From: Maria Del Pilar Luna Ramirez (Northern NSW LHD)

Sent: Wednesday, 17 April 2024 3:53 PM
To: Birth Trauma
Subject: CM: RE: Birth Trauma ? Post-hearing responses ? 11 March 2024
Attachments: MGP_NT.pdf; 0.pdf

Dear Julianna

Thanks for the transcript, I have no correction on it.

I took on notice to provide evidence about examples of all risk midwifery group practise . Please find attached publication from my previous work place re the use of all risk MGP model. Main conclusions are that this service has the potential to be cost saving (no statistically significant), but it is at least cost neutral.

The reality of pregnant women in the NT is vastly different to those in other states, but if the model proves itself to be cost neutral in such a challenging situation, it is reasonable to think that it would only be better in less challenging settings. The benefits of midwifery continuity of care have been largely demonstrated in numerous studies and there should be no further need of evidence to justify the implementation of it. Among those studies I have attached a Cochrane RV where it is stated

"Policy makers who wish to achieve clinically important improvements in maternity care, particularly around normalising and humanising birth, should consider midwife-led models of care and consider how financing of midwife-led services can be reviewed to support this"

Kind regards,

Maria (Tane) Luna Ramirez

Obstetrician and Gynecologist staff specialist. FRANZCOG, DDU.
Acting Head of Department. | **Women's care unit**

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A cost-consequences analysis of a Midwifery Group Practice for Aboriginal mothers and infants in the Top End of the Northern Territory, Australia

Yu Gao, MD, PhD (Research Fellow)[a,*], Lisa Gold, PhD (Associate Professor)[b], Cath Josif, RN, RM, Graduate Certificate Child Health, BN (NH&MRC Doctoral Research Candidate)[a], Sarah Bar-Zeev, RN, RM, MPH, MNSc (NH&MRC Doctoral Research Candidate)[a], Malinda Steenkamp, M.Phil, PhD (Post-doctoral Researcher)[f], Lesley Barclay, RN, RM, Med, PhD (Professor and Director)[a], Yuejen Zhao, MD, PhD (Principal Health Economist)[c], Sally Tracy, RM, RGON, DMid, BNurs, DipMid, MA, PhD (Professor of Midwifery)[d], Sue Kildea, RN, RM, BHSC (Hons), PhD (Professor of Midwifery)[e]

[a] University Centre for Rural Health North Coast, School of Public Health, Sydney Medical School, University of Sydney, Lismore, NSW 2480, Australia
[b] Deakin Population Health SRC, Faculty of Health, Deakin University, Burwood, VIC 3125, Australia
[c] Health Gains Planning, Northern Territory Department of Health, Darwin, NT 0811, Australia
[d] Sydney Nursing School, University of Sydney, Sydney, NSW 2006, Australia
[e] Women's Health and Newborn Services, Australia Catholic University and Mater Mothers Hospital, Brisbane 4101, Australia
[f] Life Course and Intergenerational Health Research Group (LIGHt), Discipline of Obstetrics and Gynaecology, Faculty of Health Sciences, The University of Adelaide, North Terrace, Adelaide SA 5005, Australia

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ABSTRACT

Objective: to compare the cost-effectiveness of two models of service delivery: Midwifery Group Practice (MGP) and baseline cohort.
Design: a retrospective and prospective cohort study.
Setting: a regional hospital in Northern Territory (NT), Australia.
Methods: baseline cohort included all Aboriginal mothers ($n=412$), and their infants ($n=416$), from two remote communities who gave birth between 2004 and 2006. The MGP cohort included all Aboriginal mothers ($n=310$), and their infants ($n=315$), from seven communities who gave birth between 2009 and 2011. The baseline cohort mothers and infant's medical records were retrospectively audited and the MGP cohort data were prospectively collected. All the direct costs, from the Department of Health (DH) perspective, occurred from the first antenatal presentation to six weeks post partum for mothers and up to 28 days post births for infants were included for analysis.
Analysis: analysis was performed with SPSS 19.0 and Stata 12.1. Independent sample of t-tests and $\chi 2$ were conducted.
Findings: women receiving MGP care had significantly more antenatal care, more ultrasounds, were more likely to be admitted to hospital antenatally, and had more postnatal care in town. The MGP cohort had significantly reduced average length of stay for infants admitted to Special Care Nursery (SCN). There was no significant difference between the two cohorts for major birth outcomes such as mode of birth, preterm birth rate and low birth weight. Costs savings (mean A$703) were found, although these were not statistically significant, for women and their infants receiving MGP care compared to the baseline cohort.
Conclusions: for remote dwelling Aboriginal women of all risk who travelled to town for birth, MGP was likely to be cost effective, and women received better care and resulting in equivalent birth outcomes compared with the baseline maternity care.

Introduction

A Midwifery Group Practice (MGP) is characterised by a small group of midwives (3–4) offering continuity of care and of carer throughout pregnancy, labour, birth and the early postnatal period (Hartz et al., 2012). Each midwife provides care for a caseload of 36–40 low risk women as their 'primary midwife'. As well as being

* Corresponding author.
E-mail addresses: yu.gao@ucrh.edu.au (Y. Gao), lisa.gold@deakin.edu.au (L. Gold), cfar3313@uni.sydney.edu.au (C. Josif), sbarzeev@mail.usyd.edu.au (S. Bar-Zeev), malinda.steenkamp@adelaide.edu.au (M. Steenkamp), Lesley.barclay@sydney.edu.au (L. Barclay), Yuejen.zhao@nt.gov.au (Y. Zhao), stracy@ozemail.com.au (S. Tracy), sue.kildea@acu.edu.au (S. Kildea).

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the 'primary midwife', this midwife will be a second or 'back up' midwife for women who have another midwife as their primary caregiver. Midwives in MGP are paid an annualised salary and operate on a 24-hour call system, negotiating their days off and leave with their colleagues (Maternity Services Inter-jurisdictional Committee, 2008). In most circumstances, the term 'midwifery-group-practice' is synonymous with the terms 'caseload midwifery', 'midwife-led-care', midwifery-managed care, and 'one-to-one midwifery care' (Hatem et al., 2008; Hartz et al., 2012; McLachlan et al., 2012). Compared to standard hospital care or consultant-led care, evaluations of the MGP model find that it reduces obstetric interventions and improves women's satisfaction (Hartz et al., 2012). However, there is limited randomised controlled evidence on the caseload model for women of all risk status (Tracy et al., 2011).

Economic analyses of midwife-led-care for low and high risk women from late pregnancy to the early postpartum period demonstrate that this model of care provides cost-savings (Kenny et al., 1994; Homer et al., 2001; Tracy and Hartz, 2006; Toohill et al., 2011). These studies, however, did not assess costs of antenatal investigations or mother and infant hospitalisation after discharge, both of which may vary according to model of care and therefore affect cost-effectiveness of a MGP. This paper reports on a study that included costs for antenatal, labour and postpartum periods, including antenatal investigations, neonatal admissions (up to 28 days) and postpartum costs (up to six weeks). Our study, as well as extending the breadth of investigation, also focused on a newly established MGP that only provided care to remote dwelling Aboriginal women from seven communities in Australia's Northern Territory (NT) who were transferred to a regional hospital for birth. This is a unique model in Australia and our findings make an important contribution to the literature.

The NT is an area of Australia occupying 1,349,129 km^2 of the mainland continent. It is the third largest federal division. Despite the relatively large landmass, it is sparsely populated. On the basis of the data from the 2006 Australian Census, the estimated population of the NT was 210,674 of whom the Indigenous population, i.e., Aboriginal and Torres Strait Islander people made up 31.6% ($n=66,582$) (Australian Bureau of Statistics, 2010). This is the highest proportion of Aboriginal[1] people in Australia—in all other jurisdictions less than 4% of the population is of Indigenous descent (Australian Bureau of Statistics, 2010). Roughly 3600 babies are born annually in the NT with approximately 1400 being born to Aboriginal mothers. Two-thirds of Aboriginal births in the NT are to remote-dwelling women compared with 5% of non-Aboriginal births (Zhang and Johnstone, 2009). For practical and administrative reasons, the NT is often divided into two regions that are geographically distinct with the *Top End* having a monsoonal tropical climate compared to the vast desert lands of *Central Australia* (Bartlett and Duncan, 2000). Our study concerns communities in the Top End and the introduction of a MGP in the NT capital Darwin (Fig. 1), where close to 500 Aboriginal births occur annually.

Maternal and infant health outcomes for the Aboriginal population in the NT are considerably worse than their non-Aboriginal counterparts. Aboriginal women receive less antenatal care, are twice as likely to smoke during pregnancy, and have higher rates of teenage pregnancy, low birth weight and preterm babies when compared with their non-Aboriginal counterparts (Zhang et al., 2010). The NT maternity service model is a complex system delivered as a conventional biomedical model by multiple sectors and organisations. The Darwin MGP was established in 2009 following the National Maternity Service Review (Department of Health and Aging, 2008) and a NT-specific Review of Maternity Services (Banscott Health Consulting Pty Ltd., 2007), which both identified a number of problems for remote dwelling mothers—most notably a lack of continuity of care/carer. The establishment of the MGP service was also informed by baseline data from the Australian National Health and Medical Research Council funded project '1+1=A Healthy Start to Life project (1+1 project)', which highlighted that an intervention was urgently needed to improve the safety and quality of care for Aboriginal mothers and infants (Ireland et al., 2010; Barclay and Gao, 2011; Bar-Zeev et al., 2012a, in press). The Darwin MGP addresses this by providing continuity of care/carer for remote-dwelling Aboriginal women from seven Top End remote communities, who travel to Darwin for birth.

When the MGP was established, there were concerns expressed that the service would be expensive and duplicate services delivered by mainstream providers. The NT Department of Health commissioned a process, impact and outcome evaluation as an addition to the 1+1 project (Josif et al., 2012). The evaluation compared the baseline data from the 1+1 project with data from women who received care through the new model. This paper used a cost-consequences analysis by comparing the costs and health outcomes between the two cohorts and investigating whether the Darwin MGP service was cost effective from the Department of Health perspective.

Methods

Baseline care pathway

Antenatal and limited postnatal care for remote-dwelling women was provided in local health centres by remote area midwives, Aboriginal health workers (AHW), remote area nurses, District Medical Officers (DMO), or specialist outreach obstetricians visited three to four times a year. Women with identified risks in pregnancy were seen by the DMO, a specialist outreach obstetrician or were transferred to the regional centre, Darwin for specialist appointments. Northern Territory practice is for women to travel to Darwin at around 38 week's gestation to await labour and birth. The Patient Assistance Transport Scheme (PATS), an Australian Government initiative, provided funding for airfares and accommodation in Darwin. Women travelled to Darwin via a commercial flight, sometimes with an escort but mostly alone (NT Department of Health, 2008). Once in Darwin women attended antenatal care and gave birth in the delivery suite at the Royal Darwin Hospital (RDH). After birth, women were discharged to family in Darwin or a hostel. Most women were transported home as soon as possible, although one airline would not transport infants less than seven days old thus extending their time away from their community. Postnatal care was typically provided in hospital. Following discharge, a small number of women received domiciliary care whilst awaiting their return flight home, although this was inconsistent and problematic (Bar-Zeev et al., in press).

Darwin MGP care pathway: the new model

The MGP team provided a woman-centred model of care to all risk remote dwelling women, from seven communities who were transferred to Darwin for birth. The team was based in a suburban shopping complex three kilometres from the hospital. The MGP had access to the RDH's facilities, systems and databases. Women were allocated a primary midwife who provided care whenever they were in Darwin during pregnancy, birth and the postnatal period. During the early antenatal period in the remote community, the women's primary midwife and other team members were introduced to them by photos at the health centre. Antenatal care in Darwin was provided in the MGP rooms or a hostel. Birthing services were provided at the

[1] In Australia, the Indigenous population is made up of people from Aboriginal and/or Torres Strait Islander descent. The term 'Aboriginal' is used throughout the rest of the paper as none of the mothers were identified as Torres Strait Islander in the data reported here.

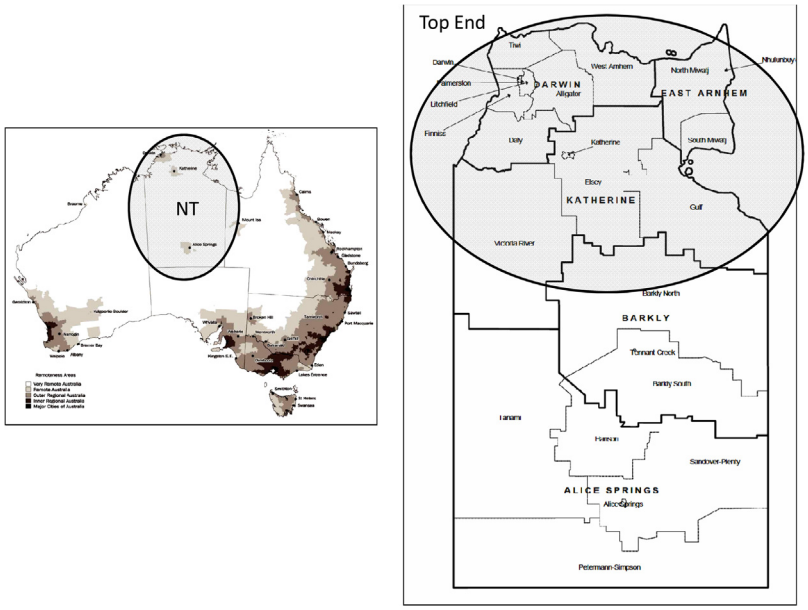

Fig. 1. Location of the NT showing remote areas according to the Australian Standard Geographical Classification and a map of the NT Health districts showing the Top End. *Sources*: Australian Institute of Health and Welfare (2004), Chondur and Guthridge (2006).

hospital. The MGP team visited women and provided postnatal care either in hospital or in the hostel. A senior woman from one of the remote communities was employed for cultural support during labour and lived at one of the hostels.

Study design

This economic evaluation examined the direct costs to the Department of Health to compare the maternity care costs pre- and post-establishment of the MGP to any change in outcomes detected up to six weeks post partum. The time horizon began with the first presentation for antenatal care and included the birth episode, postnatal care in Darwin and postnatal care in remote communities up to six weeks after birth, readmissions up to six weeks postnatally for mothers and up to 28 days after birth for infants. The type of costs included were: women's antenatal care costs in remote communities and town, antenatal hospitalisation costs with associated transport costs, birth costs with associated transport costs, infant admission to the Special Care Nursery (SCN), postnatal care costs in communities and town, and postnatal hospitalisation costs with associated transport costs. Allied health staff costs were not easily captured in either cohort and have not been included. Costs were measured in 2010 Australian dollars (A$) from a Department of Health perspective; no discounting was applied as the time horizon was less than one year. The personnel cost for antenatal/postnatal visits in the community were estimated using the standard working unit (SWU)[2] developed by the Health Gains Planning, NT Department of Health (Zhao et al., 2006). The cost of antenatal/postnatal care visits in Darwin (baseline cohort only) and the costs of diagnostic tests were drawn from the Medicare Benefits Schedule and the costs of pharmaceuticals from the Pharmaceutical Benefits Schedule (Australian Government Department of Health and Ageing, 2010). The costs of antenatal/postnatal care visits in town by the MGP team were based on the hourly costs of an MGP midwife, AHW, and Senior Woman. All the hospitalisation costs were based on Australian Refined Diagnostic Related Groups (Australian Department of Health and Ageing, 2006) (Fig. 2).

Data collection and analysis

A retrospective and prospective cohort study provided data for economic analysis. Two cohorts were identified in this study: (a) Aboriginal mothers from two of the largest remote communities in the NT (the field sites for the 1+1 project) who gave birth from 2004 to 2006 (the baseline cohort) prior to the introduction of the MGP, and (b) mothers from seven communities who were clients of the MGP during 2009–2011 (the MGP cohort). The baseline cohort included 412 cases: 408 singleton maternity episodes and four multiple births (i.e., eight infants). The MGP cohort included 310 cases consisting of 305 singleton maternity episodes and five multiple birth pregnancies (i.e., 10 infants). In the MGP cohort, 230 (76%) were from the two communities in the baseline cohort. Women who had a multiple birth (nine cases; 18 infants) or birthed interstate (three cases from MGP cohort) were excluded from analysis.

Data collection occurred from January to August in 2008 for the baseline cohort. All Aboriginal women from the two communities who gave birth to an infant at the regional hospital, in hostel accommodation, in transit or in the remote community from 1 January 2004 to 31 December 2006 with gestation of at least 20 weeks or birth weight of at least 400 g, were included. The baseline cohort was constructed through manual data linkage between community birth records from two government operated primary health centres and medical records at the regional hospital (Bar-Zeev et al., in press). The MGP cohort data collection occurred from September 2009 to October 2012. The MGP cohort included Aboriginal women from seven communities who gave birth to an infant at the RDH or other hospitals, in hostel accommodation, in transit or in the remote community from 29 September 2009 to 27 June 2011. Data obtained from medical charts were entered into a Microsoft Access™ database at separate times for the two cohorts. The MGP and baseline cases were merged into one dataset for analysis. Outcomes compared included: age, parity, antenatal visits, antenatal screening tests and investigations, maternal condition, mode of birth, birth weight and neonatal admission.

[2] The price for a SWU equals a 25-minute professional's consultation costs in a typical NT remote health centre. Professional's salary, on-cost, operational costs and capital were included in the calculations of a SWU price.

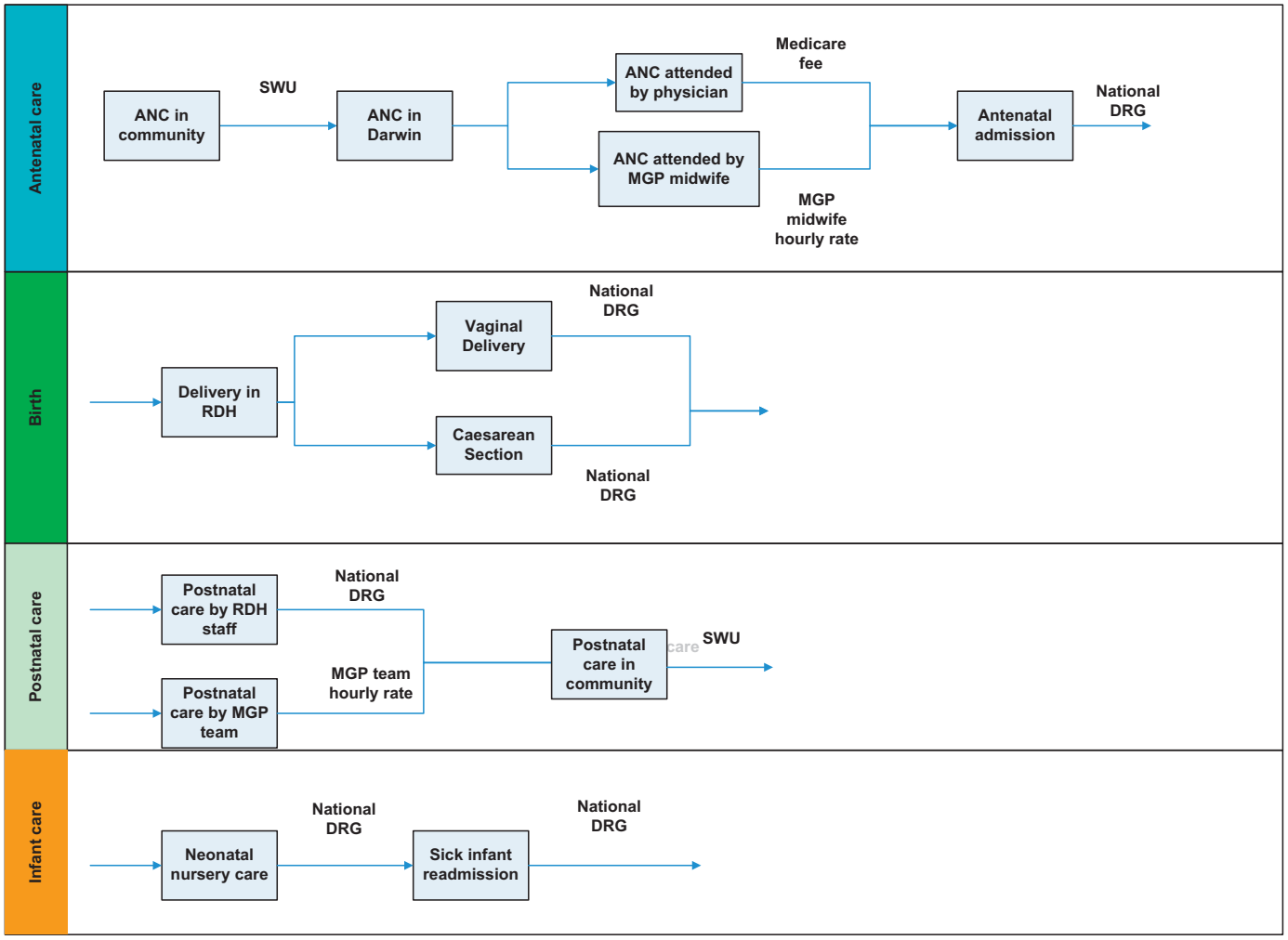

Fig. 2. Unit cost items measurements SWU: standard working units; RDH: Royal Darwin Hospital; ANC: antenatal care; DRG: Australian Refined Diagnostic Related Groups; MGP: midwifery group practice.

Main maternal conditions or complications investigated were sexually transmitted infections, cardiac conditions, pre-existing diabetes, anaemia etc. Table 1 lists the cost items included in the analysis and their unit costs. Costs of each mother–infant episode were calculated from frequencies of resource use and their unit costs. Average costs per mother–infant episode were calculated and presented in tables. The student *t*-tests were conducted to determine the cost difference between the baseline and MGP cohort. Analysis was performed with SPSS 19.0 (IBM Corporation, Chicago, United States of America) and Stata 12.1 (Statacorp 2011). Ethics approval was granted by the Human Research Ethics Committee of the NT Department of Health and the Menzies School of Health Research (09/37).

Cost assumptions

Health-care records often lack data at the level of precision required for detailed economic evaluation. In recognition of this, and in the absence of sufficient time and research resources for primary data collection, we constructed a set of cost assumptions. These drew on the expert opinion of the group of clinicians and researchers involved in the 1+1 project, including one author (SK) with many years experience of midwifery care in this region and doctoral students (SBZ and CJ) with in-depth analysis of both baseline and MGP groups.

Antenatal/postnatal visits

Neither the baseline nor the MGP cohort had data on the role of practitioner performing each antenatal service in the remote health centre. The assumptions we made were: for normal pregnancy all but one of the women's antenatal visits in the remote health centre were assumed to have been performed by a midwife and one was performed by doctor. For women with complications we assumed that half of the visits were performed by doctors and half by midwives. On the basis of Zhao et al.'s (2006) estimation and our own observations (Bar-Zeev et al., in press), we assumed that it took a doctor or midwife 25 minutes (1 SWU) to complete a visit in the remote health centre. For the baseline cohort, all the antenatal visits in Darwin were assumed to have been performed by a doctor.

The baseline cohort did not record the frequency of care providers for postnatal visits in Darwin. As the domiciliary service did not cater for women from remote areas, we assumed women had no domiciliary postnatal service unless it was recorded. The MGP cohort antenatal/postnatal care was provided in Darwin for each woman and the number of visits was recorded in the Pregnancy Health Record by the care providers. On the basis of our observations of the Darwin MGP, we assumed that a standard antenatal or postnatal visit by a MGP team member was one hour.

Transport costs

Transport created substantial costs for the Department of Health as the current practice recommended all women living in

Table 1
Resource items included in the study and their unit costs.

Costs items	Unit costs	Source
Antenatal care visits		
Seen community midwife (25 minutes)	$25.80	Zhao et al. (2006)
Seen MGP midwife (1 hour)	$108.51	This paper
Seen Aboriginal Health Worker (1 hour)	$51.63	This paper
Seen Senior Woman (1 hour)	$25.00	This paper
Seen doctor (25 minutes)	$44.55	Zhao et al. (2006)
Ultrasound scans		
Scans 0–13 weeks	$70.00	MBS item 55704
Scans 14–28 weeks	$115.00	MBS item 55712
Scans 29–42 weeks	$115.00	MBS item 55721
Nuchal scan	$70.00	MBS item 55707
Antenatal blood tests		
Antibodies	$23.35	MBS item 65111
FBE	$17.05	MBS item 65070
HepBsAg	$15.75	MBS item 69405
HIV	$15.75	MBS item 69405
MSU	$20.70	MBS item 69333
Blood group/Rh	$11.20	MBS item 65090
Rubella	$15.75	MBS item 69405
Syphilis serology	$15.75	MBS item 69405
Maternal serum genetic screen	$55.60	MBS item 66751
GCT	$15.90	MBS item 66545
GTT	$20.05	MBS item 66548
Antenatal investigation		
LV swabs for group B strep	$34.00	MBS item 69312
Urine microscopy	$4.60	MBS item 73805
Hospital admissions		
In-hospital costs	$525–18,145 depending on the DRG	This paper
Transport costs	$210–270 one way for 'routine transfer' and $400–1000 for 'emergency transfer' depending on the community	This paper
Postnatal visits		
Seen community midwife (25 minutes)	$25.80	Zhao et al. (2006)
seen MGP midwife (1 hour)	$108.51	This paper
Seen Aboriginal Health Worker (1 hour)	$51.63	This paper
Seen Senior Woman (1 hour)	$25.00	This paper

Note: MBS: Medicare Benefits Schedule; FBE: Full Blood Examination; GCT: Glucose Challenge Test; GTT: Glucose Tolerance Test; HepBsAg: Hepatitis B Surface Antigen; HIV: Human Immunodeficiency Virus; LV swab: lower vaginal swab; MGP: Midwifery Group Practice; MSU: Mid Stream Urine; Rh: Rhesus; DRG: Diagnostic Related Groups.

remote areas fly to Darwin to give birth. Data kept by PATS, however, were poorly recorded and it was impossible to link this data with our sample. According to a woman's admission diagnosis, three of the authors assigned each woman's admission as either a 'routine transfer' or an 'emergency transfer'. The transport costs for a 'routine transfer' were estimated as the cost of commercial airfares ($210–270 one way depending on the community). The transport costs for an 'emergency transfer' were estimated at $2 per km applied to the distances (km) between the communities and Darwin (Zhao et al., 2006) (approximately $400–1000 one-way depending on the community).

Missing records

If antenatal tests and neonatal admissions were 'not recorded', we assumed they did not occur. For length of hospital stay (LOS), if the admission or discharge date was missing, we estimated this using the next best recorded time that other care had been provided.

Findings

There were a small number of missing records in both cohorts, with the proportion of cases with missing data varying from 3.7% to 24.5% across the different resource use variables in the baseline cohort and from 1.3% to 10.2% in the MGP cohort. Fifty one per cent of all cases had some form of missing information. Missing data were replaced with the cost assumptions (see above) where appropriate.

Clinical outcomes

The key maternal characteristics for the baseline and MGP cohorts are described in Table 2. There were differences in the maternal age distributions between the two cohorts, with MGP mothers being older (MGP 24.1 years versus baseline 23.2, $p < 0.05$; Table 2). Parity was similar between groups. A significantly higher percentage of mothers in the MGP cohort had at least one maternal condition or pregnancy complication (Table 2), but this increase might have been due to better recording of conditions

Birth outcomes and frequencies of resource use are shown in Table 3. Compared to the baseline group, the MGP cohort had significantly higher numbers of antenatal visits in town (2.5 versus 1.6, $p < 0.001$) but fewer antenatal visits in communities (6.4 versus 7.3, $p = 0.017$), with no significant difference in the mean total number of antenatal visits (8.9 versus 8.9, $p = 0.893$). Women in the MGP cohort were more likely to be admitted to hospital antenatally and have a significantly higher number of ultrasounds (Table 3).

Since the establishment of the MGP service, fewer women gave birth in remote community health centres (6.3% versus 9.3%). The MGP women experienced a higher rate of labour induction or augmentation and more MGP women experienced two or three

Table 2
Maternal characteristics.

Maternal characteristics	Baseline (n=408)	MGP (n=302)	*p*-Value
Mean age in years (±SD)	23.2 (±6.0)	24.1 (±5.72)	**0.038**
Teenage mothers, i.e., aged <20 years, n (%)	110 (31.5%)	74 (24.5%)	**0.047**
First pregnancy, n (%)	135 (33.1%)	87 (28.8%)	0.342
Maternal conditions recorded, n (%)			**0.003**
None recorded	269 (66.1%)	160 (54.1%)	
One recorded	111 (27.3%)	96 (32.4%)	
Two recorded	21 (5.2%)	29 (9.8%)	
Three recorded	6 (5.2%)	11 (3.7%)	
Pregnancy complications, n (%)			**0.010**
None recorded	131 (32.1%)	82 (27.2%)	
One recorded	126 (30.9%)	124 (41.1%)	
Two recorded	94 (23.0%)	71 (23.5%)	
Three recorded	57 (14.0%)	25 (8.3%)	

Note: SD=standard deviation.

Table 3
Antenatal, birth, neonatal and postnatal outcomes.

Outcomes	Baseline (n=408)	MGP (n=302)	*p*-Value
Antenatal care, mean (±SD) unless otherwise stated			
Mean total antenatal visits	8. 9 (±5.2)	8.9 (±4.7)	0.8936
Mean number of antenatal visits in community	7.3 (±4.9)	6.5 (±4.0)	**0.0174**
Mean number of antenatal visits in hospital	1.6 (±1.8)	2.5 (±2.1)	**0.000**
Mean number of ultrasounds	1.5 (±0.7)	2.3 (±1.3)	**0.000**
Antenatal admission, n (%)	96 (23.5%)	79 (26.2%)	0.422
Place of birth, n (%)			**0.012**
RDH or RDH Birth Centre	365 (89.7%)	271 (89.7%)	
Remote community health centre	38 (9.3%)	19 (6.3%)	
Other (e.g., in transit, at home, etc.)	<5	12 (4.0%)	
Induction, n (%)			0.071
Yes	43 (10.6%)	45 (15.2%)	
No	363 (89.4%)	252 (84.9%)	
Augmented labour (for mothers who experienced labour), n (%)	(*n*=373)	(*n*=231)	0.405
Yes	106 (28.4%)	73 (31.6%)	
No	267 (71.6%)	158 (68.4%)	
Pain relief methods in labour (for mothers who experienced labour), n (%)			**0.002**
One method applied	125 (53.0%)	91 (48.7%)	
Two methods applied	97 (23.8%)	51 (27.3%)	
Three methods applied	27 (11.4%)	45 (24.1%)	
Mode of birth, n (%)			0.466
Non-instrumental vaginal birth	282 (69.1%)	203 (67.4%)	
Instrumental vaginal birth	23 (5.6%)	24 (8.0%)	
Caesarean section	103 (25.3%)	74 (24.6%)	
Labour complications, n (%)			0.153
None recorded	194 (47.7%)	156 (52.7%)	
One recorded	173 (42.5%)	104 (35.1%)	
Two or more recorded	40 (9.7%)	34 (12.2%)	
Neonatal outcomes, n (%) unless otherwise stated			
Preterm birth (< 37 weeks)	84 (20.6%)	56 (18.5%)	0.498
Mean birth weight in grams (±SD)	2954 (±659)	3110 (±727)	0.1246
Low-birthweight rate	74 (18.1%)	51 (17.0%)	0.695
Apgar score <7 at 5 minutes	40 (9.9%)	19 (6.4%)	0.105
Admitted to SCN	115 (29.6%)	101 (33.7%)	0.259
Average LOS in SCN in days (±SD)	17.8 (±22.1)	11.7 (±13.9)	**0.0214**
Maternal complications during postnatal period, n (%)			**0.588**
None recorded	211 (51.8%)	170 (56.3%)	
One recorded	136 (33.4%)	95 (31.5%)	
Two recorded	45 (11.1%)	31 (10.3%)	
Three or more recorded	15 (3.2%)	6 (2.0%)	
Postnatal outcomes for mothers, mean (±SD)			
Average LOS for mothers after birth in days (±SD)	4.6 (±3.1)	4.8 (±5.3)	0.5613
Postnatal visits in town	0.6 (±0.496)	2.7 (±2.6)	**0.000**
Postnatal contacts with remote health centre within 6 weeks of birth	0.7 (±1.3)	0.7 (±0.7)	0.699
Mother hospitalisation within 6 weeks of birth, n (%)	45 (11.3%)	16 (5.3%)	**0.004**
Postnatal outcomes for infants, mean (±SD)			
One hospitalisation within 28 days of birth	12 (2.9%)	14 (4.6%)	0.235
Two hospitalisations within 28 days of birth	0 (0%)	3 (1.0%)	**0.044**
Average LOS for infants hospitalisation within 28 days of birth in days (±SD)	8 (±4.78)	5 (±3.75)	**0.048**
Infant re-hospitalisation within 28 days of birth after SCN admission	4 (3.5%)	4 (3.9%)	0.863

Note: LOS=length of hospital stay; RDH=Royal Darwin Hospital; SCN=Special Care Nursery; SD=standard deviation; <5=case counts were less than five and are not reported; Statistical significance of $p<0.05$ is indicated in boldface.

pain relief methods ($p=0.002$). There were no statistically significant changes between the two cohorts in mode of birth, preterm birth rate or low birth weight (Table 3). MGP women experienced less labour complications but again this was not statistically significant ($p=0.153$, see Table 3). Average birth weight and the percentage of infants with an Apgar score less than 7 at 5 minutes were similar between the two cohorts. About half of the women in both cohorts experienced postnatal maternal complications and there was no difference between the two cohorts (56.3% versus 51.8%, $p=0.588$). Both MGP and baseline infants had a high percentage of SCN admissions rates (33.7% versus 29.6%, $p=0.259$), without significant difference between the two cohorts. Infants born to mothers who were clients of the MGP had a significantly shorter LOS for each SCN admission (11.7 days), compared to the infants born to baseline mothers (17.8 days). For both cohorts, four infants who were admitted to SCN were re-hospitalised within 28 days of birth and the difference was not statistically significant ($p=0.863$).

After discharge from hospital, MGP women had significantly more postnatal visits than baseline mothers. The MGP women had an average 2.7 postnatal visits and the baseline cohort women only had 0.6 visits, which was significantly different ($p<0.001$). However, both groups received similar postnatal contacts with remote health centres within 6 weeks of birth (0.7 versus 0.7, $p=0.699$).

More infants from the MGP cohort were readmitted within 28 days, although this difference was not statistically significant for infants re-hospitalised once (4.6% versus 2.9%; $p=0.235$) and the significant difference in infants re-hospitalised twice rests on small numbers (3 versus 0). The length of stay for infant hospital readmission within the 28 days of birth was significantly reduced from 8 days to 5 days in the baseline and MGP cohorts respectively ($p=0.048$).

Costs

In 2010/2011, the total costs for the Darwin MGP service were $1,543,524, consisting of operational costs ($230,000) and personnel costs ($1,313,524). The personnel costs covered six midwives (6.0 FTE), one co-ordinator (1.0 FTE), two Aboriginal Health Workers (1.7 FTE), one Senior Woman (1.0 FTE), one administration officer and two midwifery holiday relievers (0.5 FTE). An MGP midwife received an annualised salary that entitled them to seven weeks annual leave, three weeks sick leave, 13 paid days off, and 2.4 weeks public holidays a year. On average, the midwives worked 44 hours per week. The costs for providing one hour of care by a MGP midwife, AHW and Senior Woman are $108.5, $51.6 and $25.0 respectively.

