

What evidence supports the use of free-standing midwifery led units (primary units) in New Zealand/Aotearoa?

Authors:

- Lesley Dixon, PhD, MMid, BA (Hons), RM
Midwifery Advisor
New Zealand College of Midwives
Email: practice@nzcom.org.nz
- Gail Prileszky, BSc (Hons) RM
Research Project Midwife
New Zealand College of Midwives
- Karen Guilliland, MA, RM, RGON, ADN, MNZM
CEO
New Zealand College of Midwives
- Chris Hendry, DMid, MPH, RM, RN
Executive Officer
Midwifery and Maternity Provider Organisation
- Suzanne Miller, MMid, RM
Lecturer
Otago Polytechnic School of Midwifery
- Jacqui Anderson, MMid, RM, RGON
LMC midwife
Senior Midwifery Lecturer and
Co Head of Midwifery
Canterbury Polytechnic Institute of Technology

ABSTRACT

Background: Free-standing midwifery led units (FMLUs) (known in New Zealand as a primary maternity unit), provide midwifery led care for low-risk women in local, family friendly environments which are generally some distance from an obstetric unit (OU) (known in New Zealand as a secondary or tertiary facility). The majority of women in New Zealand/Aotearoa choose to give birth in an OU and reasons for this choice may be related to safety concerns.

Aim: To identify, compare and critically evaluate published studies on FMLUs to determine the evidence that contributes to safety and may be useful for the New Zealand/Aotearoa maternity context.

Method: Five databases were searched using the search terms: place of birth, midwife-led, primary unit, maternal outcomes, neonatal outcomes. The primary outcome of interest was place of birth and the impact on mortality or morbidity rates for maternal and neonatal health. Secondary outcome measures were intervention rates during labour.

Findings: Three studies were found which compared maternal and neonatal outcomes for low risk women planning to birth in free standing midwifery led units or obstetric units. These studies found less augmentation during labour and higher rates of normal birth in FMLUs. Low-risk women who planned to birth in an OU had higher rates of epidural anaesthesia, instrumental birth, cesarean section and episiotomy rates. Neonatal health appeared to benefit with no differences in mortality rates but higher Apgar scores at 5 minutes and lower rates of admission to a neonatal intensive care unit for babies when birth was planned at a FMLU.

Conclusion: There is strong and consistent evidence to support FMLU birth as a safe option for women experiencing a low-risk pregnancy.

KEY WORDS:

Free standing midwifery led units, midwife-led, primary unit, maternal outcomes, neonatal outcomes

INTRODUCTION

There are many choices for parents when a pregnancy is confirmed, one of which is deciding on where to give birth. In New Zealand/Aotearoa women have the choice of giving birth at home, in a free standing midwifery led unit (FMLU), known in New Zealand as a primary maternity unit, or an obstetric unit (OU) known in New Zealand as a secondary or tertiary maternity unit. However, there are some regions of New Zealand that do not have free standing midwifery units (FMLUs) so women's choice is reduced to either home or an Obstetric Unit (OU). In 2009 there were 52 primary maternity units (FMLUs) in New Zealand most of which are situated in rural or provincial towns although there are several situated within main cities but are still free standing and separate to an obstetric unit (Hendry, 2009; Ministry of Health, 2012a). A primary unit is defined as:

"A community-based birthing unit, usually staffed by midwives. Primary birthing units provide access for women assessed as being at low risk of complications for labour and birth care. They do not provide epidural analgesia or operative birth services" (Ministry of Health, 2011a, p. 31).

Primary units are midwife led units which are physically separate (and often some distance) from obstetric units. For this paper the term FMLU will be used to replace primary unit so as to support consistency with international language. FMLUs provide midwifery led care for women who are well and healthy considered low risk and suited to birthing environments that are relaxed and home like. They are also more likely to be close to women's homes, therefore community based with familiar surroundings, which may have cultural significance for many families/whanau. It has been argued that midwives need to support and utilise FMLUs because women are more likely to birth normally in these units (Skinner & Lennox, 2006).

Despite this encouragement, many of the FMLUs in New Zealand are reporting low bed occupancy levels whilst OUs are full and often oversubscribed (Canterbury District Health Board, 2012). In 2010, 12.5% of women who had a midwife Lead Maternity Carer (LMC) who was also a

member of the Midwifery and Maternity Provider Organisation (MMPO) gave birth in a FMLU (primary unit) compared to 46.9% in a secondary unit (OU) and 35.4% in a tertiary unit (OU) (New Zealand College of Midwives & Midwifery and Maternity Provider Organisation, 2011). So whilst FMLUs are often available and provide an option for women to birth in their local community, the majority of women in New Zealand are actually giving birth in an obstetric unit. It is not known what role midwives play in the choice of birth place for women.

The choice of birth place is clearly not just dependent on availability but is often a deeply personal decision influenced by both rational and non-rational considerations. These can include influences such as culture, tradition, perceptions of safety, media, fear, previous experiences and the views and expectations of family/whanau and friends (Houghton, Bedwell, Forsey, Baker, & Lavender, 2008; McCourt, Rance, Rayment, & Sandall, 2011). The majority of research exploring choice of birth place has focused on why women choose to give birth at home. There is currently little research exploring the reasons why women do not choose to give birth in FMLUs in New Zealand or whether midwives promote their use.

In the United Kingdom there are a similar range of settings for women to consider when choosing a place of birth. These settings are home, FMLUs alongside midwifery led units (AMLU) and obstetric units (Redshaw, et al., 2011). Alongside midwifery led units are situated within or on the same site as an obstetric unit but care provision is led by midwives. These options are not fully available in all regions with FMLUs more available in the South West of England than elsewhere.

UK research has found that women's view on place of birth is influenced by safety, previous birth experiences, the influences of friends, family and doctors, social class and cultural values (McCourt, et al., 2011). Drivers for choosing hospital birth were access to epidural for pain relief and not needing to be transferred during labour if there was a problem. Women reported being prepared to travel up to two hours from a rural location to their preferred place of birth, and often associated consultant led (obstetric) units with increased safety (Pitchforth, et al., 2008). Often women were unaware of different options and considered that giving birth in an obstetric unit was the norm and a safe environment (Houghton, et al., 2008).

