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An investigation of the relationship between the caseload model of midwifery for vulnerable women and childbirth outcomes using routine data- A retrospective, observational study

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Abstract

Objective

The objective of this study was to describe and compare childbirth outcomes and processes of women with complex social factors who received caseload midwifery care, and standard maternity care in the UK.

Background

Women with complex social factors experience high rates of morbidity, mortality and poor birth outcomes. A caseload team was established to support these women throughout pregnancy and childbirth by providing continuity and individualized care.

Methods

Data was collected from computerized birth details of 194 women with complex social factors who presented for maternity care between May 2012 and June 2013; 96 received standard care and 98 caseload care. SPSS v21 was used to calculate descriptive and inferential statistics. Logistic regression modelling found no differences in demographics, therefore unadjusted statistics are presented. Comparative analysis between women receiving caseload care, and those receiving standard care was accomplished using χ^2 test, relative risk (RR) and 95% confidence intervals (CI).

Results

The relationship between type of care and outcome was not changed by the inclusion of confounding factors. Women receiving caseload care were more likely to experience; spontaneous vaginal delivery (80% vs. 55% RR 1.88, 95%CI 1.27-2.77, $P < 0.001$), use water for pain relief (32% vs. 10%, RR 4.10 95%CI 1.95-8.64, $p < 0.001$), birth in the midwife led centre (26% vs. 13% RR 1.48 95%CI 1.12-1.95, $p = 0.023$), assessment by 10 weeks gestation (24% vs. 8% RR 1.61 95%CI 1.24-2.10, $p = 0.008$), shorter postnatal stay (1 day vs. 3 days SD 1.2 vs. 2.2, $p < 0.001$), and know their midwife (90% vs. 8% RR 8.98 95%CI 4.97-16.2, $p < 0.001$). More women in the caseload group were referred to multidisciplinary support services; psychiatry (56% vs. 19% RR 2.06 95%CI 1.59-2.65, $p < 0.001$), domestic violence advocacy (42% vs. 18% RR 1.68 CI 1.31-2.15, $p < 0.001$) and other services (56% vs. 31% RR 1.58 95%CI 1.15-2.16, $p = 0.03$). They were less likely to have a caesarean section (11% vs. 33% RR 0.26 95%CI 0.12-0.55, $P < 0.001$), an epidural/spinal for pain relief (35% vs. 56%, RR 0.64 95%CI 0.46-0.86, $p = 0.004$), give birth on the labourward (70% vs. 88% RR 0.63 95%CI 0.49-0.83, $p = 0.006$), and had fewer antenatal admissions (0.9(SD 1.1) vs. 1.3(SD 1.5), $p = 0.036$) and neonatal unit admissions (4% vs. 18%, RR 0.35 95%CI 0.15-0.85, $p = 0.005$).

Conclusion

Caseload midwifery care appeared to convey benefit and no harm. Findings differed from previous literature depending on outcome, suggesting caseload care may affect women in different ways depending on their individual needs.

Keywords

Caseload; continuity; vulnerable; inequalities; complex social factors; birth outcomes.

Introduction

Socioeconomic inequalities in pregnancy and birth outcomes exist across the globe, but it is western countries such as the US and UK that demonstrate a widening gap in inequality with detrimental consequences for women and children from poorer socioeconomic backgrounds (Wilkinson and Pickett, 2006). Although the disparities associated with the two countries differ; for example in the US ‘ethnicity’ is thought to be the most common factor for health inequalities, and in the UK ‘social class’, they are similar in their impact on health for women and children (Adler and Rehkopf, 2008, Lu and Halfon, 2003, Marmot, 2010). Interventions to tackle these disparities have recently become a marked feature of the health systems in both the UK and the US, with researchers recommending the comparison and evaluation of different models of healthcare ([Houweling et al, 2007](#)).

Complex social circumstances associated with poorer pregnancy outcomes in western countries include women from ethnic minorities and women of lower socio-economic status (Boy and Salihu, 2004, King-Hele, 2009, Kramer, 2000). The most recent review into maternal deaths in the UK found mortality rates are highest amongst women seeking asylum or refugee status, those experiencing domestic abuse, mental illness, learning difficulties and substance abuse problems (Centre for Maternal and Child Enquiries (CMACE), 2011). The review also found that infants born into these circumstances are around twice as likely to be stillborn as those who are not. Further evidence shows an association between pregnant women with socially complex lives, low birth-weight, preterm birth and stillbirth (Blumenshine et al, 2010, Goldenberg et al, 2008, Flenady et al, 2011). Research has also shown that in high-income countries, women from socially disadvantaged groups are at greatest risk of the poor outcomes associated with increased obstetric intervention such as induction of labour, epidural anaesthesia, instrumental delivery and caesarean section (D’Souza and Garcia, 2004, Lawn et al, 2009, Oakley et al, 2009). We know that the many women in the UK with socially complex lives, who experience significantly high morbidity and mortality rates often struggle to engage with maternity services (Commission for Healthcare and Audit Inspection, 2006, National Institute of Clinical Excellence (NICE), 2010, CMACE, 2011). It is hypothesized a lack of antenatal care and engagement with services is directly linked to poor outcomes women experience, therefore policies are often focused on improving access to care (NICE, 2010).

