Outcomes of Free-Standing, Midwife-Led Birth Centers: A Structured Review

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ABSTRACT: Background: *Over the last two decades, childbirth worldwide has been increasingly concentrated in large centralized hospitals, with a parallel trend toward more birth interventions. At the same time in several countries, interest in midwife-led care and free-standing birth centers has steadily increased. The objective of this review is to establish the current evidence base for free-standing, midwife-led birth centers.* **Methods**: *A structured review, based on Cochrane guidelines, was conducted that included nonrandomized studies. The comparative outcomes measured were rates of normal vaginal birth; cesarean section; intact perineum; episiotomy; transfers; and babies remaining with their mothers.* **Results**: *Of the 5 controlled studies that met the review criteria, all except one was a single site study. Since no study was randomized, meta-analysis was not performed. The included studies all raised quality concerns, and significant heterogeneity was observed among them. For the outcomes measured, every study reported a benefit for women intending to give birth in the free-standing, midwife-led unit.* **Conclusions**: *The benefits shown for women recruited into the included studies who intended to give birth in a free-standing, midwife-led unit suggest a question about the efficacy of consultant unit care for low-risk women. However, the findings cannot be generalized beyond the individual studies. Good quality controlled studies are needed to investigate these issues in the future. (BIRTH 31:3 September 2004)*

Over the last two decades, maternity care and childbirth across the world have increasingly become concentrated in large hospitals (1). In the United Kingdom, birth in small midwife-led units and birth centers has decreased from 13 percent in 1970 to 3 percent in 2000 (2). This trend has been accompanied by increased rates of cesarean section, up from 9 percent in 1980 to 20 percent in 2000 (3). Other western countries, such as Canada, the United States, and Italy, all have cesarean rates at or above 20 percent (3). Recent studies in the United Kingdom have also noted an increase in routine birth interventions, even in births recorded as being "normal" (4). This change in practice has generated concern from practitioners, service users, and governmental bodies across the world.

Against this background, interest in midwife-led care and in the establishment of birth centers has steadily increased. Midwife-led care is usually interpreted as a model in which the woman books with the midwife; medical input is absent, unless there is a clinical necessity, the women chooses such input, or both. Midwife-led care systems have been instituted in several different settings, including consultant units (5,6).

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The nature of birth centers appears to have evolved over time. In the United States the term "birth center" covers a number of organizational models, including facilities directed by midwives or jointly run by midwives and obstetricians, units that are free-standing or on the same site as an acute hospital, and a mixture of state or private provision. The National Birth Center study provided research evidence for the expansion of free-standing birth centers at the beginning of the 1990s (7). The National Association of Childbirth Centers continues to encourage the developing and licensing of free-standing birth centers, and currently, 37 states license birth centers.

In the 1980s a large number of small free-standing (so-called "isolated") maternity units existed in the United Kingdom. They were generally overseen by general practitioners, and run on a day-to-day basis by midwives (8,9). Between the 1980s and 1990s most these units were closed, on the grounds of safety or, more recently, cost. Since the 1990s, some units that were closed have reopened as midwife-led units, and those that remained open evolved into similar facilities. More recently, as reconfiguration of smaller consultant units resulted in closures, free-standing units have opened on the sites left behind. In some places, sections of the existing consultant unit were physically separated to become "integrated" midwifery-led units. In general, these units are characterized by an absence of routine medical staff attendance, and an orientation toward normal birth (10). Recent official governmental reports from both England (11) and Scotland (12) have given cautious approval to the expansion of such facilities.

Integrated midwifery-led birthing suites, sometimes called "home-from-home" units, have been well researched both within the United Kingdom and elsewhere, and the resulting studies have been subject to meta-analysis (12). However, the Cochrane review (13) did not locate any randomized trials of free-standing midwife-led units.

It is likely that the expansion of integrated units, with their rapid access to medical input, is relatively uncontroversial, which may not be the case with units that are geographically isolated with no routine access to medical staff. Nevertheless, units with these characteristics are being opened in various countries across the world. Research into free-standing, midwife-led birth centers presents a confusing picture, partly because of difficulties of definition, and also because of eclectic research designs adopted for their evaluations. Researchers do not always identify if the birth centers they are studying are free-standing or integrated. In some cases the birth centers under scrutiny have an obstetric or physician presence on site, and so they cannot be said to be midwife-led (7).

