth retardation. No differences occurred in perinatal mortality between the two groups. **Conclusions:** Continuity of midwifery care was associated with a reduction in medical procedures in labor and a shorter length of stay without compromising maternal and perinatal safety. Continuity of midwifery care is realistically achievable in a tertiary obstetric referral service. (BIRTH 27:3 September 2000)

Government-sponsored reviews of maternity services in Australia (1,2) and the United Kingdom (3-5) have recommended the development of models of care that

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emphasize an increase in continuity, greater involvement of women in decisions about their own care, and an expanded role for midwives. Various models of care have been established to address these issues, including midwives' antenatal clinics, team midwifery models in which a small team of midwives provide care to a group of women throughout the childbearing year, and so-called "case-load midwifery" in which midwives carry their own personal case load.

Several trials in Britain (6-9) and Australia (10-12) have examined the impact of the new schemes. These trials have all shown a reduction in obstetric interventions, no statistical difference in perinatal mortality, and greater satisfaction for women compared with traditional models. A systematic review comparing continuity of midwifery care with standard maternity services concluded that continuity of midwifery care was associated with lower intervention rates, but the authors suggested that more research should be con-

ducted to enable definite conclusions about infant safety (13). Although the benefits of continuity of care by midwives was established in these trials, it is less clear whether these benefits result from the midwife caregivers or continuity of care (14).

The concept of continuity of care has been described in the literature in several ways. Hodnett describes it as an ambiguous term with a number of definitions, including caregivers committed to a shared philosophy of care or care provided by a small group throughout the childbearing episode (14). The definition often referred to as continuity of carer, or caregiver, refers to the same caregiver (usually the midwife) who plans and provides most care throughout pregnancy, labor, birth, and the postnatal period (15).

Continuity of care in the context of our study was characterized by a small group of midwives (the team) who gave care to the same group of women throughout the childbearing episode. The aim of the team model was that each woman would have the opportunity of meeting the midwife who would provide her care in labor. The potential of seeing the same midwife at antenatal visits and knowing the one who would provide a woman's care in labor was therefore determined by the number of midwives in the team and the opportunities a woman had of meeting all the midwives before labor.

By means of a randomized trial, the purpose of this study was to assess whether a team midwifery model of care, which included low- as well as high-risk women and was characterized by continuity of midwifery care from early pregnancy to the early postpartum period, was associated with a lower rate of obstetric interventions, greater satisfaction for women, and a reduced length of stay in hospital after birth when compared with the standard model of maternity care. This article reports on maternal and infant outcomes.

Methods

Study Population and Design

The study was conducted at Monash Medical Centre-Clayton Campus in Melbourne, Victoria, Australia, which provides tertiary level obstetric care to approximately 2600 public women annually. Women booking at Clayton campus are more likely to be primiparous or to have had obstetric complications when compared with the Victorian population (16). They are also more likely to come from a non-English-speaking background. Monash Medical Centre's Human Research and Ethics Committee gave approval to conduct the study in November 1995.

Of the 4260 women who booked for care in early

pregnancy at the Clayton campus between March 1996 and January 1998, 3049 were assessed for suitability for the trial. A total of 2049 women were found to be ineligible because they requested shared obstetric care (913), could not attend Monday/Tuesday clinics (when team midwives were rostered) or needed care in the maternal-fetal medicine unit (393), were more than 24 weeks' gestation or unsuitable for other reasons (375), and did not speak English or Vietnamese (368).

The remaining 1000 women consented to participate in the trial, and were randomly allocated to receive team care or standard care. Allocations were computer generated and processed onto paper strips with the text "standard care" or "team care." The paper strips were inserted into opaque envelopes, which were then placed into a lockable box kept by medical records staff, who were not associated with the project. Women were encouraged to enroll in the trial during a booking visit at the midwives' assessment clinic held on Tuesday and Wednesday afternoons, but later enrollments were also possible. Midwives involved in the assessment clinic were asked to present the team midwifery project briefly to each woman. If a woman was interested and met the inclusion criteria, a member of the research team was contacted to speak with her. Once the woman had consented to recruitment, the research team member telephoned the medical records staff and asked them to select an envelope with the randomized treatment allocation.