Marmot’s review of social determinants of health encourages the development of partnerships with

those affected by social inequities working with their health providers (Marmot et al, 2008). Central to this approach is empowerment through putting in place effective mechanisms that give those affected a real say in decisions that affect their lives, and by recognizing their fundamental human rights. These values are echoed in recent UK maternity service policies and guidelines, encouraging women- centered, individualized care with a focus on choice (NICE, 2010, Department of Health (DOH) 2012). National Health Service clinical guidelines in England (NICE, 2010) called for a reorganisation of services to improve antenatal care for women facing complex social circumstances and identified gaps in evidence regarding effective service provision. More recently, national policy guidance set strategic objectives to ensure that over 90% of women receive their first midwife assessment before 12 weeks of pregnancy, and promised all women a 'named midwife' to ensure one-to-one care through their pregnancy and postnatal period (DOH, 2012). This is currently a far cry from reality with a large, national survey reporting 65% of women did not have a named midwife and a large proportion describing continuity of care as inadequate (Care Quality Commission (CQC), 2013).

The caseload model of midwifery care is associated with high levels of continuity (Finlayson, 2002). For the purpose of this study 'caseload' is defined 'a named midwife as the lead professional in the planning, organisation and delivery of care given to a woman from initial booking to the postnatal period' (Royal College of Obstetrics and Gynaecology (RCOG) 2001, Sandall et al, 2013).

A growing body of evidence has found that women cared for under caseload models in the UK are less likely to experience antenatal admission, regional analgesia, and instrumental delivery, and more likely to experience spontaneous vaginal birth, more control during childbirth, attendance at birth by a known midwife, and higher breastfeeding rates (Sandall et al, 2013, Hodnett, 2008), but the impact of caseload care for vulnerable women remain unclear. It is known, however, that positive experiences of maternity care from socially disadvantaged women are often attributed to higher levels of continuity (Walsh, 1999, Kelly et al, 2013). Studies by Bulman and McCourt (2010) and, McCourt et al (1998) have specifically compared experiences of women receiving caseload care to standard maternity care in a socially disadvantaged area, both finding associations between continuity and advocacy, individualized care and positive outcomes. However, a recent systematic review found insufficient evidence of adequate quality to recommend routine implementation of any programme reviewed as a means of reducing infant mortality in disadvantaged populations- caseload care was not considered (Hollowell et al, 2011). The review concluded that more evidence is needed on what interventions work to reach socially excluded and vulnerable groups.

An inner city maternity service responded to government policies and research recommendations by introducing caseload midwifery in 2008 to support vulnerable women throughout their pregnancy and birth by providing continuity and individualised care. This study was conducted following encouraging audit results of childbirth outcomes for the women who had received caseload care in 2011. The team consists of 6 midwives, each the primary care provider for 35 women throughout pregnancy, birth and postnatal care, with women able to contact a caseload midwife at anytime. Care is carried out in the home setting where possible and labour care is provided by the caseload midwife or wherever possible her partner midwife. The caseload midwife is directly liaises with multi professional services and coordinates communication between key care providers.

The central aim of this study was to question the hypothesis that ‘there is a positive relationship between caseload midwifery care and birth outcomes for vulnerable women’ by identifying processes and outcomes of vulnerable women receiving the caseload model of care, compared to those receiving standard maternity care.

Methods

The unit of analysis in the study was pregnant, vulnerable women, with the independent variable being the type of maternity care received. Dependant variables included clinical care processes and outcomes listed below;

Clinical care processes and outcomes	Organisational Processes
Mode of birth (primary outcome) Augmentation, Induction of labour, Episiotomy, Fetal heart rate monitoring (CTG) Level of analgesia used in labour Perineal trauma Postpartum haemorrhage Preterm birth Neonatal apgar score Method of feeding at birth Birth weight Perinatal and maternal mortality	Gestation at booking Number of antenatal appointments Referral to external services; Social Services Psychiatry Domestic Violence Drug/Alcohol Abuse Other Midwife at birth known to mother Place of birth Length of hospital stay Antenatal admissions to hospital Admission’s to Neonatal Unit (NNU)