Table 4 indicates that on average each MGP mother–infant episode saved the Department $703 when compared to the baseline cohort, though this saving was not statistically significant ($p=0.566$). The breakdown of care showed that the MGP model significantly reduced birthing costs (−$411, $p=0.049$) and SCN costs (−$1767, $p=0.144$) but increased costs of antenatal care ($272, $p<0.001$), postnatal care in town ($277, $p<0.001$), infant readmission costs ($476, $p=0.05$) and travel ($115, $p=0.011$). In a further breakdown of birth costs by severity of care (Table 5), MGP women experienced less catastrophic outcomes associated with vaginal birth than women in the baseline cohort ($p<0.001$) but there was no difference with caesarean birth ($p=0.757$).

Discussion

When performing an evaluation of service change such as the introduction of MGP, it is important to include an economic evaluation alongside the evaluation of clinical outcomes. This study found that women in the MGP received significantly more antenatal and postnatal care in town. The Darwin MGP did not significantly affect mode of delivery, rate of admission to SCN or low-birthweight rate. These findings are consistent with the Cochrane review of MGP care versus other models of care on childbearing (Hatem et al., 2008). Inconsistent with the findings of the Cochrane review, however, is that, the Darwin MGP did not reduce instrumental vaginal delivery, episiotomy rate and did not improve spontaneous vaginal birth rates (Hatem et al., 2008).

Due to the resource and geographical limitations, the Darwin MGP did not provide continuity of care to the women until they were transferred to Darwin at around 38 weeks gestation, unless they had required antenatal review in Darwin prior to this for a health problem. This may limit the impact of the service on many health outcomes. There may also be true differences in outcomes reported in this study that are masked by the variation in cost and outcome data in our study, which is confined to the relatively small sample sizes of the population of pregnant women in NT remote communities. In our study women did not self-select the MGP service, rather all Aboriginal women (all risk) from the designated communities were eligible. This reduced the selection bias and improved the internal validity of the study.

Economic studies to date have used different evaluation methods from varying perspectives and report a cost-saving effect of the MGP compared to standard care with the major savings found in antenatal and intrapartum care costs (Young et al., 1997; Homer et al., 2001; Toohill et al., 2011; Bernitz et al., 2012). These studies found that women in MGP models need fewer antenatal visits compared to standard hospital care, which led to antenatal cost-

Table 4
Comparison of differences in average cost of each maternity episode per mother–infant episode baseline and MGP cohorts.

Costs	Baseline ($n=408$) mean ($\pm$SD)	MGP ($n=302$) mean ($\pm$SD)	Mean difference (95% CI)	*p*-Value
Antenatal care costs	$842 ($\pm$$424)	$1114 ($\pm$$488)	$272 ($203, $340)	0.000
Antenatal admission costs	$813 ($\pm$$1573)	$932 ($\pm$$1991)	$119 (−$144, $381)	0.376
Births costs	$5948* ($\pm$$2933)	$5537# ($\pm$$2474)	−$411 (−$820, −$1.74)	0.049
SCN costs	$5303 ($\pm$$2050)	$3535 ($\pm$$11,424)	−$1767 (−$4141, $106)	0.144
Postnatal visits costs in hospital by MGP team	n.a.	$287 ($\pm$$279)	n.a.	n.a.
Postnatal care costs in town	$15 ($\pm$$13)	$292 ($\pm$$286)	$277 ($245, $310)	0.000
Postnatal care costs in communities	$30 ($\pm$$57)	$29 ($\pm$$30)	−$1 (−$8, $5)	0.699
Postnatal admission costs	$89 ($\pm$$475)	$110 ($\pm$$559)	$21 ($−56, $96)	0.600
Infant readmission costs within 28 days of births	$356 ($\pm$$2305)	$832 ($\pm$$3725)	$476 ($−0.7, $953)	0.050
Transport costs	$657 ($\pm$$456)	$772 ($\pm$$679)	$115 ($26, $204)	0.011
Average total costs per mother–infant episode	$13,658* ($\pm$$20,283)	$12,955† ($\pm$$11,215)	−$703 (−$3108, $1702)	0.566

Note: CI=confidence interval; MGP=Midwifery Group Practice; SCN=Special Care Nursery; SD=standard deviation; n.a.=not applicable.

* $n=386$.

† $n=290$.

Table 5
ARDRG for birthing in baseline and MGP cohort.

DRG code	DRG short description	Baseline (n=366)	MGP (n=273)	Difference	χ^2 comparison of severity by type of birth
O01	**Caesarean delivery (total)**	**102 (27.9%)**	**74 (27.1%)**		Complicated/Severe (O01A+O01B) versus Uncomplicated (O01C): Pearson χ^2 (df 1)=0.0956 p=0.757
O01A	Caesarean delivery with a catastrophic complication/ comorbidity	14 (3.8%)	<5	..	
O01B	Caesarean delivery with a severe complication/comorbidity	25 (6.8%)	29 (10.6%)	+3.8%	
O01C	Caesarean delivery without a catastrophic or severe complication/comorbidity	63 (17.2%)	44 (16.1%)	−1.1%	
O02	**Vaginal delivery with operating room procedure (total)**	**<5**	**0**		Complicated/Severe (O02A, O02B, O60A) versus
O02A	Vaginal delivery with operating room procedure with catastrophic or severe complication/comorbidity	<5	0	..	Uncomplicated (O60B+O60C): Pearson χ^2 (df 1)=12.8294 p=0.000
O02B	Vaginal delivery with operating room procedure without catastrophic or severe complication/comorbidity	<5	0	..	
O06	**Vaginal delivery (total)**	**262 (71.6%)**	**199 (72.9%)**		
O60A	Vaginal delivery with catastrophic or severe complication/ comorbidity	37 (10.1%)	9 (3.3%)	−6.8%	
O60B	Vaginal delivery without catastrophic or severe complication/ comorbidity	93 (25.4%)	71 (26.0%)	+0.6%	
O60C	Vaginal delivery single uncomplicated without other condition	132 (36.1%)	119 (43.6%)	+7.5%	

Note: DRG=Diagnostic Related Groups; MGP=Midwifery Group Practice; <5: case counts were less than five and are not reported.

savings. These results differ from the study reported here, where women in the MGP model cost more in the antenatal period due to increased contact with health services. This difference reflects the increased time taken for an antenatal visit with MGP (one hour) compared to care provided in local health centres in remote communities (25 minutes). MGP women had more antenatal visits in town but less in community than those of the baseline cohort. Women in the MGP cohort received more antenatal screening tests, had more ultrasounds, and more had either pre-existing medical conditions or pregnancy complications (which may be because of increased diagnosis rather than increased prevalence).

The most significant cost savings in Darwin MGP were due to savings in intrapartum costs, which is consistent with the findings from other studies in Australia (Rowley et al., 1995; Homer et al., 2001; Toohill et al., 2011), UK (Young et al., 1997) and Norway (Bernitz et al., 2012). The intrapartum savings were due to the MGP women experiencing fewer complications than women in the baseline cohort. The fact that the Darwin MGP model, contrary to findings elsewhere, did not reduce average length of stay was likely due to limited access to alternatives such as hostel accommodation for women in Darwin post partum therefore increasing their stay in hospital, combined with the extraordinary air transport policy of one airline which regulated that 'infants less than two days would not be accepted for carriage and infants less than seven days old would not be carried unless extenuating circumstances existed' (Air North, 2012).

On average the MGP cohort reduced neonatal costs by $1767. Though a higher percentage of infants in the MGP cohort were admitted to the SCN, these admissions were shorter and less costly than for the baseline cohort. This is consistent with the results of Cochrane reviews that infants under MGP service have a shorter length of stay (Hatem et al., 2008). Our data suggest that the provision of case management and support from the MGP team, and their advocacy to assist women progress through the system in a timely manner, contributed to this reduction in length of stay. Infants were more likely to be discharged to the hostel to stay with their mother who was visited daily by MGP midwives after discharge from hospital.

The establishment of the MGP was associated with higher infant readmission costs, as readmission rates were higher but with a reduced length of stay. The low numbers involved in infant readmissions limits the conclusions that can be drawn here; additional research is currently being undertaken to further explore SCN admissions and readmissions.

Study limitations

The study is limited by the small sample size, before–after study design and missing data. Our evaluation was confined to the relatively small population size of pregnant women in remote NT communities, which prohibited sufficient statistical power to detect clinically meaningful changes in many outcomes. We have therefore considered findings in terms of both the size of suggested effects as well as statistical significance.

The study design was dictated by the nature of this evaluation; the before–after design means that results shown here may be due to the change from standard care to MGP between cohorts, or to some broader time trend, or to a combination of these effects. Time trends are the most likely explanation of the increase in maternal age between cohorts. Time trends may also at least partly explain the reduction in infant length of hospital stay (in SCN admissions and infant readmissions) and, if so, the suggested cost savings associated with MGP would be reduced.

There were a small number of missing records in both cohorts. Although 51% of all cases had some form of missing data, the highest level of missing data for any one variable was below 25%. The study did not delete patients with missing data as estimates based on complete cases will be biased and precision of estimate will be lower due to a smaller sample size. Rather, we made reasonable assumptions based on our observational data (Bar-Zeev et al., in press) and after consulting with clinicians. The exclusion of certain cost items may be a more relevant concern. Due to the resource and time limit, we could not track the women's hostel costs while they were in Darwin, which would cause underestimate of the costs for the whole mother–baby episode. From our experiences, however, the hostel bed usage pattern is similar between the two cohorts therefore it will not make much

difference to the final findings. The perspective of our study also meant that we excluded women's out-of-pocket costs.

Conclusion

This evaluation demonstrated that, in less than two years of operation, the Darwin MGP most likely cost less than the previous service, though this was not statistically significant. Several of the clinical outcomes showed important differences, for example reduced catastrophic events intrapartum, length of stay in the SCN and the length of stay following hospital admission for infants less than 28 days old. Given that improvements have occurred overall in the quality of care (not reported in this paper but elsewhere); the maternal and infant health data; the increased Aboriginal employment in maternity services, and that women are increasingly accessing the service and reporting positive experiences (Josif et al., submitted for publication), the results demonstrate that improved outcomes can be achieved at no increased cost. The redesign of maternity care for remote dwelling Aboriginal women from the top end of the NT has the potential to improve the health of women and their babies at no extra cost to the system. This type of service should be rolled out to all women from remote areas who have to relocate for birth. However, due to the resource and time limitations, many cost items were beyond our ability to collect (such as family's out-of-pocket costs, hostel costs, and transport costs which were often very significant costs for both the family and the Department). We suggest a more comprehensive economic cost analysis could be conducted in any future evaluation of the service.

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Midwife-led versus other models of care for childbearing women (Review)

Hatem M, Sandall J, Devane D, Soltani H, Gates S

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[Intervention Review]

Midwife-led versus other models of care for childbearing women

Marie Hatem[1], Jane Sandall[2], Declan Devane[3], Hora Soltani[4], Simon Gates[5]

[1]Département de médecine sociale et préventive, Université de Montréal, Montréal, Canada. [2]Health and Social Care Research Division, King's College, London, UK. [3]School of Nursing and Midwifery, National University of Ireland Galway, Galway, Ireland. [4]Faculty of Health and Wellbeing, Sheffield Hallam University, Sheffield, UK. [5]Warwick Clinical Trials Unit, Warwick Medical School, University of Warwick, Coventry, UK

Contact address: Jane Sandall, Health and Social Care Research Division, King's College, Waterloo Bridge Wing, 150 Stamford Street, London, SE1 9NH, UK. jane.sandall@kcl.ac.uk.

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ABSTRACT

Background

Midwives are primary providers of care for childbearing women around the world. However, there is a lack of synthesised information to establish whether there are differences in morbidity and mortality, effectiveness and psychosocial outcomes between midwife-led and other models of care.

Objectives

To compare midwife-led models of care with other models of care for childbearing women and their infants.

Search methods

We searched the Cochrane Pregnancy and Childbirth Group's Trials Register (January 2008), Cochrane Effective Practice and Organisation of Care Group's Trials Register (January 2008), Current Contents (1994 to January 2008), CINAHL (1982 to August 2006), Web of Science, BIOSIS Previews, ISI Proceedings, (1990 to 2008), and the WHO Reproductive Health Library, No. 9.

Selection criteria

All published and unpublished trials in which pregnant women are randomly allocated to midwife-led or other models of care during pregnancy, and where care is provided during the ante and intrapartum period in the midwife-led model.

Data collection and analysis

All authors evaluated methodological quality. Two authors checked data extraction.

Main results

We included 11 trials (12,276 women). Women who had midwife-led models of care were less likely to experience antenatal hospitalisation, risk ratio (RR) 0.90, 95% confidence interval (CI) 0.81 to 0.99), regional analgesia (RR 0.81, 95% CI 0.73 to 0.91), episiotomy (RR 0.82, 95% CI 0.77 to 0.88), and instrumental delivery (RR 0.86, 95% CI 0.78 to 0.96), and were more likely to experience no intrapartum analgesia/anaesthesia (RR 1.16, 95% CI 1.05 to 1.29), spontaneous vaginal birth (RR 1.04, 95% CI 1.02 to 1.06), feeling in control during childbirth (RR 1.74, 95% CI 1.32 to 2.30), attendance at birth by a known midwife (RR 7.84, 95% CI 4.15 to 14.81) and initiate breastfeeding (RR 1.35, 95% CI 1.03 to 1.76), although there were no statistically significant differences between groups for caesarean births (RR 0.96, 95% CI 0.87 to 1.06). Women who were randomised to receive midwife-led care were less likely to experience fetal loss before 24 weeks' gestation (RR 0.79, 95% CI 0.65 to 0.97), although there were no statistically significant differences in fetal loss/neonatal death of at least 24 weeks (RR

1.01, 95% CI 0.67 to 1.53) or in fetal/neonatal death overall (RR 0.83, 95% CI 0.70 to 1.00). In addition, their babies were more likely to have a shorter length of hospital stay (mean difference -2.00, 95% CI -2.15 to -1.85).

Authors' conclusions

Most women should be offered midwife-led models of care and women should be encouraged to ask for this option although caution should be exercised in applying this advice to women with substantial medical or obstetric complications.

PLAIN LANGUAGE SUMMARY

Midwife-led versus other models of care for childbearing women

Midwife-led care confers benefits for pregnant women and their babies and is recommended.

In many parts of the world, midwives are the primary providers of care for childbearing women. Elsewhere it may be medical doctors or family physicians who have the main responsibility for care, or the responsibility may be shared. The underpinning philosophy of midwife-led care is normality, continuity of care and being cared for by a known and trusted midwife during labour. There is an emphasis on the natural ability of women to experience birth with minimum intervention. Some models of midwife-led care provide a service through a team of midwives sharing a caseload, often called 'team' midwifery. Another model is 'caseload midwifery', where the aim is to offer greater continuity of caregiver throughout the episode of care. Caseload midwifery aims to ensure that the woman receives all her care from one midwife or her/his practice partner. All models of midwife-led care are provided in a multi-disciplinary network of consultation and referral with other care providers. By contrast, medical-led models of care are where an obstetrician or family physician is primarily responsible for care. In shared-care models, responsibility is shared between different healthcare professionals.

The review of midwife-led care covered midwives providing care antenatally, during labour and postnatally. This was compared with models of medical-led care and shared care, and identified 11 trials, involving 12,276 women. Midwife-led care was associated with several benefits for mothers and babies, and had no identified adverse effects.

The main benefits were a reduction in the use of regional analgesia, with fewer episiotomies or instrumental births. Midwife-led care also increased the woman's chance of being cared for in labour by a midwife she had got to know, and the chance of feeling in control during labour, having a spontaneous vaginal birth and initiating breastfeeding. However, there was no difference in caesarean birth rates.

Women who were randomised to receive midwife-led care were less likely to lose their baby before 24 weeks' gestation, although there were no differences in the risk of losing the baby after 24 weeks, or overall. In addition, babies of women who were randomised to receive midwife-led care were more likely to have a shorter length of hospital stay.

The review concluded that most women should be offered midwife-led models of care, although caution should be exercised in applying this advice to women with substantial medical or obstetric complications.

BACKGROUND

In many parts of the world, midwives are the primary providers of care for childbearing women (Koblinsky 2006). There are, however, considerable variations in the organisation of midwifery services and in the education and role of midwives (WHO 2006). Furthermore, in some countries, e.g. in North America, medical doctors are the primary care providers for the vast majority of childbearing women, while in other countries, e.g. Australia, New Zealand, the Netherlands, the United Kingdom and Ireland, various combinations of midwife-led, medical-led, and shared care models are available, and childbearing women are often faced with different opinions as to which option might be best for them (De Vries 2001). The midwife-led model of care is based on the premise that pregnancy and birth are normal life events and is woman-centred. The midwife-led model of care includes: continuity of care; monitoring the physical, psychological, spiritual and social well-being of the woman and family throughout the childbearing cycle; providing the woman with individualised education, counselling and antenatal care; continuous attendance during labour, birth and the immediate postpartum period; ongoing support during the postnatal period; minimising technological interventions; and identifying and referring women who require obstetric or other specialist attention. Differences between midwife-led and other models of care often include variations in philosophy, focus, relationship between the care provider and the pregnant woman, use of interventions during labour, care setting (home, home-from-home or acute hospital setting, and in the goals and objectives of care (Rooks 1999). In addition, there is much debate about the clinical and cost effectiveness of the different models of maternity care (Henderson 2001) and hence continuing debate on the optimal model of care for routine antenatal, intrapartum and postnatal care for healthy pregnant women (Sibbald 2004). There is a lack of synthesised information to establish whether there are differences in morbidity and mortality, effectiveness and psychosocial outcomes between midwife-led and other models of care. This review attempts to provide this evidence.

Midwife-led models of care have generally aimed to improve continuity of care over a period of time. However, the general literature on continuity notes that a lack of clarity in definition and measurement of different types of continuity has been one of the limitations in research in this field (Haggerty 2003). Continuity has been defined by Freeman 2007 as three major types - management, informational and relationship. Management continuity involves the communication of both facts and judgements across team, institutional and professional boundaries, and between professionals and patients. Informational continuity concerns the timely availability of relevant information. Relationship continuity means a therapeutic relationship of the service user with one or more health professionals over time. Relationship/personal continuity over time has been found to have a greater effect on user experience and outcome (Saultz 2004; Saultz 2005). Some models of midwife-led care offer continuity with a group of midwives, and others offer personal or relationship continuity, and thus the models of care that are the foci of this review are defined as follows.

(1) Midwife-led models of care

Whilst it is difficult to exclusively categorise maternity models of care due to the influence of generic policies and guidelines, it is assumed that the underpinning philosophy of a midwifery model of care is on normality and the natural ability of women to experience birth with minimum or without routine intervention. Midwife-led care has been defined as care where "the midwife is the lead professional in the planning, organisation and delivery of care given to a woman from initial booking to the postnatal period" (RCOG 2001). Some antenatal and/or intrapartum and/or postpartum care may be provided in consultation with medical staff as appropriate. Within these models, midwives are, however, in partnership with the woman, the lead professional with responsibility for assessment of her needs, planning her care, referral to other professionals as appropriate, and for ensuring provision of maternity services. Thus, midwife-led models of care aim to provide care in either community or hospital settings, normally to healthy women with uncomplicated or 'low-risk' pregnancies. In some models midwives provide continuity of midwifery care to all women from a defined geographical location, acting as lead professional for women whose pregnancy and birth is uncomplicated, and continuing to provide midwifery care to women who experience medical and obstetric complications in partnership with other professionals.

Some models of midwife-led care aim to provide continuity of care to a defined group of women through a team of midwives sharing a caseload, often called 'team' midwifery. Thus, a woman will receive her care from a number of midwives in the team, the size of which can vary. Other models, often termed 'caseload midwifery', aim to offer greater relationship continuity, by ensuring that childbearing women receive their ante, intra and postnatal care from one midwife or her/his practice partner (McCourt 2006). There is continuing debate about the risks, benefits, and costs of team and caseload models of midwife-led care (Ashcroft 2003; Benjamin 2001; Green 2000; Johnson 2005; Waldenstrom 1998).

(2) Other models of care

Other models of care include:
(a) Obstetrician-provided care. This is common in North America, where obstetricians are the primary providers of antenatal care for most childbearing women. An obstetrician (not necessarily the one who provides antenatal care) is present for the birth, and nurses provide intrapartum and postnatal care.
(b) Family doctor-provided care, with referral to specialist obstetric care as needed. Obstetric nurses or midwives provide intrapartum and immediate postnatal care but not at a decision making level, and a medical doctor is present for the birth.
(c) Shared models of care, where responsibility for the organisation and delivery of care, throughout initial booking to the postnatal period, is shared between different health professionals.

At various points during pregnancy, childbirth, and the postnatal period, responsibility for care can shift to a different provider or group of providers. Care is often shared by family doctors and midwives, by obstetricians and midwives, or by providers from all three groups. In some countries (e.g. Canada and the Netherlands) the midwifery scope of practice is limited to the care of women experiencing uncomplicated pregnancies, while in other countries (e.g. United Kingdom, France, Australia and New Zealand) midwives provide care to women who experience medical and obstetric complications in collaboration with medical colleagues. In addition, maternity care in some countries (e.g. Republic of Ireland, Iran and Lebanon) is predominantly provided by a midwife but is obstetrician-led, in that the midwife might provide the actual care, but the obstetrician assumes responsibility for the care

provided to the woman throughout her pregnancy, intrapartum and postpartum periods.

Available randomised studies suggest some benefit for women intending to give birth within midwife-led models of care compared with similar risk women who intend giving birth within traditional or other models of care. Lower rates of intrapartum analgesia and augmentation of labour and increased mobility during labour experience been reported (Hodnett 2000). In addition, other study designs suggest that rates of spontaneous vaginal birth are higher, and rates of caesarean section, episiotomy, severe perineal injury and neonatal admission to special care units are lower in midwife-led models of maternity care (Fraser 2000; Saunders 2000). The evidence also suggests increased satisfaction for women who are cared for within midwife-led models of care. However, previous reviews have found a trend toward higher rates of perinatal mortality and neonatal morbidity and mortality within midwife-led home-from-home units in hospital settings. It has been suggested that this could result from either a failure to detect complications and/or initiate appropriate action and/or a failure of appropriate tertiary response (Hodnett 2005; Waldenstrom 1998). A systematic review of trials that compare midwife-led and other models of care for childbearing women would provide valuable information concerning the efficacy of such models of care. This review complements other work on models of maternity care and attributes thereof, specifically, the work of Hodnett (Hodnett 2005) and Olsen (Olsen 1998) in which the relationships between the various birth settings and pregnancy outcomes were systematically evaluated. This review also subsumes the Cochrane review, 'Continuity of caregivers during pregnancy, childbirth, and the postpartum period' (Hodnett 2000).

OBJECTIVES

The primary objective of this review is to compare midwife-led models of care with other models of care for childbearing women and their infants.
Secondary: to determine whether the effects of midwife-led care are influenced by: 1) models of midwifery care that provide differing levels of continuity; 2) varying levels of obstetrical risk and 3) practice setting (community or hospital based).

METHODS

Criteria for considering studies for this review

Types of studies

All studies in which pregnant women are randomly allocated to midwife-led models of care and other models of care during pregnancy.

Types of participants

Pregnant women classified as low and mixed risk of complications.

Types of interventions

Models of care are classified as midwife-led, other or shared care on the basis of the lead professional in the ante and intrapartum periods, as decisions and actions taken in pregnancy affect intrapartum events. In midwife-led care, the midwife is the woman's lead professional, but one or more consultations with medical staff are often part of routine practice. Other models of care include a) where the physician/obstetrician is the lead professional, and midwives and/or nurses provide intrapartum care and in-hospital postpartum care under medical supervision; b) shared care, where the lead professional changes depending on whether the woman is pregnant, in labour or has given birth, and on whether the care is given in the hospital, birth centre (free standing or integrated) or in the community setting(s); and c) where the majority of care is provided by physicians or obstetricians.

Types of outcome measures

Outcomes considered are presented within the following headings: antenatal, labour, delivery and immediate postpartum, neonatal, maternal postpartum. Fetal loss was assessed by gestation using 24 weeks as a common cut off for viability in many countries.

1. Antenatal
1.1. Mean number of antenatal visits
1.2. Antenatal hospitalisation
1.3. Antepartum haemorrhage
1.4. Fetal loss and neonatal death less than 24 weeks
1.5. Fetal loss or neonatal death more than or equal to 24 weeks
1.6 Total fetal loss and neonatal death

2. Labour
2.1. Amniotomy
2.2. Augmentation/artificial oxytocin during labour
2.3. No intrapartum analgesia/anaesthesia
2.4. Regional analgesia (epidural/spinal)
2.5. Opiate analgesia
2.6. Mean labour length
2.7. Induction of labour

3. Delivery and immediate postpartum
3.1. Caesarean birth
3.2. Attendance at birth by known carer
3.3. Instrumental vaginal birth (forceps/vacuum)
3.4. Spontaneous vaginal birth
3.5. Episiotomy
3.6. Perineal laceration requiring suturing
3.7. Intact perineum
3.8. Postpartum haemorrhage (as defined by trial authors)
3.9. Maternal death
3.10. Duration of postnatal hospital stay (days)

4. Neonatal
4.1. Low birthweight (less than 2500 gm)
4.2. Preterm birth (less than 37 weeks)
4.3. Five-minute Apgar score less than seven
4.4. Admission to special care nursery/neonatal intensive care unit
4.5. Mean length of neonatal hospital stay
4.6. Neonatal convulsions (as defined by trial authors)
4.7. Cord blood acidosis (as defined by trial authors)

5. Maternal postpartum
5.1. Postpartum depression
5.2. Breastfeeding initiation
5.3. Any breastfeeding at three months
5.4. Prolonged perineal pain (as defined by trial authors)
5.5. Pain during sexual intercourse (as defined by trial authors)
5.6. Urinary incontinence (as defined by trial authors)
5.7. Faecal incontinence (as defined by trial authors)
5.8. Prolonged backache (as defined by trial authors)
5.9 High perceptions of control during labour and childbirth

Outcomes for subgroup analyses are:
1. Fetal loss and neonatal death less than 24 weeks
2. Fetal loss or neonatal death more than or equal to 24 weeks
3. No intrapartum analgesia/anaesthesia
4. Regional analgesia (epidural/spinal)
5. Opiate analgesia
6. Caesarean birth
7. Instrumental vaginal birth (forceps/vacuum)
8. Spontaneous vaginal birth
9. Five-minute Apgar score less than seven
10. Postpartum depression

Search methods for identification of studies

Electronic searches

We searched the Cochrane Pregnancy and Childbirth Group's Trials Register by contacting the Trials Search Co-ordinator (January 2008).

The Cochrane Pregnancy and Childbirth Group's Trials Register is maintained by the Trials Search Co-ordinator and contains trials identified from:

1. quarterly searches of the Cochrane Central Register of Controlled Trials (CENTRAL);
2. weekly searches of MEDLINE;
3. handsearches of 30 journals and the proceedings of major conferences;
4. weekly current awareness alerts for a further 44 journals plus monthly BioMed Central email alerts.

Details of the search strategies for CENTRAL and MEDLINE, the list of handsearched journals and conference proceedings, and the list of journals reviewed via the current awareness service can be found in the 'Specialized Register' section within the editorial information about the Cochrane Pregnancy and Childbirth Group.

Trials identified through the searching activities described above are each assigned to a review topic (or topics). The Trials Search Co-ordinator searches the register for each review using the topic list rather than keywords.

In addition, we searched the Cochrane Effective Practice and Organisation of Care Group's Trials Register (January 2008), Current Contents (1994 to January 2008), CINAHL (1982 to August 2006), Web of Science, BIOSIS Previews, ISI Proceedings, (1990 to 2008), and the WHO Reproductive Health Library (WHO-RHL), No. 9. Through WHO-RHL we obtained unpublished studies from the System for Information on Grey Literature In Europe (SIGLE). We used the search strategy detailed in Appendix 1, modifying it for each database as appropriate by checking each thesaurus for relevant subject headings and replacing them with text-word search terms when a subject heading was not available.

We did not apply any language restrictions.

Data collection and analysis

We developed the methods of the review in consideration of the Cochrane Handbook for Systematic Reviews of Interventions (Higgins 2005).

Selection of studies

We considered all trials that compared midwife-led models of care with other models of care for childbearing women and their infants for inclusion. We assessed for inclusion all potential studies identified as a result of the search strategy. We resolved any disagreement through discussion. We obtained potentially eligible trials identified by the search strategy as full-text papers and two authors independently assessed each for inclusion. There were no studies where eligibility was hampered by requirement for translation or missing information.

Data extraction and management

We designed a form to extract data. At least two review authors extracted the data using the agreed form. We resolved discrepancies through discussion. We used the Review Manager software (RevMan 2003) to double enter all the data or a subsample. When information regarding any of the above was unclear, we attempted to contact authors of the original reports to provide further details.

Assessment of methodological quality of included studies

We assessed the validity of each study using the criteria outlined in the Cochrane Handbook for Systematic Reviews of Interventions (Higgins 2005). Methods used for generation of the randomisation sequence were described for each trial. Two review authors independently assessed the quality of each included trial using the criteria outlined in Higgins 2005. Quality assessment was based on the criteria of selection (allocation concealment).

(1) Selection bias (allocation concealment)

We assigned a quality score for each trial, using the following criteria:
(A) adequate concealment of allocation: such as telephone randomisation, consecutively-numbered, sealed opaque envelopes;
(B) unclear whether adequate concealment of allocation: such as list or table used, sealed envelopes, or study does not report any concealment approach;
(C) inadequate concealment of allocation: such as open list of random-number tables, use of case record numbers, dates of birth or days of the week.

(2) Attrition bias (loss of participants, eg withdrawals, dropouts, protocol deviations)

We assessed completeness to follow up using the following criteria:
(A) less than 5% loss of participants;
(B) 5% to 9.9% loss of participants;
(C) 10% to 19.9% loss of participants;
(D) more than 20% loss of participants.
Any outcome for a given study was excluded from analyses where loss to follow up was greater than 20%.

(3) Performance bias (blinding of participants, researchers and outcome assessment)

It was not possible to blind participants to the model of care they receive. Therefore lack of blinding was not considered as part of the quality assessment of included trials.

Measures of treatment effect

We carried out statistical analysis using the Review Manager software (RevMan 2003).

Dichotomous data

For dichotomous data, we presented results as summary risk ratio with 95% confidence intervals.

Continuous data

For continuous data, we used the mean difference if outcomes were measured in the same way between trials. We used the standardised mean difference to combine trials that measured the same outcome, but used different methods. If there was evidence of skewness according to the test suggested by Altman 1996, we have reported this.

Unit of analysis issues

Cluster-randomised trials

We included the one cluster-randomised trial in the analyses along with the other individually randomised trials. We adjusted the sample size using the methods described by Gates 2005 using an estimate of the intracluster correlation coefficient (ICC) derived from the trial. This trial estimated the ICC to be zero, so for the main analysis we used this estimate and did not adjust the sample sizes. We also conducted a sensitivity analysis, to investigate the effects of variation in the ICC. The analysis was repeated using values of 0.001 and 0.01 for the ICC.

Dealing with missing data

We analysed data on all participants with available data in the group to which they were allocated, regardless of whether or not they received the allocated intervention. If in the original reports participants were not analysed in the group to which they were randomised, and there was sufficient information in the trial report, we restored them to the correct group. Denominators were the number of women randomised minus the number of participants known to have missing data. Women with miscarriages and termination of pregnancy were included in the denominators for maternal and neonatal outcomes. This denominator was also used for perineal outcomes. Where data was available on twin births, these were added to the neonatal denominator. Where detailed denominator outcome data were available, these were used in the analysis. Any outcome for a given study was excluded from analyses where loss to follow up was greater than 20%.

Assessment of heterogeneity

We used the I^2 statistic to assess heterogeneity between the trials in each analysis. An I^2 value of 30% suggests mild heterogeneity and a value of more than 50% indicates substantial heterogeneity. High levels of heterogeneity (exceeding 50%) were explored by prespecified subgroup analysis, and a random-effects meta-analysis was used for an overall summary.

Data synthesis (meta-analysis)

We used fixed-effect meta-analysis for combining data in the absence of significant heterogeneity if trials were sufficiently similar.

Subgroup analyses

We conducted the planned subgroup analyses to investigate the effects of greater continuity in caseload models, variations in maternal risk status and of less medicalised environments provided by community settings.
(1) Variations in the model of midwife-led care (caseload versus team)
(2) Variations in maternal risk status (low-risk versus mixed-risk status)
(3) Variations in practice setting: community based (antenatal and/or intrapartum and/or postnatal care provided in the community) or hospital based (all care provided in a hospital setting).

All of these subgroup analyses investigate potential sources of heterogeneity, as differences in the type of intervention, risk profile of the population or setting may affect the treatment effects. Subgroup analyses were conducted by interaction tests as described by Deeks 2001.

Sensitivity analyses

We performed sensitivity analysis based on quality comparing high-quality trials with trials of lower quality. Given that study reports on attrition after allocation have not been found to be consistently related to bias, 'high quality' was, for the purposes of this sensitivity analysis, defined as a trial having allocation concealment classified as 'A' (adequate). We excluded studies that did not achieve an 'A' rating in the sensitivity analysis in order to assess for any substantive difference to the overall result.

RESULTS

Description of studies

See 'Characteristics of included studies' table.

Our search strategy identified 54 citations relating to 31 studies for potential inclusion. Of those, we included 11 trials involving 12,276 randomised women in total (Biro 2000; Flint 1989; Harvey 1996; Hicks 2003; Homer 2001; Kenny 1994; MacVicar 1993; North Stafford 2000; Rowley 1995; Turnbull 1996; Waldenstrom 2001) and excluded 18 studies (Berglund 1998; Berglund 2007; Chambliss 1991, Chapman 1986; Giles 1992; Heins 1990; Hildingsson 2003; Hundley 1994; James 1988; Kelly 1986; Klein 1984; Law 1999; Marks 2003; Runnerstrom 1969; Slome 1976; Stevens 1988; Tucker 1996; Waldenstrom 1997) (*see* 'Characteristics of excluded studies').

Included studies were conducted in the public health systems in Australia, Canada, New Zealand and the United Kingdom with variations in model of care, risk status of participating women and practice settings. The Zelen method was used in three trials (Flint 1989; Homer 2001; MacVicar 1993) and one trial used cluster randomisation (North Stafford 2000).

Two studies offered a caseload team model of care (North Stafford 2000; Turnbull 1996) and nine studies provided a team model of care: (Biro 2000; Flint 1989; Harvey 1996; Hicks 2003; Homer 2001; Kenny 1994; MacVicar 1993; Rowley 1995; Waldenstrom 2001). The composition and modus operandi of the teams varied among trials. Levels of continuity (measured by the percentage of women who were attended during birth by a known carer varied between 63% to 98% for midwife-led models of care to 0.3% to 21% in other models of care).

Seven studies compared a midwife-led model of care to a shared model of care (Biro 2000; Flint 1989; Hicks 2003; Homer 2001; Kenny 1994; North Stafford 2000; Rowley 1995), three studies compared a midwife-led model of care to medical-led models of care (Harvey 1996; MacVicar 1993; Turnbull 1996) and one study compared midwife-led care with various options of standard care including medical-led care and shared care (Waldenstrom 2001).