The outcome measures chosen for the review reflect both the stated orientation to normality of these units, and measures of mortality and morbidity. The research question was as follows: Are outcomes of labor and birth affected by booking with a free-standing midwife-led birth center when compared with booking for a consultant unit?

Methods

The general principles based on Cochrane guidelines for systematic reviews were followed for the framing of the research question and for the location, selection, quality review, and organization of included studies (14). The search was not restricted to randomized controlled trials.

A free-standing midwife-led birth center is defined as a maternity unit that has no routine labor involvement of medical staff and no facility for epidural analgesia and cesarean section, and is geographically separate from any maternity care site that has facilities for epidural analgesia and for undertaking cesarean sections.

Inclusion criteria were studies examining the outcomes associated with free-standing birth centers compared with consultant units; papers published between 1970 and August 2002; studies using a controlled comparative design that attempted to match women in both arms according to eligibility for birth center care either at the time of booking or the onset of labor; studies adopting an intention-to-treat analysis.

The only exclusion criterion was non-English language papers. However, some large and frequently quoted studies of birth centers, among them the National Birth Center Study (13), were excluded either because they did not separate free-standing from integrated units (13) or because they showed evidence that some units had routine medical involvement (15). Thus these studies failed to meet the review's inclusion criteria of being both free-standing and midwifery led compared with consultant obstetric units.

Search terms applied to this review were "birth centre/unit," "midwifery led care/unit," "alternative birth," "general practitioner maternity units," "midwifery care," "maternity care," "midwife," "childbirth," "research," and "evaluation."

The following databases were searched: Medline 1970 to August 2002; CINAHL 1980 to 1998, 1998 to August 2002; BNI 1994 to August 2002; Embase 1980 to August 2002; Pre Medline 1970 to August 2002; Cochrane Database of Systematic Reviews to 3rd edition 2002; National Research Register (NRR)

to August 2002; Database of Abstracts of Reviews of Effectiveness (DARE) to August 2002; Evidence-Based Medicine (EBM) to August 2002; Midirs Database to 1980 August 2002; Miriad Database to August 2002; ENB database 1995 to August 2002; Royal College of Nursing (RCN) 1985 to 1994; ASSIA 1987 to August 2002; International Bibliography of Social Sciences (Bids) 1970 to August 2002; Social Sciences Citation Index (SSCI) 1981 to August 2002; PsychInfo 1974 to August 2002; AMED 1985 to August 2002; Journal Full Ovid Text to August 2002; Nesli 1992 to August 2002; Ingenta 1988 to August 2002; Catchword 1997 to August 2002; Science Direct 1974 to August 2002; EBSCO 1996 to August 2002; and Ideal 1990 to August 2002.

Hand searches were carried out for 9 journals: *British Journal of Midwifery* (1993 to August 2002); *Midirs* (1980 to June 2002); *Midwifery* (1980 to June 2002); *Birth* (1980 to June 2002); *Modern Midwife* (1994 to 1997); *The Practising Midwife* (1998 to August 2002); *Journal of Nurse-Midwifery* (1980 to 1999); *Journal of Midwifery & Women's Health* (2000 to August 2002); *British Journal of Obstetrics & Gynaecology* (1980 to August 2002).

Requests for information on any unpublished or ongoing studies were sent to two relevant electronic research lists. Initial selection of abstracts, based on the search strategy and primary review of full papers, was conducted by DW; consensus was then reached between DW and SMD on the final inclusion after review of the remaining papers.

Outcome Measures and Analysis

Six outcome measures were examined: normal spontaneous vaginal birth; cesarean section; intact perineum, episiotomy; babies remaining with the mother and not requiring transfer to secondary neonatal care; perinatal mortality; and intrapartum transfer rates between the free-standing units and the host consultant unit.

Meta-analysis was planned if well-designed randomized controlled trials were identified. In the absence of such trials, the planned analytical strategy involved summarizing the studies under outcome measures, tabulating them in a hierarchy of generalizability, and producing a structured narrative analysis of the findings.

Results

Included Papers

Of the 122 papers selected as original research from the initial search results (Fig. 1), some either used qualitative designs or only examined nonclinical outcomes such as cost, or attitudinal measures such as satisfaction. After removing these from the list, 85 papers qualified as quantitative research focusing on clinical outcomes, most of which reported on integrated birth center/midwifery led units or units that were jointly staffed by doctors and midwives. One paper, which fitted the criteria, presented summary data that could not be compared with the other included studies (16), and it was rejected.