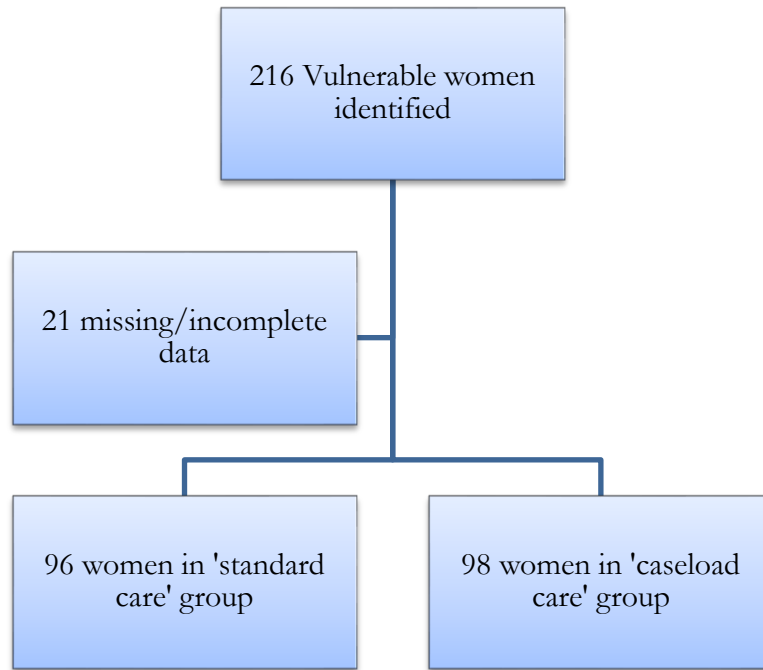
(Figure 1- List of Outcomes)

Ethical approval was sought from the Trusts research and development department prior to collecting data. Routinely collected computerised data were collected from a clinical database that has

been validated for commonly recorded pregnancy outcome variables (Cleary et al, 1994). This method of retrospective audit has been used extensively in healthcare research to identify trends in outcomes and areas for further improvement, although it does not ascertain causality (Bowling, 2009).

Sample and Data Collection

A power calculation was based on the findings of the caseload practice audit in 2011 which found a 33% increase in normal birth, from 22% to 55%. One hundred and eighty participants were considered necessary to demonstrate the statistical significance of a 33% increase. Data were collected from 216 women who had booked for maternity care between May 2012 and June 2013 and identified as 'vulnerable' as per government recommendations (NICE, 2010) and referral criteria to the caseload service. This includes women experiencing; domestic violence, homelessness, mental health issues, substance and/or alcohol abuse, seeking asylum or refugee status, learning and/or physical disabilities, safeguarding issues, or women from living within the travelling community. Twenty one sets of birth outcomes were missing due to women moving out of area and giving birth in a different maternity service. Ninety six women received standard maternity care due to living outside the services geographical boundary, and ninety eight received caseload maternity care. Standard Care comprised of routine antenatal appointments carried out at a hospital clinic by midwives and obstetricians, with intrapartum care from rostered midwives. Women under caseload care received antenatal, intrapartum and postnatal care from a known midwife. Data were anonymised by a health informatics team before being made available to the principle researcher, who was blinded to the model of care each group received to minimize bias.



(Figure 2- Flowchart of data collection)

Data Analysis

Data were then transferred to SPSS Version 21 for analysis. Independent, double-checking of 20% of the data entry was carried out to check for accuracy, and errors corrected. The demographics, processes and outcomes of the 2 groups were analysed using descriptive and inferential statistics. Comparative analysis of outcomes between women receiving caseload care, and those receiving standard care were accomplished using χ^2 test, relative risk (RR) and 95% confidence intervals (CI). P-values were calculated and those less than 0.05 indicate statistical significance. Tests of correlation were carried out to minimise risks of confounding factors and cross checked by two independent college statisticians. Logistic regression modeling found the relationship between type of care and outcome was not changed by the inclusion of confounding factors in the women's demographics. Due to this lack of difference the initial unadjusted statistics are reported in this paper. Full dataset, statistics output documents and adjusted results are available from the researcher.

Sample Demographics

Table 1: Characteristics of women at time of booking. Values given as mean(\pm SD) or n(%)