The sample size was based on the available hospital data on spontaneous and operative delivery rates. A sample size of 401 women in each group would give the study adequate power ($p = 0.05$, power 80%) to detect an increase in spontaneous vaginal delivery rates from an expected 63 to 73 percent with a corresponding decrease in the operative delivery rates from 37 to 27 percent. We recruited 1000 women within the time allocated for recruitment, which allowed for some loss to follow-up without detriment to the required sample size.

The alternative model of care (standard care) comprised a team of seven full-time midwives, who provided antenatal, intrapartum, and postpartum care to the same group of women in consultation and collaboration with medical staff.

Interventions

A team midwife saw low-risk women at each visit, except for three scheduled visits with the obstetric staff at 12 to 16, 28, and 36 weeks' gestation. If a woman remained undelivered at 41 weeks, she had another obstetric consultation. High-risk women had an individualized care plan developed in consultation with a senior consultant. The frequency of obstetric visits was

determined by the woman's high-risk status. Those women requiring visits with the obstetric staff also saw a team midwife at the visit. In most cases a team midwife provided intrapartum care according to the protocols operating within the delivery suite. Unit staff provided most postnatal care, but team midwives provided up to a shift a day of care for team care women in the postnatal unit. Team midwives occasionally cared for women in standard care, when they were not busy caring for team care women.

Several options were available within standard care. During pregnancy these included shared care between general practitioners in the community and hospital obstetric staff, shared care between midwives in a community health center and hospital obstetric staff, care by hospital obstetric staff only, and less commonly, care by hospital midwives in collaboration with obstetric staff, similar to antenatal team care. Women within these options experienced a variable level of continuity of care during their pregnancy, from seeing the same midwife or doctor at most visits to seeing several doctors and midwives.

Irrespective of the option of antenatal care within standard care, women were cared for by a variety of doctors and midwives during labor. A doctor they had met during pregnancy could care for them, but this was unusual. They had not met the midwives who provided their care during labor.

After birth, women in standard care were transferred to one of two postnatal units where they were cared for by a variety of doctors and midwives. They could have met one of the doctors antenatally or during labor, but they would not have met the midwives.

Data Collection and Analysis

A questionnaire completed before randomization provided information about the participants' background characteristics. Data on interventions and maternal and infant outcomes were extracted from hospital records

and the hospital's computerized birthing outcome system database.

The strategy of analysis was by intention-to-treat. All women were included in their allotted group, irrespective of withdrawals and transfers. All statistical tests were two sided. Categorical data were analyzed by chi-square tests with odds ratios and associated 95% confidence intervals. For continuous data the Student *t* test was used, with 95% confidence intervals being calculated for the differences between means.

Results

Participants

A total of 502 women were allocated to team midwifery care and 498 to standard care. No statistical differences were found between the groups in the number of women who had a miscarriage or termination (team: 30; standard: 36) or were lost to follow-up (team: 14; standard: 18). A few women (team: 9; standard: 5) who were inadvertently re-recruited when they returned for a successive pregnancy after a miscarriage were eliminated from the study. The participants included 12 sets of twins in the team care group and 13 sets in standard care. Consequently, data from hospital records were available for 449 women and 461 babies in the team care group, and for 439 women and 452 babies in the standard care group.

No statistical differences were found between the randomized groups in age and gestation at booking, parity, marital status, country of birth, and educational level (Table 1). When comparing women in the two groups for whom outcome data were available, no statistically significant differences were found.

Model of Care

Approximately 95 percent of women allocated to the team care group received team care; the remaining 5

Table 1. Baseline Characteristics of Participants

<i>Characteristic</i>	<i>Team</i>	<i>Standard</i>	<i>Mean Difference</i>
	<i>(n = 502)</i>	<i>(n = 498)</i>	<i>(95% CI)</i>
Age at booking (mean, SD)	28.2 (5.2)	28.3 (5.4)	-0.11 (-0.75-0.53)
Gestation at booking (mean, SD)	14.3 (2.7)	14.1 (2.9)	-0.19 (-0.19-0.56)
	<i>No. (%)</i>	<i>No. (%)</i>	<i>Odds Ratio</i>
			<i>(95% CI)</i>
Expecting first baby	320 (63.7)	304 (61.0)	1.12 (0.86-1.46)
Married	338 (67.3)	360 (72.3)	0.79 (0.60-1.05)
Born in Australia	253 (50.4)	261 (52.4)	0.92 (0.71-1.19)
Secondary school to yr 12	297 (61.6)	298 (61.3)	0.97 (0.75-1.26)

percent elected other models of care after they had been randomized. Eighty percent of women in team care compared with 0.3 percent of women in standard care met the midwife who cared for them in labor. A team midwife was present at 90 percent of all team care women's labors.