With so many women giving birth in an obstetric unit despite the availability of FMLUs in New Zealand it is likely that women are basing their decisions on similar concerns about safety as in the UK. What is the evidence that supports increased safety of obstetric units when compared to free standing midwifery led units? There have been several structured reviews examining the outcomes and cost effectiveness of FMLUs to ascertain the benefits and harms of these units (Henderson & Petrou, 2008; Stewart, McCandish, Henderson, & Brocklehurst, 2004; Walsh & Downe, 2004). These reviews found that in general women who birthed in FMLUs were more likely to birth normally with less intervention, but that there was a lack of conclusive evidence about neonatal mortality and morbidity. The reviews recommended more research be conducted using robust study designs that would support confidence in the reliability of the findings and in order to provide information to women about the safety of all birth place settings.

The Birthplace in England Collaborative Group have recently published the results of a large well conducted prospective cohort study involving 64,538 women aimed at comparing the perinatal outcomes, maternal outcomes, interventions during labour and the costs for the various options of birthplace in the United Kingdom (Birthplace in England Collaborative Group, 2011). The authors conclude that women planning birth in a FMLU experience fewer interventions than those planning birth in an OU with no impact on perinatal outcomes. This research is being used to provide evidence based information to women and support for low risk women to give birth in free standing midwife led units in England.

The maternity model of care in England, whilst similar to that of New Zealand, also has some differences. The authors of the Birthplace England study caution that their findings may not apply to countries where care is provided differently. So what are the similarities and differences between the UK and New Zealand? Both countries have midwives providing primary care in the community, both have fully funded maternity services, both support choice for women and both provide a choice of birth place which includes FMLUs for intrapartum care. In New Zealand women have universal access to the same midwife from antenatal care through the labour and birth and into the postnatal period. In England this type of

The choice of birth place is
clearly not just dependent
on availability but is often a
deeply personal decision.

continuity of care is less common and universal access to a known midwife is not the usual practice. This means that when transfer of care between units is necessary the women do not generally have a midwife stay with them and continue care in the obstetric unit. This continuity of care may have an impact on birth outcomes.

We considered it timely to critically review the evidence relating to the safety of FMLUs and to consider the relevance of those findings to the New Zealand context. Previous reviews of studies published prior to 2004 reported limited evidence on perinatal morbidity and mortality and poor study designs (Stewart, et al., 2004; Walsh & Downe, 2004). Our focus was to identify research studies that have been published since 2004 and in which outcomes could be considered transferrable to or are from the New Zealand context. Our research questions were: What is the evidence of safety for FMLUs and how does this evidence fit the New Zealand context? This paper provides the results of a structured literature review which aimed to identify, compare and critically evaluate published studies on FMLUs to determine the evidence that contributes to safety and may be useful for the New Zealand maternity context.

METHOD

The primary objective of this structured literature review was to assess the elements of maternity care that contribute to safety for the woman and baby. Therefore the search strategy was designed to find all research studies on maternal and/or neonatal outcomes for births planned for free standing midwifery led units. Specific outcomes included interventions during labour, mode of birth, maternal morbidity such as Post Partum Haemorrhage (PPH), 3rd or 4th degree tears and episiotomy, perinatal mortality and morbidity such as stillbirth and neonatal mortality, Neonatal Intensive Care Unit (NICU) admission and low Apgar score

Search Strategy

The authors identified five databases to be searched to ensure a comprehensive review of the literature. Meta-searches of four databases were undertaken Cinahl, Embase, Medline and Pubmed. An additional database Scopus was searched separately. Key words used were place of birth, midwife-led, primary unit, maternal outcomes and neonatal outcomes. Identified studies were also hand searched for further references. Results were restricted to English language, peer reviewed papers and for the years 2004 to 2012.

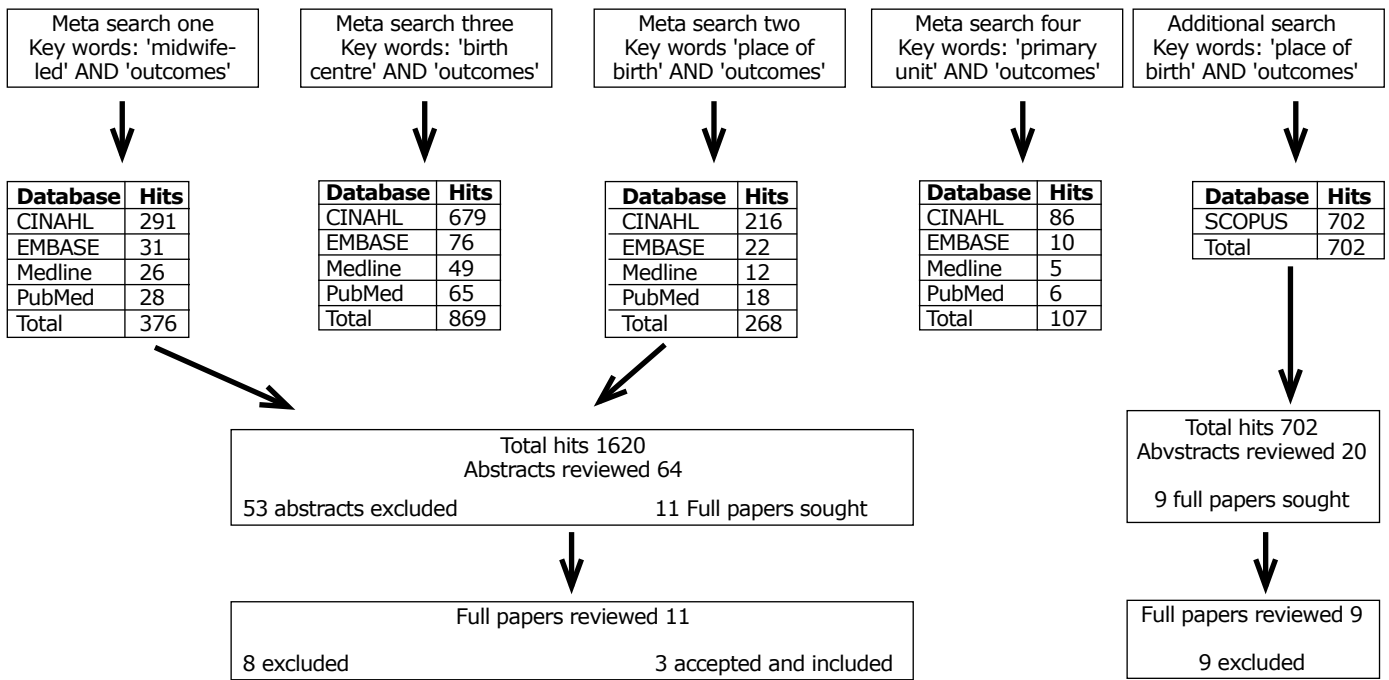
RESULTS

The search resulted in 2322 hits with 84 full abstracts reviewed and 11 full texts retrieved and assessed (figure 1). All identified studies were assessed separately by two authors then discussed together. Studies were selected if they provided maternal or neonatal outcomes.