Characteristics	Standard Care n=96	Caseload Care n=98	Whole Sample n=194
Age (years)	29 (\pm SD 6.1)	28 (\pm SD 6.8)	28 (\pm SD 6.5)
Body Mass Index (BMI)	26 (\pm SD 6.0)	26 (\pm SD 4.9)	25 (\pm SD 5.4)
Smoker	26 (27%)	35 (36%)	61 (31%)
Primiparous	37 (38%)	40 (41%)	77 (40%)
Ethnicity:			
White British	20 (18%)	27 (25%)	47 (22%)
Black African	22 (20%)	12 (11%)	34 (16%)
Black Caribbean	16 (15%)	11 (10%)	27 (13%)
Other European	6 (6%)	15 (14%)	21 (10%)
Mediterranean	5 (5%)	8 (7%)	13 (6%)
Asian	16 (15%)	14 (13%)	30 (14%)
Middle Eastern	8 (7%)	7 (7%)	15 (7%)
Other/Unknown	3 (3%)	4 (4%)	7 (3%)
High Obstetric Risk	31 (32%)	24 (25%)	55 (28%)
IMD Score (Mean Rank)	104	112	-
Distance from hospital (miles)	4.8 (\pm SD 2.6)	2.3 (\pm SD 1.4)	3.6 (\pm SD 2.4)
Vulnerability:			
Domestic Violence	54 (50%)	55 (51%)	109 (51%)
Drug/Alcohol	20 (18%)	12 (15%)	32 (15%)
Safeguarding Issues	44 (41%)	44 (41%)	88 (41%)
Asylum Seeker/Refugee	16 (15%)	27 (25%)	43 (20%)
Homeless	21 (19%)	26 (24%)	47 (22%)
Traveller	1 (1%)	3 (3%)	4 (2%)
Physical Disability	5 (5%)	6 (6%)	11 (5%)
Learning Disability	5 (5%)	12 (11%)	17 (8%)
Common Mental Health	34 (32%)	40 (37%)	74 (34%)
Severe Mental Health	8 (7%)	15 (14%)	23 (11%)
Number of vulnerable factors:			
One	39 (36%)	27 (25%)	66 (31%)
Two	42 (39%)	45 (42%)	87 (40%)
Three	16 (15%)	22 (21%)	38 (18%)

Four or more | 11 (10%) 13 (12%) 24 (11%)

Results

Table 2; Birth Processes and Outcomes data

	Standard Maternity care n=96		Caseload Care n=98		Total n=194	Relative Risk for Caseload		
	n	%	n	%	n(%)	RR	95% CI	P
SVD	53	(55)	78	(80)	131(68)	1.88	1.27-2.77	<0.001
Instrumental Delivery	10	(10)	9	9	19(10)	0.93	0.58-1.53	0.962
Emergency Caesarean	17	(18)	5	5	22(11)	0.42	0.19-0.92	0.011
Elective Caesarean	16	(17)	6	6	22(11)	0.51	0.25-1.02	0.037
Total Caesarean	33	(34)	11	(11)	44(23)	0.26	0.12-0.55	<0.001
ARM	24	25	22	22	46(24)	0.93	0.66-1.31	0.804
Syntocinon	23	24	21	21	44(23)	0.93	0.65-1.31	0.804
IOL	23	24	20	20	43(22)	0.90	0.63-1.28	0.674
CTG	59	62	54	55	113(58)	0.88	0.67-1.61	0.453
Episiotomy	12	13	8	8	20(10)	0.77	0.44-1.34	0.450
Intact	57	59	58	59	105(59)	0.99	0.75-1.32	0.906
Sutured	35	37	32	32	67(35)	0.91	0.68-1.24	0.685
3/4 th Tear	4	4	1	1	5(3)	0.39	0.67-2.26	0.354
PPH	45	47	20	20	65(34)	0.29	0.15-0.54	<0.001
Maternal Death	0	0	0	0	0 (0)	-	-	-

Table 2(i) Birth processes and outcomes data for spontaneous vaginal deliveries only

	Standard Maternity care n=55		Caseload Care n=78		Totals n=133	Relative Risk for Caseload		
	n	%	n	%	%	RR	95% CI	P
Normal Birth	31	32	51	52	82(42)	1.34	0.65-2.75	0.423
Intact Perineum	25	26	46	46	71(37)	1.61	0.80-3.25	0.183
Episiotomy	4	3	4	3	8(4)	1.20	0.59-2.44	0.845
3/4 th tear	2	2	0	0	2(1)	0.39	0.31-0.48	0.162
PPH (>500mls)	7	7	5	5	12(6)	0.45	0.13-1.50	0.186

The findings for birth processes showed that women in the caseload group were more likely to have a spontaneous vaginal delivery compared to women receiving standard maternity care (80% vs. 55% RR 1.88, 95%CI 1.27-2.77, P=<0.001). These women also had fewer emergency caesarean sections (5% vs. 18% RR 0.42, 95%CI 0.19-0.92, P=<0.011), fewer elective caesarean sections (6% vs. 17% RR 0.51, 95%CI 0.25-1.02, p= 0.037), fewer postpartum haemorrhage >500mls (20% vs. 47% RR 0.29 95%CI 0.15-0.54, p= <0.001), and more normal births, although the latter was not statistically significant (52% vs. 32%, p=0.423). When combining the number of women having elective and emergency caesarean sections, a significantly lower rate was found in the caseload group (11% vs. 33% RR 2.25 95%CI 1.32-3.81, P=<0.001). The data within the sample of women who had spontaneous vaginal deliveries only shows the PPH rate was no longer significant. There were no maternal deaths in the whole sample.