Participating women received ante-, intra- and postpartum care in 10 studies (Biro 2000; Flint 1989; Harvey 1996; Hicks 2003; Homer 2001; Kenny 1994; North Stafford 2000; Rowley 1995; Turnbull 1996; Waldenstrom 2001) and antenatal and intrapartum care in one study (MacVicar 1993).

Some midwife-led models included routine visits to the obstetrician or family physicians (GPs), or both. The frequency of such visits varied. Such visits were dependent on women's risk status during pregnancy (Biro 2000); routine for all women (one to three visits) (Flint 1989; Harvey 1996; Kenny 1994; MacVicar 1993; Rowley 1995; Waldenstrom 2001) or determined based on the development of complications (Hicks 2003; Turnbull 1996).

Women were classified as being at low risk of complications in six studies (Flint 1989; Harvey 1996; Hicks 2003; MacVicar 1993; Turnbull 1996; Waldenstrom 2001) and as 'low and high' and 'high' in five studies (Biro 2000; Homer 2001; Kenny 1994; North Stafford 2000; Rowley 1995).

The midwifery models of care were hospital-based in four studies (Biro 2000; MacVicar 1993; Rowley 1995; Waldenstrom 2001) or offered (i) antenatal services in an outreach community-based clinic and intra- and postpartum care in hospital (Homer 2001); (ii) ante- and postpartum community-based care with intrapartum hospital-based care (Hicks 2003; North Stafford 2000; Turnbull 1996) or (iii) postnatal care in the community with hospital-based ante- and intrapartum care (Flint 1989; Harvey 1996; Kenny 1994). Three studies offered intrapartum care in homelike settings, either to all women in the trial (Waldenstrom 2001), or to women receiving midwife-led only (MacVicar 1993; Turnbull 1996).

Risk of bias in included studies

Allocation concealment

Six studies reported genuine random methods of generation of the randomisation sequence (Biro 2000; Homer 2001; Harvey 1996; Kenny 1994; Rowley 1995; Turnbull 1996). Four gave no information (Flint 1989; MacVicar 1993; North Stafford 2000; Waldenstrom 2001) and one used a questionable method (shuffling; Hicks 2003). Allocation concealment was graded A for eight studies (Biro 2000; Harvey 1996, Hicks 2003; Homer 2001; Kenny 1994; MacVicar 1993; Turnbull 1996; Waldenstrom 2001). Two studies were graded B; Rowley 1995 gave no information about the process of random allocation, and Flint 1989 used sealed opaque envelopes but did not specify any numbering. The North Stafford 2000 trial was a cluster randomised trial, whereby allocation concealment was not possible and graded C.

Losses and exclusions

For some studies it was possible to include more women in the review's analyses than were included by the published papers, as there was sufficient information to allow inclusion of some women inappropriately excluded. For example, four studies excluded women who had miscarriages or terminations from their published analysis (Biro 2000, Harvey 1996, Homer 2001; Waldenstrom 2001), and these have been included in the review. Generally, losses and exclusions were small to moderate, and eight studies were graded A (Biro 2000; Flint 1989; Kenny 1994; MacVicar 1993; North Stafford 2000; Rowley 1995; Turnbull 1996; Waldenstrom 2001), one B (Homer 2001) and two C (Harvey 1996; Hicks 2003). The maximum rate of losses and exclusions was 13.5% (Hicks 2003). For one study (Flint 1989) there was some uncertainty about the exact numbers that could be included in analyses because of discrepancies between two reports of the study. This was resolved by discussion among the review's authors. However, the discrepancies were very small and would not have affected the analyses appreciably. Two studies (MacVicar 1993; North Stafford 2000) gave no information on losses or exclusions, and presented results for the same number of participants as were randomised; it is therefore possible either that they included all women randomised in their analysis, or that only women for whom data were available were included in the report. One study (Rowley 1995) included all randomised women in the published analyses by assuming that women with missing data did not have outcomes. We have omitted the women with missing data from this trial in the review's analyses.

Analysis in randomised groups

Several trials claimed to have used intention-to-treat analyses but as all had some missing data, a strict intention-to-treat analysis was not in fact possible, and "available case" analysis was actually performed. No studies restricted the analysis to participants compliant with their allocation, or analysed by treatment received. One study (Harvey 1996) excluded some participants post-randomisation because they were found to be ineligible or withdrew from their allocated treatment. Two studies (MacVicar 1993; North Stafford 2000) did not report any missing data, and may therefore have presented true intention-to-treat analyses.

Compliance with allocated interventions

Compliance with the experimental interventions was generally good. Two studies did not report any data on non-compliance (Harvey 1996; North Stafford 2000), but among the remaining studies it varied from 0% (Hicks 2003) to 20% (Rowley 1995). The three studies that used the Zelen randomisation design all had low rates of non-compliance; 9% (Flint 1989), 12% (Homer 2001) and 8% (MacVicar 1993). Compliance with the comparison groups, standard care, was either not reported or was 100%. It can be reasonably assumed that it would be very rare for any woman in the standard care arm to receive the experimental intervention.

Effects of interventions

Comparison 1 (main comparison): midwife-led models of care versus other models of care for childbearing women and their infants - all trials

Women randomised to midwife-led models of care were less likely to experience:

- antenatal hospitalisation (five trials, n = 4337, risk ratio (RR) 0.90, 95% confidence interval (CI) 0.81 to 0.99), fixed effects analysis;
- fetal loss or neonatal death less than 24 weeks (eight trials, n = 9890, risk ratio (RR) 0.79, 95% confidence interval (CI) 0.65 to 0.97), fixed effects analysis;

- regional analgesia/anaesthesia (11 trials, n = 11,892, RR 0.81, 95% CI 0.73 to 0.91), random effects analysis;
- an instrumental (forceps/vacuum) birth (10 trials, n = 11,724, RR 0.86, 95% CI 0.78 to 0.96), fixed effects analysis;
- an episiotomy (11 trials, n = 11,872, RR 0.82, 95% CI 0.77 to 0.88), fixed effects analysis;

In addition, infants of women randomised to midwife-led models of care had a shorter mean length of stay in hospital (two trials, n = 259, mean difference (WMD) -2.00 days, 95% CI -2.15 to -1.85, random effects analysis) than infants of women randomised to other models of care. However, for one of the trials in this analysis (Waldenstrom 2001), there was strong evidence of skewness in this outcome and for the other (Biro 2000), the standard deviations appear implausibly small.

Women randomised to midwife-led models of care were more likely to experience:

- no intrapartum analgesia/anaesthesia (five trials, n = 7039, RR 1.16, 95% CI 1.05 to 1.29), fixed-effect analysis;
- attendance at birth by a known midwife (six trials, n = 5525, RR 7.84, 95% CI 4.15 to 14.81), random-effects analysis;
- a spontaneous vaginal birth (nine trials, n = 10,926, RR 1.04, 95% CI 1.02 to 1.06), fixed-effect analysis;
- breastfeeding initiation (one trial, n = 405, RR 1.35, 95% CI 1.03 to 1.76), random-effects analysis;
- high perceptions of control during labour (one trial, n = 471, RR 1.74, 95% CI 1.32 to 2.30), fixed effects analysis.

There were no statistically significant differences between groups for:

- antepartum haemorrhage (four trials, n = 3655, RR 0.86, 95% CI 0.63 to 1.17, fixed-effect);
- mean number antenatal visits (one trial, n = 405, WMD 1.50, 95% CI 0.96 to 2.04, fixed-effect);
- overall fetal loss and neonatal death (10 trials, n = 11,806, RR 0.83, 95% CI 0.70 to 1.00, fixed-effect);
- fetal loss or neonatal death more than or equal to 24 weeks (nine trials, n = 11,604, RR 1.01, 95% CI 0.67 to 1.53, fixed-effect);
- amniotomy (three trials, n = 1543, RR 0.88, 95% CI 0.75 to 1.04, random-effects);
- augmentation during labour (10 trials, n = 11,709, RR 0.92, 95% CI 0.81 to 1.05, random-effects);
- mean length of labour (two trials, n = 1614, WMD 0.27, 95% CI -0.18 to 0.72, random-effects);
- induction of labour (10 trials, n = 11,711, RR 0.94, 95% CI 0.83 to 1.06, random-effects);
- the use of opiate analgesia (nine trials, n=10,197, RR 0.88, 95% CI 0.78 to 1.00, random-effects);
- caesarean section rate (11 trials, n = 11897, RR 0.96, 95% CI 0.87 to 1.06, fixed-effect);
- perineal laceration requiring suturing (seven trials, n = 9349, RR 0.99, 95% CI 0.94 to 1.03, fixed-effect);
- intact perineum (eight trials, n = 9706, RR 1.05, 95% CI 0.95 to 1.16, random-effects);
- postpartum haemorrhage (seven trials, n = 8454, RR 1.02, 95% CI 0.84 to 1.23, fixed-effect);
- duration of postnatal hospital stay (days) (two trials, n = 1944, WMD -0.14, 95% CI -0.33 to 0.04, fixed-effect);
- low birthweight infant (five trials, n = 8009, RR 0.99, 95% CI 0.83 to 1.17, fixed-effect);
- preterm birth (five trials, n = 7516, RR 0.87, 95% CI 0.73 to 1.04, fixed-effect);
- five-minute Apgar score less than or equal to seven (eight trials, n = 6780, RR 1.06, 95% CI 0.79 to 1.41, fixed-effect);
- admission of infant to special care or neonatal intensive care unit(s) (10 trials, n = 11,782, RR 0.92, 95% CI 0.81 to 1.05, fixed-effect);
- neonatal convulsions (one trial, n = 1216, RR 0.33, 95% CI 0.01 to 8.03, fixed-effect);
- postpartum depression (one trial, n = 1213, RR 1.94, 95% CI 0.18 to 21.32, fixed-effect).

There was evidence of skewness in the data from one of the trials in the analyses of length of labour (Turnbull 1996) and duration of postnatal hospital stay (Waldenstrom 1997). There was substantial statistical heterogeneity in many of the analyses. The I^2 value was greater than 50% for eight outcomes (amniotomy, augmentation, regional analgesia, opiate analgesia, induction of labour, attendance at birth by known carer, intact perineum, duration of postnatal hospital stay) and greater than 30% for a further five (antenatal hospitalisation, antepartum haemorrhage, episiotomy, perineal laceration, 5-minute Apgar score less than 7).

It was not possible to analyse the following outcomes, either because data were not reported by any studies, they were reported in a way that did not allow extraction of the necessary statistics for meta-analysis, or losses and exclusions were more than 20% of the randomised participants: maternal death, cord blood acidosis, breastfeeding at three months, prolonged perineal pain, urinary incontinence, faecal incontinence, prolonged backache, pain during sexual intercourse.

The North Staffordshire trial was a cluster randomised trial and allocation concealment was not possible. North Stafford was excluded from all outcomes in the primary comparison (comparison 1) for which it had contributed data. This did not alter the findings for any outcome, which remained consistent with overall findings with all trials included.

Subgroup analyses

The following outcomes were considered in the following subgroup analyses. It is hypothesised that differential effects and outcomes are due to the levels of continuity with care provider (caseload models of care offer higher levels of personal relationship continuity), whether women are low- or mixed-risk, and provision of care in a community-based practice setting.

Comparison 2: variation in midwifery models of care (caseload or one to one versus team)

Two trials randomised 2804 women to compare a caseload model of care (defined as one midwife carrying responsibility for a defined caseload of women in partnership with a midwife partner) with other models of care (North Stafford 2000; Turnbull 1996). Caseload size was reported to be 35 to 40 women (North Stafford 2000) and 32.4 women per midwife (Turnbull 1996). Nine trials randomised 9472 women to compare team models of midwifery (defined as a group of midwives sharing responsibility for a caseload of women)

with other models of care (Biro 2000; Flint 1989; Harvey 1996; Hicks 2003; Homer 2001; Kenny 1994; MacVicar 1993; Rowley 1995; Waldenstrom 2001).

There was a statistically significant difference in the treatment effects between subgroups for 5-minute Apgar score less than 7 (interaction chi squared = 5.62, P = 0.02), and fetal loss and neonatal death at greater than or equal to 24 weeks (interaction chi squared 5.25, P = 0.02). There were no statistically significant differences between midwife-led and other models of care in any individual subgroup. The risk ratio for fetal loss or neonatal death greater than or equal to 24 weeks was 0.48 (95% CI 0.23, 1.03) in the two caseload trials and 1.44 (95% CI 0.86, 2.42) in the seven team trials. In the analysis of the proportion of neonates with 5-minute Apgar score less than 7 the risk ratio was 0.62 (95% CI 0.38, 1.02) in one caseload trial and 1.40 (95% CI 0.97, 2.01) in seven team trials. However, the significance of the analyses of individual subgroups is not a reliable guide to whether the treatment effects differ between subgroups, because non-significance may be due to a small sample size (and hence wide confidence intervals). Interaction tests provide an appropriate test of differences between the subgroups, but need to be interpreted with caution because the number of outcome events in these analyses was low, subgroup analyses are by their nature observational (not randomised), and the increase in the number of analyses performed caused by subgroup analyses may have led to some statistically significant results arising by chance. There was no evidence of any difference in treatment effects between the subgroups for any other outcome.

Comparison 3: variation in risk status (low risk versus mixed)

Six trials randomised 7228 women to compare midwife-led models of care versus other models of care in women defined to be at low risk by trial authors (Flint 1989; Harvey 1996; Hicks 2003; MacVicar 1993; Turnbull 1996; Waldenstrom 2001). Five trials randomised 5048 women to compare midwife-led models of care versus other models of care in women defined to be at mixed risk of complications by trial authors (Biro 2000; Homer 2001; Kenny 1994; North Stafford 2000; Rowley 1995). Of these, two trials excluded women who booked late - after 24 weeks' gestation (Biro 2000; Homer 2001) and 16 weeks' gestation (Kenny 1994). Two trials excluded women with a substance misuse problem (Kenny 1994; Rowley 1995) and two trials excluded women with significant medical disease/previous history of a classical or more than two caesareans (Homer 2001), or requiring admission to the maternal fetal medicine unit (Biro 2000).

Although there was a statistically significant reduction in overall fetal loss and neonatal death in the "mixed risk status" subgroup, the interaction test result did not indicate any evidence of a difference in treatment effect between this and the low-risk subgroup (interaction chi squared = 1.14, P = 0.29). There was no strong evidence of any difference in treatment effects between the subgroups for any other outcomes that could be analysed.

Comparison 4: variation in practice setting (community versus hospital)

Three trials randomised 2988 women to midwife-led care that provided antenatal care in community and hospital settings compared to other models of care (Hicks 2003; Homer 2001; North Stafford 2000). No study offered home birth. Eight trials randomised 8278 women to midwife-led care that only provided antenatal and intrapartum care in a hospital setting compared to other models of care (Biro 2000; Flint 1989; Harvey 1996; Kenny 1994; MacVicar 1993; Rowley 1995; Turnbull 1996; Waldenstrom 2001). There was evidence of a difference between the subgroups for opiate analgesia (interaction chi squared 5.51, P = 0.02) and for 5-minute Apgar score less than 7 (interaction chi squared = 5.81, P = 0.02). There was a reduction in opiate analgesia in seven hospital-based trials (RR 0.83, 95% CI 0.71, 0.96) but not in two community/hospital-based trials (RR 1.04, 95% CI 0. 83, 1.31). For 5-minute Apgar score less than 7 there appeared to be an increase in six hospital-based trials (RR 1.56, 95% CI 1.03, 2.36) but a reduction in two community-based trials (RR 0.70, 95% CI 0.46, 1.07). There was no evidence of any difference in treatment effect for any other outcomes.

The three subgroup analyses did not explain the high heterogeneity (I^2 greater than 50%) that was found for eight outcomes; of these, a subgroup difference was found only for opiate analgesia, and considerable heterogeneity remained within each subgroup in this analysis.

Maternal satisfaction

Due to the lack of consistency in conceptualisation and measurement of women's experiences and satisfaction of care, a narrative synthesis of such data is presented. Nine studies reported maternal satisfaction with various components of the childbirth experiences (Biro 2000; Flint 1989; Harvey 1996; Hicks 2003; Kenny 1994; MacVicar 1993; Rowley 1995; Turnbull 1996; Waldenstrom 2001). Given the ambiguity surrounding the concept of satisfaction, it was not surprising to find inconsistency in the instruments, scales, timing of administration and outcomes used to 'measure' satisfaction across studies. Because of such heterogeneity and as might be expected, response rates of lower than 80% for most of these studies, meta-analysis for the outcome of satisfaction was considered inappropriate and was not conducted.

Satisfaction outcomes reported in the included studies included maternal satisfaction with information, advice, explanation, venue of delivery, preparation for labour and birth, as well as giving choice for pain relief and behaviour of the carer. One study assessed perceptions of control in labour (Flint 1989) using a three-point scale. In the majority of the included studies, satisfaction in various aspects of care appeared to be higher in the midwife-led compared to the other model of care. For convenience and ease of understanding, tabulated results of the overall satisfaction or indicators which directly relate to staff attitude, or both, are presented in Table 1.

Sensitivity analyses

Assuming values for the ICC of 0.01 or 0.001 for the one cluster-randomised trial (North Stafford 2000) made very little difference to the overall effect estimates, and for no outcome were the conclusions changed. Similarly, a sensitivity analysis including only the studies rated A for allocation concealment found that there were only minor differences from the overall analyses; two outcomes (no intrapartum analgesia and antenatal hospitalisation) that had statistically significant results in the overall analysis were non-significant in the sensitivity analysis because of the wider confidence intervals when some trials were omitted. However, the point estimates were similar to those of the overall analysis: for no intrapartum analgesia RR 1.07 (0.93, 1.22) compared with 1.16

(1.05, 1.29), and for antenatal hospitalisation RR 0.95 (0.83, 1.09) compared with 0.90 (0.81, 0.99).

Economic analysis

Findings from economic analyses will vary depending on the structure of health care in a given country, and what factors are included in the modelling. Due to the lack of consistency in measurement of economic evaluations, a narrative synthesis of such data is presented. Five studies presented economic analysis in which various measures and items were included in the final cost estimation (Flint 1987; Homer 2001; Kenny 1994; Rowley 1995; Young 1997).

Flint 1989 examined the costs for a subgroup of women (n = 49) and estimated costs for antenatal admission and antenatal care, and found antenatal care was 20% to 25% cheaper for women in the midwife-led care group due to differences in staff costs. Women in the midwife-led care group had fewer epidurals (£19,360 versus £31,460).

Kenny 1994 examined the costs of care in detail. The average cost/client in the antenatal period was $158 midwife-led and $167 control. For high-risk women the average cost /client was $390 midwife-led and $437 control, and for low-risk women $119 midwife-led and $123 control. The average cost per woman for intrapartum care was $219 midwife-led and $220 control and for postnatal care was $745 midwife-led and $833 control. The total cost/woman was $1122 midwife-led and $1220 control.

Rowley 1995 used the Australian national cost weights for diagnostic related groups (AN-DRGs) to estimate maternity care in each study group. The average cost per delivery was higher in the standard care group ($3475) compared to the team-midwifery group ($3324). This method was limited to the acute inpatient and did not include antenatal or postnatal care cost estimations. An assessment of midwife salaries from the first antenatal visit up to and including labour and delivery care resulted in a cost of $653 for each team care woman and $688 for each routine care woman. The amount of sick leave taken by team care midwives was half that taken by standard care midwives.

Young 1997 used the "individual patient-based costing" approach, in which an assumption was made about the number of caseloads per midwife. When the assumption was based on a median caseload of 29 women per midwife, the cost of midwife managed care was not significantly different from the shared-care group in the antenatal and intrapartum periods, but it was higher in the postpartum period. The authors also used an alternative assumption including a caseload of 39 women per midwife. A lower cost in the antenatal period for the midwife-managed care was shown in comparison with the shared-care group (mean: £346 versus £384, P = 0.05), but the postnatal care cost remained higher in the former group (£444 versus £397, respectively, P < 0.01). The authors did not recalculate the cost of intrapartum care for the second assumption, and used the same estimation as for the 29 caseload per midwife (since they indicated that the main effects were in the unit costs of clinic and home visits). They reported no significant differences between the midwifery and shared-care group, in the cost of intrapartum care (£280 versus £276, P = 0.4).

Homer 2001 calculated the costs of all aspects of care from the healthcare provider's perspective, including salaries and wages; goods and services; and repair, maintenance and renewal (RMR). The associated costs for all stages of antenatal, intrapartum and postnatal care were calculated and presented as the mean cost per woman per group. The results showed a cost-saving effect in the team midwifery group compared with the standard care arm of the study (mean cost per woman: $2579 versus $3483, respectively).

In summary, five studies presented cost data using different economic evaluation methods. All studies suggest a cost-saving effect in intrapartum care. One study suggests a higher cost, and one study no differences in cost of postnatal care when midwife-led care is compared with medical-led maternity care. There is a lack of consistency in estimating maternity care cost among the available studies; however there seems to be a trend towards the cost-saving effect of midwife-led care in comparison with medical-led care.

DISCUSSION

This review summarises 11 trials involving 12,276 women that took place in four countries in a wide variety of settings and health systems. The methodological quality of the included trials based on allocation concealment was 'high quality' for nine trials and 'unclear' for two trials. Sensitivity analysis to assess for any substantive difference in the overall result made very little difference to the overall estimates and the conclusions were not changed for any outcome. All trials involved midwife-led models of care that included either team or caseload midwifery, women classified as low or mixed risk, and care provided in both community and hospital settings. All trials included licensed midwives, and none included lay or traditional midwives. The review includes trials that compared midwife-led care given both during the ante- and the intrapartum period with other models of care which included obstetricians or family physicians, or both, collaborating with nurses and midwives in a variety of organisational settings.

In the primary comparison, the results consistently show less use of some interventions for women who were randomised to receive midwife-led care compared to women randomised to receive other models of care. Specifically, women were less likely to experience antenatal hospitalisation, the use of regional analgesia, episiotomy and instrumental delivery, and more likely to experience spontaneous vaginal birth, no intrapartum analgesia/anaesthesia, feeling in control during labour and childbirth and to be attended at birth by a known midwife, although there were no differences in caesaean birth rates.

We did not examine intrapartum fetal death rates, but the babies of women who were randomised to receive midwife-led care compared to women randomised to receive other models of care were more likely to have a mean shorter length of neonatal stay. Women who were randomised to receive midwife-led care were less likely to experience fetal loss before 24 weeks' gestation, although there were no statistically significant differences in fetal loss/neonatal death of at least 24 weeks or in fetal/neonatal death overall. The subgroup analyses should be interpreted with caution, but showed a statistically significant difference in effect between caseload and team models of care, where there was a reduction in 5-minute Apgar score and fetal loss and neonatal death at greater than or equal to 24 weeks in caseload models of care.

Sub-group analysis also showed a statistically significant difference in effect between hospital and community-based models of care,

where there was a reduction in use of opiate analgesia in hospital-based models of care and a decrease for 5-minute Apgar score less than 7 in community-based models. Other findings were generally consistent in direction across subgroup analyses by level of risk, practice setting, and organisation of care.

Overall, we did not find any increased likelihood for any adverse outcome for women or their infants associated with having been randomised to a midwife-led model of care. These results were moderate in magnitude and generally consistent across all the trials.

It is possible that practice settings such as midwife-led units can be a confounding influence on outcomes of midwife-led care, and home birth was not offered in any of the trials. Three trials offered care alongside midwife-led units (MacVicar 1993; Turnbull 1996; Waldenstrom 2001), which was available to women in both arms of one trial (Waldenstrom 2001) and only women in the midwife led group in two trials (MacVicar 1993; Turnbull 1996). It would appear likely that the observed effects are due to the model of midwife-led care rather than the practice setting. The increased likelihood of spontaneous vaginal birth in women randomised to midwife-led models of care may be a function of increased mobility due to less use of a range of analgesics, a much greater likelihood of attendance at birth by a known midwife, and the philosophy of care on offer. Midwife-led care is a complex intervention, and it is impossible to unpick the relative importance of philosophy and continuity of care.

Government and hospital policies affect how midwives are 'allowed' to practice, and/or the institutional structure within which midwives practice, and would thus affect practices and outcomes by limiting the potential of midwife-led care in some settings. However, outcomes are generally consistent across different ways of organising midwife-led care. In the subgroup analysis, examining caseload and team care, there was evidence of differences of some treatment effects favouring caseload midwifery. However, the number of events in these analyses was low and caution is needed in their interpretation. This review cannot answer questions about the reasons why, but team midwifery models have been found to increase fragmentation of care and may have an influence on this trend (Ashcroft 2003). This is in contrast to models of health care which offer relationship continuity over time, which have been found to prevent clients falling through 'gaps in care' (Cook 2000). Women's experiences of care reported in the original studies include maternal satisfaction with information, advice, explanation, venue of delivery and preparation for labour and birth, as well as perceptions of choice for pain relief and evaluations of carer's behaviour. In the majority of the included studies, satisfaction with various aspects of care appears to be higher in the midwife-led compared to the other models of care.

Estimates of cost and resource use employed different economic evaluation methods. Results generally suggest a cost-saving effect in intrapartum care; one study suggests a higher cost of postnatal care when midwife-led care is compared with medical-led care. However, there is a lack of consistency in estimating maternity care cost among the available studies, and there seems to be a trend towards a cost-saving effect of midwife-led care in comparison with medical-led care.

AUTHORS' CONCLUSIONS

Implications for practice

Midwife-led care confers benefits and shows no adverse outcomes; however, due to the exclusion of women with significant maternal disease and substance abuse from some trials of women at mixed risk, caution should be exercised in applying the findings of this review to women with substantial medical or obstetric complications. Policy makers and healthcare providers should be aware that such benefits are conferred whether midwives provide antenatal care in hospital or community settings. Not all areas of the world have health systems where midwives are able to provide midwife-led models of care (De Vries 2001) and health system financing is a potential barrier to implementation. Policy makers who wish to achieve clinically important improvements in maternity care, particularly around normalising and humanising birth, should consider midwife-led models of care and consider how financing of midwife-led services can be reviewed to support this.

Implications for research

Questions remain about the best way to organise midwife-led care under varying conditions, and further comparisons of different models of midwife-led care would be helpful. Further research is needed on more recently developed midwife-led models of care that include home birth and greater levels of relationship continuity in community settings to women classified at low and high risk of complications (Haggerty 2003; Saultz 2003; Saultz 2004; Saultz 2005). One such model that should be evaluated is the community-based caseload model of midwife-led care. These models offer continuity of carer, with a named midwife working in partnership with associate midwives (usually two). They provide community-based outreach and locally accessible services, in association with other care providers as necessary, with the option of intrapartum care provided at home, in a midwife-led unit or in a hospital setting as appropriate.

All trials should provide greater description of intervention and standard models of care being assessed and how they are being delivered. Little is known about the interface between midwife-led models of care and the multi-disciplinary network of support. Although continuity of care has been identified as a core component of a model of midwife-led care, there is wide variation in the definition and measurement of continuity of care which will require greater sophisication in future studies. Future research should also assess acceptability to midwives of different models of midwife-led care that offer relational continuity. Future trials in this area would benefit from drawing on a framework for trials of complex interventions which explicitly requires theoretical modelling between processes and outcomes in the pre-trial stage, and a process evaluation of the trial (Campbell 2000).

Questions remain about why fetal loss is reduced for babies under 24 weeks' gestation in midwife-led models of care, and the impact of midwife-led models of care that improve access and continuity in relation to early antenatal care and maternal and fetal wellbeing and parenting should be explored in future research.

There remains relatively little information about the effects of midwife-led models of care on mothers' and babies' health and wellbeing in the longer postpartum period. Future research should

pay particular attention to outcomes that have been under-researched, but are causes of significant morbidity, including urinary and faecal incontinence, duration of caesarean incision pain, pain during intercourse, prolonged perineal pain and birth injury (to the baby). We will add these to the review outcomes when the review is updated as available, if not already specified in this review.

There were no trials in resource constrained countries and additional trials may be required in such settings.

Little is known about whether women feel they are part of the decision making process; sense of control; maternal self-confidence; post-traumatic stress disorder, coping after the birth. There is wide variation in the instruments used to measure women's views of and experiences of care. There is a need to develop meaningful, robust, valid and reliable methods to assess psychosocial outcomes and wellbeing in pregnant and childbearing women. All trials should include an assessment of maternal and fetal wellbeing. There is a lack of consistency in estimating maternity care cost, and further research using standard approaches of cost estimation is required which also includes cost to women and families. All trials should include economic analyses of the relative costs and benefits.

Given the heterogeneity in the choice of outcome measures routinely collected and reported in randomised evaluations of models of maternity care, a core (minimum) dataset, such as that by Devane 2007, would be useful not only within multicentre trials and for comparisons between trials, but might also be a significant step in facilitating useful meta-analyses of similar studies. In addition, future trials should include measures of optimal outcomes for mothers and babies in addition to measures of morbidity.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Biro 2000

Methods	RCT conducted 1993-95. Randomisation on presentation at antenatal clinic by midwife who telephoned records staff to select an opaque envelope containing computer allocated paper strips with the text "standard care" or "team midwife led care". Available case analysis.
Participants	Setting: public tertiary hospital, Monash Medical Centre, Melbourne, Australia. Participants included women at low and high risk of complications. Exclusion criteria: women who requested shared obstetric care, needed care in the maternal-fetal medicine unit, were > 24 weeks' gestation, did not speak English. A total of 502 were allocated to team midwifery care and 498 to standard care. Loss to follow up = 14 team care and 18 standard care. 95% women allocated to team care received team care. 83% women allocated to standard care received care from doctors only.
Interventions	Experimental: team of 7 full-time midwives who provided antenatal, intrapartum, and some postnatal care in hospital in consultation with medical staff. Doctors and team midwife jointly saw women at 12-16, 28, 36, 41 weeks. Women at high risk of complications had individual care plan. Control: various options of care including shared care between GPs in the community and hospital obstetric staff, shared care between midwives in a community health centre and hospital obstetric staff, care by hospital obstetric staff only, and less commonly, care by hospital midwives in collaboration with obstetric staff. 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.
Outcomes	Maternal: primary outcome = SVD, pain relief, mode of birth, fetal monitoring, oxytocin use, acceleration, induction, perineal status, length of hospital stay, and maternal satisfaction. Neonatal: admission to special care, birthweight, gestation, Apgar score, length of hospital stay. Maternal and fetal mortality.
Notes	Two groups similar at baseline. 80% of experimental group and 0.3% of standard group had previously met midwife attending labour.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Flint 1989

Methods	RCT conducted 1983-1985. Zelen design. After 1st visit to hospital, women who met eligibility criteria were randomised to midwife-led care or standard care using "sealed opaque envelopes". Available case analysis.
Participants	Setting: tertiary hospital and community settings, St George's Hospital, London, UK. Participants included women at low risk of complications who booked at the study hospital and were likely to receive all their antenatal care at that hospital. Exclusion criteria: under 5 feet tall, serious medical problems, previous uterine surgery, past obstetric history of > 2 miscarriages/TOP/SB/NND, Rh antibodies. A total of 503 women were allocated to team-midwifery care and 498 to standard care. 43 women declined team care and received standard care but have been analysed in team-care group. Loss to follow up = 15 team care and 19 standard care. 91% women allocated to team care received team care.
Interventions	Experimental: team of 4 midwives who provided antenatal, intrapartum and postnatal care in hospital, and postnatal care in the community for women in predefined geographic area. Obstetrician seen at 36 and 41 weeks as appropriate. Control: standard antenatal, intrapartum and postpartum care provided by assortment of midwives and obstetricians.
Outcomes	Maternal: antenatal admission, induction, oxytocin, acceleration, pain relief, mode of birth, perineal status, continuity of care, satisfaction with pain relief and control. Neonatal: admission to special care, birthweight, Apgar score. Maternal and fetal mortality. Economic analysis.
Notes	At baseline, more Asian women in control group (18% vs 10%) and more smokers in experimental group (30% vs 22%). Sub-analysis of case notes found that 98% of experimental group and 20% of standard group had previously met midwife attending labour. Data for instrumental birth discrepancy and drawn from report and not published paper.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Harvey 1996

Methods	RCT conducted 1992-1994. Eligible women responding to advertisement to join study were randomised by a series of consecutively-numbered sealed opaque envelopes containing a computer-generated random allocation. Analysed in allocated groups except for 6 post-randomisation exclusions.
Participants	Setting: range of city hospitals and community settings in Alberta, Canada. Participants included women at low risk of complications who requested and qualified for nurse-midwife led care. Women recruited by advertising. Exclusion criteria: past history of caesarean section, primigravidas < 17 or > 37, > 24 weeks' gestation at time of entry to study. A total of 109 women randomised to team-midwife led care and 109 to standard care. Loss to follow up = 8 team care and 16 standard care. The number of women allocated to team care who received team care is unknown.

Harvey 1996 *(Continued)*

Interventions	Experimental: team of 7 nurse-midwives who provided antenatal and intrapartum care in the hospital and postnatal care in the community. Obstetrician seen at booking and 36 weeks. Control: physician care (family practice or obstetrician) which women chose from a range of city hospitals following usual process.
Outcomes	Maternal: ultrasound use in pregnancy, antenatal complications, mode of birth, perineal status, pain relief, acceleration, oxytocin, length of hospital stay and satisfaction. Neonatal: admission to special care, birthweight, Apgar score. Maternal and fetal mortality.
Notes	At baseline, more women in experimental group had longer period in education (16 years vs 15.23 years). Level of continuity not reported.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Hicks 2003

Methods	RCT conducted date unknown. Eligible women booking for care were randomised by giving each woman a sealed envelope containing one of two care options. The envelopes had been shuffled previously by an individual not involved in the recruitment process, and then numbered consecutively.
Participants	Setting: tertiary hospital and community, UK. Participants included women at low risk of complications. A total of 100 women randomised to team midwife-led care and 100 to standard care. Loss to follow up = 19 team care and 8 standard. Cause of loss to follow up due to non-response to questionnaires. All women received their allocated intervention.
Interventions	Experimental: team of 8 midwives who provided antenatal, intrapartum and postnatal care 24 hours a day, 7 days a week in both hospital and community. The team was attached to a GP practice. Referral to obstetrician as necessary. Control: shared care between community and hospital midwives and GPs and obstetricians when necessary. Women delivered by hospital midwife or community midwife if under domino scheme (1 midwife provides care for a woman throughout pregnancy, accompanies her into hospital for birth and returns home with her and baby a few hours after the birth, and care in postnatal period).
Outcomes	Primary outcome = maternal satisfaction. Maternal: continuity of care, mode of birth, perineal status, epidural. Neonatal: none reported.
Notes	Two groups similar at baseline. 71% of experimental group and 14% of standard group had previously met midwife attending labour.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Homer 2001

Methods	RCT conducted between 1997-1998. Zelen method of randomisation. Consent sought after randomisation for those allocated to team-midwife care. Eligible women referred for hospital care by GPs were randomised remotely prior to first hospital visit using computer-generated random numbers and stratified by parity. Women in both groups were aware they were part of a study. Available case analysis.
Participants	Setting: public tertiary hospital and community, Sydney, Australia. Participants included women at low and high risk of complications who lived in the catchment area and planned to have baby in the delivery suite. Exclusion criteria: women more than 24 weeks' gestation at their first visit to the hospital, women with an obstetric history of 2 previous caesareans or a previous classical caesarean and medical history of significant maternal disease. A total of 640 women were allocated to team-midwife led care and 643 to standard care. Loss to follow up: 46/42 moved away. 483/550 (88%) received team-midwifery model of care. 537/539 (100%) received standard care.
Interventions	Experimental: 2 teams of 6 midwives sharing a caseload of 300 women a year/team. Provided antenatal care in outreach community-based clinics, intrapartum and postpartum hospital and community care. The obstetrician or obstetric registrar did not see women routinely, but acted as a consultant and reviewed women only as necessary. Women who developed complications during their pregnancy continued to receive care from the same group of carers. Control: standard care provided by hospital midwives and doctors in hospital-based antenatal clinic delivery suite and postnatal ward. Woman at high risk of complications were seen by obstetrician or registrar. Low-risk women were seen by midwives and shared care with GPs in a shared model of care.
Outcomes	Primary outcome: caesarean section. Maternal: antenatal complications, onset of labour, pain relief, fetal monitoring, augmentation, acceleration, mode of delivery, PPH, retained placenta, satisfaction and sense of control in childbirth. Neonatal: Apgar scores, admission to special care. Maternal and fetal mortality. Cost analysis.
Notes	2 groups similar at baseline. 63% of experimental group and 21% of standard group had previously met midwife attending labour.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Kenny 1994

Methods	RCT conducted1992-1993. Eligible women given information about the study at booking appointment and allocated a sealed numbered randomisation envelope. The number was recorded. At next appointment, women who agreed to participate were allocated group by program midwife who opened the envelope at this point. Analysis by intention to treat.
Participants	Setting: Westmead public hospital, NSW, Australia. Participants included women at low and high risk of complications who lived in the catchment area and planned to have a baby in the public hospital. Exclusion criteria: Women requiring the drug use in pregnancy service, or booked after 16 weeks gestation.