Excluded Studies

Eight studies were excluded; six of these described outcomes for alongside midwifery units in Ireland, Norway, China, and Australia (Begley, et al., 2011; Bernitz, et al., 2011; Cheung, et al., 2011; Eide, Nilsen, & Rasmussen, 2009; Laws, Tracy, & Sullivan, 2010; Tracy, et al., 2007).

Figure 1 Flowchart detailing literature search for place of birth paper



A further two described outcomes for midwifery led care as opposed to place of birth (Table 1) (Maassen, et al., 2008; Symon, Winter, Inkster, & Donnan, 2009).

Included Studies

Three studies were included which met our search objectives (Table 2). This review has included one prospective cohort study from the UK, a prospective cohort study from Denmark and a retrospective observational study from New Zealand (Birthplace in England Collaborative Group, 2011; Davis, et al., 2011; Overgaard, A Moller, Fenger-Gron, Knudsen, & Sandall, 2011).

Findings

Overview and Quality assessment of included studies

Birthplace in England Study

The aim of the Birthplace in England study was to compare perinatal outcomes, maternal outcomes and interventions during labour by planned place of birth at the start of labour for women with low risk pregnancies (Birthplace in England Collaborative Group, 2011). It was a prospective cohort study involving 64,538 eligible women who were classified as low risk. This national study collected data for women who gave birth in one of the following places: at home, in a FMLU, an ALMU or an OU. Data was collected between April 2008 and April 2010. The results found no significant differences in the adjusted odds (1.00 OU, 1.59 Home, 1.22 FMLU, 1.26 AMLU) of the primary outcome (a composite of perinatal mortality and intrapartum related morbidities) for any of the non-obstetric unit settings compared with obstetric units (Table 3). Interventions during labour were substantially lower in all of the non-obstetric settings (these included homebirth, FMLU & AMLU). There were differences between nulliparous and multiparous women's outcomes depending on place of birth. Nulliparous women who planned to birth at home had an increased odds ratio (OR 2.80, 95% CI 1.66-4.76) for the primary outcome when compared to nulliparous women who planned to birth in a FMLU (OR 1.40, 95% CI 0.76-1.96). Additionally transfers from non-obstetric unit settings were more frequent for nulliparous women.

This study was able to compare outcomes by the woman's planned place of birth at the start of labour and had high participation rates from all the maternity units and hospitals in England. It also had a large sample size with sufficient statistical power to detect clinically important differences in adverse perinatal outcomes. Selection bias was minimised owing to a high response rate and there was the ability to compare groups that were similar for identified clinical risk. A weakness of the study was the use of a composite of perinatal outcomes, both mortality (perinatal death) and

morbidity (neonatal encephalopathy, meconium aspiration syndrome etc) outcomes were used. This was because of the low rate of events for individual perinatal outcomes, but putting these two outcomes together may have concealed important differences between planned places of birth. The generalisability of the findings to other settings is problematic as models of maternity care may differ.

Danish Study

The objective of the Danish study was to compare the perinatal and maternal morbidity and birth interventions in low-risk women who planned to give birth either in one of two FMLU or in two OUs (Overgaard, et al., 2011). This was a prospective study involving a cohort of 839 low risk women who planned to give birth in a FMLU. Participants in the study were matched for age, ethnicity, parity and other factors and compared to a control group of 839 low risk women who gave birth in an OU (Overgaard, et al., 2011). The results indicated no increase in perinatal morbidity (poor Apgar scores, admittance to NICU, asphyxia) but significant reductions in caesarean section and increased likelihood of spontaneous vaginal birth for women with low-risk pregnancies who planned to give birth in a FMLU (Table 4). As a prospective cohort study this research had rigorous processes and well defined criteria to ensure that the outcomes for low-risk women were provided. The research was carried out in the same region so there was reduced risk of cultural or regional variances. A complete set of data was obtained and the cohorts were matched and adjusted to reduce the influences of confounding factors. However, the risk of confounding by unknown factors persists because of the study design.

New Zealand study

The New Zealand study was a large retrospective cohort study describing mode of birth according to birth place settings and intrapartum and perinatal outcomes using data extracted from the Midwifery and Maternity Provider Organisation (MMPO) database (Davis, et al., 2011). The MMPO is an organisation which supports self employed LMC midwives to manage their practice. It assists midwife members with payment claims and collects summary data based on the clinical information submitted by midwives. The database provides national data collected prospectively for a large number of women who birth in New Zealand. In this research study the cohort involved 16,453 low-risk women who gave birth between 2006 and 2007 and who planned to birth at home, in a FMLU (primary unit) or in an OU (secondary/tertiary unit). The results demonstrated that low-risk women planning to birth in a secondary or tertiary hospital had a high incidence of caesarean section,