Procedures During Labor

Less augmentation of labor, less use of narcotic and epidural analgesia, and less use of electronic fetal monitoring were reported in the team care group compared with the standard care group (Table 2). No statistical differences occurred between the trial groups in operative procedures. A statistically significant difference was found between the two groups in perineal outcomes, with team care women experiencing fewer episiotomies and more unsutured tears. Team care women stayed in hospital 7 hours less than standard care women.

Infant Outcomes

Fewer team care babies were admitted to the special care nursery (> 5 days) for preterm birth than standard care babies (Table 3), but more team care babies were admitted to the special care nursery for intrauterine growth retardation. Of the latter infants, four were diagnosed with suspected growth retardation in pregnancy, three were both preterm and growth retarded, and one was a twin.

Other measures, such as total number of admissions to the special care nursery, days in the nursery, preterm births, and babies with intrauterine growth retardation showed no differences between the two trial groups. Apgar scores were similar in both groups.

Five perinatal deaths occurred in the team care group and 4 in standard care. The team care deaths included 2 at 20 weeks' gestation, one of which was a termination for fetal abnormality, 2 in twin pregnancies at 25 and 36 weeks' gestation, and 1 at 24 weeks'

Table 2. Maternal Outcomes

Outcome	Team		Standard		Odds Ratio (95% CI)
	No.	(%)	No.	(%)	
Analgesia*	(n = 412)		(n = 391)		
Nitrous oxide	256	(62.1)	249	(63.7)	0.94 (0.70-1.26)
Pethidine	188	(45.6)	208	(53.2)	0.74 (0.55-0.98)
Epidural	100	(24.3)	129	(33.0)	0.65 (0.47-0.90)
Pudendal block	16	(3.9)	16	(4.1)	0.95 (0.44-2.02)
Anesthesia	(n = 447)		(n = 435)		
Spinal	59	(13.2)	55	(12.6)	1.05 (0.70-1.59)
General	19	(4.3)	13	(3.0)	1.44 (0.67-3.13)
No analgesia/anesthesia	62	(13.9)	57	(13.1)	1.07 (0.71-1.60)
Monitoring of labor*	(n = 409)		(n = 389)		
Continuous electronic fetal monitoring	222	(54.3)	242	(62.2)	0.72 (0.54-0.97)
Auscultation only	184	(45.0)	143	(36.8)	1.43 (1.06-1.91)
No monitoring	3	(0.7)	4	(1.0)	0.71 (0.20-2.35)‡
Augmentation*	(n = 413)		(n = 394)		
	109	(26.3)	139	(35.2)	0.66 (0.48-0.90)
Induction*	(n = 414)		(n = 395)		
	136	(32.9)	115	(29.1)	1.19 (0.87-1.62)
Mode of delivery	(n = 449)		(n = 439)		
Spontaneous	282	(62.8)	262	(59.7)	1.14 (0.86-1.51)
Operative vaginal	67	(14.9)	86	(19.6)	0.72 (0.50-1.04)
Emergency C/S	65	(14.5)	47	(10.7)	1.41 (0.93-2.15)
Elective C/S	35	(7.8)	44	(10.0)	0.76 (0.46-1.24)
Perineal status†	(n = 349)		(n = 347)		
Episiotomy	89	(25.5)	121	(34.9)	0.64 (0.46-0.90)
Sutured tear	143	(41.0)	133	(38.3)	1.16 (0.84-1.60)
Unsutured tear	51	(14.6)	16	(4.6)	3.54 (1.91-6.62)
Intact	66	(18.9)	77	(22.2)	0.82 (0.56-1.20)
Days in hospital	(n = 448)		(n = 436)		Mean difference (95% CI)
Days (mean, SD)	4.3	(1.8)	4.6	(1.9)	-0.3 (-0.5 to -0.04)

* Excludes elective cesarean sections.

† Excludes all cesarean sections.

‡ Exact confidence limits.

(n =) varies due to small number of missing values.