Table 3: Pain relief used for labour and/or birth

	Standard Maternity care n=96		Caseload Care n=98		Total n=194	Relative Risk for Caseload		
	n	%	n	%	n(%)	RR	95% CI	P
Water in labour and/or birth	11	10	34	32	45(23)	4.10	1.95-8.64	<0.001
Non Pharmalogical	32	34	42	43	74(38)	1.21	0.92-1.60	0.225
Epidural/Spinal	54	56	34	35	88(45)	0.64	0.47-0.86	0.004
Opioid	14	15	7	7	21(11)	0.63	0.34-1.17	0.152

The type of pain relief used also reflected significant differences with women in the caseload group more likely to use water (32% vs. 10%, RR 4.10 95%CI 1.95-8.64, p=<0.001) and less likely to need epidural or spinal anaesthesia (35% vs. 56%, RR 0.64 95%CI 0.46-0.86, p=0.004).

Table 4: Place of Birth

	Standard Maternity care n=96		Caseload Care n=98		Total n=194	Relative Risk for Caseload		
	n	%	n	%	n(%)	RR	95% CI	P
Labourward	84	88	69	70	153(79)	0.63	0.49-0.83	0.006
Birth Centre	12	13	26	26	38(20)	1.48	1.12-1.95	0.023

Home	0	0	3	2	3(1)	2.11	1.74-2.31	0.084
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Place of birth findings also contrasted significantly with women in the caseload group more likely to use the midwife led birth centre (26% vs.13% RR 1.48 95%CI 1.12-1.95, p=0.023) and less likely to give birth on the labourward (70% vs. 88% RR 0.63 95%CI 0.49-0.83, p=0.006). The 3 women in the whole sample who gave birth at home were all caseloaded. There were no statistically significant differences in women’s normal birth outcome depending on their risk status at booking or delivery, but it is noted that women who were caseloaded experienced more normal births on the labour ward than women in the standard care group.

Table 5: Neonatal Outcome and method of feeding data

	Standard Maternity care n=96		Caseload Care n=98		Total n=194 n(%)	Relative Risk for Caseload		
	n	%	n	%		RR	95% CI	P
Gest <37 at birth	8	8	3	3	11(6)	0.53	0.19-1.39	0.203
Birth weight < 2500g	6	6	1	1	7(4)	0.26	0.45-1.69	0.051
Apgar <8 @ 5mins	2	2	1	1	3(2)	0.66	0.13-3.27	0.986
NNU Admission	17	18	4	4	21(11)	0.35	0.15-0.85	0.005
Breastfed	74	77	77	79	151(78)	0.96	0.67-1.35	0.940
Artificially fed	20	20	20	20	40(21)	1.01	0.72-1.43	0.942
Mixed Feeding	2	1	1	1	3(2)	1.52	0.36-7.60	0.549
Skin-to-Skin	79	82	86	87	165(85)	1.26	0.80-1.99	0.388
Neonatal Death	0	0	0	0		-	-	-

The only statistically significant neonatal outcome was the number of newborns admitted to the neonatal unit was far less in the caseload group (4% vs. 18%, RR 0.35 95%CI 0.15-0.85, p=0.005). Of the 6 newborns admitted to the neonatal unit for neonatal abstinence syndrome (NAS), only 1 was in the caseload group (1% vs. 5% OR 0.19 95%CI 0.02-1.69, p=0.100). There were no significant differences in prematurity, low birth weight, type of feeding, apgar scores, and skin-to-skin rates. There were no neonatal deaths prior to discharge from hospital in the whole sample.

Table 6: Admission and inpatient data, continuity of carer and referral processes

	Standard Care		Caseload Care		Total n=194 n(%)	Relative Risk for Caseload		
	n	% (±SD)	n	% (±SD)		RR	95% CI	P
Booked by 10/40 (NICE, 2010)	8	8	23	24	32(16)	1.61	1.24-2.10	0.008
Antenatal Appointments mean	7	(±9.8)	9	(±3)				.229
Antenatal Admissions mean	1.3	(±1.5)	0.9	(±1.1)				0.036
Length of postnatal stay (days) mean	3	(±2.2)	1	(±1.2)				<0.001
MW known at birth	8	8	88	90	96(49)	8.98	4.97-16.2	<0.001
Referrals:								
Social Services	86	90	79	81	165(85)	0.85	0.63-1.15	0.399
Psychiatry	18	19	55	56	73(38)	2.06	1.59-2.65	<0.001
DV	17	18	41	42	58(30)	1.68	1.31-2.15	<0.001
Drug	12	13	11	11	23(12)	0.96	0.61-1.50	0.981
Other	30	31	55	56	85(44)	1.58	1.15-2.16	0.03