Table 1 Excluded studies

Authors and country	Study design	Sample size	Inclusion / exclusion criteria	Outcome measures	Main findings	Reason for exclusion from review
Begley et al 2011 Republic of Ireland	Randomised trial intention to treat analysis	1653 women randomised 1101 to MLU (Midwife Led Unit), 552 to CLU (consultant led unit)	Comprehensive exclusion criteria to determine risk factors including demographic characteristics, medical, gynaecological and obstetric history	9 key maternal and neonatal outcomes including caesarean birth, induction, episiotomy, instrumental birth, Apgar score<8, PPH, breastfeeding initiation, continuous EFM, augmentation of labour	No significant difference in seven key maternal and neonatal outcomes. MLU women significantly less likely to have continuous EFM and augmentation of labour	Alongside midwifery led unit
Bernitz et al 2011 Norway	Randomised controlled trial	1111 low risk women randomised to special unit, normal unit or midwife led unit	Low risk at onset of labour defined by inclusion criteria matching selection criteria at the MLU	Primary outcome was operative delivery rate. Secondary outcomes were augmentation, pain relief, PPH, sphincter injuries, intrapartum transfer, Apgar score<7, metabolic acidosis and transfer to NICU	No significant differences in operative delivery rates, PPH, sphincter injuries or neonatal outcomes. Significantly less augmentation, epidural analgesia in MLU.	Alongside midwifery led unit
Cheung et al 2011 China	Retrospective cohort study plus questionnaire survey	226 women accessing MNBU matched with 226 controls accessing standard care	Term women with singleton cephalic pregnancy, no complications of pregnancy or significant medical problem and a normal CTG trace were included	Mode of birth and model of care	Vaginal birth rate of 87.6% in MNBU (Midwife-led Normal Birth Unit) compared to 58.8% in standard care unit	Alongside midwifery led unit
Eide et al 2009 Norway	Prospective non randomised observational study	252 women in MLW and 201 women in CDW (Conventional Delivery Ward). Allocation was alternated between MLW and CDW	Low risk women who met the criteria for delivery in the MLW (Midwife Led Ward) who did not have a preference were allocated to either MLW or CDW. Women requesting epidural were excluded	Maternal intervention rates, caesarean section and instrumental birth rates.	No significant difference between emergency caesarean and instrumental rates. Higher incidence of episiotomy, epidural analgesia, pudendal nerve block and nitrous oxide in the CDW. Higher incidence of opiate and non-pharmacological pain relief in the MLW	Alongside midwifery led unit
Laws et al 2010 Australia	Retrospective analysis of population database	822,955 mothers and 836,919 babies. 2.7% (22,222) of these women intended to birth in a birth centre	Women aged 20-34 yrs, who had a singleton baby of >2500g. Women who had hypertension or diabetes (pre-existing or gestational) were excluded	Maternal and neonatal outcomes including method of birth, onset of labour, episiotomy, third fourth degree tear, Apgar score, admission to NICU	Lower rates of intervention and adverse perinatal outcomes for women in birth centres. No significant difference in perinatal mortality for low risk women at term.	Alongside midwifery led unit
Maassen et al 2008 The Netherlands	Retrospective analysis of national database	107,667 low risk women; 87,817 in primary care with midwife, 19,850 in secondary care with obstetrician	Inclusion and exclusion criteria as assessment of risk clearly defined	Primary outcome: rate of operative deliveries	Significantly lower rates of operative vaginal birth, caesarean section in primary care group. Significantly lower rates of primiparous caesarean section in primary care group. Significantly higher rates of spontaneous vaginal birth for multiparous and primiparous women in primary care group	Comparison of model of care (midwife verses obstetrician) not place of birth
Symon et al 2009 UK	Retrospective matched cohort analysis	8676 women; 1462 cared for by independent midwives (IMA) matched with 7214 cared for by NHS midwives (NHS)	All women cared for by independent midwives in UK between 2002-2005	Primary outcome: rate of unassisted vertex delivery. Secondary outcomes; live birth, perinatal death, onset of labour, gestation, use of pharmacological analgesia, duration of labour, apgar scores, admission to NICU and infant feeding	IMA mothers were significantly more likely to have an unassisted vertex birth but were also more likely to experience a stillbirth or neonatal death. Exclusion of high risk pregnancies made this a non significant difference. The low risk IMA perinatal mortality rate is comparable to other low risk studies. IMA mothers were more likely to have a spontaneous onset of labour and use less pharmacological pain relief	Comparison of model of care not place of birth
Tracy et al 2007 Australia	Retrospective population based study	1,001,249 women of whom 21,800 gave birth in a birth centre	All women who gave birth in Australia between 1999-2002. Multiparous and primiparous women analysed separately	Perinatal outcomes including stillbirth and perinatal death	Perinatal death rate was significantly lower in birth centres than in hospitals irrespective of parity	Alongside midwifery led unit

Table 2 Included studies

Authors and country	Study design and sample size	Inclusion / exclusion criteria	Outcome measures	Main findings	Comments
Birthplace in England Collaborative Group 2011 UK	Prospective cohort study 64538 women Cohorts were by planned place of birth; home, standalone MLU, alongside MLU, stratified sample of obstetric units	Singleton pregnancy at term included planned caesarean section or caesarean section prior to labour were excluded	Composite primary outcome measure of perinatal mortality and morbidity. Secondary outcomes were maternal morbidities, interventions and mode of birth	No significant differences in primary outcome for any non obstetric setting compared with obstetric units. Nulliparous women who planned a home birth had higher odds of primary outcome	Sub analysis was conducted to differentiate between low risk and higher risk pregnancies
Overgaard et al 2011 Denmark	Retrospective matched cohort study 839 low risk women intending FMLU birth matched with 839 low risk women intending obstetric unit birth	All women who were admitted to FMLU in labour between 2004 and 2008. Controls were matched to individual obstetric and social characteristics	Perinatal and maternal morbidity and interventions	No differences in perinatal morbidity. Significantly reduced incidences of maternal morbidity, birth interventions and increased likelihood of spontaneous normal birth for women intending FMLU birth	Four units were compared two FMLU and two obstetric units
Davis et al 2011 New Zealand	Retrospective cohort study 16453 Low risk women	Low risk women defined by range of medical and obstetric criteria	Mode of birth, intrapartum interventions, neonatal outcomes	Higher risk of caesarean section, assisted modes of birth and intrapartum intervention for women planning to birth in secondary or tertiary unit plus higher risk of neonatal admission to NICU	Data collected from MMPO database