After blind peer review and consensus discussions, five papers were included. Table 1 describes the study characteristics. No study was randomized; one study was prospective; two selected the birth center women prospectively, but the control women retrospectively; and two were retrospective for both groups. Three studies were carried out in the United States, one in the United Kingdom, and one in Germany; they were published between 1986 and 2000.

General Quality of Studies

Four studies were conducted at a single site (5,17,19,20), and the fifth included two sites (18). No papers provided details about the distances between the birth centers and their host unit. None of the included studies reported power calculations. Inclusion criteria were based on local criteria for booking with the birth center in every case. Two studies used additional matching criteria (17,18). Of the three studies that gave demographics, the findings in two retrospective studies suggested that women booking with the birth center were in a higher socioeconomic group than those booking with the control site, based on differences in parity and employment status (18,19). In the third study a significant difference in rates of nulliparas between the two groups may have biased the final results (5). Ascertainment and completeness of follow-up was reasonable in all cases, except for the only fully prospective study of Stone and Walker (16). All studies included women of all parity. Entry points ranged from "time of booking with birth center" to "on entry to the facility in labor." No study reported blind assessment of outcomes.

Outcomes

Selected outcomes are shown in Table 2.

Normal Vaginal Birth

Of the four studies reporting normal vaginal birth, in each case the control group reached high levels of normal birth (5,17–19). This outcome may indicate that they were reasonably matched to the birth center

groups in terms of obstetric risk factors, although nonrandomized designs cannot control for all confounders. In all four studies, across three different countries and separated by up to 14 years, vaginal birth was higher in the birth centers. The range of absolute percentage increase in normal vaginal birth across the studies between experimental and control groups was 4.8 to 13.3 percent. It is likely that the difference of 13.3 percent found in the study of Saunders et al is at least partly explained by a higher percentage of multiparas in the birth center group (5).

Cesarean Section

The four studies that reported rates of cesarean sections demonstrated a lower rate in birth center groups compared with hospital groups. Despite being separated by 14 years, and despite being undertaken in two different countries, the findings in three of these studies (17,5,19) were remarkably comparable (6% vs 14%, 6.1% vs 12.6%, and 6.5% vs 11.3%, respectively). One retrospective comparative study found considerably lower rates in both groups, with a more marginal difference (3% vs 4%) (18). The range of *absolute* percentage decrease in cesarean section between experimental and control groups across the studies was 1 to 8 percent.

Intact Perineum

Rates were variable in the four studies reporting on intact perineum. Incidence was high in both arms of the study by Saunders et al (5), and difference between the groups was minimal (46.7% vs 43.3%). Stone's small study found lower rates and bigger differences (22% vs 8%) (20). In the two retrospective studies reporting this measure, the rates were 30 versus 22 percent (18) and 25 versus 6.3 percent (19). It is of interest that both United States studies although separated by 10 years, had similar findings (19,20). These differences in relative rates among the studies may stem from different approaches to the use of episiotomy in different countries. The range of absolute percentage increase in intact perineum between experimental and control groups across the studies was 3.4 to 18.7 percent.

Episiotomy

Episiotomy rates were extremely variable across all studies, probably reflecting known differences between and within countries (21). The only United Kingdom study reported episiotomy rates of 5 percent at the birth center compared with 18.9 percent in the hospitals (5). The German (18) and United States