Processes data showed women who had received caseload care were more likely to be booked for maternity care by 10 weeks gestation (24% vs. 8% RR 1.61 95%CI 1.24-2.10, p=0.008), had a shorter mean postnatal stay (3 days vs. 1 day SD 1.2 vs. 2.2, p=<0.001) and less antenatal admissions (0.9(SD 1.1) vs. 1.3(SD 1.5), p=0.036). These women also had a higher mean number of antenatal appointments, and were much more likely to know the midwife caring for them at time of birth (90% vs. 8% RR 8.98 95%CI 4.97-16.2, p=<0.001). No differences were found in the number of women referred to social services and drug support groups, but significantly more women in the caseload group were referred to psychiatry services (56% vs. 19% RR 2.06 95%CI 1.59-2.65, p=<0.001),

domestic violence advocacy (42% vs.18% RR 1.68 CI 1.31-2.15, $p < 0.001$) and other support services (56% vs. 31% RR 1.58 95%CI 1.15-2.16, $p = 0.03$).

Discussion

The data presented here show many health benefits for using the caseload model with vulnerable women, and no negative effects. The findings for birth outcomes found that more women in the caseload group had a spontaneous vaginal delivery and fewer had a caesarean section. Women in the caseload group were more likely to use water for pain relief in labour, less likely to use pharmacological analgesia, and more likely give birth in the midwife led birth centre. Infants of caseloaded women were over four-times less likely to be admitted to a neonatal unit. Women receiving caseload care were more likely to be booked for maternity care by 10 weeks gestation, had a shorter mean postnatal stay, and less antenatal admissions. Women in the caseload group also had a higher mean number of antenatal appointments, and were much more likely to know the midwife caring for them at time of birth. More women in the caseload group were referred to psychiatry services, domestic violence advocacy, and other support services.

Birth Outcomes;

The findings have shown a number of marked differences between the outcomes of the two samples, all of which are more positive within the 'caseload' group. The slightly higher number of women who received standard maternity care and were assessed as 'high obstetric risk' at booking could correlate with the increased likelihood of caesarean section on the standard care group, although it was found that of the 12 women in the whole sample who were deemed 'low risk' at booking and had an emergency caesarean section only 1 women received caseload care (92% vs. 8%) which outweighs the initial differences in the two samples risk at booking. It is therefore suggested that the studies contrasting findings in caesarean section were due to the nature of care women received.

Another potential confounding factor in this study is the possibility that 'place of birth' impacted women's outcomes over the type of maternity care they received. Women receiving caseload care were more likely to give birth outside of the obstetric labour ward (28% vs. 13%). It was not possible for a generalised linear model to converge risk due to every woman who delivered outside of the labour ward having a normal birth. This could be factored into future research by having a larger sample size and including an 'intended place of birth' variable, so that there would be a comparative number in each group. This evidence might support the rationale that caseload midwifery care

contributes indirectly to a woman's choice of birthplace and therefore risk of caesarean section.

Place of birth is well documented in terms of improving birth outcomes, with birth outside an obstetric unit increasing the likelihood of achieving normal birth (NICE, 2010, Hollowell et al, 2011a), this is demonstrated in the findings. However, findings from a large cohort study (Hollowell, et al, 2011) cannot be directly compared to findings in this study due to the differences in population; particularly the fact it only studied 'low risk' pregnancy outcomes, and women were analyzed in the group they planned to give birth in, not where the birth occurred. In the UK births outside an obstetric unit are relatively uncommon. In 2012 in England and Wales 2.3% of women giving birth did so at home and around 5% in midwifery led settings (Office of National Statistics (ONS), 2013). 28% of the women who received caseload care in this study gave birth outside an obstetric unit, a statistically significant difference compared to 13% in the standard care group. Of these 28% in the caseload group, only 2% gave birth at home. This statistic concurs with other studies findings which showed women planning to give birth at home were more likely to be older, white, have a fluent understanding of English, and live in a more socioeconomically advantaged area (Nove et al, 2011, ONS, 2013). Another recent study (Overgaard et al, 2012) found the effect of birth place did not differ with levels of social disadvantage, these findings suggest the benefits of birth outside obstetric units applies to women of all social demographics, but are not equally accessed.