Table 3 Maternal and Neonatal Outcomes for the Birthplace in England study

Birthplace in England Collaborative group 2011						
	FMLU		CI 99%	OU		CI 99%
Mode of birth	N = 11280	%		N = 19688	%	
Spontaneous vaginal birth	10,150	90.7	(89.1-92.0)	14,645	73.8	(71.1-76.4)
Ventouse birth	321	2.7	(2.0-3.5)	1535	8.1	(6.4-10.1)
Forceps birth	365	2.9	(2.3-3.7)	1307	6.8	(5.4-8.4)
Intrapartum caesarean section	405	3.5	(2.8-4.2)	2158	11.1	(9.5-13.0)
Interventions during labour						
Syntocinon Augmentation	878	7.1	(6.0-8.5)	4549	23.5	(21.1 - 26.2)
Epidural	1251	10.6	(9.1-12.3)	5817	30.7	(27.5-34.2)
Immersion in water	5253	45.7	(35.6-56.3)	1836	9.1	(6.4-12.6)
General anaesthesia	61	0.5	(0.3-0.8)	285	1.5	(1.1-1.8)
No active management of 3rd stage	2568	22.1	(15.8-30.0)	1188	6.1	(4.6-8.1)
Maternal morbidity						
Third or fourth degree tears	259	2.3	(1.9-2.9)	625	3.2	(2.7-3.7)
Episiotomy	995	8.6	(7.3-10.1)	3780	19.3	(17.4-21.4)
Neonatal mortality & morbidity composite						
Overall cohort	N = 11,199		Per 1000 (95% CI)	N = 19551		Per 1000 (95% CI)
Without complicating conditions at start of labour	N= 10,571		N=15676			
	35		3.2 (2.3-4.6)	48		3.1 (2.2-4.2)

*neonatal composite outcomes were: stillbirth after start of labour care, early neonatal death, neonatal encephalopathy, meconium aspiration syndrome, brachial plexus injury, fractured humerus or clavicle

assisted births and other interventions when compared to women planning to birth at home or in a FMLU (Table 5). Additionally, women planning to birth at home or in a primary unit had less incidence of the baby being admitted to a neonatal intensive care unit.

The observational research design of this study increases the possibility for selection bias and there is a possibility that confounders (such as Body Mass Index (BMI) and socio-economic status which were not defined) could have had an influence on outcomes. Additionally, when there are multiple comparisons being made from a large database it is possible that some results may reach significance by chance. However, the level of significance for many of the outcomes this study measured were at the level of 0.001 or

less thereby reducing chance outcomes to one in a 1000. The study was not powered to detect differences in perinatal mortality.

OUTCOMES

Maternal outcomes

Interventions during labour

The Birthplace in England study found women had less intervention during their labour and birth when they planned to birth in a FMLU compared with women who planned to birth in an OU (Table 3). The results included women whose planned place of birth changed during labour. They found reduced rates of syntocinon augmentation,

Table 4 Maternal and neonatal outcomes for the Danish study

Danish Study (Overgaard et al., 2011)	FMLU n = 839 women		OU n = 839 women		RR 95%	P Value
	N	%	N	%		
Mode of birth						
Spontaneous vaginal birth	796	94.9	751	89.5	1.06 (1.03-1.09)	0.000
Instrumental birth	25	3.0	61	7.8	0.4 (0.3-0.6)	0.000
Caesarean section	19	2.3	34	4.0	0.6 (0.3-0.9)	0.04
Interventions during labour						
Augmentation	69	8.2	154	18.6	0.5 (0.3-0.6)	0.000
Epidural (pain relief)	35	4.2	85	10.3	0.4 (0.3-0.6)	0.000
Water tub for pain relief	269	32.1	197	23.5	1.4 (1.2- 1.6)	0.0001
Maternal morbidity						
Third and fourth degree tears	19	2.3	24	2.9	0.8 (0.4-1.4)	0.5224
PPH > 500 mls	29	3.5	68	8.1	0.4 (0.3-0.7)	0.0001
PPH > 1000mls	11	1.3	14	1.7	0.8 (0.4-1.7)	0.6900
Perinatal morbidity						
Neonatal asphyxia	27	3.2	41	4.9	0.7 (0.4-1.1)	0.1143
Apgar score <7 at 5 minutes	5	0.6	5	0.6	1.0 (0.3-3.4)	1.0000
Admission to NICU	28	3.3	42	5.0	0.7 (0.4-1.1)	0.1143

Table 5 Maternal and Neonatal outcomes for NZ planned place of birth study

Planned place of birth in New Zealand (Davis, et al 2011)	Primary Unit (FMLU) n = 2873		Secondary unit (OU) n = 7,353		Tertiary Unit (OU) n = 4,095		P value for tertiary unit
	N	%	N	%	N	%	
Mode of birth							
Spontaneous vaginal birth	2,722	94.7	6,216	84.5	2,979	72.7	
Ventouse birth	34	1.1	352	4.8	304	7.4	
Forceps birth	24	0.9	161	2.2	201	4.9	
Caesarean section	91	3.2	622	8.5	610	14.9	
Interventions during labour	Ref		Adjusted RR (95% CI)				
Augmentation	1.0		1.91 (1.73-2.10)		1.87 (1.68-2.08)		0.001
Artificial Rupture of Membranes	1.0		1.49 (1.34-1.65)		1.51 (1.35-1.70)		0.001
Pharmacological pain management	1.0		1.49 (1.36-1.64)		1.64 (1.47-1.82)		0.001
Maternal morbidity							
Perineal trauma – level not stated	1.0		0.83 (0.76-0.91)		0.91 (0.82-1.02)		0.098
Episiotomy	1.0		1.88 (1.54-2.30)		2.91 (2.37-3.57)		0.001
PPH >1000mls	1.0		1.20 (0.80-1.81)		1.39 (0.90-2.16)		0.138
Neonatal outcomes							
Apgar score <7 at 5 minutes	1.0		1.39 (0.87-2.22)		1.58 (0.95-2.61)		0.077
Admission to NICU	1.0		1.40 (1.05-1.87)		1.78 (1.31-2.42)		0.001

*Relative risks adjusted for age, parity, ethnicity & smoking

reduced rates of epidural and general anaesthesia and increased use of water immersion and non active third stage. The Danish study also reported lower rates of oxytocin augmentation and epidural anaesthesia and increased use of water for pain relief for low-risk women who planned to birth in a FMLU (Table 4). The New Zealand study found significantly higher levels of intervention for women who birthed in a secondary or tertiary unit. The primary unit was used as the reference point in the analysis. The tertiary units had an adjusted relative risk of 1.87 (CI 95% 1.68-2.08 P < 0.001) for augmentation during labour as well as increased risks for artificial rupture of membranes and pharmacological pain management (Table 5).