Kenny 1994 *(Continued)*

	A total of 213 women were allocated to team-midwifery care and 233 to standard care. Loss to follow up = 19 team care and 22 standard who either moved or had a miscarriage.
Interventions	Experimental: team of 6.8 WTE midwives sharing a caseload. Provided antenatal and intrapartum care in hospital and postnatal care in hospital and community. The obstetrician saw all women at first visit and 32 weeks, and after 40 weeks, and as appropriate. Team midwife was on call for out of hours care. Control: Low-risk women seen in midwives' hospital antenatal clinics, and all other women seen by medical staff. Women received intrapartum care from delivery suite midwives, and postnatal care from midwives on postnatal ward and community postnatal care.
Outcomes	Maternal: number consultations, continuity, length of stay, number home visits, antenatal admissions, Analagesia in labour, duration labour, induction, augmentation, mode of delivery, satisfaction. Neonatal: feeding method, gestation, Apgar score, admission to NICU.
Notes	2 groups similar at baseline. 96% of experimental group and 13% of standard group had previously met midwife attending labour.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

MacVicar 1993

Methods	RCT conducted between 1989-1991. Zelen method of randomisation conducted prior to assessment for eligibility at first clinic visit. Antenatal clinic clerk attached consecutively numbered sealed opaque envelope to records of 7906 women attending hospital antenatal clinic for the first time. Of these, 3510 (44%) were considered eligible for the study, and the envelopes were opened. Allocation by random sequence with 2:1 allocation in favour of team-midwife led care. Women in the standard care group not informed about the trial. No statement of losses or exclusions.
Participants	Setting: tertiary hospital and community in Leicester, UK. Participants included women at low risk of complications. Excluded from randomisation: mothers who had a previous caesarean section or difficult vaginal delivery, a complicating general medical condition, a previous stillbirth or neonatal death, or a previous small-for-gestational-age baby, multiple pregnancy, Rhesus antibodies, and a raised level of serum alpha-feto protein. A total of 2304 women were allocated to team midwifery and 1206 to standard care. 189/2304 (8%) women opted out of team-midwife care post-randomisation and were analysed by intention-to-treat analysis. 1044 (45%) women transferred to medical-led care (537 antenatally and 507 intrapartum).
Interventions	Experimental: team of 2 midwifery sisters assisted by 8 staff midwives provided hospital-based antenatal, intrapartum (in hospital-based 3 room home-from-home unit (no EFM or epidural) and hospital postnatal care only. All the staff were volunteers. Antenatal midwife-led hospital clinic with scheduled visits at 26, 36 and 41 weeks' gestation. Intervening care shared with GPs and community midwives. Referral to obstetrician as appropriate. At 41 weeks mandatory referral to consultant. Other indications for transfer were prolonged pregnancy, vaginal bleeding, failure to progress, rupture of membranes without signs of labour longer than 12 hours. Postnatal care in community provided by community midwife and GP. Control group: received shared antenatal care with GP and midwife. Intrapartum care provided by hospital staff.

MacVicar 1993 *(Continued)*

Outcomes	Maternal: antenatal hospital admission, fetal monitoring, induction, augmentation, intrapartum complications, length of labour, pain relief, perineal status, transfer rates, satisfaction. Neonatal: birthweight, Apgar score, paediatrician required. Maternal and fetal mortality.
Notes	At baseline more women in control group smoked. Women in the team-midwifery group also had access to the home-from-home unit which women in the standard-care group did not have, which could be a confounding factor. 189/2304 (8%) women refused to participate in team midwifery and had standard care. There is also substantial crossover in this trial, 537 (23%) A/N and 99 (4%) intrapartum. Level of continuity not reported.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

North Stafford 2000

Methods	RCT conducted date unknown. Cluster randomisation: 6 geographic areas chosen to represent urban/rural locations containing 3 pairs. 1 of each pair chosen at random to be experimental site and standard care site. Individual consent was not taken.
Participants	Setting: tertiary hospital and community, UK. Participants included women at low and high risk of complications booking for care in the study geographical areas. A total of 770 women were randomised to midwife-led caseload care and 735 to standard-care group. Loss to follow up: not reported. Data are only reported for those completing the study.
Interventions	Experimental: 3 geographic areas with 21 wte midwives working in 3 practices offering a caseload model of care. Each midwife was attached to 2-3 GP practices and cared for 35-40 women. Midwives worked in pairs/threesomes. Caseload midwives were existing community midwives, plus new midwives recruited from community and hospital resulting in a mix of senior and junior staff. Monthly antenatal care in the community, intrapartum and postnatal care in hospital and postnatal care in the community provided. Control: shared care in the community between GPs, community midwives and obstetricians. Each community midwife cared for 100/150 women each.
Outcomes	Primary outcome: SVD. Maternal: length of labour, mode of delivery, induction, acceleration, perineal status, epidural. Neonatal: gestation, advanced resuscitation, admission to special care, birthweight. Maternal and fetal mortality.
Notes	Two groups similar at baseline. 95% of experimental group and 7% of standard group had previously met midwife attending labour.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Rowley 1995

Methods	RCT conducted between 1991-1992. Women attending hospital antenatal clinic assessed for eligibility. Allocated by computer-generated random assignment to team midwife-led care or standard care after stratification for risk category (high/low) and parity (nulliparous or not). Available case analysis.
Participants	Setting: John Hunter hospital, Newcastle, NSW, Australia. Participants included women booked for delivery at hospital of low and high risk. Exclusion criteria: women who had chosen shared antenatal care with their GP or had a substance abuse problem. 405 women were allocated to team care and 409 to standard care. Loss to follow up: no data available on 12 team and 4 standard care. 80% women randomised to team care received it.
Interventions	Experimental: team of 6 experienced and newly graduated midwives provided antenatal care, intrapartum care, and postnatal care in hospital. Women at low risk had scheduled consultations with an obstetrician at 12-16, 36, 41 weeks and additional consultations as needed. Women at high risk had consultations with an obstetrician at a frequency determined according to their needs. Control: received antenatal care from hospital physicians and intrapartum and postnatal care from midwives and doctors working in the delivery suite, and the postnatal ward. Women were usually seen by a doctor at each visit. Control-group midwives were also a mix of experienced and newly qualified midwives.
Outcomes	Maternal: antenatal admission, antenatal class attendance, induction, acceleration, pain relief, length of labour, mode of delivery, perineal status, breastfeeding at discharge, satisfaction. Neonatal: gestation, Apgar score, admission to special care, birthweight. Maternal and fetal mortality and cost effectiveness.
Notes	2 groups similar at baseline. Level of continuity not reported.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Turnbull 1996

Methods	RCT conducted between 1993-1994. Following screening for eligibility, women randomly assigned without stratification to midwife-led caseload care or standard care. Restricted randomisation scheme (random permutated blocks of 10) by random-number tables prepared for each clinic by a clerk not involved in determining eligibility or involved in care. The research team telephoned a clerical officer in a separate office for care allocation for each woman. Available case analysis.
Participants	Setting:Glasgow Royal Maternity Hospital, UK. Participants included all women at low risk of complications who booked for antenatal care at the hospital. Exclusion criteria included women booking after 16 weeks of pregnancy, not living in catchment area, medical/obstetric complications. A total of 648 women were allocated to caseload midwifery and 651 women to the standard group. Loss to follow up: 5 team care and 16 shared care.

Turnbull 1996 *(Continued)*

Interventions	Experimental: care was provided by 20 midwives who volunteered to join the MDU. Each pregnant woman had a named midwife whom she met at her first booking visit who aimed to provide the majority of care. When the named midwife was not available, care was provided by up to 3 associate midwives. Women not seen by medical staff at booking. Antenatal care was provided at home, community-based clinics or hospital clinics. Intrapartum care was in hospital (MDU - 3 rooms with fewer monitors and homely surroundings) or main labour suite. Postnatal care was provided in designated 8-bed MDU ward and community. A medical visit was scheduled where there was a deviation from normal. Control: All women seen by medical staff at booking. Shared antenatal care with from midwives, hospital doctors and GPs/family doctors. Intrapartum care from labour ward midwife on labour suite. Postnatal care on postnatal ward and community by community midwife.
Outcomes	Maternal: mean number antenatal visits, induction, fetal monitoring, acceleration, pain relief, length of labour, mode of delivery, perineal status, antenatal and intrapartum complications, satisfaction, depression, breastfeeding at discharge, length of stay, transfer rates. Neonatal: gestation, birthweight, Apgar score, admission to special care. Maternal and fetal mortality and cost-effectiveness.
Notes	2 groups similar at baseline. Women in the intervention group had access to the MDU unit which women in the standard-care group did not have, and could be a confounding factor. Overall, women in the intervention group saw 7 fewer care providers.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Waldenstrom 2001

Methods	RCT conducted between 1996-1997. Women recruited in hospital antenatal clinic following assessment for eligibility. Research midwife in clinic telephoned clerk who opened an opaque, sealed numbered envelope which contained information about allocation to team midwife-led care or standard care. Available case analysis.
Participants	Setting: public tertiary hospital. Royal Women's Hospital, Melbourne, Australia. Participants included women at low risk of complications booking for public care. Exclusion criteria: non-English speaking women, those > 25 weeks; gestation at booking, women with high-risk criteria including previous obstetric complications, preterm delivery, IUGR, PET, previous fetal loss, significant medical disease, > 3 abortions, substance addiction, infertility > 5 years. 495 women were allocated to the team-midwife care and 505 to the standard care. Lost to follow up: 11 team care and 9 standard-care group. 93% women allocated to team care received it.
Interventions	Experimental: care was provided by team of 8 midwives who provided hospital-based antenatal, intrapartum (delivery suite or family birth centre) and some postnatal care in collaboration with medical staff. Control: standard care included different options of care being provided mostly by doctors, care mainly by midwives in collaboration with doctors (midwives clinics), birth centres and shared care between general practitioners and hospital doctors.

Waldenstrom 2001 *(Continued)*

	Antenatally 64% women shared care between GP and hospital doctors, 20% shared care between hospital midwives and hospital doctors, intrapartum care was provided by midwives and doctors or 10% women had care in the birth centre by midwives.
Outcomes	Primary outcome: satisfaction and epidural rates. Maternal: antenatal admissions, ultrasounds, mean number antenatal visits, fetal monitoring, induction, acceleration, pain relief, mode of birth, antenatal and intrapartum complications, length of labour, perineal status, postnatal wellbeing and depression 2 months after birth, satisfaction. Neonatal: admission to special care, gestation, length of stay, birthweight, Apgar score. Maternal and fetal mortality. Mortality/morbidity.
Notes	2 groups similar at baseline. 65% of experimental group and 8% of standard group had previously met midwife attending labour.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

EFM: electronic fetal monitoring
GP: general practitioner
IUGR: intrauterine growth restriction
MDU: Midwifery Development Unit
NICU: neonatal intensive care unit
PET: positron emissions tomography
PPH: postpartum haemorrhage
RCT: randomised controlled trial
SVD: spontaneous vertex delivery
vs: versus
wte: whole time equivalent

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Berglund 1998	This study was a retrospective study comparing outcomes for 2 groups of women who gave birth in 1990 and 1992.
Berglund 2007	This study compared risk assessment by physicians with midwives reporting new mothers to the doctor. It does not compare midwife-led with other models of care.
Chambliss 1991	Women admitted in labour were assigned to either midwife-led or a resident physician and antenatal care was not part of the intervention.
Chapman 1986	This study compares similar models of care occurring in 2 different birth environments rather than comparing 2 different models of care. The same group of community midwives cared for the women in both groups. Method of randomisation is not stated.
Giles 1992	The study compares 2 models of antenatal care i.e. antenatal care by midwives and obstetricians or antenatal care by midwives only. Intrapartum and postpartum care are not part of the intervention.
Heins 1990	The study presents a randomised trial of nurse-midwifery prenatal care to reduce low birthweight: intrapartum and postpartum care are not part of the intervention.

Study	Reason for exclusion
Hildingsson 2003	The aim of the study was to determine women's interest in home birth and in-hospital birth centre care in Sweden and to describe the characteristics of these women. It did not compare the models of care in these 2 settings.
Hundley 1994	The main objective was to compare care and delivery of low-risk women in a midwife-managed delivery unit with care and delivery in the consultant-led labour ward. It is not indicated if women in the birth centre group had antenatal midwifery-led care.
James 1988	This study compared a schematic approach to antenatal care only and conventional shared care.There are no data available.
Kelly 1986	Study protocol only, search strategy did not reveal any evidence that the trial was conducted and completed.
Klein 1984	The intervention involved the comparison of 2 birthing environments.
Law 1999	In this study, the randomisation took place on the admission to labour ward, thus the study compared intrapartum care only.
Marks 2003	This study aimed to compare continuity of midwifery care with standard midwifery care in reducing postnatal depression in women with a past history of depression. Thus midwife-led care is not being compared to another model of care.
Runnerstrom 1969	The primary reason for exclusion is the fact that the study did not compare a midwifery model of care to another model. The purpose of the investigation was to study the effectiveness or non-effectiveness of nurse-midwives in a supervised hospital environment. The population of the study comprised student nurse-midwives and compared their services to those of MD residents in the same unit. Moreover, there is not enough comparable data.
Slome 1976	Large loss to follow up after randomisation. A total of 66.5% in the treatment group and 63.5% in the control group were excluded or lost to the study.
Stevens 1988	The care was not midwifery-led. Both groups received shared care. One group received most of their care at a satellite clinic in their neighbourhood, which was an inner-city, socioeconomically deprived area. The other group received care at the hospital clinic. Women receiving satellite clinic care also had additional social support from link workers during pregnancy. It was a comparison of the same model of care at different settings.
Tucker 1996	The study compares a shared care model vs a medical-led model. The primary analyses are not included.
Waldenstrom 1997	This study compared birth centre care - characterised by comprehensive antenatal, intrapartum and postpartum care, on the same premises with a home-like environment and the same team of midwives - to the standard obstetric care divided into antenatal care at neighbourhood antenatal clinics, intrapartum care in hospital delivery wards, and postpartum care in hospital postpartum wards. In the standard obstetric care, a woman usually meets with the same midwife, at the antenatal clinic, throughout pregnancy. In the delivery ward she meets a new staff team, and in the hospital postpartum ward, yet another staff team. Thus, the study compares continuous midwifery-led caseload model of care to team midwifery-led care.

MD: medical doctor
vs: versus

Characteristics of ongoing studies *[ordered by study ID]*

Begley 2007

Trial name or title	An evaluation of the effectiveness of midwifery-led services in the Health Service Executive-Dublin North East: The MidU study.
Methods	
Participants	Women are eligible for trial entry if they are: 1. healthy with an absence of risk factors for complications for labour and delivery as identified in the Midwifery-led Unit (Integrated) Guidelines for Practitioners; 2. aged between 16 and 40 years of age; 3. within 24 completed weeks of pregnancy.
Interventions	The experimental group receive the experimental intervention of midwifery-led care in a midwifery-led unit while the control group receive standard care in a consultant-led unit.
Outcomes	Primary outcome measures: 1. Rate of interventions 2. Maternal satisfaction 3. Neonatal and maternal morbidity outcomes
Starting date	01/02/2005
Contact information	Prof. Cecily Begley School of Nursing and Midwifery Trinity College Dublin 24, D'Olier St Dublin 2 Ireland
Notes	www.controlled-trials.com

McLachlan 2008

Trial name or title	COSMOS: COmparing Standard Maternity care with One-to-one midwifery Support: a randomised controlled trial
Methods	Two arm, unblinded randomised controlled design, stratified by parity.
Participants	Women are eligible for trial entry if they are at low medical risk as defined by exclusion criteria provided - English-speaking: able to speak, read and write in English; - Less than 24 completed weeks gestation at recruitment; - Low-medical risk at recruitment (list below); - Singleton pregnancy.
Interventions	Caseload midwifery care compared with standard maternity care.
Outcomes	Primary outcome measures: the proportion of women having a caesarean section birth.
Starting date	
Contact information	Helen L McLachlan Mother and Child Health Research, La Trobe University, 324-328 Little Lonsdale St, Melbourne, Australia, h.mclachlan@latrobe.edu.au

McLachlan 2008 *(Continued)*

Notes	Trial registration: Australian New Zealand Clinical Trials Registry ACTRN012607000073404. McLachlan,H. et al (2008) COSMOS: COmparing Standard Maternity care with One-to-one midwifery Support: a randomised controlled trial, BMC Pregnancy and Childbirth 2008, 8:35,1-12.

Tracy 2008

Trial name or title	The M@NGO Study (Midwives at New Group practice Options): A randomised controlled trial of caseload midwifery care.
Methods	Two arm unblinded randomised controlled trial
Participants	Women at low risk (as defined by trial authors) over 18 years booking at the participating hospital at or less than 24 weeks pregnant with a single, live fetus.
Interventions	Caseload midwifery care compared with standard maternity care.
Outcomes	Primary outcome measures: caesarean section rates; instrumental birth rates;rates of admission to neonatal intensive care
Starting date	
Contact information	Sally Tracy Faculty of Nursing, Midwifery and Health, University of Technology, Sydney, sally tracy [stracy@ozemail.com.au]
Notes	NHRMC grant 510207

DATA AND ANALYSES

Comparison 1. Midwife-led versus other models of care for childbearing women and their infants

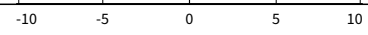
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mean number of antenatal visits	1	405	Mean Difference (IV, Fixed, 95% CI)	1.5 [0.96, 2.04]
2 Antenatal hospitalisation	5	4337	Risk Ratio (M-H, Fixed, 95% CI)	0.90 [0.81, 0.99]
3 Antepartum haemorrhage	4	3655	Risk Ratio (M-H, Fixed, 95% CI)	0.86 [0.63, 1.17]
4 Fetal loss/neonatal death before 24 weeks	8	9890	Risk Ratio (M-H, Fixed, 95% CI)	0.79 [0.65, 0.97]
5 Fetal loss/neonatal death equal to/after 24 weeks	9	11604	Risk Ratio (M-H, Fixed, 95% CI)	1.01 [0.67, 1.53]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
6 Overall fetal loss and neonatal death	10	11806	Risk Ratio (M-H, Fixed, 95% CI)	0.83 [0.70, 1.00]
7 Amniotomy	3	1543	Risk Ratio (M-H, Random, 95% CI)	0.88 [0.75, 1.04]
8 Augmentation/artificial oxytocin during labour	10	11709	Risk Ratio (M-H, Random, 95% CI)	0.92 [0.81, 1.05]
9 No intrapartum analgesia/anaesthesia	5	7039	Risk Ratio (M-H, Fixed, 95% CI)	1.16 [1.05, 1.29]
10 Regional analgesia (epidural/spinal)	11	11892	Risk Ratio (M-H, Random, 95% CI)	0.81 [0.73, 0.91]
11 Opiate analgesia	9	10197	Risk Ratio (M-H, Random, 95% CI)	0.88 [0.78, 1.00]
12 Mean labour length	2	1614	Mean Difference (IV, Random, 95% CI)	0.27 [-0.18, 0.72]
13 Induction of labour	10	11711	Risk Ratio (M-H, Random, 95% CI)	0.94 [0.83, 1.06]
14 Caesarean birth	11	11897	Risk Ratio (M-H, Fixed, 95% CI)	0.96 [0.87, 1.06]
15 Attendance at birth by known midwife	6	5225	Risk Ratio (M-H, Random, 95% CI)	7.84 [4.15, 14.81]
16 Instrumental vaginal birth (forceps/vacuum)	10	11724	Risk Ratio (M-H, Fixed, 95% CI)	0.86 [0.78, 0.96]
17 Spontaneous vaginal birth (as defined by trial authors)	9	10926	Risk Ratio (M-H, Fixed, 95% CI)	1.04 [1.02, 1.06]
18 Episiotomy	11	11872	Risk Ratio (M-H, Fixed, 95% CI)	0.82 [0.77, 0.88]
19 Perineal laceration requiring suturing	7	9349	Risk Ratio (M-H, Fixed, 95% CI)	0.99 [0.94, 1.03]
20 Intact perineum	8	9706	Risk Ratio (M-H, Random, 95% CI)	1.05 [0.95, 1.16]
21 Postpartum haemorrhage (as defined by trial authors)	7	8454	Risk Ratio (M-H, Fixed, 95% CI)	1.02 [0.84, 1.23]
22 Maternal death	0	0	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
23 Duration of postnatal hospital stay (days)	2	1944	Mean Difference (IV, Fixed, 95% CI)	-0.14 [-0.33, 0.04]
24 Low birthweight (< 2500 g)	5	8009	Risk Ratio (M-H, Fixed, 95% CI)	0.99 [0.83, 1.17]
25 Preterm birth (< 37 weeks)	5	7516	Risk Ratio (M-H, Fixed, 95% CI)	0.87 [0.73, 1.04]
26 5-minute Apgar score below or equal to 7	8	6780	Risk Ratio (M-H, Fixed, 95% CI)	1.06 [0.79, 1.41]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
27 Admission to special care nursery/neonatal intensive care unit	10	11782	Risk Ratio (M-H, Fixed, 95% CI)	0.92 [0.81, 1.05]
28 Mean length of neonatal hospital stay (days)	2	259	Mean Difference (IV, Random, 95% CI)	-2.00 [-2.15, -1.85]
29 Neonatal convulsions (as defined by trial authors)	1	1216	Risk Ratio (M-H, Fixed, 95% CI)	0.33 [0.01, 8.03]
30 Postpartum depression	1	1213	Risk Ratio (M-H, Fixed, 95% CI)	1.94 [0.18, 21.32]
31 Breastfeeding initiation	1	405	Risk Ratio (M-H, Random, 95% CI)	1.35 [1.03, 1.76]
32 High perceptions of control during labour and childbirth	1	471	Risk Ratio (M-H, Fixed, 95% CI)	1.74 [1.32, 2.30]

Analysis 1.1. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 1 Mean number of antenatal visits.

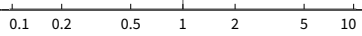
Study or subgroup	Midwife-led care		Other models of care		Mean Difference	Weight	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI		Fixed, 95% CI
Kenny 1994	194	12.5 (3.2)	211	11 (2.2)		100%	1.5[0.96,2.04]
Total ***	**194**		**211**			**100%**	**1.5[0.96,2.04]**
Heterogeneity: Not applicable							
Test for overall effect: Z=5.45(P<0.0001)							



Favours midwifery — Favours other models

Analysis 1.2. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 2 Antenatal hospitalisation.

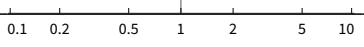
Study or subgroup	Midwife-led care	Other models of care	Risk Ratio	Weight	Risk Ratio
	n/N	n/N	M-H, Fixed, 95% CI		M-H, Fixed, 95% CI
Flint 1989	123/484	146/475		25.81%	0.83[0.67,1.01]
Homer 2001	53/594	72/601		12.53%	0.74[0.53,1.04]
Kenny 1994	29/194	38/211		6.37%	0.83[0.53,1.29]
Rowley 1995	114/393	135/405		23.28%	0.87[0.71,1.07]
Waldenstrom 2001	190/484	185/496		32%	1.05[0.9,1.23]
Total (95% CI)	**2149**	**2188**		**100%**	**0.9[0.81,0.99]**
Total events: 509 (Midwife-led care), 576 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=5.84, df=4(P=0.21); I^2=31.56%					
Test for overall effect: Z=2.08(P=0.04)					



Favours midwifery — Favours other models

Analysis 1.3. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 3 Antepartum haemorrhage.

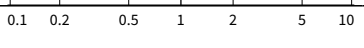
Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Harvey 1996	4/105	5/97		6.23%	0.74[0.2,2.67]
Homer 2001	9/594	14/601		16.69%	0.65[0.28,1.49]
Turnbull 1996	45/643	57/635		68.78%	0.78[0.54,1.13]
Waldenstrom 2001	14/484	7/496		8.29%	2.05[0.83,5.03]
Total (95% CI)	**1826**	**1829**		**100%**	**0.86[0.63,1.17]**
Total events: 72 (Midwife-led care), 83 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=4.34, df=3(P=0.23); I^2=30.88%					
Test for overall effect: Z=0.96(P=0.34)					



Favours midwifery — Favours other models

Analysis 1.4. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 4 Fetal loss/neonatal death before 24 weeks.

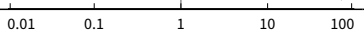
Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Biro 2000	32/500	36/493		18.03%	0.88[0.55,1.39]
Flint 1989	11/488	8/479		4.02%	1.35[0.55,3.33]
Harvey 1996	4/105	4/97		2.07%	0.92[0.24,3.59]
Homer 2001	44/597	64/608		31.54%	0.7[0.49,1.01]
MacVicar 1993	24/2304	15/1206		9.79%	0.84[0.44,1.59]
Rowley 1995	9/398	19/413		9.28%	0.49[0.23,1.07]
Turnbull 1996	20/613	24/603		12.04%	0.82[0.46,1.47]
Waldenstrom 2001	23/486	27/500		13.24%	0.88[0.51,1.51]
Total (95% CI)	**5491**	**4399**		**100%**	**0.79[0.65,0.97]**
Total events: 167 (Midwife-led care), 197 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=3.62, df=7(P=0.82); I^2=0%					
Test for overall effect: Z=2.24(P=0.03)					



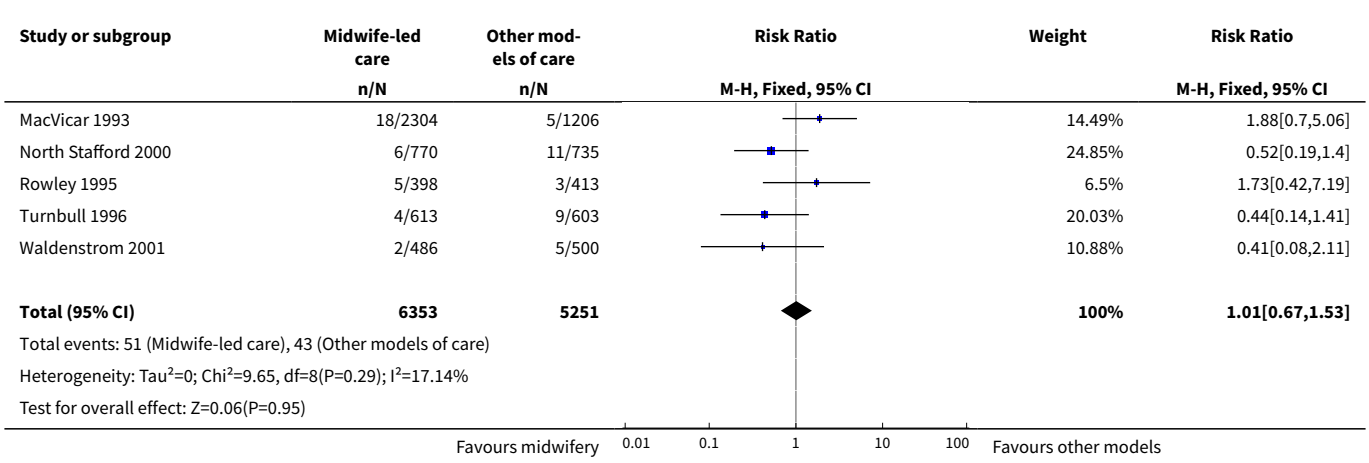
Favours midwifery — Favours other models

Analysis 1.5. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 5 Fetal loss/neonatal death equal to/after 24 weeks.

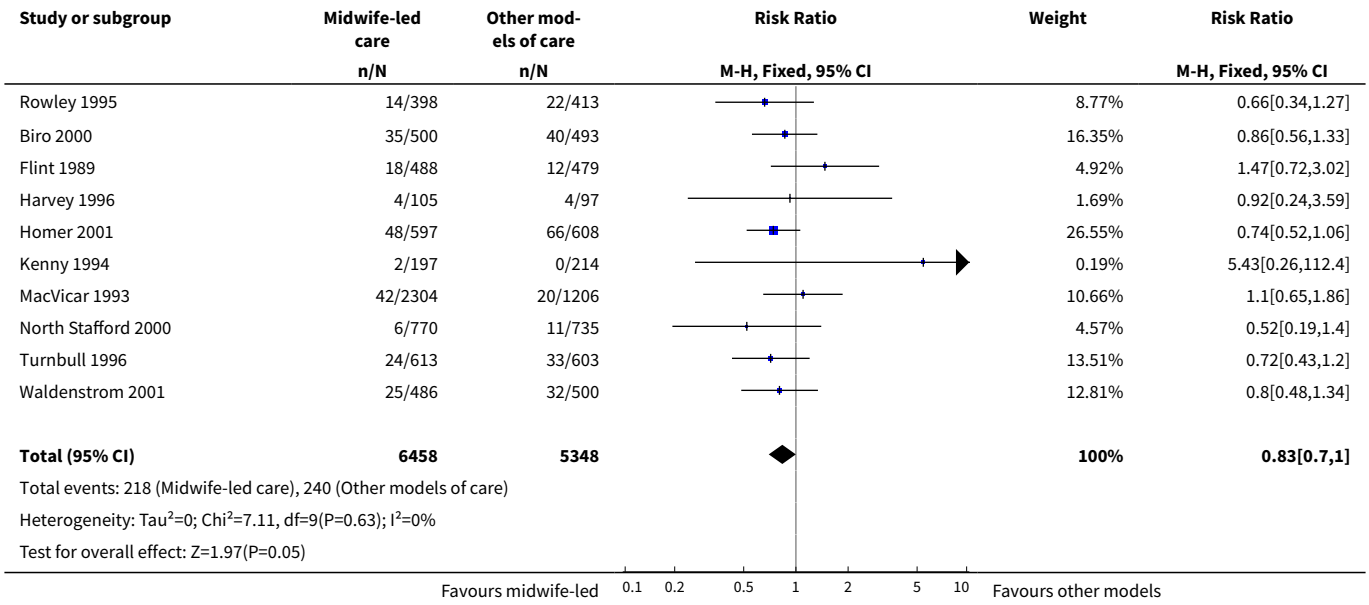
Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Biro 2000	3/500	4/493		8.89%	0.74[0.17,3.29]
Flint 1989	7/488	4/479		8.91%	1.72[0.51,5.83]
Homer 2001	4/597	2/608		4.38%	2.04[0.37,11.08]
Kenny 1994	2/197	0/214		1.06%	5.43[0.26,112.4]



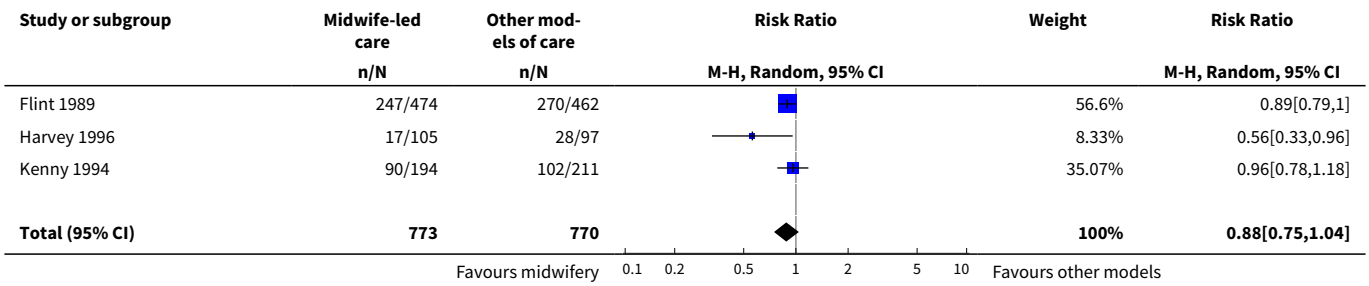
Favours midwifery — Favours other models



Analysis 1.6. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 6 Overall fetal loss and neonatal death.



Analysis 1.7. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 7 Amniotomy.



Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Total events: 354 (Midwife-led care), 400 (Other models of care)					
Heterogeneity: Tau^2=0.01; Chi^2=3.4, df=2(P=0.18); I^2=41.22%					
Test for overall effect: Z=1.53(P=0.13)					

Favours midwifery 0.1 0.2 0.5 1 2 5 10 Favours other models

Analysis 1.8. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 8 Augmentation/artificial oxytocin during labour.

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Biro 2000	109/487	139/479		10.54%	0.77[0.62,0.96]
Flint 1989	80/474	114/466		9.46%	0.69[0.53,0.89]
Harvey 1996	14/105	19/97		3.31%	0.68[0.36,1.28]
Homer 2001	227/594	200/601		12.35%	1.15[0.99,1.34]
Kenny 1994	30/194	30/211		5.12%	1.09[0.68,1.73]
MacVicar 1993	270/2304	192/1206		11.82%	0.74[0.62,0.87]
North Stafford 2000	351/770	387/735		13.58%	0.87[0.78,0.96]
Rowley 1995	118/393	104/405		10.33%	1.17[0.93,1.46]
Turnbull 1996	264/597	237/611		12.83%	1.14[1,1.3]
Waldenstrom 2001	122/484	130/496		10.65%	0.96[0.78,1.19]
Total (95% CI)	**6402**	**5307**		**100%**	**0.92[0.81,1.05]**
Total events: 1585 (Midwife-led care), 1552 (Other models of care)					
Heterogeneity: Tau^2=0.03; Chi^2=38.79, df=9(P<0.0001); I^2=76.8%					
Test for overall effect: Z=1.21(P=0.23)					

Favours midwifery 0.1 0.2 0.5 1 2 5 10 Favours other models

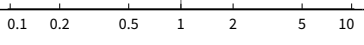
Analysis 1.9. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 9 No intrapartum analgesia/anaesthesia.