In relation to this study's findings, accessibility is greatly improved in the caseload group. Although this does not show a direct association between continuity and improved birth outcomes for vulnerable women, it may be a moderating/mediating factor and is an important finding in itself; raising questions around why women receiving caseload care are more likely to give birth outside of obstetric units. Possible explanations include midwives working in the caseload team may share a similar philosophy, promoting an approach to care that results in improved outcomes, or they have more time to offer informed choice. Previous randomised trials have highlighted the possibility that characteristics of midwives working in different settings may explain outcome differences (Sandall et al, 2013, McLachlan et al, 2012). In concurrence with the North Staffordshire Changing Childbirth Research Team (NSCCRT, 2000) findings, there were no statistically significant differences in the normal birth rate between the two samples, in this particular study this was hypothesized to be due to the similar rates of induction and augmentation of labour. However, the normal birth rate raises interesting questions when compared to place of birth; women were more likely to have a normal birth if they were both caseloaded and gave birth on the birth centre compared to women receiving standard care and giving birth on the birth centre (68% vs. 32%). Research tackling these concepts could help distinguish between the benefits of place of birth, care provider and level of continuity.

One of the highly significant differences found in the maternal outcomes was the caesarean section rates between the two groups, this was in contrast to Sandall et al's (2013) systematic review, which found no differences in caesarean section rates, but concurred with the earlier randomised control trial by McLachlan et al (2012). The difference was primarily related to a reduction in emergency caesareans, although elective caesareans were also significantly lower in the caseload group. This may be an outcome that effects vulnerable women in particular through increased level of advocacy and individualised care (Finlay and Sandall, 2009). The reduction in caesarean section is particularly important in relation to inner city NHS Trusts targets to reduce the caesarean section rates, which are currently one of the highest in the UK at around 30% (DOH, 2013). Comparing the 35% caesarean section rate for women receiving standard care in this study to the Trust and National rates suggests vulnerable women receiving standard care are more likely to have a caesarean section than women who are not deemed vulnerable.

The large proportion of women in the caseload group who had a spontaneous vaginal delivery was essentially explained by fewer caesareans, as the instrumental birth rate did not differ. In addition to place of birth, lower rates of pharmacological analgesia and increased use of water for pain relief in the caseload group might have contributed towards the statistically significant increased spontaneous vaginal delivery rate (Simkin and O'Hara, 2002). As epidural analgesia has been shown in many randomized trials to reduce the likelihood of a normal vaginal delivery (Anim-Somuah et al, 2011), it is likely this difference accounted for variations in normal delivery, spontaneous vaginal delivery and caesarean section rates in this study. This increase in spontaneous vaginal delivery was also found in many of the papers included in the literature review (McLachlan et al, 2012, Benjamin et al, 2001, Sandall et al, 2013).

Neonatal Outcomes;

A particularly interesting finding was the significant reduction in admissions to the neonatal unit in the caseload group. This outcome has not been found in other studies on caseload midwifery schemes, and may point towards a further positive outcome for vulnerable women receiving this type of care. As many infants with neonatal abstinence syndrome (NAS) require a prolonged neonatal unit admission (Johnson, Greenough et al. 2003) we could speculate that the increased advocacy, antenatal support, and referrals to specialist agencies, associated with caseload care may have reduced numbers of infants born with NAS. Numbers for the other neonatal outcomes and analysis of NNU admissions for NAS were too small to find a significant difference. Breastfeeding rates were the same for each sample; a surprising outcome when compared to previous studies increased rates within midwife-led care (Sandall et al, 2010). Breastfeeding rates for both groups fell just below the national rate of 81% (Health and Social Care Information Centre, 2012), with known lower initiation rates

among disadvantaged groups (MacGregor and Hughes, 2010) this finding suggests more specialist interventions may be required to increase breastfeeding for women with complex social factors.

Processes;

Women in the caseload group were significantly more likely to be referred to psychiatric services, domestic violence advocacy and other support (including translation services, early health visitor input, children's centre's, housing and parenting support). This may have a profound impact on women's outcomes, safety, and ability to parent: A randomized control trial found that antenatal intervention significantly reduced the occurrence of major depressive disorder among financially disadvantaged women (Zlotnick et al, 2006). A Cochrane review later found that women who receive more support have better labour progress, higher Apgar scores, less antenatal admissions, experience less postpartum depression, and interestingly less cesarean section (Hodnett et al, 2010). This support may be a direct effect of developing a trusting relationship with a midwife, or indeed the additional support offered through referral to external services. Another important factor to consider is the high proportion of women experiencing domestic violence in both groups in the study compared to those who were referred to advocacy services. Although the effectiveness and indeed safety of interventions for domestic violence lacks evidence (Wathen and MacMillan, 2003), we should note that domestic violence is an important risk marker for the development of obstetric complications and postnatal depression (Bacchus et al, 2004), and appropriate referrals should be made to ensure women are able to access support safely. Evidence of poorer outcomes and the negative impacts women with undiagnosed mental health, domestic violence and substance abuse experience (Mckee et al, 2001, Morrissey et al, 2005), should inform practice of all health professionals caring for potentially vulnerable women. The specialist midwives in the caseload team had received additional training in this area and have frequent, direct communication with other agencies that may have increased the number of referrals made. The CMACE (2011) report found that poor communication between health professionals was one of the main aspects of substandard care leading to avoidable maternal deaths with a key recommendation being 'Referrals to specialist services in pregnancy should be prioritized as urgent'.