Mode of birth

The England birthplace study reported higher rates of spontaneous normal vertex birth (90.7%) for women who planned to birth in FMLUs and

higher rates of operative births for women who planned to birth in an OU (Table 3). The Danish study also reported higher normal birth rates (94.9%) and lower operative births for women who planned birth in a freestanding midwifery led unit (Table 4). The New Zealand study similarly found higher rates of vaginal birth for low-risk women who gave birth in a primary unit (94.7%) compared to low-risk women birthing in secondary units (84.5%) and tertiary units (72.7%).

Maternal morbidity

Maternal morbidity outcomes for each study varied with some overlap between studies. The Birthplace England study reported reduced rates of third and fourth degree tears for women who planned to birth in a FMLU. The Danish study also reported reduced rates of third and fourth degree tears and PPH although the differences between units for PPH of more than 1000mls were not significantly different (Table 4). The New Zealand

study found that the adjusted relative risk of episiotomy for women who planned a tertiary unit birth was 2.91 (CI 95% 2.37-3.57) times that for a woman planning a primary unit birth. For PPH of more than 1000mls, the adjusted relative risk for a woman planning a tertiary unit birth was 1.39 (CI 95% 0.90-2.16) times that of a woman planning a primary unit birth.

Neonatal outcomes

The UK birthplace study reported on the perinatal mortality and morbidity for the whole cohort as 4.3 per 1000 (CI 95% 3.3 – 5.5). This included outcomes such as stillbirth, early neonatal death, neonatal encephalopathy, meconium aspiration syndrome, brachial plexus injury, fractured humerus or clavicle as an adverse event. For women without any complicating conditions at the start of labour, the rate of adverse events was 3.1 per 1000. Differences between the FMLUs and the OUs reduced when this restriction was applied to the cohort (Table 3).

The Danish study found no difference in perinatal morbidity between infants of low-risk women who intended to birth in a FMLU compared to OUs (Table 4). There was one neonatal death in the total cohort which was due to a severe diaphragmatic hernia not detected on ultrasound screening.

The New Zealand study was not powered to detect differences between place of birth and perinatal mortality but did report on Apgars of less than 7 at five minutes and admission to NICU (Table 5). For women with low-risk pregnancies who planned to give birth in a tertiary unit the adjusted risk ratio of having a baby with an Apgar of less than 7 at five minutes was 1.58 (CI 95% 0.95- 2.61) times that of a woman with a low- risk pregnancy planning to birth in a FMLU. The risk of admission to a NICU for a baby of a woman with a low-risk pregnancy who planned to birth in a tertiary unit was 1.78 (CI 95% 1.31-2.42) times that of a woman planning a FMLU.

Transfer to an obstetric unit

Both the Birthplace UK study and the Danish study reported on transfer rates between free standing midwifery led units and obstetric units (Table 6). There were variations in the rate of transfer between the studies but similarities in transfer rates for nulliparous women. The New Zealand study did not report data on transfers.

Table 6 Transfer rates for Danish and Birth in England studies

Transfers from freestanding midwifery led unit	Birthplace in England	Danish Study
Overall transfer rates	21.9%	14.8%
Before the birth	16.5%	11.5%
After the birth	4.8%	3.2%
Nulliparous women	36.3%	36.7%
Multiparous women	9.4%	7.2%

DISCUSSION

This literature review has been structured in a systematic way so that findings which are central to the issues could be rigorously and systematically mapped out and critically appraised. A clearly identified question and search strategy was utilised. Differing quantitative research designs were included as it was considered that randomised control trials may not be feasible for this research issue. Two well designed prospective cohort studies and an observational study have been included in this review. Well designed cohort studies can provide several advantages. They can demonstrate causal associations, provide direct calculation of the incidence of risk and allow different and sometimes uncommon outcomes to be assessed.

The aim of this review was to compare and critically appraise published studies on FMLU's to determine the evidence that may be transferrable to the New Zealand maternity context. The three studies identified by this review have demonstrated similar and consistent outcomes. This review has appraised data on a total of 14,998 women and their babies, who planned to birth in a FMLU, of which 19% (n=2,877) were from the New Zealand maternity context. It was found that when low-risk women planned to birth in a FMLU there was less augmentation of labour and increased rates of spontaneous vaginal birth when compared to women who gave birth in an OU. There was a concomitant reduction in the rates of instrumental birth,

caesarean section and episiotomy when compared with outcomes for low-risk women who planned to birth in an OU. Neonatal health appeared to benefit with no differences in mortality rates but higher Apgar scores and lower rates of admission to a neonatal unit for babies when birth was planned in FMLU. Thus there would appear to be substantial health and safety benefits for low-risk women and their babies who plan to birth in FMLU.

The New Zealand context

Can the results of this review be generalised to the New Zealand maternity context? There are clearly some similarities and differences between the New Zealand maternity system and those of Denmark and England. In New Zealand women are universally able to access continuity of care from a LMC midwife or her backup (Ministry of Health, 2011a). The woman meets the midwife LMC when first pregnant and all antenatal care is provided in the community by the midwife. This enables the development of a relationship with the woman and her family/whanau which includes intrapartum care planning and provision. Additionally, when a woman requires transfer to an obstetric unit the midwife will often accompany the woman and continue to provide care. Having a midwife who knows the woman may enhance and support increased safety because the midwife has an in-depth knowledge of the woman, her obstetric, medical and pregnancy history which can be shared with other health professionals when required. This model of care enhances satisfaction with maternity services. The recently published consumer satisfaction survey indicates that LMC midwifery care achieves the highest level of satisfaction (Ministry of Health, 2012a).

This model of care is not universally available in either Denmark or England although continuity of care is considered important in England with the following commitment statement made in 2007 by the Department of Health (Department of Health, 2007).

... every woman will be supported by a midwife she knows and trusts throughout her pregnancy and after birth (p5).