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Biro 2000	62/486	57/476		10.77%	1.07[0.76,1.49]
Flint 1989	246/479	180/473		33.87%	1.35[1.17,1.56]
Kenny 1994	53/194	62/211		11.11%	0.93[0.68,1.27]
MacVicar 1993	270/2304	127/1206		31.18%	1.11[0.91,1.36]
Turnbull 1996	76/613	69/597		13.07%	1.07[0.79,1.46]
Total (95% CI)	**4076**	**2963**		**100%**	**1.16[1.05,1.29]**
Total events: 707 (Midwife-led care), 495 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=6.81, df=4(P=0.15); I^2=41.24%					
Test for overall effect: Z=2.93(P=0)					

Favours other models 0.1 0.2 0.5 1 2 5 10 Favours midwifery

Analysis 1.10. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 10 Regional analgesia (epidural/spinal).

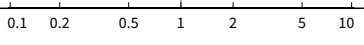
Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Biro 2000	100/486	129/476		10.26%	0.76[0.6,0.95]
Flint 1989	88/479	143/473		10.07%	0.61[0.48,0.77]
Harvey 1996	13/105	22/97		2.51%	0.55[0.29,1.02]
Hicks 2003	6/81	19/92		1.4%	0.36[0.15,0.85]
Homer 2001	157/594	172/601		12.3%	0.92[0.77,1.11]
Kenny 1994	52/194	64/211		7.36%	0.88[0.65,1.2]
MacVicar 1993	326/2304	208/1206		13.56%	0.82[0.7,0.96]
North Stafford 2000	80/770	110/735		8.66%	0.69[0.53,0.91]
Rowley 1995	69/393	73/405		7.7%	0.97[0.72,1.31]
Turnbull 1996	194/613	198/597		13.38%	0.95[0.81,1.12]
Waldenstrom 2001	158/484	178/496		12.82%	0.91[0.76,1.08]
Total (95% CI)	**6503**	**5389**		**100%**	**0.81[0.73,0.91]**
Total events: 1243 (Midwife-led care), 1316 (Other models of care)					
Heterogeneity: Tau^2=0.02; Chi^2=20.97, df=10(P=0.02); I^2=52.31%					
Test for overall effect: Z=3.79(P=0)					



Favours midwifery — Favours other models

Analysis 1.11. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 11 Opiate analgesia.

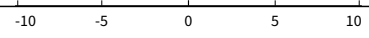
Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Biro 2000	188/486	208/476		13.61%	0.89[0.76,1.03]
Flint 1989	114/479	128/473		11.25%	0.88[0.71,1.09]
Harvey 1996	16/105	17/97		3.3%	0.87[0.47,1.62]
Homer 2001	159/594	136/601		11.92%	1.18[0.97,1.44]
Kenny 1994	45/194	40/194		6.76%	1.13[0.77,1.64]
MacVicar 1993	812/2304	477/1206		15.61%	0.89[0.82,0.97]
Rowley 1995	53/393	127/405		8.98%	0.43[0.32,0.57]
Turnbull 1996	253/613	262/597		14.32%	0.94[0.83,1.07]
Waldenstrom 2001	215/484	248/496		14.25%	0.89[0.78,1.01]
Total (95% CI)	**5652**	**4545**		**100%**	**0.88[0.78,1]**
Total events: 1855 (Midwife-led care), 1643 (Other models of care)					
Heterogeneity: Tau^2=0.02; Chi^2=34.37, df=8(P<0.0001); I^2=76.72%					
Test for overall effect: Z=1.97(P=0.05)					



Favours midwifery — Favours other models

Analysis 1.12. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 12 Mean labour length.

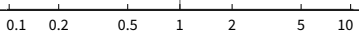
Study or subgroup	Midwife-led care		Other models of care		Mean Difference	Weight	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Random, 95% CI		Random, 95% CI
Kenny 1994	194	6.1 (3.9)	211	5.7 (4)		34.46%	0.4[-0.37,1.17]
Turnbull 1996	612	7.9 (4.9)	597	7.7 (5)		65.54%	0.2[-0.36,0.76]
Total ***	**806**		**808**			**100%**	**0.27[-0.18,0.72]**
Heterogeneity: Tau^2=0; Chi^2=0.17, df=1(P=0.68); I^2=0%							
Test for overall effect: Z=1.17(P=0.24)							



Favours midwifery — Favours other models

Analysis 1.13. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 13 Induction of labour.

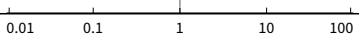
Study or subgroup	Midwife-led care	Other models of care	Risk Ratio	Weight	Risk Ratio
	n/N	n/N	M-H, Random, 95% CI		M-H, Random, 95% CI
Biro 2000	136/488	115/480		12.25%	1.16[0.94,1.44]
Flint 1989	51/474	60/466		7.44%	0.84[0.59,1.19]
Harvey 1996	8/105	14/97		1.95%	0.53[0.23,1.2]
Homer 2001	125/594	109/601		11.54%	1.16[0.92,1.46]
Kenny 1994	40/194	41/211		6.49%	1.06[0.72,1.57]
MacVicar 1993	218/2304	131/1206		12.64%	0.87[0.71,1.07]
North Stafford 2000	134/770	133/735		12.09%	0.96[0.77,1.2]
Rowley 1995	58/393	68/405		8.26%	0.88[0.64,1.21]
Turnbull 1996	146/611	199/597		13.72%	0.72[0.6,0.86]
Waldenstrom 2001	156/484	155/496		13.62%	1.03[0.86,1.24]
Total (95% CI)	**6417**	**5294**		**100%**	**0.94[0.83,1.06]**
Total events: 1072 (Midwife-led care), 1025 (Other models of care)					
Heterogeneity: Tau^2=0.02; Chi^2=20.01, df=9(P=0.02); I^2=55.01%					
Test for overall effect: Z=0.98(P=0.33)					



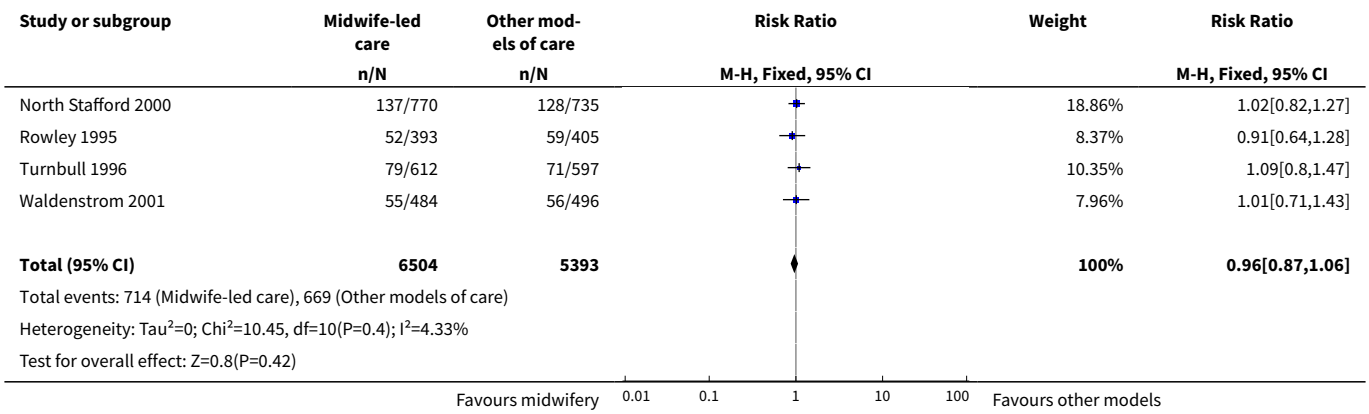
Favours midwifery — Favours other models

Analysis 1.14. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 14 Caesarean birth.

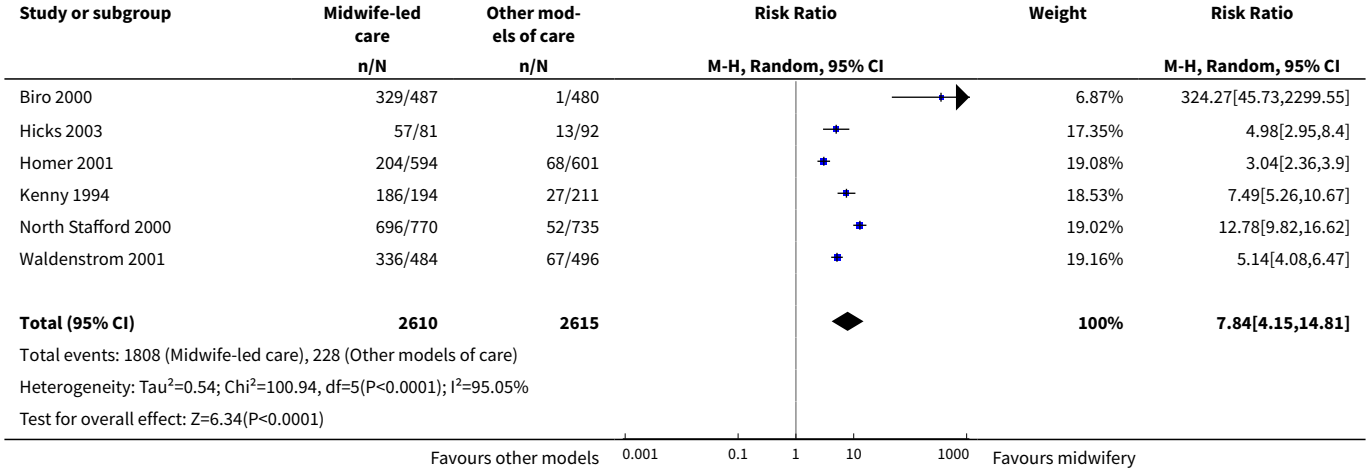
Study or subgroup	Midwife-led care	Other models of care	Risk Ratio	Weight	Risk Ratio
	n/N	n/N	M-H, Fixed, 95% CI		M-H, Fixed, 95% CI
Biro 2000	100/488	91/480		13.21%	1.08[0.84,1.39]
Flint 1989	37/479	35/473		5.07%	1.04[0.67,1.63]
Harvey 1996	4/105	14/97		2.1%	0.26[0.09,0.77]
Hicks 2003	9/81	14/92		1.89%	0.73[0.33,1.6]
Homer 2001	73/594	96/601		13.74%	0.77[0.58,1.02]
Kenny 1994	24/194	27/211		3.72%	0.97[0.58,1.62]
MacVicar 1993	144/2304	78/1206		14.74%	0.97[0.74,1.26]



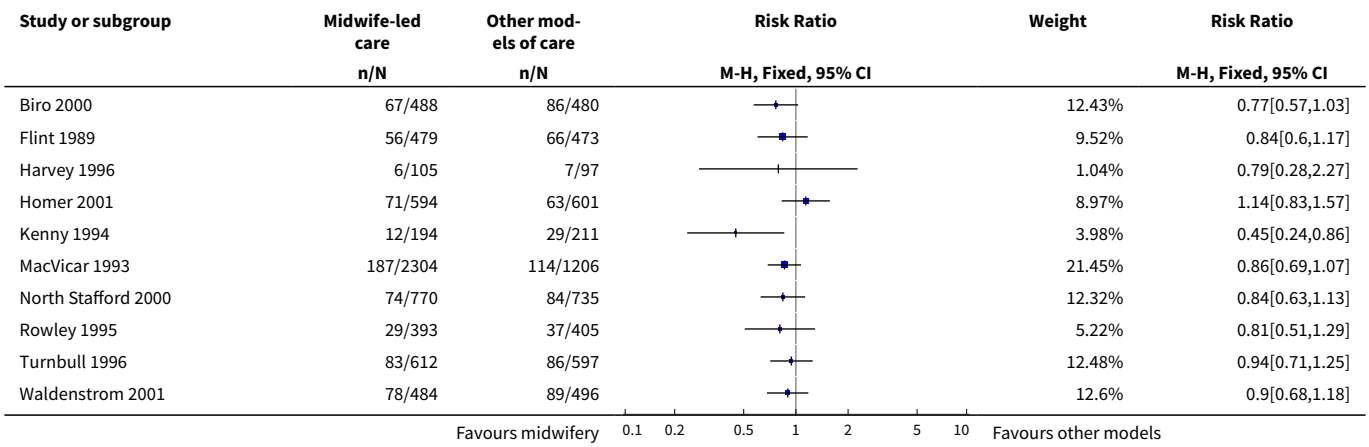
Favours midwifery — Favours other models



Analysis 1.15. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 15 Attendance at birth by known midwife.



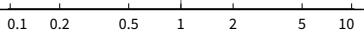
Analysis 1.16. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 16 Instrumental vaginal birth (forceps/vacuum).



Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Total (95% CI)	**6423**	**5301**		**100%**	**0.86[0.78,0.96]**
Total events: 663 (Midwife-led care), 661 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=8.09, df=9(P=0.53); I^2=0%					
Test for overall effect: Z=2.81(P=0)					

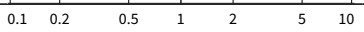
Analysis 1.17. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 17 Spontaneous vaginal birth (as defined by trial authors).

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Biro 2000	282/488	262/480		6.99%	1.06[0.95,1.18]
Flint 1989	386/479	372/473		9.91%	1.02[0.96,1.09]
Harvey 1996	89/105	71/97		1.95%	1.16[1,1.34]
Homer 2001	402/594	374/601		9.84%	1.09[1,1.18]
Kenny 1994	158/194	155/211		3.93%	1.11[1,1.23]
MacVicar 1993	1847/2304	931/1206		32.36%	1.04[1,1.08]
North Stafford 2000	542/770	509/735		13.79%	1.02[0.95,1.09]
Turnbull 1996	450/612	440/597		11.79%	1[0.93,1.07]
Waldenstrom 2001	362/484	360/496		9.42%	1.03[0.96,1.11]
Total (95% CI)	**6030**	**4896**		**100%**	**1.04[1.02,1.06]**
Total events: 4518 (Midwife-led care), 3474 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=6.9, df=8(P=0.55); I^2=0%					
Test for overall effect: Z=3.31(P=0)					

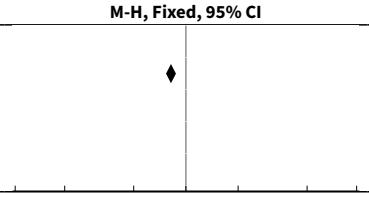


Analysis 1.18. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 18 Episiotomy.

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Biro 2000	89/488	121/479		8.39%	0.72[0.57,0.92]
Flint 1989	152/480	185/473		12.8%	0.81[0.68,0.96]
Harvey 1996	15/105	26/97		1.86%	0.53[0.3,0.94]
Hicks 2003	25/81	31/92		1.99%	0.92[0.59,1.41]
Homer 2001	63/594	66/601		4.51%	0.97[0.7,1.34]
Kenny 1994	20/194	55/211		3.62%	0.4[0.25,0.63]
MacVicar 1993	475/2304	326/1206		29.4%	0.76[0.67,0.86]
North Stafford 2000	181/770	175/735		12.3%	0.99[0.82,1.18]
Rowley 1995	46/393	56/405		3.79%	0.85[0.59,1.22]
Turnbull 1996	147/604	173/580		12.12%	0.82[0.68,0.98]
Waldenstrom 2001	134/484	136/496		9.23%	1.01[0.82,1.24]

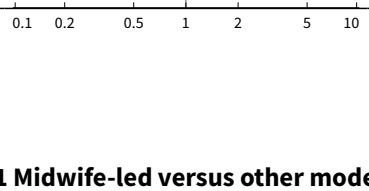


Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Total (95% CI)	**6497**	**5375**		**100%**	**0.82[0.77,0.88]**
Total events: 1347 (Midwife-led care), 1350 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=23.02, df=10(P=0.01); I^2=56.56%					
Test for overall effect: Z=5.89(P<0.0001)					



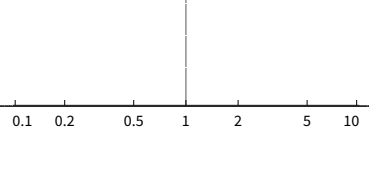
Analysis 1.19. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 19 Perineal laceration requiring suturing.

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Biro 2000	143/488	133/479		7.13%	1.06[0.86,1.29]
Kenny 1994	107/194	115/211		5.85%	1.01[0.85,1.21]
MacVicar 1993	1389/2304	743/1206		51.83%	0.98[0.93,1.03]
North Stafford 2000	197/770	180/735		9.79%	1.04[0.88,1.24]
Rowley 1995	141/393	126/405		6.59%	1.15[0.95,1.4]
Turnbull 1996	218/604	216/580		11.71%	0.97[0.83,1.13]
Waldenstrom 2001	100/484	135/496		7.09%	0.76[0.61,0.95]
Total (95% CI)	**5237**	**4112**		**100%**	**0.99[0.94,1.03]**
Total events: 2295 (Midwife-led care), 1648 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=8.66, df=6(P=0.19); I^2=30.68%					
Test for overall effect: Z=0.54(P=0.59)					

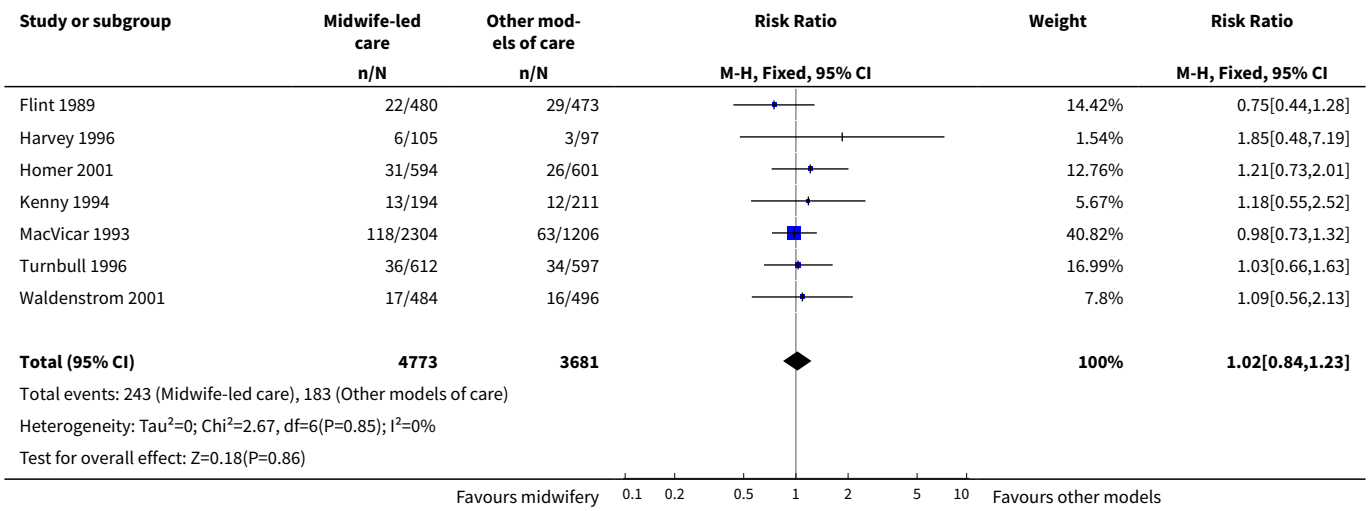


Analysis 1.20. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 20 Intact perineum.

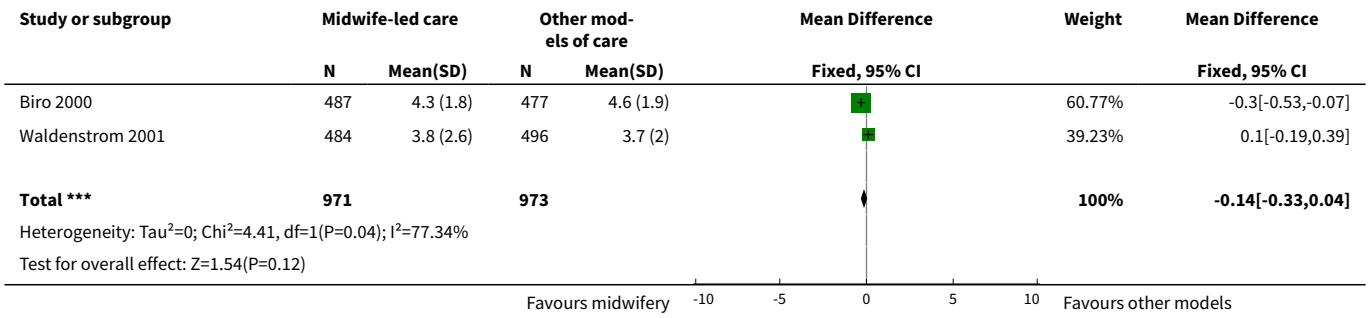
Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Biro 2000	66/488	77/479		7.43%	0.84[0.62,1.14]
Flint 1989	107/480	104/473		10.18%	1.01[0.8,1.29]
Harvey 1996	50/105	58/97		9.21%	0.8[0.61,1.03]
Kenny 1994	98/194	100/211		12.38%	1.07[0.87,1.3]
MacVicar 1993	669/2304	308/1206		18.54%	1.14[1.01,1.28]
North Stafford 2000	370/770	361/735		19.48%	0.98[0.88,1.09]
Turnbull 1996	160/604	120/580		11.87%	1.28[1.04,1.58]
Waldenstrom 2001	128/484	107/496		10.91%	1.23[0.98,1.53]
Total (95% CI)	**5429**	**4277**		**100%**	**1.05[0.95,1.16]**
Total events: 1648 (Midwife-led care), 1235 (Other models of care)					
Heterogeneity: Tau^2=0.01; Chi^2=15.69, df=7(P=0.03); I^2=55.4%					
Test for overall effect: Z=0.92(P=0.36)					



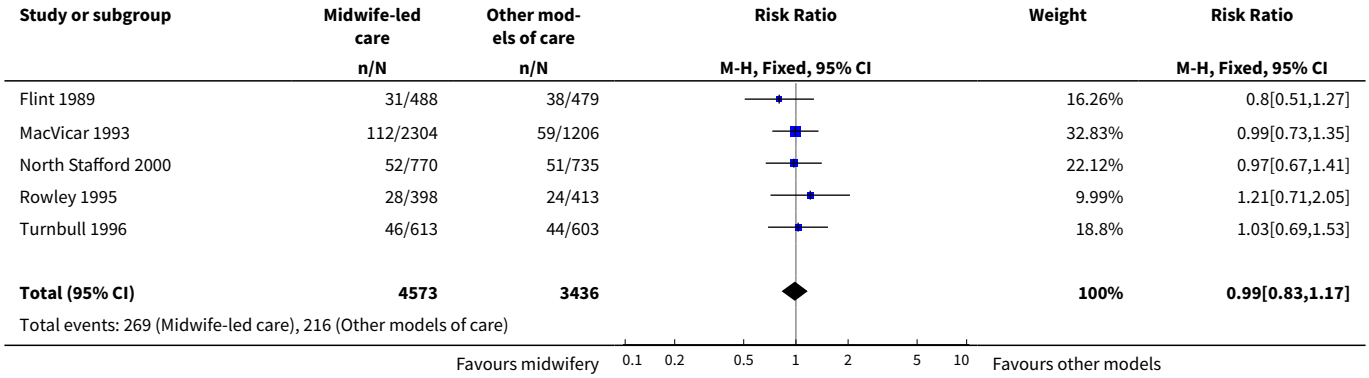
Analysis 1.21. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 21 Postpartum haemorrhage (as defined by trial authors).



Analysis 1.23. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 23 Duration of postnatal hospital stay (days).



Analysis 1.24. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 24 Low birthweight (< 2500 g).



Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Heterogeneity: Tau²=0; Chi²=1.43, df=4(P=0.84); I²=0%					
Test for overall effect: Z=0.16(P=0.87)					

Favours midwifery — Favours other models

Analysis 1.25. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 25 Preterm birth (< 37 weeks).

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Biro 2000	36/500	42/493		17.52%	0.85[0.55,1.3]
MacVicar 1993	110/2304	70/1206		38.07%	0.82[0.61,1.1]
Rowley 1995	52/398	54/413		21.96%	1[0.7,1.43]
Turnbull 1996	30/613	42/603		17.54%	0.7[0.45,1.11]
Waldenstrom 2001	16/486	12/500		4.9%	1.37[0.66,2.87]
Total (95% CI)	**4301**	**3215**		**100%**	**0.87[0.73,1.04]**
Total events: 244 (Midwife-led care), 220 (Other models of care)					
Heterogeneity: Tau²=0; Chi²=3.05, df=4(P=0.55); I²=0%					
Test for overall effect: Z=1.53(P=0.13)					

Favours midwifery — Favours other models

Analysis 1.26. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 26 5-minute Apgar score below or equal to 7.

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Biro 2000	13/500	11/493		12.71%	1.17[0.53,2.58]
Flint 1989	17/480	6/476		6.91%	2.81[1.12,7.06]
Harvey 1996	4/105	4/97		4.77%	0.92[0.24,3.59]
Homer 2001	12/597	13/608		14.77%	0.94[0.43,2.04]
Kenny 1994	7/197	1/214		1.1%	7.6[0.94,61.25]
Rowley 1995	6/398	7/413		7.88%	0.89[0.3,2.62]
Turnbull 1996	24/613	38/603		43.94%	0.62[0.38,1.02]
Waldenstrom 2001	9/486	7/500		7.91%	1.32[0.5,3.52]
Total (95% CI)	**3376**	**3404**		**100%**	**1.06[0.79,1.41]**
Total events: 92 (Midwife-led care), 87 (Other models of care)					
Heterogeneity: Tau²=0; Chi²=12.6, df=7(P=0.08); I²=44.45%					
Test for overall effect: Z=0.37(P=0.71)					

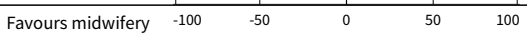
Favours midwifery — Favours other models

Analysis 1.27. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 27 Admission to special care nursery/neonatal intensive care unit.

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Biro 2000	89/492	87/481		20.22%	1[0.77,1.31]
Flint 1989	23/485	21/478		4.86%	1.08[0.61,1.92]
Harvey 1996	8/105	18/97		4.3%	0.41[0.19,0.9]
Homer 2001	80/597	102/608		23.22%	0.8[0.61,1.05]
Kenny 1994	15/197	33/214		7.27%	0.49[0.28,0.88]
MacVicar 1993	31/2304	20/1206		6.03%	0.81[0.46,1.42]
North Stafford 2000	45/770	34/735		7.99%	1.26[0.82,1.95]
Rowley 1995	17/398	20/413		4.51%	0.88[0.47,1.66]
Turnbull 1996	56/613	58/603		13.44%	0.95[0.67,1.35]
Waldenstrom 2001	48/486	36/500		8.15%	1.37[0.91,2.07]
Total (95% CI)	**6447**	**5335**		**100%**	**0.92[0.81,1.05]**
Total events: 412 (Midwife-led care), 429 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=16.08, df=9(P=0.07); I^2=44.04%					
Test for overall effect: Z=1.23(P=0.22)					

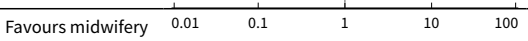
Analysis 1.28. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 28 Mean length of neonatal hospital stay (days).

Study or subgroup	Midwife-led care N	Mean(SD)	Other models of care N	Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Biro 2000	89	6.8 (0.5)	86	8.8 (0.5)		99.99%	-2[-2.15,-1.85]
Waldenstrom 2001	48	11.1 (23.2)	36	17.2 (34)		0.01%	-6.1[-19,6.8]
Total ***	**137**		**122**			**100%**	**-2[-2.15,-1.85]**
Heterogeneity: Tau^2=0; Chi^2=0.39, df=1(P=0.53); I^2=0%							
Test for overall effect: Z=26.46(P<0.0001)							

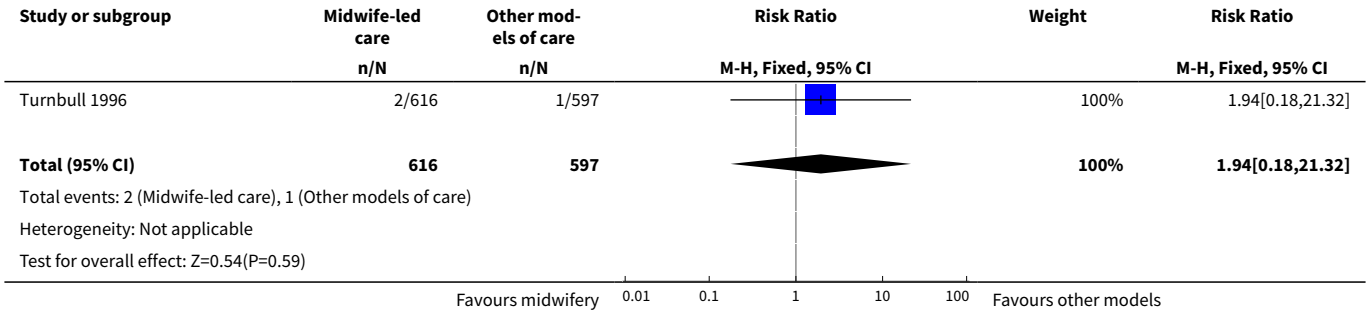


Analysis 1.29. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 29 Neonatal convulsions (as defined by trial authors).

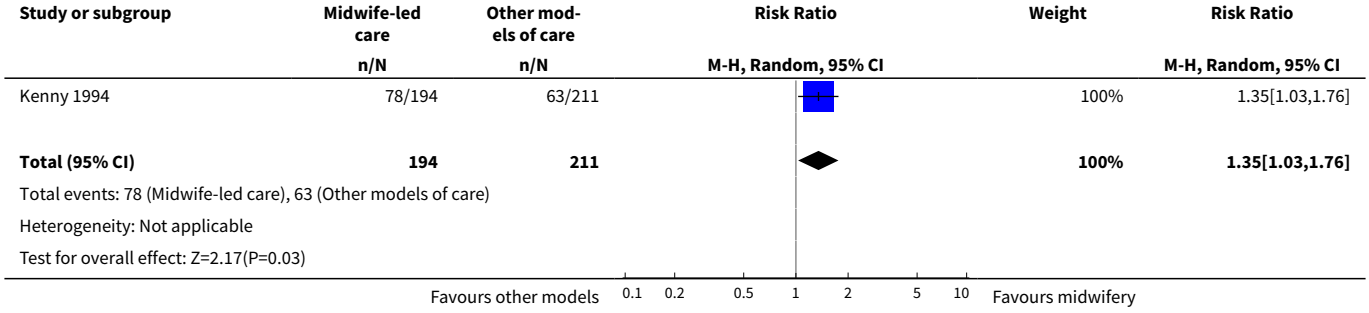
Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Turnbull 1996	0/613	1/603		100%	0.33[0.01,8.03]
Total (95% CI)	**613**	**603**		**100%**	**0.33[0.01,8.03]**
Total events: 0 (Midwife-led care), 1 (Other models of care)					
Heterogeneity: Not applicable					
Test for overall effect: Z=0.68(P=0.49)					



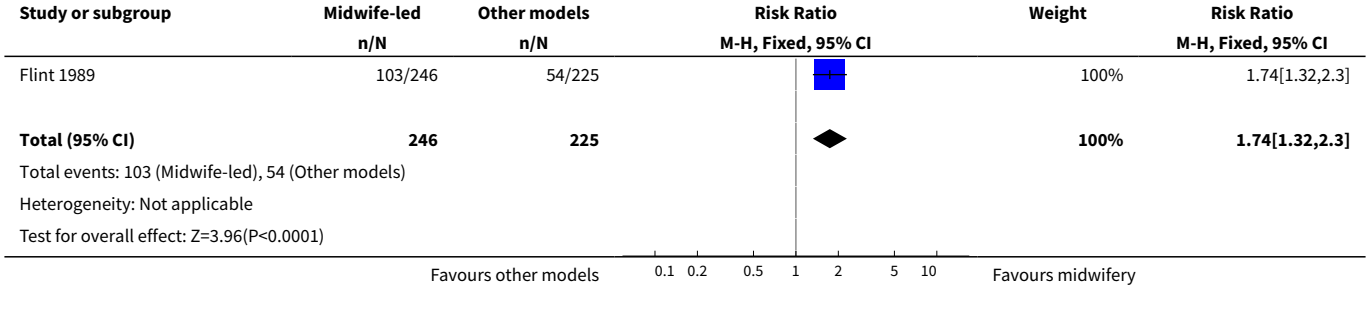
Analysis 1.30. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 30 Postpartum depression.



Analysis 1.31. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 31 Breastfeeding initiation.



Analysis 1.32. Comparison 1 Midwife-led versus other models of care for childbearing women and their infants, Outcome 32 High perceptions of control during labour and childbirth.