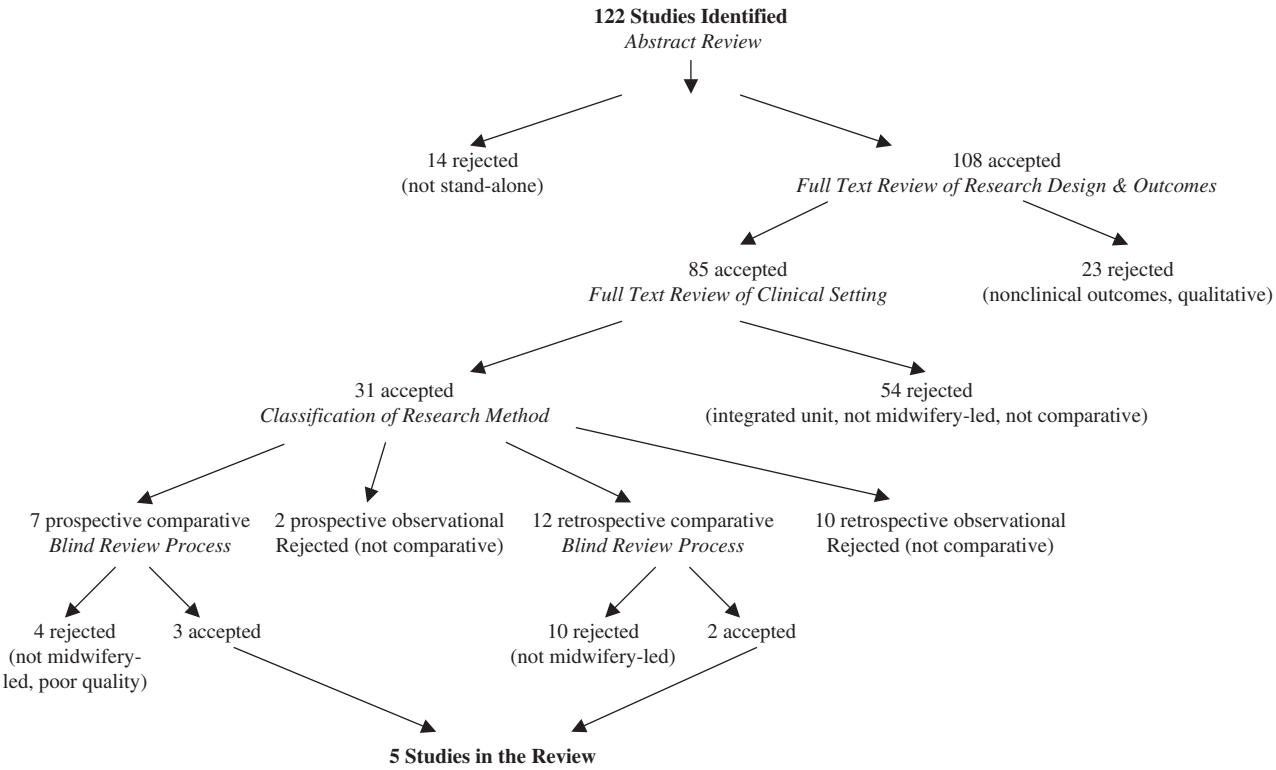

Fig. 1. Process of study selection.

Table 1. Quality of Included Studies

Study	*No. of Centers & Sample*	*Control Method*	*Inclusion Criteria*	*Matching Criteria*	*Demographics*	*Point of Entry*	*Completeness of Ascertainment*	*Comments*
Prospective Controlled Design								
Stone, 1998, USA (20)	1 69 BC 77 control	Comparative cohort	Both groups met	None stated eligibility criteria for BC at 34–36 wk gestation	No data	36 wk gestation	Data only available on 106 women for intact perineum (54/52)	
Partial Prospective Controlled Design								
Scupholme et al, 1986, USA (17)	1 250 BC 250 hospital	Matched pairs: BC group entered into study prospectively, matching group retrospective from delivery book	BC: all women arriving in labor during first 15 mo Control postnatal women meeting BC criteria who were a match (up to 2 wk after date of index birth)	As for BC criteria plus age, parity, ethnic background, financial status	Characteristics said to be "identical" except for educational status (no information on nature of difference in educational status between groups); no details of other demographics	Onset of labor	Apparently complete ascertainment, although number is not always given with percentages	Retrospective selection of controls may introduce systematic bias
Saunders et al, 2000, UK (5)	1 1) 589 women BC 2) 19,529 of all 73,223 singleton births on database of 14 hospitals	Comparative cohort BC entered prospectively, matching group retrospective from delivery book	*All*: eligibility for booking at BC *Group 1*: booked at BC giving birth Sept 1997 to Aug 1999 *Group 2*: birth occurring 1997–98	None stated	No tables Authors note parity differences (primigravidas: BC 27.2%, controls 41.5%)	1) At point of booking for BC 2) after birth of baby	1) 589 of all 602 booked in the BC women over 2 yr 2) all births where eligibility criteria would have been fulfilled	Retrospective selection of controls may introduce systematic bias
Retrospective Controlled Design								
Feldman & Hurst, 1987, USA (19)	1 77 BC 72 hospital	Comparative cohort	BC criteria at 37 wk gestation May–July 1981 entry (BC group) June 1981 entry (control) No Medicare Complete medical records	Nil	BC women more likely to be nulliparous, white, and college educated Hospital group more Hispanics	37 wk gestation	Data are given for all women	
David et al, 1999, Germany (18)	2 801 BC, 3,271 hospital	Matched cohort	Births between 1992–1994 meeting BC criteria Exclusions: (hospital group): induction of labor; elective cs; ethnic minority groups; incomplete data	Maternal employment	No table given, although authors state that groups were comparable for risk status, but that BC group had more nulliparas, fewer women working during pregnancy, and fewer single mothers	Admission to BC or hospital in labor	Not clear because numbers not always given with percentages	