The maternity service in the UK is striving to support continuity of midwifery care for the antenatal and postnatal periods but universal access to full continuity involving the provision of intrapartum care is not available except for women planning a homebirth (National Childbirth Trust, 2008). In Denmark maternity care is more fragmented with provision of antenatal and postnatal care in the community by midwives with hospital midwives providing intrapartum care. The free standing midwifery units were considered innovative for the Danish maternity situation and were closed during the study period by the Danish National Board of Health owing to concerns that a new model of care had been introduced without sufficient evaluation (Overgaard, et al., 2011). Yet the move to and centralisation of births to obstetric units has occurred with little evaluation in many countries.

Although the model of maternity care is different in each country midwifery care is the key determinate of the differences between the obstetric units and midwifery led units. Midwifery led care is often considered a 'social' model of care and characterized by a philosophy that views birth as a physiological and social process (National Childbirth Trust, 2011; New Zealand College of Midwives, 2008; Wagner, 1994). Care provision within midwifery led units will often follow this philosophy of care with a focus on emotional and psychological support as well as physical care (National Childbirth Trust, 2008; New Zealand College of Midwives, 2008; Smythe, Payne, Wilson, & Wynward, 2009). FMLUs offer welcoming family friendly environments which support the woman and her family by providing a range of options such as different positions for labour, alternative non-pharmacological approaches to help women cope with pain and positive reinforcement (National Childbirth Trust, 2008; Smythe, et al., 2009). Women reported more satisfaction with FMLUs in the UK stating that they had a greater sense of freedom, more privacy and autonomy and were more likely to be able to walk around (National Childbirth Trust, 2008). They were also more able to control who came into the room as well as control the lighting, set up and temperature of their environment. This philosophy of woman-centred care is the key similarity in the care provision in FMLU's.

There has been a move within the United Kingdom to increase choice for women by providing increased access to midwifery led care and more availability of midwifery led birthing facilities (Department of Health, 2007). In 2007 only 2% of women in England gave birth in a FMLU (Birthplace in England Collaborative Group, 2011). The proportion of trusts providing FMLU in the UK has subsequently increased from 18% in 2007 to 24% in 2010. In a recent survey of 121 women in the UK 62.8% of respondents reported that they would choose to have their baby in a FMLU

because of the homely environment, accessibility and ability to use water for labour (Rogers, Harman, & Selo-Ojeme, 2011). The main reason given among those who would prefer to birth in an obstetric unit were concerns about safety. The results of the Birthplace in England research are being used to provide women with evidence to facilitate their decision making about place of birth (Birthplace in England Collaborative Group, 2011).

An issue that has been highlighted by this review is the differences in transfer rates between England (21%) and Denmark (14.8%). It is unclear why this is but these differences could be caused by a variety of influences such as differences in labour care and management, distance from an obstetric unit or confidence levels of the midwives or mothers. Both studies that reported this outcome measure found a higher rate of transfer for nulliparous women. The level of transfer in New Zealand was not reported in the New Zealand study that was used but overall transfer rates are reported in the NZCOM/MMPO annual reports. The report for 2010 found that approximately 16% of women transfer from a primary unit during labour (New Zealand College of Midwives & Midwifery and Maternity Provider Organisation, 2011). Higher numbers of multiparous women (14.6%) give birth in a primary unit than nulliparous women (9.5%).

New Zealand has a set of referral guidelines recently updated, which outline the criteria for referral to secondary/tertiary services along with process maps that provide pathways to support transfer during intrapartum care (Ministry of Health, 2011a). These guidelines are designed to support national consistency whilst also ensuring that the woman, her baby and family/whanau remain at the centre of any discussions and decision-making. These long standing national guidelines may have an influence on the rates of transfer as they are used nationally to support decisions about place of birth and transfers from primary to secondary/tertiary services. Transfer rates may also be influenced by geography/rurality.

The results of this review indicate benefits for both maternal and neonatal health when low-risk women plan to give birth in a FMLU. We would argue that the results of this review are transferrable to the New Zealand context.

Midwives need to discuss and share these findings with women and their families/whanau. Information resources need to be designed that support decision making and choice for women and which take into account the outcomes for each birth place setting.

IMPLICATIONS FOR FURTHER RESEARCH

More research is needed in New Zealand exploring the choices of place of birth. Who and what influence women's decision making about birth place setting? There is also a need for a specific prospective study of maternal and perinatal outcomes (as per the Birthplace in England study) for planned place of birth for all settings and which is powered to detect differences in neonatal outcomes. This will provide more specific evidence for the New Zealand maternity sector and provide detailed information on outcomes, transfer rates and the safety of primary units for low risk women.

CONCLUSION

There is now strong and consistent evidence that women with low-risk pregnancies who plan to birth in a FMLU are more likely to have a normal birth, have less intervention during labour and experience low levels of perinatal mortality and morbidity. Giving birth in an obstetric unit increases the likelihood of intervention during labour and subsequent morbidities for the low-risk mother without any improvement in perinatal outcomes. The similarities in outcomes of the included studies in this review add to the midwifery knowledge base and provide important evidence indicating that the optimal place of birth for low-risk women is in a FMLU. These units provide low key individualised care for women in a calm and comfortable environment.

REFERENCES

Begley, C., Devane, D., Clarje, M., McCann, C., Hughes, P., Reilly, M., et al. (2011). Comparison of midwife-led and consultant-led care of healthy women at low risk of childbirth complications in the Republic of Ireland: a randomised trial. *BMC Pregnancy and Childbirth*, 11(85).

Bernitz, S., Rolland, R., Blix, E., Jacobson, M., Sjoborg, K., & Oian, P. (2011). Is the operative delivery rate in low-risk women dependant on the level of birth care? A randomised controlled trial. *BJOG An International Journal of Obstetrics and Gynaecology*, 118(11), 1357-1364.

Birthplace in England Collaborative Group (2011). Perinatal and maternal outcomes by planned place of birth for healthy women with low risk pregnancies: the Birthplace in England national prospective cohort study. *BMJ*, 343d7400. doi:10.1136/bmj.d7400

Canterbury District Health Board (2012). *Improving the Maternity Journey For Women in Canterbury*. Christchurch: Canterbury District Health Board.

Cheung, N., Mander, R., Wang, X., Fu, W., Zhou, H., & Zhang, L. (2011). Clinical outcomes of the first midwife-led normal birth unit in China: a retrospective cohort study. *Midwifery*, 27, 582-587.