90% of women in the caseload group knew the midwife who cared for them in labour, which far exceeds the 'indicator for success' target of 75% (DOH, 2004), compared to 8% in the standard care group. Levels of continuity in the updated Cochrane review (Sandall et al, 2013) were measured by the percentage of women who were attended during birth by a known carer, and varied between 63% to 98% for caseload models of care, to 0.3% to 21% in other models of care. Green et al (2000)

recognized the importance of defining the ‘quality’ of continuity in research. These variations are one explanation for the differences in caesarean section rates in the associated studies; another is the theory that vulnerable women are more likely to experience caesarean section. As continuity in this study is defined as having met the midwife responsible at delivery at some point in the antenatal period, it could be argued that continuity is an unlikely single reason for the decreased caesarean section rate in the caseload group, although this is not an accurate reflection of the level of continuity experienced. This quality of continuity is something that should be taken into account when planning further research into continuity models.

The national maternity guideline for women with complex social factors recommended women are booked for maternity care by 10 weeks gestation (NICE, 2010). Although only 24% of the vulnerable women in the caseload group met this recommendation, it was statistically significant compared to 4% in the standard care group. This again points to improved accessibility and continued involvement with maternity services which is reflected in the increased number of antenatal appointments attended by women in the caseload group. These factors may have influenced the reduced number of antenatal admissions, Sandall et al’s (Sandall et al, 2013) systematic review also found this along with length of postnatal stay. Further analysis of this phenomenon would be useful in evaluating the economic impact of caseload midwifery care.

Strengths and limitations

These findings should be considered in light of the study’s limitations. The non-randomized design of the study represents an overall limitation. Although the two sample groups appeared similar and sensitivity analysis was carried out to identify confounding factors in baseline demographics using logistic regression analysis, the risk of residual confounding and confounding by unknown factors related to birth outcomes cannot be fully eliminated. The influences of unknown factors related to women’s choice of birthplace, personal wishes, culture and philosophy about birth are unknown. For example, some women are choosing to receive maternity care at a hospital that is not closest to their home, for unknown reasons. These ‘personal’ factors may also be prevalent in midwives’ characteristics and philosophies.

Table 1 shows there were no significant baseline differences between groups for age, BMI, parity, deprivation score and type or number of vulnerable factors. There was however a significant difference in ‘distance from hospital’, which was expected due to the criteria denoting women who received standard care resided outside of the Trusts geographical area. Tests of correlation however, found no effect between distance from hospital and deprivation score. This use of deprivation scoring as a proxy for social disadvantage could perhaps be seen as a limitation as no single

measurement is likely to be able to capture the full complexity of social disadvantage.

During the data collection and analysis the researcher remained blinded to the type of care each sample received, adding strength to the study. Twenty percent of data entry was independently double checked, and 2 independent statisticians crosschecked data analysis to minimise inaccurate findings.

Conclusion and Future Research Recommendations

The caseload midwifery care for vulnerable women in this particular population achieved high levels of 'known carer at delivery' which appeared to be associated with a reduction in caesarean section, pharmacological analgesia, antenatal admissions, NNU admission, length of postnatal stay and increased spontaneous vaginal delivery and intact perineum. Overall the caseload model appeared to convey benefit and no harmful outcomes were found. Findings were both similar and varied from previous literature depending on each outcome, suggesting the model of care may affect different populations of women in different ways depending on their individual needs.

Although the generalisability of these findings is restricted by the non-randomized design and possible confounding factors, they are encouraging and highlight the need for other maternity units to set up and evaluate services for vulnerable women, particularly those with a focus on continuity. As it is unknown what component of the caseload model in the study affected women's outcomes it would be helpful for future research in continuity to factor for place of birth, midwives characteristics and autonomy, and the impact of trust and support. Although these factors may all play a part in the positive outcomes experienced by vulnerable women, a stronger evidence base will help inform the organization of future models of care for this 'at risk' population. This indicates a need for a randomized trial, as well as gaining further insight into women and families views. Future research could also include investigating the longer term follow up of women and their families within a full scale trial, and how increased referrals to caseload services might affect maternity services and the way midwives currently work. The long term impact of these policy and research recommendations has the potential to transform maternity services for vulnerable women, ensuring equal access, improved outcomes for women in subsequent pregnancies, child health, and enhanced social cohesion.

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