UK = United Kingdom; USA = United States of America; BC = birth center; cs = cesarean section.

(19) studies both showed a large difference between groups (15.7% vs 54.8% and 47.2% vs 78.1%, respectively). In every case the rates for the birth center group were lower, with the absolute percentage decrease ranging from 13.9 to 39.1 percent. Although the study by Stone discussed numbers of episiotomies in the text, the denominator was not given (20).

Babies Remaining with Their Mothers

Data about babies remaining with their mothers can be extrapolated for three studies that reported admissions to neonatal units (5,18,19). In all cases the rates for both birth center and hospital groups was above 90 percent. The range of difference across the studies was 0.8 to 3.6 percent in favor of birth center groups.

Intrapartum Transfer Rates

For the three studies reporting intrapartum transfer rates, the range was 14.6 to 22 percent (5,17,18) In all three studies the main indication for transfer was failure to progress in first stage of labor. Although delivery outcomes were not separately reported for transfers, intention-to-treat analysis reflected their inclusion in overall outcomes.

Perinatal Mortality

The perinatal mortality data in most studies rendered it impossible to report reliably on this measure. One study (5) that could have been large enough to report this finding gave percentages of stillbirths, which can be extrapolated to approximately 2:1,000 for the birth center versus 4:1,000 for the hospital births. The perinatal mortality data were not reported in any of the studies, since numbers of births were generally too small. One study did report the number of stillbirths, which could be extrapolated to approximately 2:1,000 for the birth center versus 4:1,000 for the hospital births (5). However, confounders make interpretation of this figure unreliable.

Discussion and Conclusions

We adopted Cochrane-style systematic review parameters in undertaking this structured review, since our focus was quantitative research designs only. A meta-synthesis of qualitative research into the same model

Table 2. Outcomes Reported in Included Studies

Variable	*Study*	*Number*	*Birth Center (%)*	*Control Group (%)*
Normal birth	Saunders et al, 2000, UK (5)	589, 19,529	(85.6)	(72.3)
	Scupholme et al, 1986, USA (17)	250, 250	(92)	(83)
	David et al, 1999, Germany (18)	801, 3,271	(91.4)	(84.3)
	Feldman & Hurst, 1987, USA (19)	77, 72	(93.5)	(88.7)
Cesarean section (total)	Saunders et al, 2000, UK (5)	589, 19,529	(6.1)	(12.6)
	Scupholme et al, 1986, USA (17)	250, 250	(6)	(14)
	David et al, 1999, Germany (18)	801, 3,271	(3)	(4.6)
	Feldman & Hurst, 1987, USA (19)	77, 71†	(6.5)	(11.3)
Intact perineum	Saunders et al, 2000, UK (5)	589, 19,529	(46.7)	(43.3)
	David et al, 1999, Germany (18)	801, 3,271	(30)	(22)
	Feldman & Hurst, 1987, USA (19)	77, 72	(25)	(6.3)
	Stone, 1998, USA (20)	54, 52*	(22)	(8)
Episiotomy	Saunders et al, 2000, UK (5)	589, 19,529	(5.1)	(18.9)
	David et al, 1999, Germany (18)	801, 3,271	(15.7)	(54.8)
	Feldman & Hurst, 1987, USA (19)	77, 72	(47.2)	(78.1)
Baby with mother	Saunders et al, 2000, UK (5)	589, 19,529	(96.4)	(94.4)
	David et al, 1999, Germany (18)	801, 3,271	(97.4)	(98)
	Feldman & Hurst, 1987, USA (19)	77, 72	(98.7)	(94.4)
Stillbirth rate	Saunders et al, 2000, UK (5)	589, 19,529	2:1000	4:1,000
Intrapartum transfer rate	Saunders et al, 2000, UK (5)	86	(14.6)	
	Scupholme et al, 1986, USA (17)	17	(22.0)	
	David et al, 1999, Germany (18)	146	(18.2)	