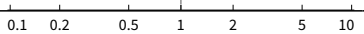
Comparison 2. Midwife-led versus other models of care: variation in midwifery models of care (caseload/one-to-one or team)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Fetal loss/neonatal death before 24 weeks	8		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
1.1 Caseload	1	1216	Risk Ratio (M-H, Fixed, 95% CI)	0.82 [0.46, 1.47]
1.2 Team models of midwifery care	7	8674	Risk Ratio (M-H, Fixed, 95% CI)	0.79 [0.64, 0.98]
2 Fetal loss/neonatal death equal to/after 24 weeks	9		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
2.1 Caseload	2	2721	Risk Ratio (M-H, Fixed, 95% CI)	0.48 [0.23, 1.03]
2.2 Team models of midwifery care	7	8883	Risk Ratio (M-H, Fixed, 95% CI)	1.44 [0.86, 2.42]
3 Overall fetal loss and neonatal death	10		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
3.1 Caseload	2	2721	Risk Ratio (M-H, Fixed, 95% CI)	0.67 [0.42, 1.05]
3.2 Team	8	9085	Risk Ratio (M-H, Fixed, 95% CI)	0.87 [0.72, 1.06]
4 No intrapartum analgesia/anaesthesia	5		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
4.1 Caseload	1	1210	Risk Ratio (M-H, Fixed, 95% CI)	1.07 [0.79, 1.46]
4.2 Team models of midwifery care	4	5829	Risk Ratio (M-H, Fixed, 95% CI)	1.18 [1.06, 1.31]
5 Regional analgesia (epidural/spinal)	11		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
5.1 Caseload	2	2715	Risk Ratio (M-H, Random, 95% CI)	0.83 [0.61, 1.13]
5.2 Team models of midwifery care	9	9177	Risk Ratio (M-H, Random, 95% CI)	0.81 [0.71, 0.91]
6 Opiate analgesia	9		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
6.1 Caseload	1	1210	Risk Ratio (M-H, Random, 95% CI)	0.94 [0.83, 1.07]
6.2 Team models of midwifery care	8	8987	Risk Ratio (M-H, Random, 95% CI)	0.87 [0.75, 1.01]
7 Caesarean birth	11		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
7.1 Caseload	2	2714	Risk Ratio (M-H, Fixed, 95% CI)	1.04 [0.88, 1.25]
7.2 Team models of midwifery care	9	9183	Risk Ratio (M-H, Fixed, 95% CI)	0.93 [0.82, 1.04]
8 Instrumental vaginal birth (forceps/vacuum)	10		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
8.1 Caseload	2	2714	Risk Ratio (M-H, Fixed, 95% CI)	0.89 [0.73, 1.09]
8.2 Team models of midwifery care	8	9010	Risk Ratio (M-H, Fixed, 95% CI)	0.85 [0.76, 0.96]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
9 Spontaneous vaginal birth (as defined by trial authors)	9		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
9.1 Caseload	2	2714	Risk Ratio (M-H, Fixed, 95% CI)	1.01 [0.96, 1.06]
9.2 Team models of midwifery care	7	8212	Risk Ratio (M-H, Fixed, 95% CI)	1.05 [1.02, 1.08]
10 5-minute Apgar score below or equal to 7	8		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
10.1 Caseload	1	1216	Risk Ratio (M-H, Fixed, 95% CI)	0.62 [0.38, 1.02]
10.2 Team models of midwifery care	7	5564	Risk Ratio (M-H, Fixed, 95% CI)	1.40 [0.97, 2.01]
11 Postpartum depression	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
11.1 Caseload	1	1213	Risk Ratio (M-H, Fixed, 95% CI)	1.94 [0.18, 21.32]
11.2 Team models of midwifery care	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

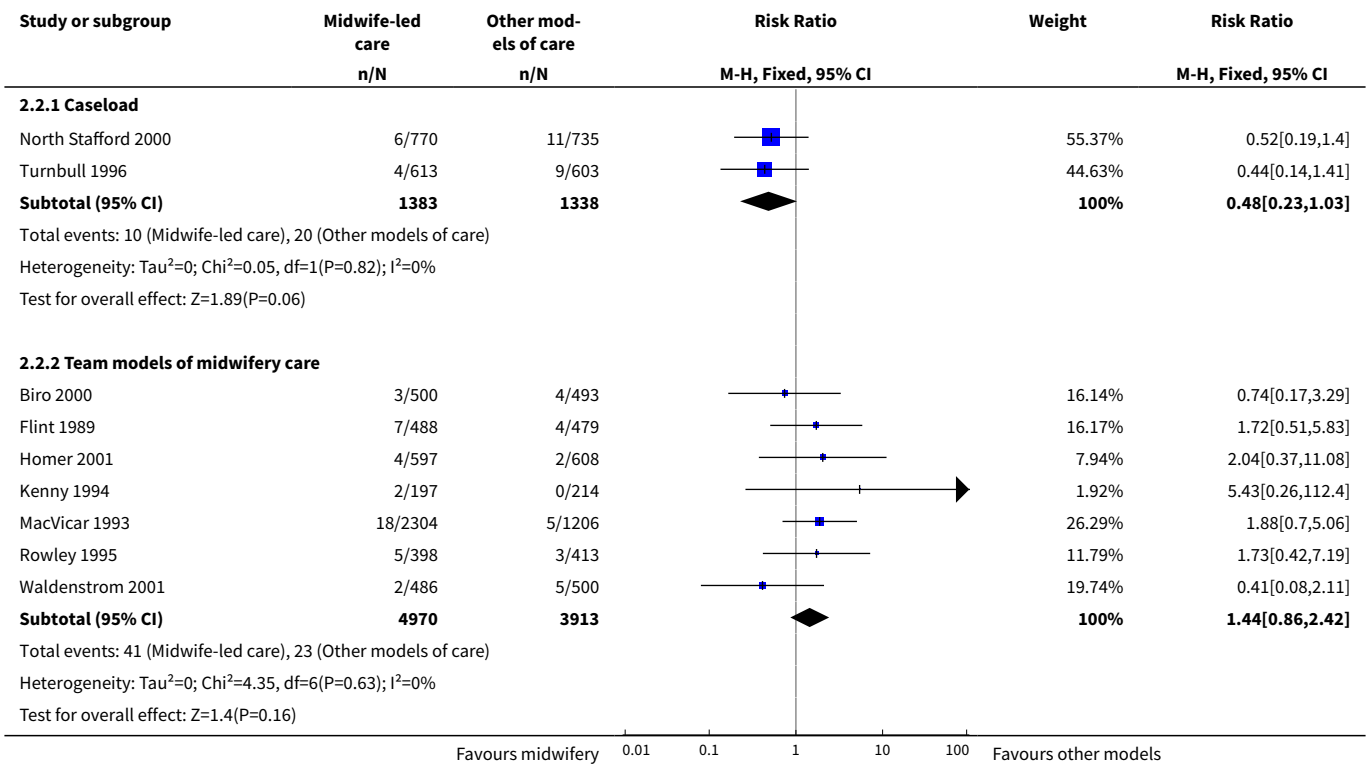
Analysis 2.1. Comparison 2 Midwife-led versus other models of care: variation in midwifery models of care (caseload/one-to-one or team), Outcome 1 Fetal loss/neonatal death before 24 weeks.

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
2.1.1 Caseload					
Turnbull 1996	20/613	24/603		100%	0.82[0.46,1.47]
Subtotal (95% CI)	**613**	**603**		**100%**	**0.82[0.46,1.47]**
Total events: 20 (Midwife-led care), 24 (Other models of care)					
Heterogeneity: Not applicable					
Test for overall effect: Z=0.67(P=0.5)					
2.1.2 Team models of midwifery care					
Biro 2000	32/500	36/493		20.5%	0.88[0.55,1.39]
Flint 1989	11/488	8/479		4.57%	1.35[0.55,3.33]
Harvey 1996	4/105	4/97		2.35%	0.92[0.24,3.59]
Homer 2001	44/597	64/608		35.86%	0.7[0.49,1.01]
MacVicar 1993	24/2304	15/1206		11.13%	0.84[0.44,1.59]
Rowley 1995	9/398	19/413		10.54%	0.49[0.23,1.07]
Waldenstrom 2001	23/486	27/500		15.05%	0.88[0.51,1.51]
Subtotal (95% CI)	**4878**	**3796**		**100%**	**0.79[0.64,0.98]**
Total events: 147 (Midwife-led care), 173 (Other models of care)					
Heterogeneity: $Tau^2=0$; $Chi^2=3.61$, df=6(P=0.73); $I^2=0\%$					
Test for overall effect: Z=2.14(P=0.03)					

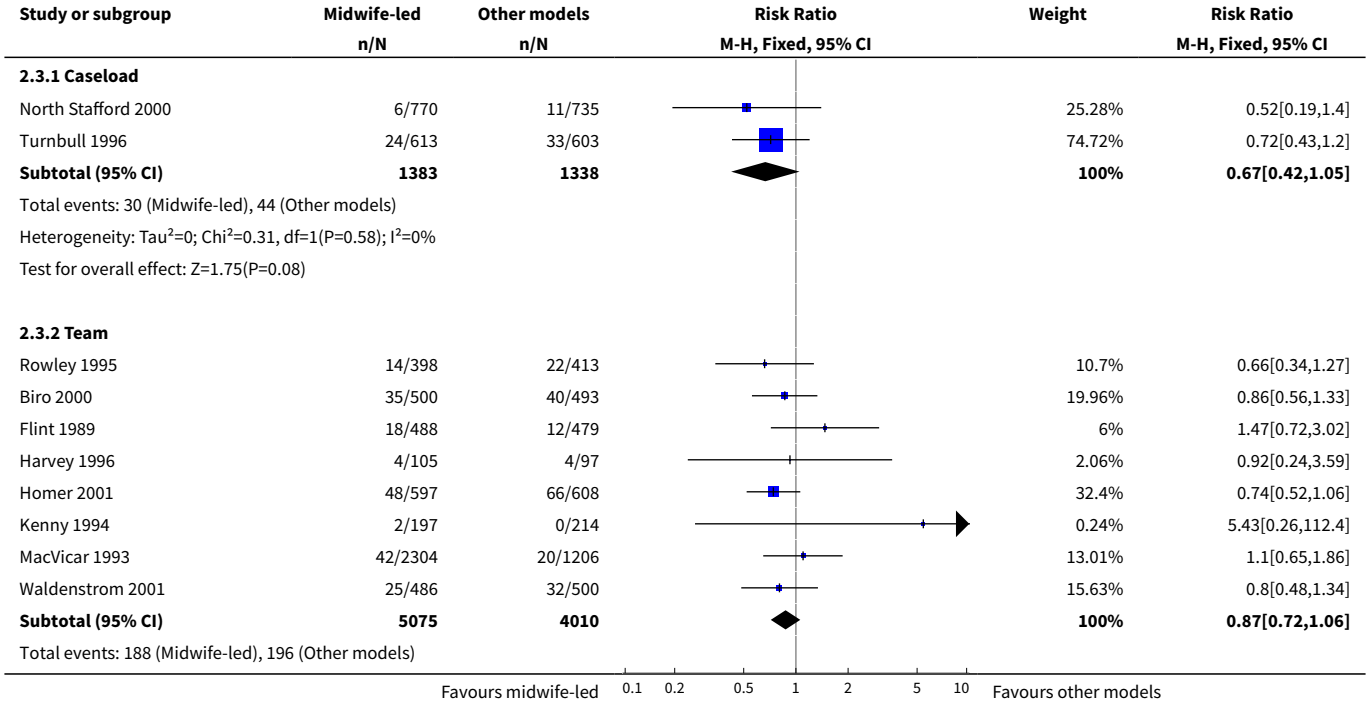


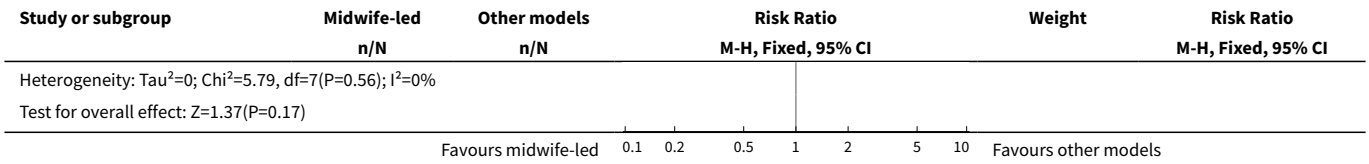
Favours midwifery — Favours other models

Analysis 2.2. Comparison 2 Midwife-led versus other models of care: variation in midwifery models of care (caseload/one-to-one or team), Outcome 2 Fetal loss/neonatal death equal to/after 24 weeks.

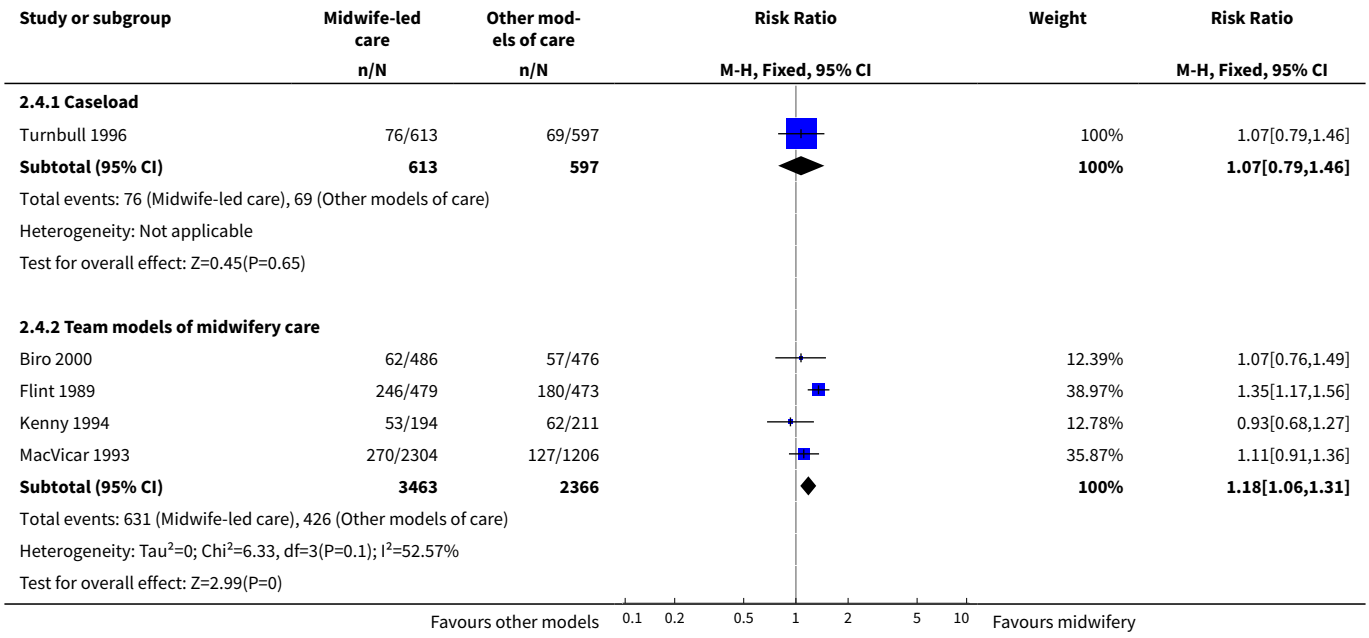


Analysis 2.3. Comparison 2 Midwife-led versus other models of care: variation in midwifery models of care (caseload/one-to-one or team), Outcome 3 Overall fetal loss and neonatal death.

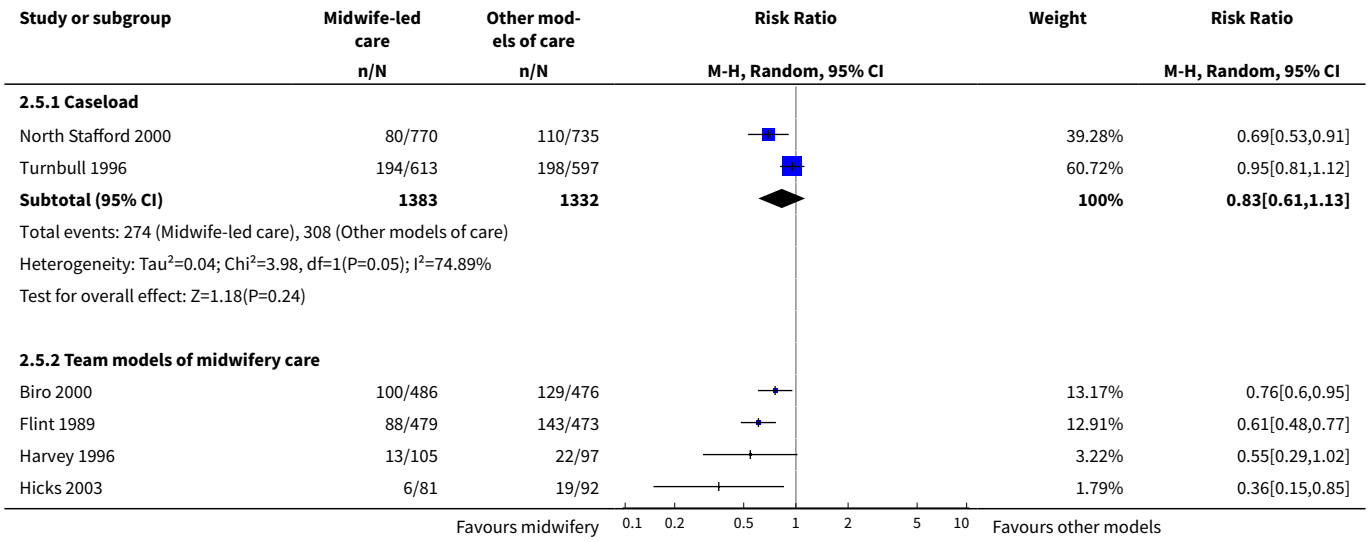


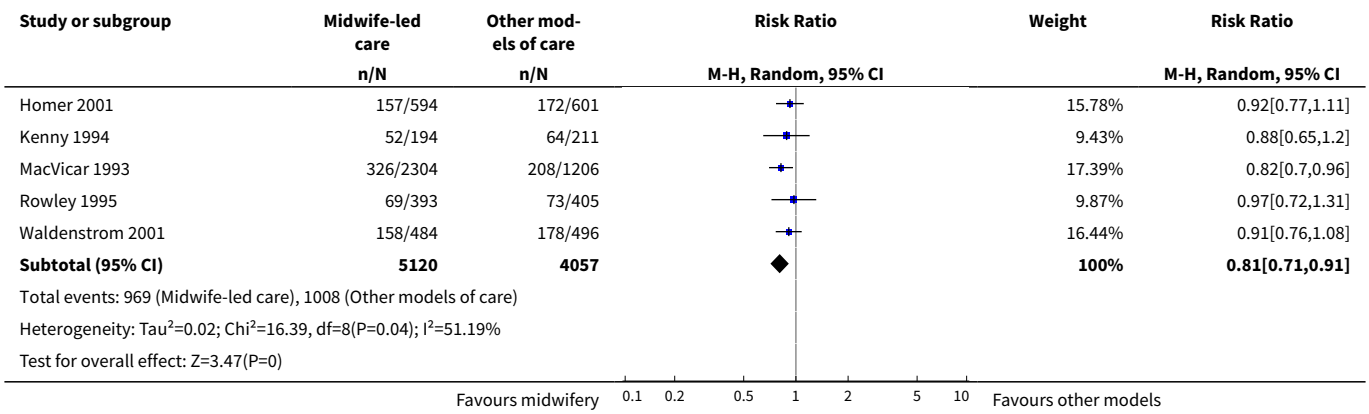


Analysis 2.4. Comparison 2 Midwife-led versus other models of care: variation in midwifery models of care (caseload/one-to-one or team), Outcome 4 No intrapartum analgesia/anaesthesia.

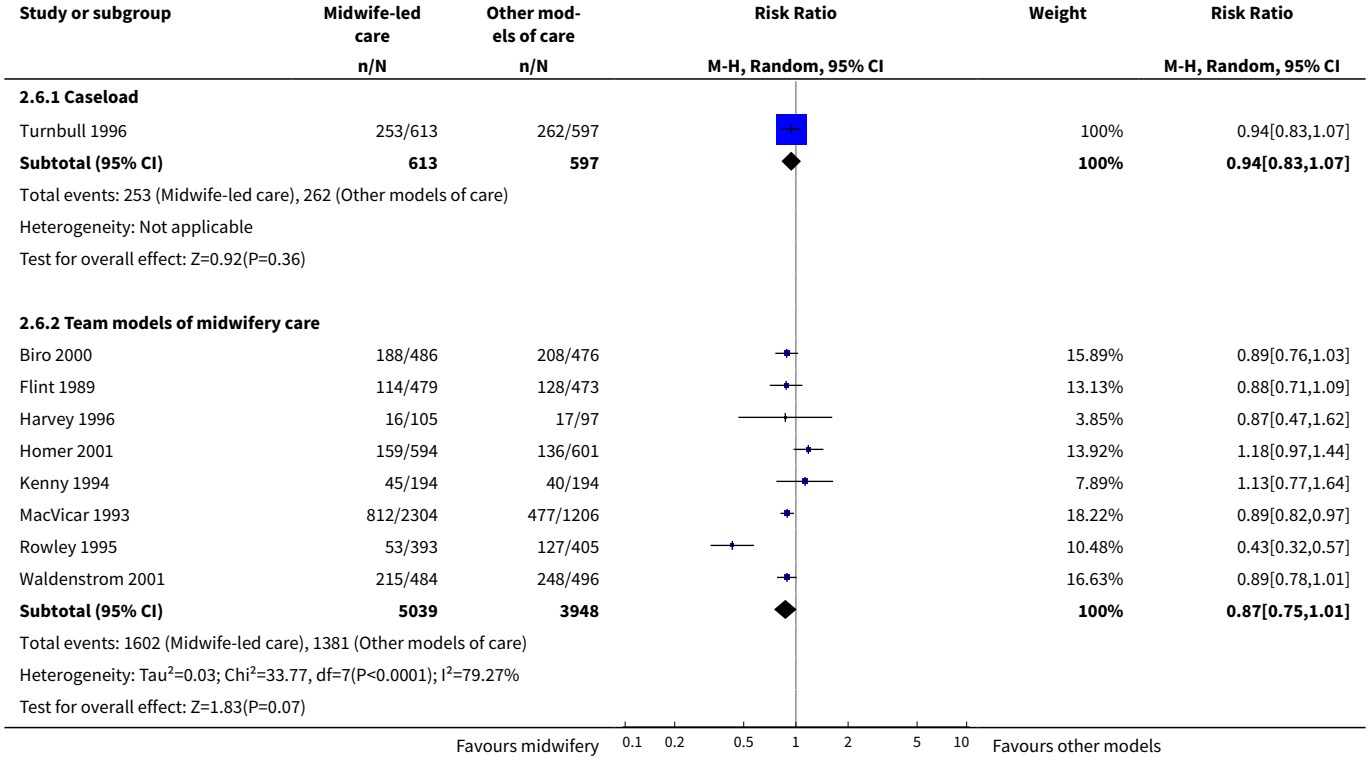


Analysis 2.5. Comparison 2 Midwife-led versus other models of care: variation in midwifery models of care (caseload/one-to-one or team), Outcome 5 Regional analgesia (epidural/spinal).

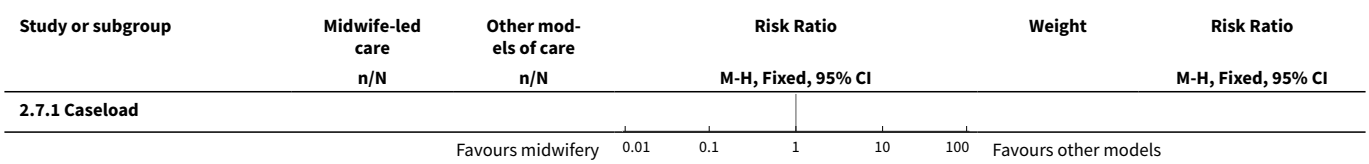




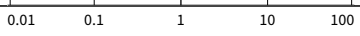
Analysis 2.6. Comparison 2 Midwife-led versus other models of care: variation in midwifery models of care (caseload/one-to-one or team), Outcome 6 Opiate analgesia.



Analysis 2.7. Comparison 2 Midwife-led versus other models of care: variation in midwifery models of care (caseload/one-to-one or team), Outcome 7 Caesarean birth.

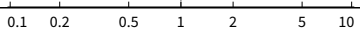


Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
North Stafford 2000	137/770	128/735		64.57%	1.02[0.82,1.27]
Turnbull 1996	79/612	71/597		35.43%	1.09[0.8,1.47]
Subtotal (95% CI)	**1382**	**1332**		**100%**	**1.04[0.88,1.25]**
Total events: 216 (Midwife-led care), 199 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=0.1, df=1(P=0.75); I^2=0%					
Test for overall effect: Z=0.48(P=0.63)					
2.7.2 Team models of midwifery care					
Biro 2000	100/488	91/480		18.66%	1.08[0.84,1.39]
Flint 1989	37/479	35/473		7.16%	1.04[0.67,1.63]
Harvey 1996	4/105	14/97		2.96%	0.26[0.09,0.77]
Hicks 2003	9/81	14/92		2.67%	0.73[0.33,1.6]
Homer 2001	73/594	96/601		19.41%	0.77[0.58,1.02]
Kenny 1994	24/194	27/211		5.26%	0.97[0.58,1.62]
MacVicar 1993	144/2304	78/1206		20.82%	0.97[0.74,1.26]
Rowley 1995	52/393	59/405		11.82%	0.91[0.64,1.28]
Waldenstrom 2001	55/484	56/496		11.25%	1.01[0.71,1.43]
Subtotal (95% CI)	**5122**	**4061**		**100%**	**0.93[0.82,1.04]**
Total events: 498 (Midwife-led care), 470 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=9.29, df=8(P=0.32); I^2=13.85%					
Test for overall effect: Z=1.27(P=0.2)					

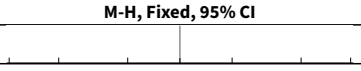


Analysis 2.8. Comparison 2 Midwife-led versus other models of care: variation in midwifery models of care (caseload/one-to-one or team), Outcome 8 Instrumental vaginal birth (forceps/vacuum).

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
2.8.1 Caseload					
North Stafford 2000	74/770	84/735		49.68%	0.84[0.63,1.13]
Turnbull 1996	83/612	86/597		50.32%	0.94[0.71,1.25]
Subtotal (95% CI)	**1382**	**1332**		**100%**	**0.89[0.73,1.09]**
Total events: 157 (Midwife-led care), 170 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=0.3, df=1(P=0.59); I^2=0%					
Test for overall effect: Z=1.11(P=0.27)					
2.8.2 Team models of midwifery care					
Biro 2000	67/488	86/480		16.52%	0.77[0.57,1.03]
Flint 1989	56/479	66/473		12.65%	0.84[0.6,1.17]
Harvey 1996	6/105	7/97		1.39%	0.79[0.28,2.27]
Homer 2001	71/594	63/601		11.93%	1.14[0.83,1.57]
Kenny 1994	12/194	29/211		5.29%	0.45[0.24,0.86]
MacVicar 1993	187/2304	114/1206		28.52%	0.86[0.69,1.07]
Rowley 1995	29/393	37/405		6.94%	0.81[0.51,1.29]
Waldenstrom 2001	78/484	89/496		16.75%	0.9[0.68,1.18]
Subtotal (95% CI)	**5041**	**3969**		**100%**	**0.85[0.76,0.96]**
Total events: 506 (Midwife-led care), 491 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=7.68, df=7(P=0.36); I^2=8.87%					



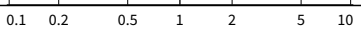
Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Test for overall effect: Z=2.61(P=0.01)					



Favours midwifery — Favours other models

Analysis 2.9. Comparison 2 Midwife-led versus other models of care: variation in midwifery models of care (caseload/one-to-one or team), Outcome 9 Spontaneous vaginal birth (as defined by trial authors).

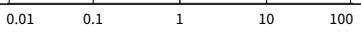
Study or subgroup	Mide-ife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
2.9.1 Caseload					
North Stafford 2000	542/770	509/735		53.9%	1.02[0.95,1.09]
Turnbull 1996	450/612	440/597		46.1%	1[0.93,1.07]
Subtotal (95% CI)	**1382**	**1332**		**100%**	**1.01[0.96,1.06]**
Total events: 992 (Mideife-led care), 949 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=0.15, df=1(P=0.7); I^2=0%					
Test for overall effect: Z=0.32(P=0.75)					
2.9.2 Team models of midwifery care					
Biro 2000	282/488	262/480		9.4%	1.06[0.95,1.18]
Flint 1989	386/479	372/473		13.32%	1.02[0.96,1.09]
Harvey 1996	89/105	71/97		2.63%	1.16[1,1.34]
Homer 2001	402/594	374/601		13.23%	1.09[1,1.18]
Kenny 1994	158/194	155/211		5.28%	1.11[1,1.23]
MacVicar 1993	1847/2304	931/1206		43.49%	1.04[1,1.08]
Waldenstrom 2001	362/484	360/496		12.65%	1.03[0.96,1.11]
Subtotal (95% CI)	**4648**	**3564**		**100%**	**1.05[1.02,1.08]**
Total events: 3526 (Mideife-led care), 2525 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=4.63, df=6(P=0.59); I^2=0%					
Test for overall effect: Z=3.68(P=0)					



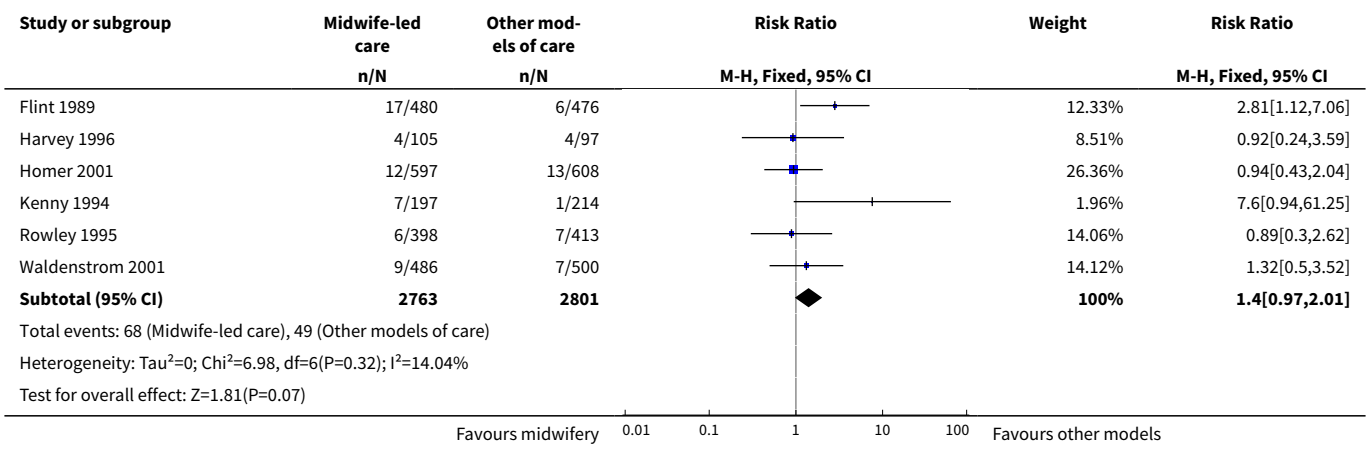
Favours other models — Favours midwifery

Analysis 2.10. Comparison 2 Midwife-led versus other models of care: variation in midwifery models of care (caseload/one-to-one or team), Outcome 10 5-minute Apgar score below or equal to 7.

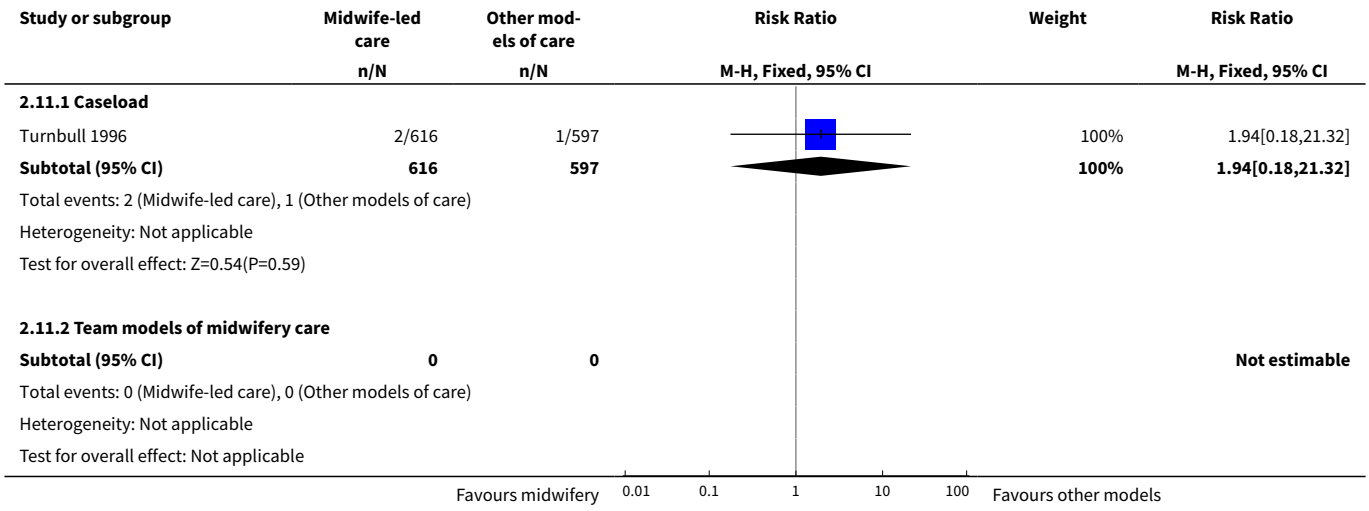
Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
2.10.1 Caseload					
Turnbull 1996	24/613	38/603		100%	0.62[0.38,1.02]
Subtotal (95% CI)	**613**	**603**		**100%**	**0.62[0.38,1.02]**
Total events: 24 (Midwife-led care), 38 (Other models of care)					
Heterogeneity: Not applicable					
Test for overall effect: Z=1.87(P=0.06)					
2.10.2 Team models of midwifery care					
Biro 2000	13/500	11/493		22.67%	1.17[0.53,2.58]



Favours midwifery — Favours other models



Analysis 2.11. Comparison 2 Midwife-led versus other models of care: variation in midwifery models of care (caseload/one-to-one or team), Outcome 11 Postpartum depression.



Comparison 3. Midwife-led versus other models of care: variation in risk status (low versus mixed)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Fetal loss/neonatal death before 24 weeks	8		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
1.1 Low risk	5	6881	Risk Ratio (M-H, Fixed, 95% CI)	0.90 [0.66, 1.22]
1.2 Other risk status	3	3009	Risk Ratio (M-H, Fixed, 95% CI)	0.72 [0.55, 0.94]
2 Fetal loss/neonatal death equal to/after 24 weeks	9		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2.1 Low risk	4	6679	Risk Ratio (M-H, Fixed, 95% CI)	1.03 [0.59, 1.81]
2.2 Other risk status	5	4925	Risk Ratio (M-H, Fixed, 95% CI)	0.99 [0.54, 1.82]
3 Overall fetal loss and neonatal death	10		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
3.1 Low risk	5	6881	Risk Ratio (M-H, Fixed, 95% CI)	0.93 [0.71, 1.21]
3.2 Other risk status	5	4925	Risk Ratio (M-H, Fixed, 95% CI)	0.76 [0.60, 0.97]
4 No intrapartum analgesia/anaesthesia	5		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
4.1 Low risk	3	5672	Risk Ratio (M-H, Fixed, 95% CI)	1.21 [1.08, 1.35]
4.2 Other risk status	2	1367	Risk Ratio (M-H, Fixed, 95% CI)	1.00 [0.79, 1.25]
5 Regional analgesia (epidural/spinal)	11		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
5.1 Low risk	6	7027	Risk Ratio (M-H, Random, 95% CI)	0.77 [0.65, 0.93]
5.2 Other risk status	5	4865	Risk Ratio (M-H, Random, 95% CI)	0.84 [0.75, 0.95]
6 Opiate analgesia	9		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
6.1 Low risk	5	6854	Risk Ratio (M-H, Random, 95% CI)	0.90 [0.85, 0.96]
6.2 Other risk status	4	3343	Risk Ratio (M-H, Random, 95% CI)	0.84 [0.57, 1.25]
7 Caesarean birth	11		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
7.1 Low risk	6	7026	Risk Ratio (M-H, Fixed, 95% CI)	0.97 [0.83, 1.13]
7.2 Other risk status	5	4871	Risk Ratio (M-H, Fixed, 95% CI)	0.96 [0.84, 1.09]
8 Instrumental vaginal birth (forceps/vacuum)	10		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
8.1 Low risk	5	6853	Risk Ratio (M-H, Fixed, 95% CI)	0.88 [0.77, 1.01]
8.2 Other risk status	5	4871	Risk Ratio (M-H, Fixed, 95% CI)	0.84 [0.72, 0.99]
9 Spontaneous vaginal birth (as defined by trial authors)	9		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
9.1 Low risk	5	6853	Risk Ratio (M-H, Fixed, 95% CI)	1.03 [1.00, 1.06]
9.2 Other risk status	4	4073	Risk Ratio (M-H, Fixed, 95% CI)	1.06 [1.01, 1.10]
10 5-minute Apgar score below or equal to 7	8		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
10.1 Low risk	4	3360	Risk Ratio (M-H, Fixed, 95% CI)	0.97 [0.67, 1.40]
10.2 Other risk status	4	3420	Risk Ratio (M-H, Fixed, 95% CI)	1.21 [0.76, 1.92]
11 Postpartum depression	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
11.1 Low risk	1	1213	Risk Ratio (M-H, Fixed, 95% CI)	1.94 [0.18, 21.32]
11.2 Other risk status	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Analysis 3.1. Comparison 3 Midwife-led versus other models of care: variation in risk status (low versus mixed), Outcome 1 Fetal loss/neonatal death before 24 weeks.