Table 3. Neonatal Outcomes

Outcome	Team		Standard		Odds Ratio (95% CI)
	No.	(%)	No.	(%)	
Admission to SCN	89	(19.9)	87	(20.0)	0.97 (0.69–1.37)
Reasons for admissions to SCN > 5 days					
Preterm	11	(2.4)	26	(6.0)	0.39 (0.18–0.84)
IUGR	8	(1.8)	0		Undefined OR†
Birth asphyxia	0		1	(0.2)	0.00 (0.00–37.30)†
Total number of preterm infants	36	(7.9)	42	(9.4)	0.83 (0.51–1.35)
Birthweight < 10th centile for gestational age	72	(15.8)	76	(16.8)	0.92 (0.64–1.33)
Apgar scores < 7 at 5 min	13	(2.9)	11	(2.5)	1.17 (0.48–2.82)
Perinatal deaths*	5		4		
Days in SCN		(n = 89)		(n = 86)	Mean difference
Days (mean, SD)	6.8	(0.5)	8.8	(0.5)	(95% CI) 2.0 (– 5.6–1.7)

Team group: 461 – 5 perinatal deaths = 456 plus missing data = 448; standard group: 452 – 4 perinatal deaths = 448 plus missing data = 436.

*20 weeks' gestation.

† Exact confidence limits.

SCN = special care nursery.

IUGR = intrauterine growth retardation estimated in retrospect by comparing birthweight versus gestation at birth (18).

gestation due to severe intrauterine growth retardation in a mother with a severe hypertensive disorder. The standard care deaths included 2 at 25 weeks' gestation, both due to severe intrauterine growth retardation, 1 at 33 weeks' gestation with a major abnormality, and 1 unexplained stillbirth at 37 weeks' gestation.

Discussion and Conclusions

In the team care group the reduction of medical procedures, such as epidural and narcotic use, augmentation of labor, electronic fetal monitoring, episiotomies, and a higher rate of unsutured tears, is in line with findings from other published trials (6–9,11,12). This reduction may well have been due to the team midwives' philosophy about natural childbirth. However, continuity of midwifery care and the continuous support in labor provided by the team midwives may be an important explanation. Trials of continuous support in labor have reported several benefits for women, including a reduced likelihood of medication for pain relief and less augmentation of labor (17).

A trend toward less operative vaginal deliveries in the team care group was reported, but this was counterbalanced by a trend toward more emergency cesarean deliveries. Neither of these findings was statistically significant, and no difference in overall cesarean delivery rates was found. These results are similar to those of previously published studies (6–9,11,12), and suggest that guidelines for more critical interventions were the same and interpreted in the same way irrespective of the model of care.

Fewer episiotomies were done in the team midwifery group, but similarly to findings of other randomized controlled trials (6,7,11), this reduction was associated with a higher rate of tears than the comparison group. However, the tears in the team midwifery group were in the unsutured category, suggesting that they were of a minor variety. No differences in sutured tear rates occurred between the two groups.

The difference in mean length of stay between the two groups may well be due to the philosophy of the team midwives about hospital stay. It is also possible that women were more confident about going home because they had several opportunities during the antenatal period to discuss postnatal issues and discharge home after birth. The differences in intervention rates may also have contributed to the earlier discharge of team group women. Length of stay in hospital has not been examined in other published trials of continuity of midwifery care, and whether or not a mean reduction of 7 hours is of financial and organizational significance will require further investigation.

Neonatal outcomes were similar between the two groups. The higher rate of preterm babies from the standard care group and the higher rate of babies with intrauterine growth retardation from the team care group admitted to the special care nurseries are likely to have occurred by chance. No statistical differences were observed in perinatal deaths, although this trial was not large enough to make conclusions about safety.

The purpose of this study was to assess the impact of continuity of midwifery care, not the effects of professional caregiver. In interpreting the results, it is

important to consider this distinction as well as the other potentially influential factors associated with continuity of midwifery care (13). Hodnett suggests that further research should be conducted in which continuity of care is not confounded with professional caregiver (14). Whether or not this is possible is a distinct organizational and research challenge.

Continuity of midwifery care was associated with a reduction in a range of medical procedures in labor and a shorter length of stay without compromising maternal and perinatal safety. Continuity of midwifery care is realistically achievable in a tertiary obstetric referral service.

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