* *Of 69/77 original participants*; † *of 77/72 original participants.*
UK = United Kingdom; USA = United States of America.

of care is in preparation. Although the Cochrane method uses strict parameters for judging bias in quantitative research and therefore is critical of nonrandomized designs, we used their criteria for its established credibility and widespread acceptance. One could argue that they are less suitable for assessing studies that are marked by the heterogeneity shown in these studies. Some suggest that alternative criteria like "signal" (the weight of the message) versus "noise" (poor methodological quality), suggested by Edwards et al (22), may be more useful in this scenario. We recognize the merit of this argument, but until alternative criteria become more common and achieve greater acceptance, we chose this more traditional approach.

No paper reported blind analysis of outcomes, and none was designed on the basis of power calculations. For some studies, at least, small sample sizes also limited interpretation of results, especially with outcomes of low incidence.

In the absence of any randomized controlled trials, the data in the included papers could not be meta-analyzed. Meta-analysis would also have been compromised by between-site heterogeneity. Although all the studies selected women who were eligible for local birth center care, criteria regulating access to birth centers are variable, and often rather idiosyncratic. In addition, whereas most included studies did attempt to control for confounders, and, in general, ascertainment and follow-up were good, the possibility of systematic bias exists in all of the reports. Obstetric risk factors aside, other differences between birth center women and hospital groups are known to exist. Women who attend birth centers tend to be better educated, older, Caucasian, wealthier, and more orientated to natural birth than women who choose hospital birth. In at least two included studies such variation appeared to be present (18,19).

Opponents of birth center provision have criticized the preceding, self-selecting dimension, stating that it will always confound hospital group comparisons (23). However, Scupholme and Kamons, in a later study, attempted to address the issue of self- selection bias by comparing a cohort of women who selected a birth center and another group who were assigned birth center care because their first preference, the main hospital, was full (24). No differences in outcomes were reported between the groups, or between these later findings and those of Scupholme et al's earlier study (17). These findings offer the possibility that preference may not be the primary influence on outcome in this context.

Variation occurred in the reference point for intended place of birth. These differences may predict different inputs into the outcome, ranging from the relationship with the caregivers for those entering the studies in the antenatal period, to the environment of birth and labor philosophy and ethos of the caregivers for those entering the study only at the point of labor. In light of these concerns, the findings reported earlier and discussed here are offered primarily as a baseline for designing future better controlled studies, rather than as definitive answers to the question of the efficacy of birth centers, or, indeed, of consultant units, for low-risk women.

Across the studies included in this paper, data are reported for 1,781 women who intended to give birth in a birth center. Taking into account the problems with the included studies, it is of interest that the universal trend arising from the reported findings supports a benefit for women who intended to use birth centers. However, these differences were not always large. One issue concerns definition. Births coded to "normal vaginal delivery" can include women who underwent augmentation, epidural analgesia, fetal blood sampling, and episiotomy. They can also include births that are entirely spontaneous with no analgesia. It is likely that the public health implications of the former are greater than those of the latter. Normal birth without intervention is more likely in a birth center due to lack of access to technologies. Further studies may need to differentiate these types of "normal birth" to capture possible public health benefits.

As a model, the free-standing, midwife-led unit is a small but growing phenomenon in many countries. Although results of existing research cannot be generalized, they do indicate that no a priori reason can be proposed to reject care in free-standing, midwife-led units on the grounds of adverse outcomes. We concur with the argument that says because these women are at low obstetric risk, these environments are safe unless proved harmful. In addition, the findings raise a question about the risk of increased morbidity for women who fulfill standard criteria for such units, but who labor and give birth in centralized obstetric units.

Good quality evidence is lacking about morbidity and public health outcomes associated with both free-standing, midwife-led units and obstetric units as the place of birth for women who fulfill low-risk criteria. Specific design issues need to be addressed, such as the nature of the outcome measures to be assessed and the timing of entry into a future controlled study. A series of well-designed studies is needed to assess both comparative clinical and psychosocial outcomes and the relevant organizational and cultural features of units that generate positive outcomes for women and babies, irrespective of the model of care or geographical location of such units.

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