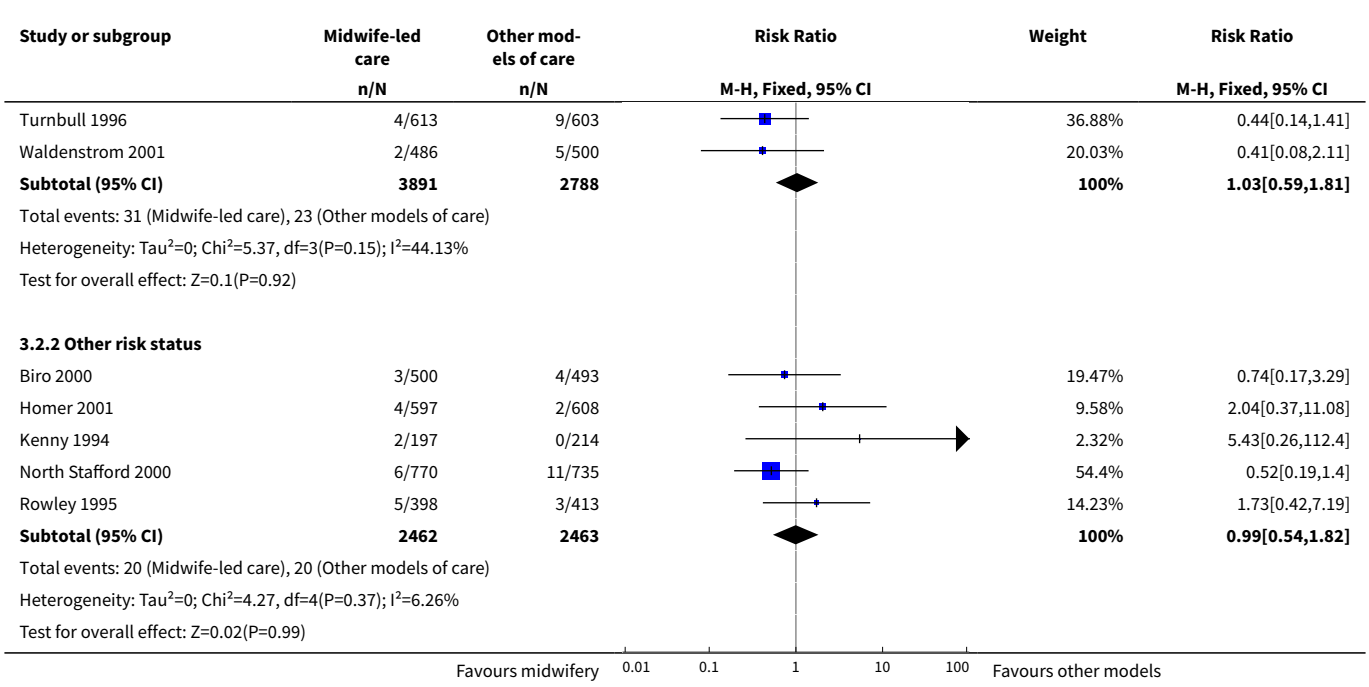
Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
3.1.1 Low risk					
Flint 1989	11/488	8/479		9.76%	1.35[0.55,3.33]
Harvey 1996	4/105	4/97		5.03%	0.92[0.24,3.59]
MacVicar 1993	24/2304	15/1206		23.8%	0.84[0.44,1.59]
Turnbull 1996	20/613	24/603		29.25%	0.82[0.46,1.47]
Waldenstrom 2001	23/486	27/500		32.17%	0.88[0.51,1.51]
Subtotal (95% CI)	**3996**	**2885**		**100%**	**0.9[0.66,1.22]**
Total events: 82 (Midwife-led care), 78 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=0.93, df=4(P=0.92); I^2=0%					
Test for overall effect: Z=0.68(P=0.5)					
3.1.2 Other risk status					
Biro 2000	32/500	36/493		30.64%	0.88[0.55,1.39]
Homer 2001	44/597	64/608		53.6%	0.7[0.49,1.01]
Rowley 1995	9/398	19/413		15.76%	0.49[0.23,1.07]
Subtotal (95% CI)	**1495**	**1514**		**100%**	**0.72[0.55,0.94]**
Total events: 85 (Midwife-led care), 119 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=1.64, df=2(P=0.44); I^2=0%					
Test for overall effect: Z=2.39(P=0.02)					

Favours midwifery — Favours other models

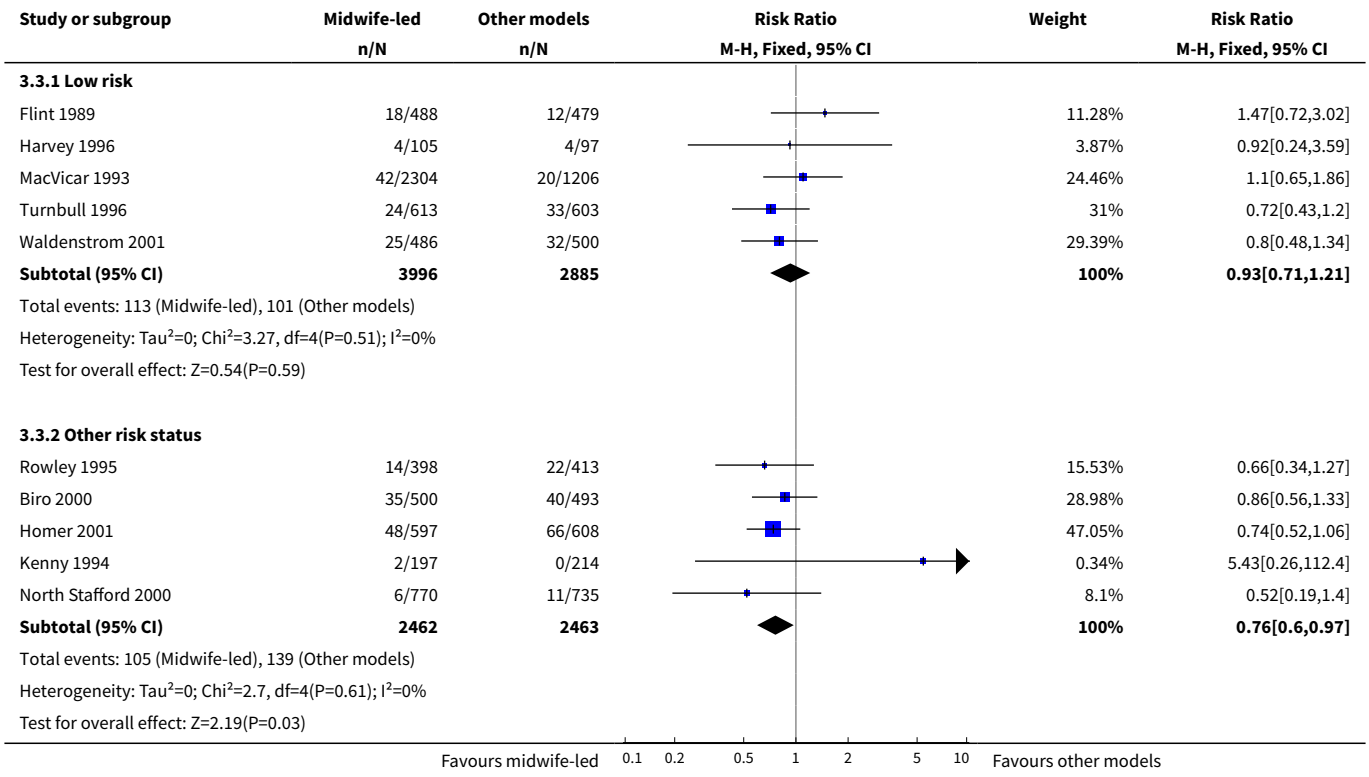
Analysis 3.2. Comparison 3 Midwife-led versus other models of care: variation in risk status (low versus mixed), Outcome 2 Fetal loss/neonatal death equal to/after 24 weeks.

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
3.2.1 Low risk					
Flint 1989	7/488	4/479		16.41%	1.72[0.51,5.83]
MacVicar 1993	18/2304	5/1206		26.68%	1.88[0.7,5.06]

Favours midwifery — Favours other models

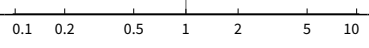


Analysis 3.3. Comparison 3 Midwife-led versus other models of care: variation in risk status (low versus mixed), Outcome 3 Overall fetal loss and neonatal death.



Analysis 3.4. Comparison 3 Midwife-led versus other models of care: variation in risk status (low versus mixed), Outcome 4 No intrapartum analgesia/anaesthesia.

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
3.4.1 Low risk					
Flint 1989	246/479	180/473		43.36%	1.35[1.17,1.56]
MacVicar 1993	270/2304	127/1206		39.91%	1.11[0.91,1.36]
Turnbull 1996	76/613	69/597		16.73%	1.07[0.79,1.46]
Subtotal (95% CI)	**3396**	**2276**		**100%**	**1.21[1.08,1.35]**
Total events: 592 (Midwife-led care), 376 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=3.49, df=2(P=0.17); I^2=42.68%					
Test for overall effect: Z=3.32(P=0)					
3.4.2 Other risk status					
Biro 2000	62/486	57/476		49.23%	1.07[0.76,1.49]
Kenny 1994	53/194	62/211		50.77%	0.93[0.68,1.27]
Subtotal (95% CI)	**680**	**687**		**100%**	**1[0.79,1.25]**
Total events: 115 (Midwife-led care), 119 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=0.34, df=1(P=0.56); I^2=0%					
Test for overall effect: Z=0.03(P=0.98)					

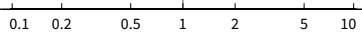


Analysis 3.5. Comparison 3 Midwife-led versus other models of care: variation in risk status (low versus mixed), Outcome 5 Regional analgesia (epidural/spinal).

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
3.5.1 Low risk					
Flint 1989	88/479	143/473		18.74%	0.61[0.48,0.77]
Harvey 1996	13/105	22/97		4.67%	0.55[0.29,1.02]
Hicks 2003	6/81	19/92		2.6%	0.36[0.15,0.85]
MacVicar 1993	326/2304	208/1206		25.23%	0.82[0.7,0.96]
Turnbull 1996	194/613	198/597		24.9%	0.95[0.81,1.12]
Waldenstrom 2001	158/484	178/496		23.86%	0.91[0.76,1.08]
Subtotal (95% CI)	**4066**	**2961**		**100%**	**0.77[0.65,0.93]**
Total events: 785 (Midwife-led care), 768 (Other models of care)					
Heterogeneity: Tau^2=0.03; Chi^2=16.19, df=5(P=0.01); I^2=69.12%					
Test for overall effect: Z=2.76(P=0.01)					
3.5.2 Other risk status					
Biro 2000	100/486	129/476		22.18%	0.76[0.6,0.95]
Homer 2001	157/594	172/601		26.58%	0.92[0.77,1.11]
Kenny 1994	52/194	64/211		15.9%	0.88[0.65,1.2]
North Stafford 2000	80/770	110/735		18.71%	0.69[0.53,0.91]
Rowley 1995	69/393	73/405		16.64%	0.97[0.72,1.31]
Subtotal (95% CI)	**2437**	**2428**		**100%**	**0.84[0.75,0.95]**
Total events: 458 (Midwife-led care), 548 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=4.74, df=4(P=0.32); I^2=15.61%					
Test for overall effect: Z=2.79(P=0.01)					

Analysis 3.6. Comparison 3 Midwife-led versus other models of care: variation in risk status (low versus mixed), Outcome 6 Opiate analgesia.

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
3.6.1 Low risk					
Flint 1989	114/479	128/473		19.15%	0.88[0.71,1.09]
Harvey 1996	16/105	17/97		5.61%	0.87[0.47,1.62]
MacVicar 1993	812/2304	477/1206		26.58%	0.89[0.82,0.97]
Turnbull 1996	253/613	262/597		24.38%	0.94[0.83,1.07]
Waldenstrom 2001	215/484	248/496		24.27%	0.89[0.78,1.01]
Subtotal (95% CI)	**3985**	**2869**		**100%**	**0.9[0.85,0.96]**
Total events: 1410 (Midwife-led care), 1132 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=0.57, df=4(P=0.97); I^2=0%					
Test for overall effect: Z=3.36(P=0)					
3.6.2 Other risk status					
Biro 2000	188/486	208/476		32.98%	0.89[0.76,1.03]
Homer 2001	159/594	136/601		28.89%	1.18[0.97,1.44]
Kenny 1994	45/194	40/194		16.38%	1.13[0.77,1.64]
Rowley 1995	53/393	127/405		21.75%	0.43[0.32,0.57]
Subtotal (95% CI)	**1667**	**1676**		**100%**	**0.84[0.57,1.25]**
Total events: 445 (Midwife-led care), 511 (Other models of care)					
Heterogeneity: Tau^2=0.14; Chi^2=33.83, df=3(P<0.0001); I^2=91.13%					
Test for overall effect: Z=0.84(P=0.4)					

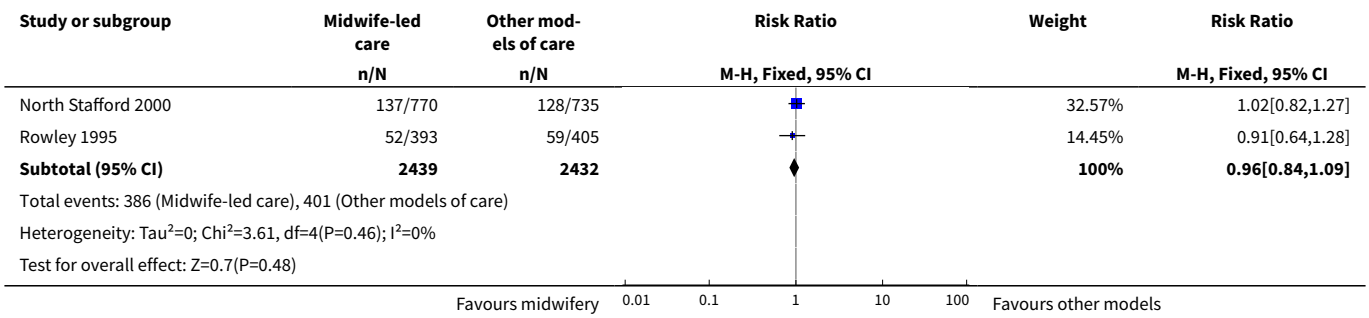


Favours midwifery — Favours other models

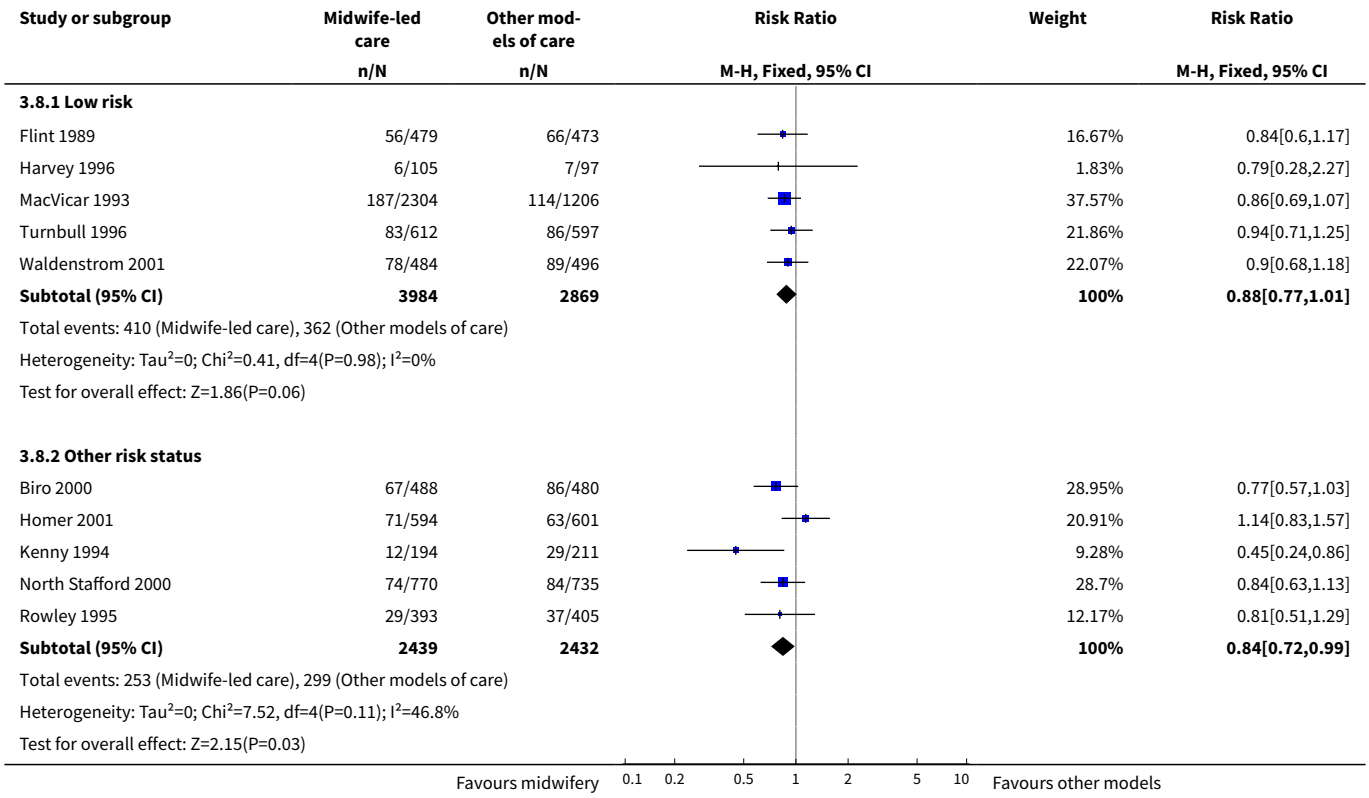
Analysis 3.7. Comparison 3 Midwife-led versus other models of care: variation in risk status (low versus mixed), Outcome 7 Caesarean birth.

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
3.7.1 Low risk					
Flint 1989	37/479	35/473		12.04%	1.04[0.67,1.63]
Harvey 1996	4/105	14/97		4.98%	0.26[0.09,0.77]
Hicks 2003	9/81	14/92		4.48%	0.73[0.33,1.6]
MacVicar 1993	144/2304	78/1206		35.01%	0.97[0.74,1.26]
Turnbull 1996	79/612	71/597		24.58%	1.09[0.8,1.47]
Waldenstrom 2001	55/484	56/496		18.91%	1.01[0.71,1.43]
Subtotal (95% CI)	**4065**	**2961**		**100%**	**0.97[0.83,1.13]**
Total events: 328 (Midwife-led care), 268 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=6.82, df=5(P=0.23); I^2=26.68%					
Test for overall effect: Z=0.42(P=0.67)					
3.7.2 Other risk status					
Biro 2000	100/488	91/480		22.82%	1.08[0.84,1.39]
Homer 2001	73/594	96/601		23.73%	0.77[0.58,1.02]
Kenny 1994	24/194	27/211		6.43%	0.97[0.58,1.62]

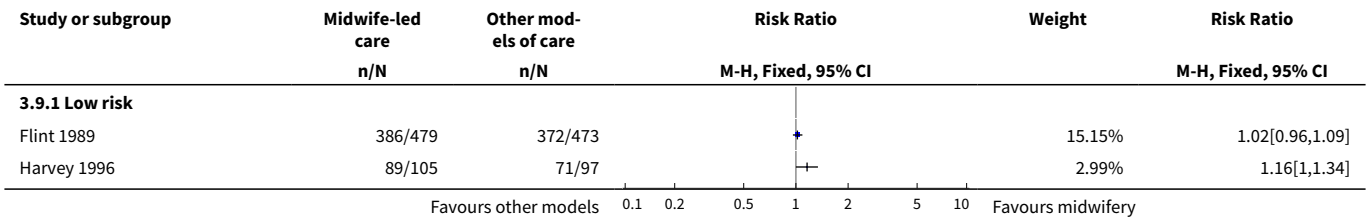
Favours midwifery — Favours other models

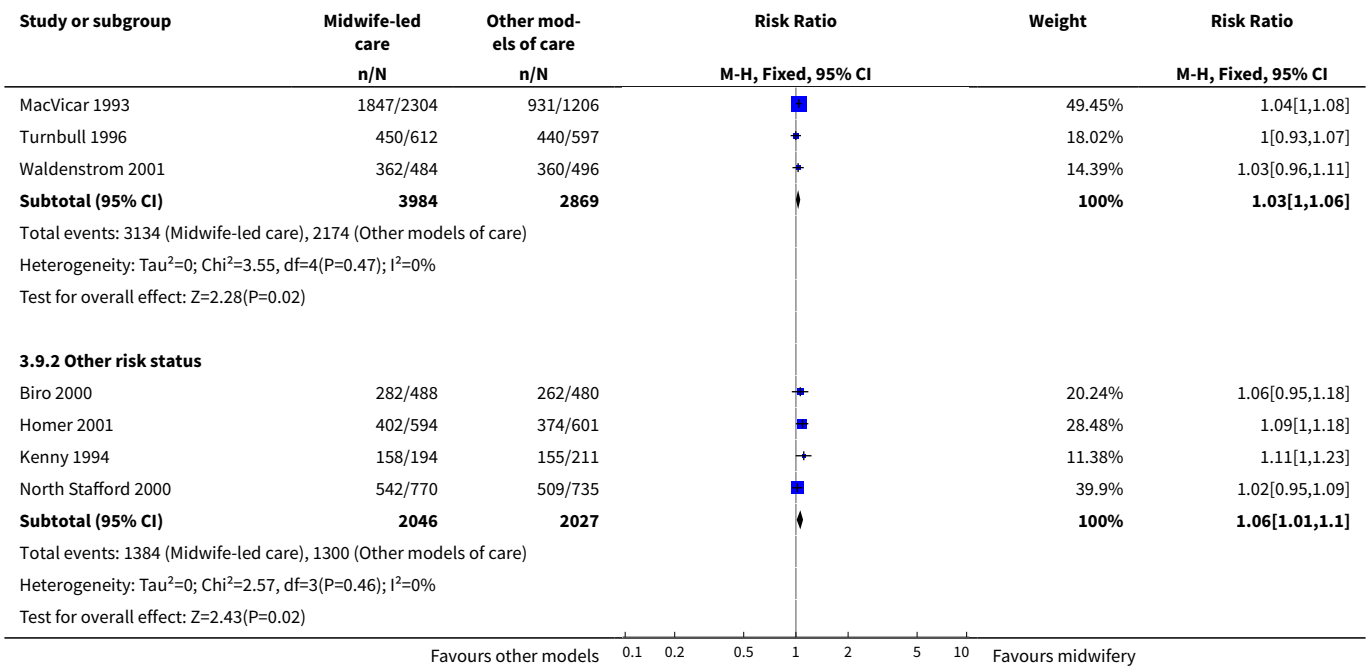


Analysis 3.8. Comparison 3 Midwife-led versus other models of care: variation in risk status (low versus mixed), Outcome 8 Instrumental vaginal birth (forceps/vacuum).

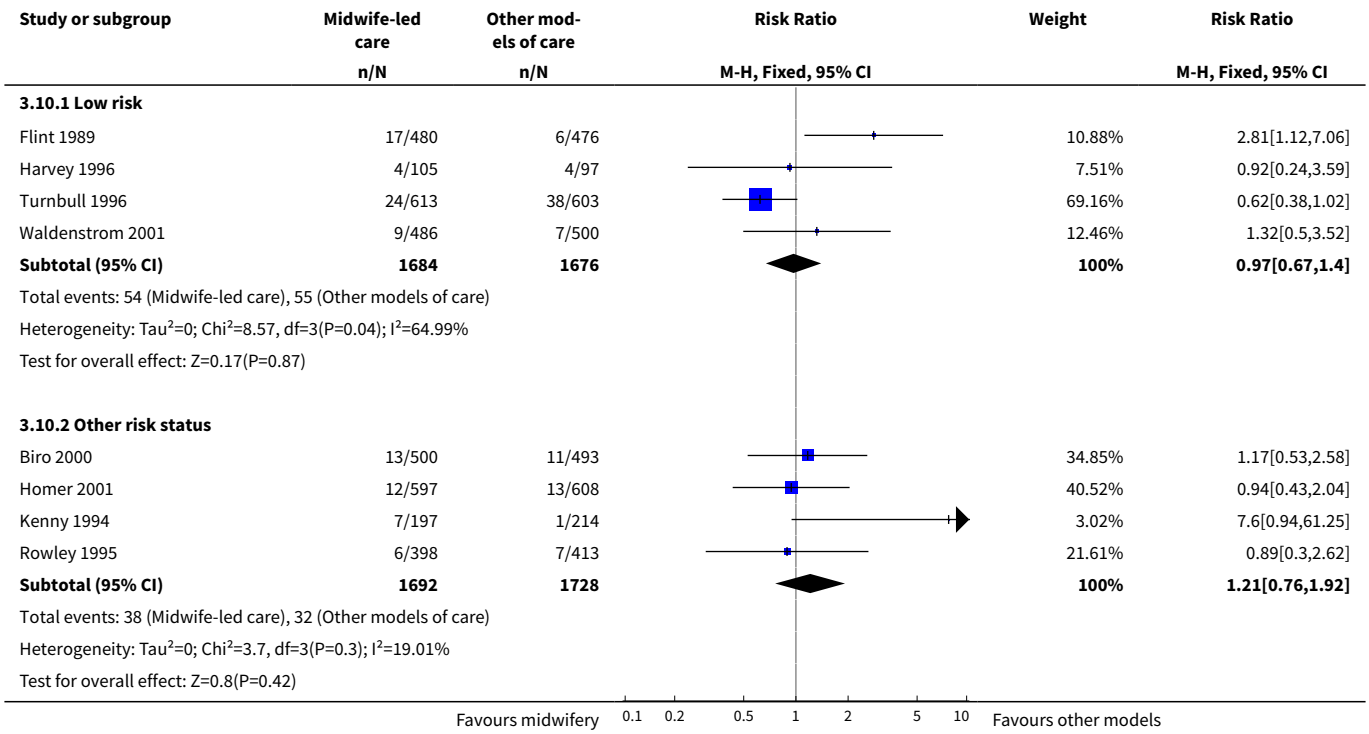


Analysis 3.9. Comparison 3 Midwife-led versus other models of care: variation in risk status (low versus mixed), Outcome 9 Spontaneous vaginal birth (as defined by trial authors).

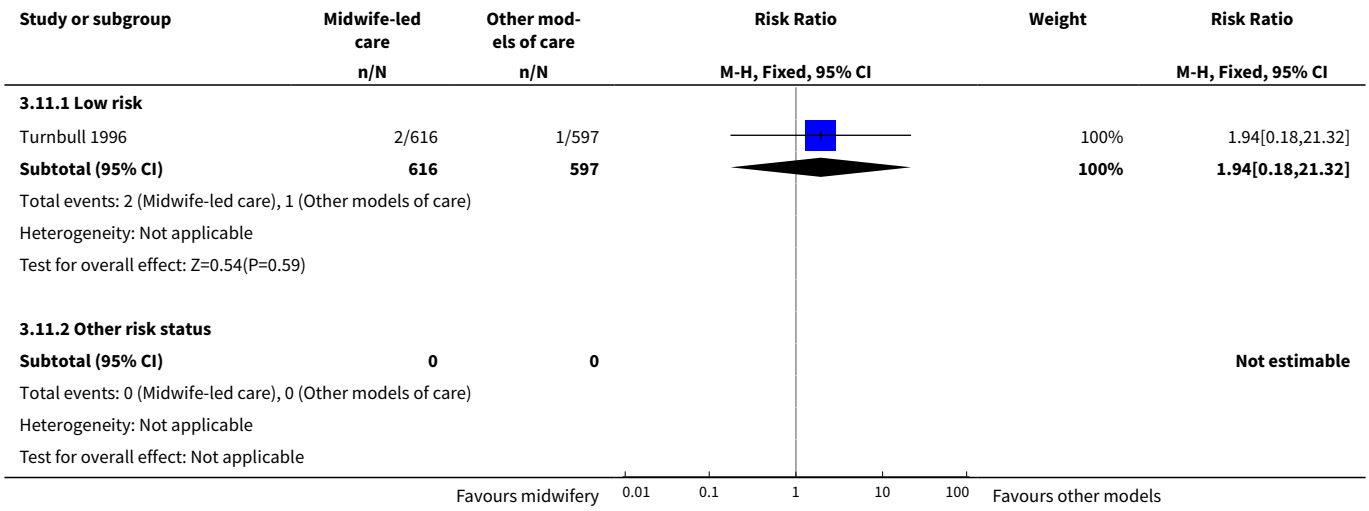




Analysis 3.10. Comparison 3 Midwife-led versus other models of care: variation in risk status (low versus mixed), Outcome 10 5-minute Apgar score below or equal to 7.



Analysis 3.11. Comparison 3 Midwife-led versus other models of care: variation in risk status (low versus mixed), Outcome 11 Postpartum depression.



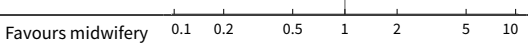
Comparison 4. Midwife-led versus other models of care: variation in practice setting (antenatal care)

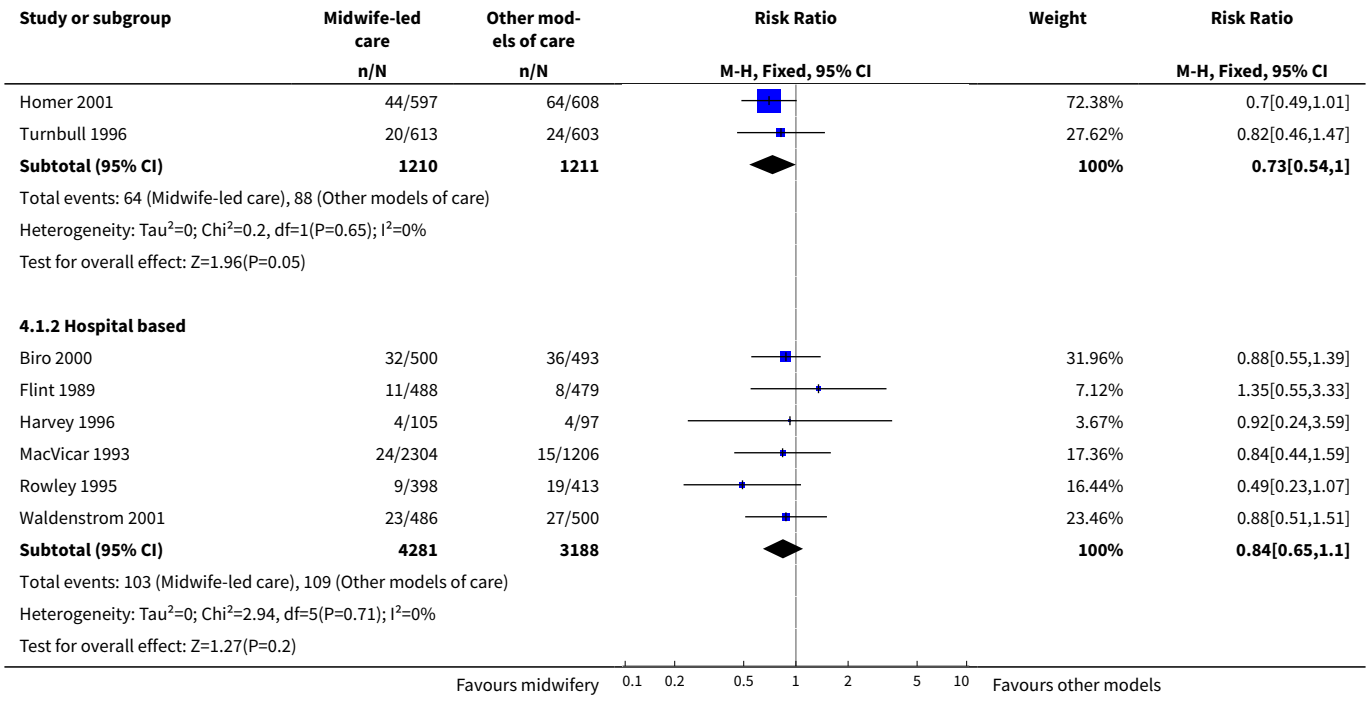
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Fetal loss/neonatal death before 24 weeks	8		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
1.1 Community based	2	2421	Risk Ratio (M-H, Fixed, 95% CI)	0.73 [0.54, 1.00]
1.2 Hospital based	6	7469	Risk Ratio (M-H, Fixed, 95% CI)	0.84 [0.65, 1.10]
2 Fetal loss/neonatal death equal to/after 24 weeks	9		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
2.1 Community based	3	3926	Risk Ratio (M-H, Fixed, 95% CI)	0.62 [0.32, 1.21]
2.2 Hospital based	6	7678	Risk Ratio (M-H, Fixed, 95% CI)	1.39 [0.81, 2.40]
3 Overall loss and neonatal death	10		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
3.1 Community based	6	5506	Risk Ratio (M-H, Fixed, 95% CI)	0.81 [0.63, 1.04]
3.2 Hospital based	4	6300	Risk Ratio (M-H, Fixed, 95% CI)	0.86 [0.67, 1.12]
4 No intrapartum analgesia/anaesthesia	5		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
4.1 Community based	1	1210	Risk Ratio (M-H, Fixed, 95% CI)	1.07 [0.79, 1.46]
4.2 Hospital based	4	5829	Risk Ratio (M-H, Fixed, 95% CI)	1.18 [1.06, 1.31]
5 Regional analgesia (epidural/spinal)	10		Risk Ratio (M-H, Random, 95% CI)	Subtotals only

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
5.1 Community based	4	4083	Risk Ratio (M-H, Random, 95% CI)	0.82 [0.67, 1.02]
5.2 Hospital based	6	4299	Risk Ratio (M-H, Random, 95% CI)	0.79 [0.67, 0.93]
6 Opiate analgesia	9		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
6.1 Community based	2	2405	Risk Ratio (M-H, Random, 95% CI)	1.04 [0.83, 1.31]
6.2 Hospital based	7	7792	Risk Ratio (M-H, Random, 95% CI)	0.83 [0.71, 0.96]
7 Caesarean birth	11		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
7.1 Community based	4	4082	Risk Ratio (M-H, Fixed, 95% CI)	0.95 [0.82, 1.10]
7.2 Hospital based	7	7815	Risk Ratio (M-H, Fixed, 95% CI)	0.97 [0.85, 1.11]
8 Instrumental vaginal birth (forceps/vacuum)	10		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
8.1 Community based	3	3909	Risk Ratio (M-H, Fixed, 95% CI)	0.96 [0.81, 1.14]
8.2 Hospital based	7	7815	Risk Ratio (M-H, Fixed, 95% CI)	0.82 [0.72, 0.93]
9 Spontaneous vaginal birth (as defined by trial authors)	9		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
9.1 Community based	3	3909	Risk Ratio (M-H, Fixed, 95% CI)	1.03 [0.99, 1.07]
9.2 Hospital based	6	7017	Risk Ratio (M-H, Fixed, 95% CI)	1.05 [1.02, 1.07]
10 5-minute Apgar score below or equal to 7	8		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
10.1 Community based	2	2421	Risk Ratio (M-H, Fixed, 95% CI)	0.70 [0.46, 1.07]
10.2 Hospital based	6	4359	Risk Ratio (M-H, Fixed, 95% CI)	1.56 [1.03, 2.36]
11 Postpartum depression	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
11.1 Community based	1	1213	Risk Ratio (M-H, Fixed, 95% CI)	1.94 [0.18, 21.32]
11.2 Hospital based	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

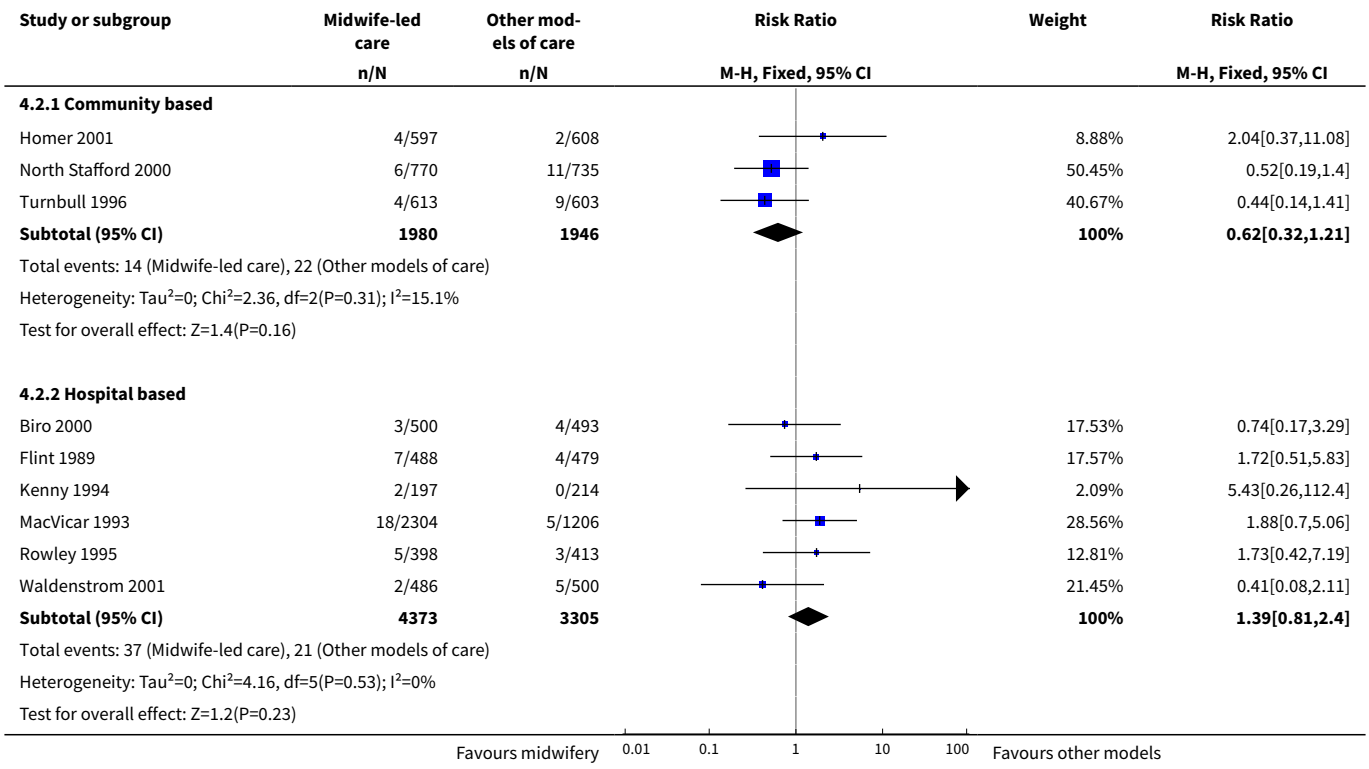
Analysis 4.1. Comparison 4 Midwife-led versus other models of care: variation in practice setting (antenatal care), Outcome 1 Fetal loss/neonatal death before 24 weeks.