Davis, D., Baddock, S., Pairman, S., Hunter, M., Benn, C., Wilson, D., et al. (2011). Planned Place of Birth in New Zealand: Does it Affect Mode of Birth and Intervention Rates Among Low-Risk Women? *Birth*, 38, 111-119.

Department of Health (2007). *Maternity matters: choice, access and continuity of care in a safe service*. United Kingdom: Department of Health.

Eide, B., Nilsen, A., & Rasmussen, S. (2009). Births in two different delivery units in the same clinic - A prospective study of healthy primiparous women. *BMC Pregnancy and Childbirth*, 9(25).

Henderson, J., & Petrou, S. (2008). Economic Implications of Home Births and Birth Centers: A Structured Review. *Birth*, 35(2), 136-146.

Hendry, C. (2009). Report on mapping the rural midwifery workforce in New Zealand for 2008. *New Zealand College of Midwives Journal*, 41(12-19).

Houghton, G., Bedwell, C., Forsey, M., Baker, L., & Lavender, T. (2008). Factors influencing choice in birth place - an exploration of the views of women and their partners and professionals. *Evidence Based Midwifery*, 6(2), 59-64.

Laws, P., Tracy, S., & Sullivan, E. (2010). Perinatal outcomes of women intending to give birth in birth centers in Australia. *Birth*, 37(1), 28-36.

Maassen, M., Hendrix, M., Vugt, H. V., Veersema, S., Smits, F., & Nijhuis, J. (2008). Operative deliveries in low-risk pregnancies in the Netherlands: Primary versus secondary care. *Birth*, 35(4), 277-282.

McCourt, C., Rance, S., Rayment, J., & Sandall, J. (2011). *Birthplace qualitative organisational case studies: how maternity care systems may affect the provision of care in different birth settings*. Birthplace in England research programme. Final report part 6: NIHR Service Delivery and Organisation programme.

Ministry of Health (2011a). *Guidelines for Consultation with Obstetric and Related Medical Services (Referral Guidelines)*. Wellington: Ministry of Health.

Ministry of Health (2011b). *New Zealand Maternity Standards: A set of standards to guide the planning, funding and monitoring of maternity services by the Ministry of Health and District Health Boards*.

Ministry of Health (2012a). *New Zealand Maternity Clinical Indicators 2009*. Wellington: Ministry of Health.

Ministry of Health (2012b). *Maternity Consumer Surveys 2011*. Wellington: Ministry of Health.

National Childbirth Trust. Your care through pregnancy, labour and birth Retrieved 5th May 2012, from <http://www.nct.org.uk/pregnancy/your-care-through-pregnancy-labour-and-birth>

National Childbirth Trust (2008). NCT Policy Briefing: Midwife-led units, community maternity units and birth centres. Retrieved 14th March 2012: http://www.nct.org.uk/sites/default/files/related_documents/MS2%20Midwife-led%20units.pdf

New Zealand College of Midwives (2008). *Midwives Handbook for Practice*. Christchurch: New Zealand College of Midwives.

New Zealand College of Midwives, & Midwifery and Maternity Providers Organisation (2011). *New Zealand College of Midwives Report on MMPO-Midwives Care Activities and Outcomes 2010*. Christchurch: New Zealand College of Midwives, Midwifery and Maternity Providers Organisation.

Overgaard, C., A Moller, Fenger-Gron, M., Knudsen, L., & Sandall, J. (2011). Freestanding midwifery unit versus obstetric unit: a matched cohort study of outcomes in low-risk women. *BMJ Open*, 2(e000262). doi:10.1136/bmjopen-2011-000262

Pitchforth, E., Watson, V., Tucker, J., Ryan, M., Teijlingen, E. v., Farmer, J., et al. (2008). Models of intrapartum care and women's trade-offs in remote and rural Scotland: a mixed-methods study. *British Journal of Obstetrics and Gynaecology*, 115(5), 560-569.

Redshaw, M., Rowe, R., Schroeder, L., Puddicombe, D., Macfarlane, A., Newburn, M., et al. (2011). *Mapping maternity care: the configuration of maternity care in England*. Birthplace in England research programme. Final report part 3. NIHR Service Delivery and Organisation programme.

Rogers, C., Harman, J., & Selo-Ojeme, D. (2011). Perceptions of birth in a stand-alone centre compared to other options. *British Journal of Midwifery*, 19(4).

Skinner, J., & Lennox, S. (2006). Promoting normal birth: a case for birth centres. *New Zealand College of Midwives Journal*, 34, 15-18.

Smythe, L., Payne, D., Wilson, S., & Wynward, S. (2009). Warkworth Birthing Centre: exemplifying the future. *New Zealand College of Midwives Journal*, 41, 7-11.

Stewart, M., McCandish, R., Henderson, J., & Brocklehurst, P. (2004). *Report of a structured review of birth centre outcomes*. United Kingdom: Maternity Research Group of the National Service Framework for Children, Young People and Maternity Services.

Symon, A., Winter, C., Inkster, M., & Donnan, P. (2009). Outcomes for births booked under an independent midwife and births in NHS maternity units: matched comparison study. *BMJ*, 338(b2060).

Tracy, S., Caplice, S., Laws, P., Wang, Y., Tracy, M., & Sullivan, E. (2007). Birth centers in Australia: A national population-based study of perinatal mortality associated with giving birth in a birth center. *Birth*, 34, 194-201.

Wagner, M. (1994). *Pursuing the Birth Machine*. Australia: ACE Graphics.

Walsh, D., & Downe, S. (2004). Outcomes of Free-Standing, Midwife-Led Birth Centers: A Structured Review. *Birth*, 31(3), 222-229.

Conflict of Interest: Lesley Dixon was also a co-author for the paper: Planned Place of Birth in New Zealand: Does it Affect Mode of Birth and Intervention Rates Among Low-Risk Women?

Accepted for publication May 2012

Dixon, L., Prileszky, G., Guilliland, K., Hendry, C., Millers, S., Anderson, J. (2012). What evidence supports the use of free standing midwifery led units (primary maternity units) in New Zealand/Aotearoa? *New Zealand College of Midwives Journal*, 13-20.

Copyright of New Zealand College of Midwives Journal is the property of New Zealand College of Midwives and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.