Study or subgroup	Midwife-led care	Other models of care	Risk Ratio	Weight	Risk Ratio
	n/N	n/N	M-H, Fixed, 95% CI		M-H, Fixed, 95% CI
4.1.1 Community based					



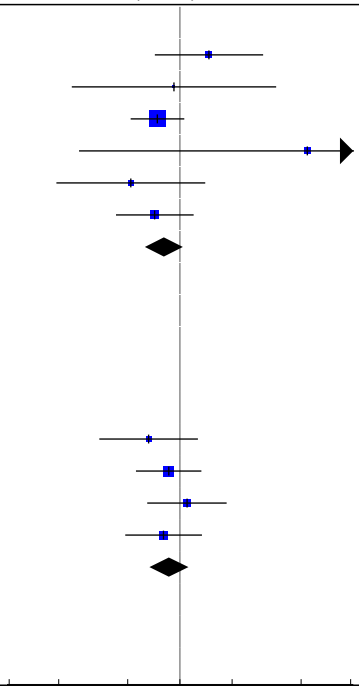


Analysis 4.2. Comparison 4 Midwife-led versus other models of care: variation in practice setting (antenatal care), Outcome 2 Fetal loss/neonatal death equal to/after 24 weeks.



Analysis 4.3. Comparison 4 Midwife-led versus other models of care: variation in practice setting (antenatal care), Outcome 3 Overall loss and neonatal death.

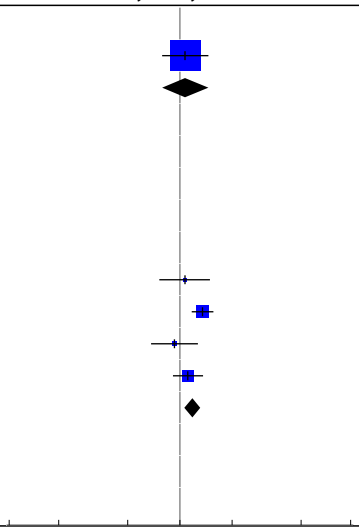
Study or subgroup	Midwife-led n/N	Other models n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
4.3.1 Community based					
Flint 1989	18/488	12/479		9.56%	1.47[0.72,3.02]
Harvey 1996	4/105	4/97		3.28%	0.92[0.24,3.59]
Homer 2001	48/597	66/608		51.63%	0.74[0.52,1.06]
Kenny 1994	2/197	0/214		0.38%	5.43[0.26,112.4]
North Stafford 2000	6/770	11/735		8.89%	0.52[0.19,1.4]
Turnbull 1996	24/613	33/603		26.27%	0.72[0.43,1.2]
Subtotal (95% CI)	**2770**	**2736**		**100%**	**0.81[0.63,1.04]**
Total events: 102 (Midwife-led), 126 (Other models)					
Heterogeneity: Tau^2=0; Chi^2=5.43, df=5(P=0.37); I^2=7.97%					
Test for overall effect: Z=1.66(P=0.1)					
4.3.2 Hospital based					
Rowley 1995	14/398	22/413		18.04%	0.66[0.34,1.27]
Biro 2000	35/500	40/493		33.66%	0.86[0.56,1.33]
MacVicar 1993	42/2304	20/1206		21.94%	1.1[0.65,1.86]
Waldenstrom 2001	25/486	32/500		26.36%	0.8[0.48,1.34]
Subtotal (95% CI)	**3688**	**2612**		**100%**	**0.86[0.67,1.12]**
Total events: 116 (Midwife-led), 114 (Other models)					
Heterogeneity: Tau^2=0; Chi^2=1.52, df=3(P=0.68); I^2=0%					
Test for overall effect: Z=1.13(P=0.26)					



Favours midwife-led — Favours other models

Analysis 4.4. Comparison 4 Midwife-led versus other models of care: variation in practice setting (antenatal care), Outcome 4 No intrapartum analgesia/anaesthesia.

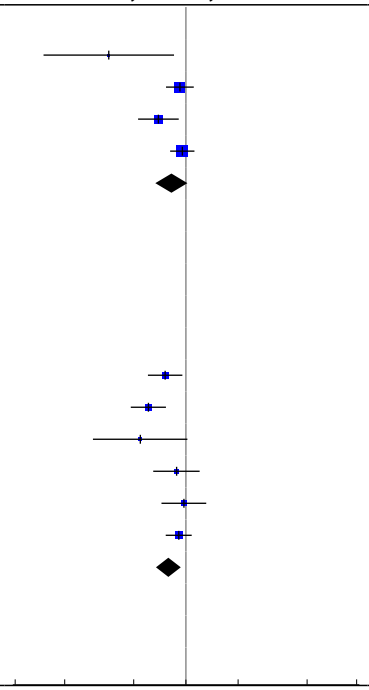
Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
4.4.1 Community based					
Turnbull 1996	76/613	69/597		100%	1.07[0.79,1.46]
Subtotal (95% CI)	**613**	**597**		**100%**	**1.07[0.79,1.46]**
Total events: 76 (Midwife-led care), 69 (Other models of care)					
Heterogeneity: Not applicable					
Test for overall effect: Z=0.45(P=0.65)					
4.4.2 Hospital based					
Biro 2000	62/486	57/476		12.39%	1.07[0.76,1.49]
Flint 1989	246/479	180/473		38.97%	1.35[1.17,1.56]
Kenny 1994	53/194	62/211		12.78%	0.93[0.68,1.27]
MacVicar 1993	270/2304	127/1206		35.87%	1.11[0.91,1.36]
Subtotal (95% CI)	**3463**	**2366**		**100%**	**1.18[1.06,1.31]**
Total events: 631 (Midwife-led care), 426 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=6.33, df=3(P=0.1); I^2=52.57%					
Test for overall effect: Z=2.99(P=0)					



Favours other models — Favours midwifery

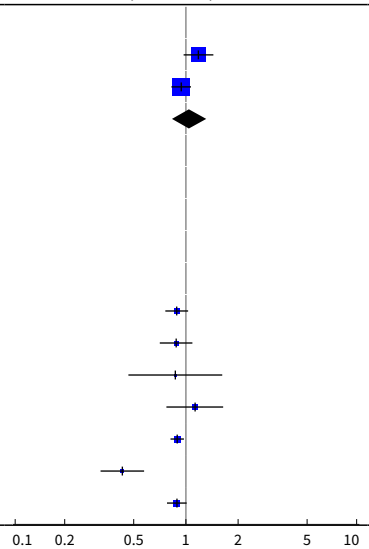
Analysis 4.5. Comparison 4 Midwife-led versus other models of care: variation in practice setting (antenatal care), Outcome 5 Regional analgesia (epidural/spinal).

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
4.5.1 Community based					
Hicks 2003	6/81	19/92		4.59%	0.36[0.15,0.85]
Homer 2001	157/594	172/601		33.9%	0.92[0.77,1.11]
North Stafford 2000	80/770	110/735		25.22%	0.69[0.53,0.91]
Turnbull 1996	194/613	198/597		36.3%	0.95[0.81,1.12]
Subtotal (95% CI)	**2058**	**2025**		**100%**	**0.82[0.67,1.02]**
Total events: 437 (Midwife-led care), 499 (Other models of care)					
Heterogeneity: Tau^2=0.03; Chi^2=8.4, df=3(P=0.04); I^2=64.28%					
Test for overall effect: Z=1.77(P=0.08)					
4.5.2 Hospital based					
Biro 2000	100/486	129/476		20.03%	0.76[0.6,0.95]
Flint 1989	88/479	143/473		19.7%	0.61[0.48,0.77]
Harvey 1996	13/105	22/97		5.55%	0.55[0.29,1.02]
Kenny 1994	52/194	64/211		15.02%	0.88[0.65,1.2]
Rowley 1995	69/393	73/405		15.63%	0.97[0.72,1.31]
Waldenstrom 2001	158/484	178/496		24.07%	0.91[0.76,1.08]
Subtotal (95% CI)	**2141**	**2158**		**100%**	**0.79[0.67,0.93]**
Total events: 480 (Midwife-led care), 609 (Other models of care)					
Heterogeneity: Tau^2=0.02; Chi^2=11.15, df=5(P=0.05); I^2=55.17%					
Test for overall effect: Z=2.77(P=0.01)					

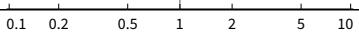


Analysis 4.6. Comparison 4 Midwife-led versus other models of care: variation in practice setting (antenatal care), Outcome 6 Opiate analgesia.

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
4.6.1 Community based					
Homer 2001	159/594	136/601		45.43%	1.18[0.97,1.44]
Turnbull 1996	253/613	262/597		54.57%	0.94[0.83,1.07]
Subtotal (95% CI)	**1207**	**1198**		**100%**	**1.04[0.83,1.31]**
Total events: 412 (Midwife-led care), 398 (Other models of care)					
Heterogeneity: Tau^2=0.02; Chi^2=3.63, df=1(P=0.06); I^2=72.44%					
Test for overall effect: Z=0.35(P=0.72)					
4.6.2 Hospital based					
Biro 2000	188/486	208/476		18.46%	0.89[0.76,1.03]
Flint 1989	114/479	128/473		15.25%	0.88[0.71,1.09]
Harvey 1996	16/105	17/97		4.47%	0.87[0.47,1.62]
Kenny 1994	45/194	40/194		9.16%	1.13[0.77,1.64]
MacVicar 1993	812/2304	477/1206		21.17%	0.89[0.82,0.97]
Rowley 1995	53/393	127/405		12.17%	0.43[0.32,0.57]
Waldenstrom 2001	215/484	248/496		19.32%	0.89[0.78,1.01]



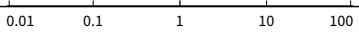
Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Subtotal (95% CI)	**4445**	**3347**		**100%**	**0.83[0.71,0.96]**
Total events: 1443 (Midwife-led care), 1245 (Other models of care)					
Heterogeneity: Tau^2=0.03; Chi^2=25.23, df=6(P=0); I^2=76.22%					
Test for overall effect: Z=2.44(P=0.01)					



Favours midwifery — Favours other models

Analysis 4.7. Comparison 4 Midwife-led versus other models of care: variation in practice setting (antenatal care), Outcome 7 Caesarean birth.

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
4.7.1 Community based					
Hicks 2003	9/81	14/92		4.21%	0.73[0.33,1.6]
Homer 2001	73/594	96/601		30.65%	0.77[0.58,1.02]
North Stafford 2000	137/770	128/735		42.06%	1.02[0.82,1.27]
Turnbull 1996	79/612	71/597		23.08%	1.09[0.8,1.47]
Subtotal (95% CI)	**2057**	**2025**		**100%**	**0.95[0.82,1.1]**
Total events: 298 (Midwife-led care), 309 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=3.76, df=3(P=0.29); I^2=20.18%					
Test for overall effect: Z=0.73(P=0.47)					
4.7.2 Hospital based					
Biro 2000	100/488	91/480		23.94%	1.08[0.84,1.39]
Flint 1989	37/479	35/473		9.19%	1.04[0.67,1.63]
Harvey 1996	4/105	14/97		3.8%	0.26[0.09,0.77]
Kenny 1994	24/194	27/211		6.75%	0.97[0.58,1.62]
MacVicar 1993	144/2304	78/1206		26.72%	0.97[0.74,1.26]
Rowley 1995	52/393	59/405		15.16%	0.91[0.64,1.28]
Waldenstrom 2001	55/484	56/496		14.43%	1.01[0.71,1.43]
Subtotal (95% CI)	**4447**	**3368**		**100%**	**0.97[0.85,1.11]**
Total events: 416 (Midwife-led care), 360 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=6.59, df=6(P=0.36); I^2=9%					
Test for overall effect: Z=0.43(P=0.67)					

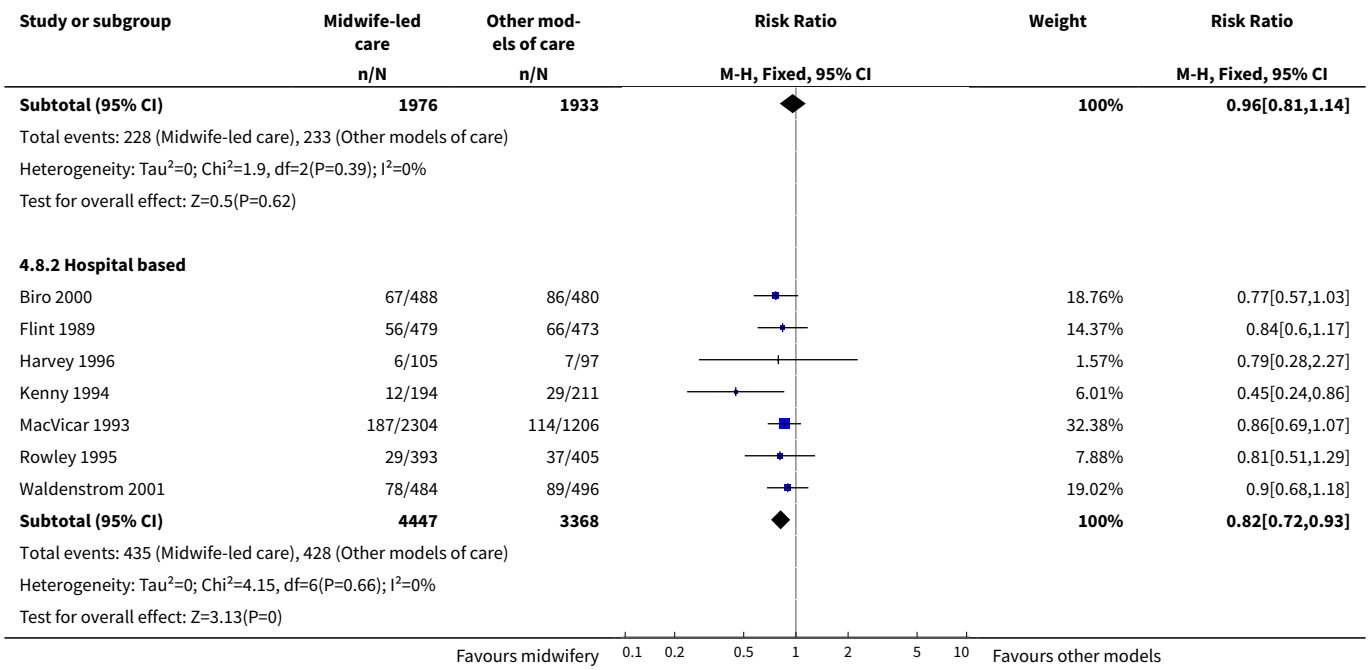


Favours midwifery — Favours other models

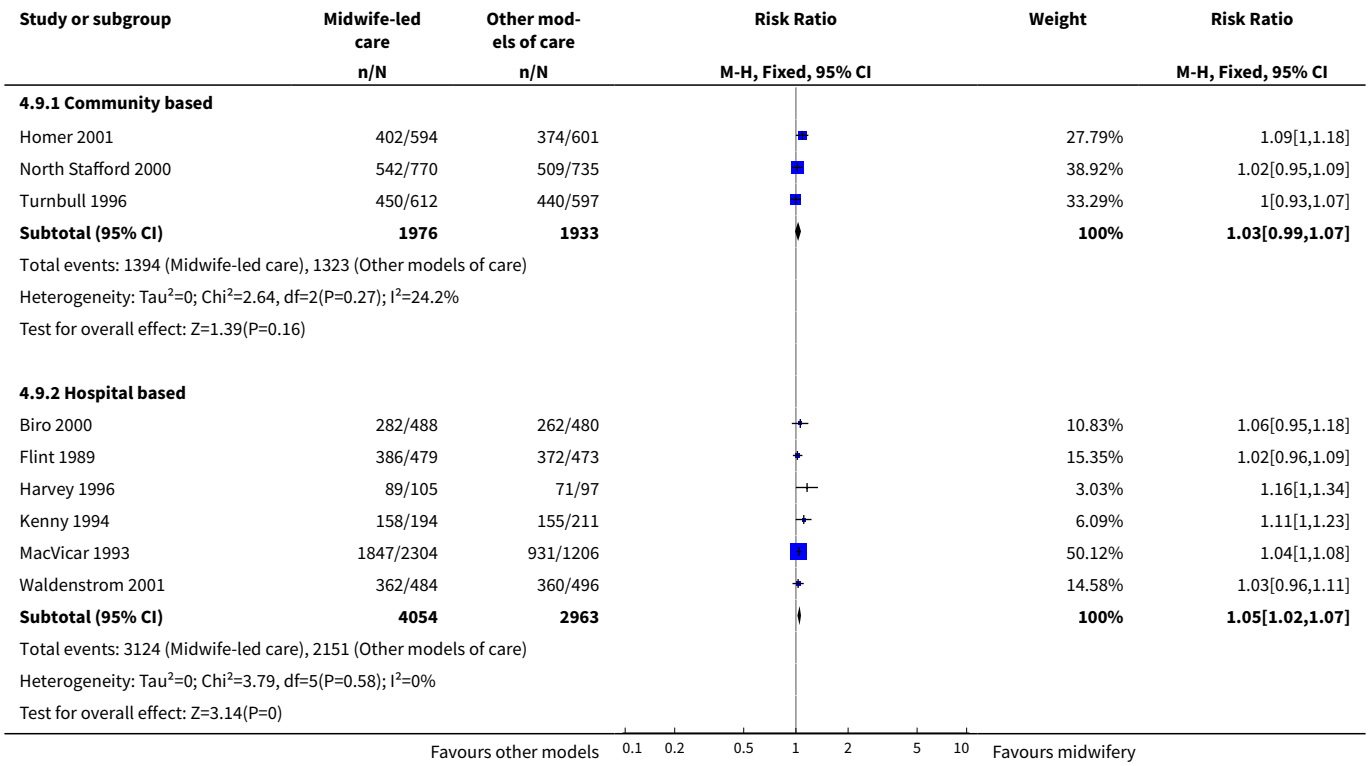
Analysis 4.8. Comparison 4 Midwife-led versus other models of care: variation in practice setting (antenatal care), Outcome 8 Instrumental vaginal birth (forceps/vacuum).

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
4.8.1 Community based					
Homer 2001	71/594	63/601		26.58%	1.14[0.83,1.57]
North Stafford 2000	74/770	84/735		36.47%	0.84[0.63,1.13]
Turnbull 1996	83/612	86/597		36.95%	0.94[0.71,1.25]

Favours midwifery — Favours other models



Analysis 4.9. Comparison 4 Midwife-led versus other models of care: variation in practice setting (antenatal care), Outcome 9 Spontaneous vaginal birth (as defined by trial authors).



Analysis 4.10. Comparison 4 Midwife-led versus other models of care: variation in practice setting (antenatal care), Outcome 10 5-minute Apgar score below or equal to 7.

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
4.10.1 Community based					
Homer 2001	12/597	13/608		25.16%	0.94[0.43,2.04]
Turnbull 1996	24/613	38/603		74.84%	0.62[0.38,1.02]
Subtotal (95% CI)	**1210**	**1211**		**100%**	**0.7[0.46,1.07]**
Total events: 36 (Midwife-led care), 51 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=0.77, df=1(P=0.38); I^2=0%					
Test for overall effect: Z=1.66(P=0.1)					
4.10.2 Hospital based					
Biro 2000	13/500	11/493		30.78%	1.17[0.53,2.58]
Flint 1989	17/480	6/476		16.74%	2.81[1.12,7.06]
Harvey 1996	4/105	4/97		11.55%	0.92[0.24,3.59]
Kenny 1994	7/197	1/214		2.66%	7.6[0.94,61.25]
Rowley 1995	6/398	7/413		19.09%	0.89[0.3,2.62]
Waldenstrom 2001	9/486	7/500		19.17%	1.32[0.5,3.52]
Subtotal (95% CI)	**2166**	**2193**		**100%**	**1.56[1.03,2.36]**
Total events: 56 (Midwife-led care), 36 (Other models of care)					
Heterogeneity: Tau^2=0; Chi^2=6.02, df=5(P=0.3); I^2=16.92%					
Test for overall effect: Z=2.11(P=0.03)					

Analysis 4.11. Comparison 4 Midwife-led versus other models of care: variation in practice setting (antenatal care), Outcome 11 Postpartum depression.

Study or subgroup	Midwife-led care n/N	Other models of care n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
4.11.1 Community based					
Turnbull 1996	2/616	1/597		100%	1.94[0.18,21.32]
Subtotal (95% CI)	**616**	**597**		**100%**	**1.94[0.18,21.32]**
Total events: 2 (Midwife-led care), 1 (Other models of care)					
Heterogeneity: Not applicable					
Test for overall effect: Z=0.54(P=0.59)					
4.11.2 Hospital based					
Subtotal (95% CI)	**0**	**0**			**Not estimable**
Total events: 0 (Midwife-led care), 0 (Other models of care)					
Heterogeneity: Not applicable					
Test for overall effect: Not applicable					

ADDITIONAL TABLES

Table 1. Women's experiences of care

Satisfaction	Intervention (n/N)	Control (n/N)	Relative rate	95% CI	Statistical test	P value
Flint 1989*						
Staff in labour (very caring)	252/275 (92%)	208/256 (81%)	1.1	1.0-1.2		
Experience of labour (wonderful/enjoyable)	104/246 (42%)	72/223 (32%)	1.3	1.0-1.8		
Satisfaction with pain relief (very satisfied)	121/209 (58%)	104/205 (51%)	1.1	0.9-1.4		
Very well prepared for labour	144/275 (52%)	102/254 (40%)	1.3	1.0-1.7		
MacVicar 1993	N = 1663	N = 826	Difference			
Very satisfied with antenatal care	52%	44%	8.3%	4.1-12.5		
Very satisfied with care during labour	73%	60%	12.9%	9.1-16.8		
Kenny 1994	N = 213	N = 233				
Carer skill, attitude and communication (antenatal care)	57.1/60	47.7/60			t = 12.4	0.0001
Convenience and waiting (antenatal care)	14.8/20	10.9/20			t = 10.1	0.0001
Expectation of labour/birth (antenatal care)	9.8/18	9.3/18			t = 1.4	0.16
Asking questions (antenatal care)	8.5/12	6.9/12			t = 6.6	0.0001
Information/communication (labour and birth)	28.3/30	24.8/30			t = 7.48	0.0001
Coping with labour (labour and birth)	20.9/30	19.3/30			t = 2.83	0.005
Midwife skill/caring (labour and birth)	22.7/24	21.3/24			t = 3.44	0.0007
Help and advice (postnatal care)	21.0/24	19.7/24			t = 1.88	0.06
Midwife skill and communication (postnatal care)	16.6/18	15.4/18			t = 4.48	0.0001

Table 1. Women's experiences of care *(Continued)*

Managing baby (postnatal care)	8.7/12	8.5/12		t = 0.77	0.77
Self-rated health (postnatal care)	7.5/12	7.1/12		t = 1.67	0.10
Rowley 1995			OR		
Encouraged to ask questions	N/A		4.22	2.72-6.55	
Given answers they could understand	N/A		3.03	1.33-7.04	
Able to discuss anxieties	N/A		3.60	2.28-5.69	
Always had choices explained to them	N/A		4.17	1.93-9.18	
Participation in decision making	N/A		2.95	1.22-7.27	
Midwives interested in women as a person	N/A		7.50	4.42-12.80	
Midwives always friendly	N/A		3.48	1.92 - 6.35	
Turnbull 1996	n/N	n/N	Mean difference - satisfaction score		
Antenatal care	534/648	487/651	0.48	0.55-0.41	
Intrapartum care	445/648	380/651	0.28	0.37-0.18	
Hospital-based postnatal care	445/648	380/651	0.57	0.70-0.45	
Home-based postnatal care	445/648	380/651	0.33	0.42-0.25	
Waldenstrom 2001	%	%	OR		
Overall antenatal care was very good (strongly agree)	58.2%	39.7%	2.22	1.66-2.95	< 0.001
Happy with the physical aspect of intrapartum care (strongly agree)	58.6%	42.5%	1.94	1.46-2.59	< 0.001
Happy with the emotional aspect of intrapartum care (strongly agree)	58.8%	44.0%	1.78	1.34-2.38	< 0.001
Overall postnatal care was very good (strongly agree)	37.6%	33.2%	1.27	0.97-1.67	0.08

Table 1. Women's experiences of care *(Continued)*

Hicks 2003**					
Care and sensitivity of staff (antenatal)	1.32	1.77	Mean difference?		0.0000
Care and sensitivity of staff (labour and delivery)	1.26	1.58	Mean difference?		0.008
Care and sensitivity of staff (postpartum at home)	1.24	1.57	Mean difference?		0.0000
Harvey 1996					
Labour and Delivery Satisfaction Index +	211	185	26	18.8-33.1	0.001
Biro 2000					
Satisfaction with antenatal care (very good)	195/344 (57%)	100/287 (35%)	1.24	1.13-1.36	0.001
Satisfaction with intrapartum care (very good)	215/241 (63%)	134/282 (47%)	1.11	1.03-1.20	0.01
Satisfaction with postpartum care in hospital (very good)	141/344 (41%)	102/284 (31%)	0.92	0.82-1.04	0.22

*: 99% Confidence interval (CI) for Flint study was reported
N/A: not available
**:Mean satisfaction scores are reported: lower scale indicates higher satisfaction. Satisfaction scores were calculated on a 5-point ordinal scale in which 1 = very satisfied and 5 = very dissatisfied.

APPENDICES

Appendix 1. Search strategy

Two review authors (MH, JS) performed the additional searches as per the following search strategy.

1 exp Pregnancy/
2 exp Prenatal Care/
3 exp Intrapartum Care/
4 exp Obstetric Care/
5 exp Postnatal Care/
6 exp Midwifery/
7 exp Midwifery Service/
8 exp Obstetric Service/
9 exp Home Childbirth/
10 exp Alternative Birth Centers/
11 or/1-10

12 exp Continuity of Patient Care/
13 exp Nursing Care Delivery Systems/
14 (midwif$ adj2 team$).tw.
15 (midwif$ adj model$).tw.
16 (multidisciplinary adj team$).tw.
17 (share$ adj care).tw.
18 (midwif$ adj led).tw.
19 (midwif$ adj manag$).tw.
20 (medical$ adj led).tw.
21 (medical adj manag$).tw.
22 or/12-21
23 exp Clinical Trials/
24 11 and 22 and 23

FEEDBACK

Bacon, May 2004

Summary

Are you planning to include intrapartum foetal death rates for women delivering in different types of unit, and with different levels of risk, as one of your outcome measures? We have been unable to find comparative data for a local review.

(Summary of comment from Sallie Bacon, May 2004)

Reply

We have not looked at intrapartum deaths specifically, but have addressed this issue in the 'Discussion'.

(Summary of response from Jane Sandall, November 2007)

Contributors

Sallie Bacon

WHAT'S NEW

Date	Event	Description
29 April 2009	Amended	In response to feedback, we have clarified what is meant by midwife-led care and have stressed the multi-disciplinary network of care providers; have added information to the Abstract about the lack of effect on caesarean section; and revised the Abstract's conclusions from "All women" to "Most women should be offered midwife-led models of care and women should be encouraged to ask for this option."

HISTORY

Protocol first published: Issue 1, 2004
Review first published: Issue 4, 2008

Date	Event	Description
9 November 2008	Amended	Amended the graph labelling for control in childbirth (Analysis 1.32) and corrected a typographical error in the Results section.
15 May 2008	Amended	Converted to new review format.

CONTRIBUTIONS OF AUTHORS

Declan Devane (DD)

DD contributed to the protocol by contributing to the design and writing.

DD contributed to the review by contributing to the design of the review, appraising the quality of and extracting data from selected papers, contributing to the interpretation of data, writing the review and providing a methodological and clinical perspective.

Simon Gates (SG)
SG provided methodological and statistical expertise in the development of the review, and assisted with analysis of data and interpretation of results.

Marie Hatem (MH)
MH registered the title and took the lead in the development of the protocol as the contact author. MH wrote the first version of the protocol, received all comments and suggestions from co-authors and referees and revised the protocol for publication.

MH is joint first author of the review. She was the contact author between 2004 and 2006. She received the list of the eligible papers from the Group. She organised the retrieval of the papers from different libraries (e.g. university; hospital, research centre) and contacted a few authors of papers that could not be found. She screened retrieved papers against the inclusion criteria, ensured that all authors had access to all of the listed papers (e.g. sent them copies of the papers) and shared these papers among the authors for checking of quality assessment. She prepared an electronic checklist for the appraisal of the quality of papers and for the extraction of the data. She did the initial appraisal of the quality of all the listed papers and the extraction of the data. She wrote to authors of papers for additional information. She entered the details of the studies for inclusion and exclusion into Review Manager. She wrote the draft of the description of the characteristics of the included papers. She entered the data into Review Manager and did the data management, adapting the comparisons, the subgroups, the outcomes, the analysis, etc., in response to discussions among all authors. She wrote the first draft of the Results and Discussion sections as well as the Plain Language Summary and the Abstract.

Jane Sandall
JS contributed to the protocol by contributing to the design and writing. JS contributed to the design, screened retrieved papers against inclusion criteria and appraised quality of papers.

JS has been the contact author for the review since July 2006 and is joint first author of the review. Since 2006, she has co-ordinated the review process, written to authors for additional information, managed data for the review, re-extracted data from papers, re-entered data into Review Manager, re-entered data for the included studies section, analysed and interpreted data, and provided a clinical and policy perspective. She has rewritten the Plain Language Summary, Abstract, Background, Methods, Description of studies, Methodological quality, Results, Analysis, Discussion and wrote the final draft of the review.

JS revised the review in response to feedback from referees and the editor. When making the revisions, JS updated the search and identified four new reports, and contacted authors for additional data, which were assessed by JS and DD, and which she included in the revised version.

JS in the guarantor for the review.

Hora Soltani (HS)
HS contributed to the design and commented on the first draft of the protocol.

HS contributed to the development of the review by contributing to the design of the review, evaluation of the quality of the articles against the inclusion/exclusion criteria, data extraction, writing to authors for clarification of original article information, data interpretation, commenting on as well as writing the review.

DECLARATIONS OF INTEREST

Declan Devane is currently conducting a randomised controlled trial to compare midwife-led care in a midwife-led unit with consultant-led care for women who are 'low risk' at antenatal booking (Begley 2007). Jane Sandall was and is principal investigator for two studies evaluating models of midwife-led care (Sandall 2001) (One to One Caseload Programme http://www.kcl.ac.uk/projects/1to1caseload), and co-investigator on the 'Birthplace in England Research Programme', an integrated programme of research designed to compare outcomes of births for women planned at home, in different types of midwifery units, and in hospital units with obstetric services http://www.npeu.ox.ac.uk/birthplace.

SOURCES OF SUPPORT

Internal sources

- King's College, London, UK.
- Research Centre - Ste-Justine's Hospital, Montreal, Canada.
- Southern Derbyshire Acute Hospitals NHS Trust, Derby, UK.
- Health Services Executive, Dublin North East, Ireland.
- Trinity College, Dublin, Ireland.

External sources

- No sources of support supplied

NOTES

The review will be updated in 2010 when the findings of current trials in progress are published. The review team will be expanded to include an obstetrician.

INDEX TERMS

Medical Subject Headings (MeSH)

Amnion [surgery]; Continuity of Patient Care [*organization & administration]; Infant Mortality; Midwifery [economics] [*methods] [organization & administration]; Models, Organizational; Patient Satisfaction; Perinatal Care [methods] [organization & administration]; Postnatal Care [*methods] [organization & administration]; Prenatal Care [*methods] [organization & administration]; Randomized Controlled Trials as Topic

MeSH check words

Female; Humans; Infant; Infant, Newborn; Pregnancy