European Journal of Obstetrics & Gynecology and Reproductive Biology 222 (2018) 102–108

Contents lists available at ScienceDirect

European Journal of Obstetrics & Gynecology and Reproductive Biology

journal homepage: www.elsevier.com/locate/ejogrb

Review article

Planned home versus planned hospital births in women at low-risk pregnancy: A systematic review with meta-analysis

A. Cristina Rossi[a,*], Federico Prefumo[b]

[a] Clinic of Obstetrics and Gynecology, Ospedale della Murgia, Via Celentano, 42, 70121, Bari, Italy
[b] Clinic of Obstetrics and Gynecology, University of Brescia, Brescia, Italy

ARTICLE INFO

Article history:
Received 4 November 2017
Received in revised form 14 January 2018
Accepted 16 January 2018

Keywords:
Hospitalization
Home births
Neonatal outcomes
Low risk pregnancy
Maternal outcomes
Birth setting

ABSTRACT

New interest in home birth have recently arisen in women at low risk pregnancy. Maternal and neonatal morbidity of women planning delivery at home has yet to be comprehensively quantified. We aimed to quantify pregnancy outcomes following planned home (PHB) versus planned hospital birth (PHos).

We did a systematic review of maternal and neonatal morbidity following planned home (PHB) versus planned hospital birth (PHos). We included prospective, retrospective, cohort and case-control studies of low risk pregnancy outcomes according to planning place of birth, identified from January 2000 to June 2017. We excluded studies in which high-risk pregnancy and composite morbidity were included. Outcomes of interest were: maternal and neonatal morbidity/mortality, medical interventions, and delivery mode. We pooled estimates of the association between outcomes and planning place of birth using meta-analyses. The study protocol is registered with PROSPERO, protocol number CRD42017058016.

We included 8 studies of the 4294 records identified, consisting in 14,637 (32.6%) in PHB and 30,177 (67.4%) in PHos group. Spontaneous delivery was significantly higher in PHB than PHos group (OR: 2.075; 95%CI:1.654–2.063) group. Women in PHB group were less likely to undergo cesarean section compared with women in PHos (OR:0.607; 95%CI:0.553–0.667) group.

PHB group was less likely to receive medical interventions than PHos group. The risk of fetal dystocia was lower in PHB than PHos group (OR:0.287; 95%CI:0.133–0.618). The risk of post-partum hemorrhage was lower in PHB than PHos group (OR:0.692; 95% CI.0.634–0.755). The two groups were similar with regard to neonatal morbidity and mortality.

Births assisted at hospital are more likely to receive medical interventions, fetal monitoring and prompt delivery in case of obstetrical complications. Further studies are needed in order to clarify whether home births are as safe as hospital births.

Contents

Introduction

During the past decades, maternal and neonatal morbidity has markedly reduced thanks to hospitalization of pregnant women in labor, which allows strict monitoring of maternal and fetal wellbeing, reduces the risk of infection, and ensures medical

* Corresponding author.
E-mail address: acristinarossi@yahoo.it (A. C. Rossi).

https://doi.org/10.1016/j.ejogrb.2018.01.016
0301-2115/

intervention, ranging from amniorrhexis to cesarean delivery. Nonetheless, new interests in home birth have recently arisen in women at low risk pregnancy and the efficacy of medicinal interventions has been questioned. Advantages of home birth consist in fewer vaginal examination, freedom to be mobile during fetal monitoring, expectant management of the third stage of labor, and delayed cord clamping [1]. Medical interventions for low risk pregnancy might be higher than necessary [2]. In contrast, hospital care allows prompt intervention without any delay for transfer and ensures interventions that cannot be provided outside hospitals. Studies, that were conducted in order to analyze perinatal and maternal outcomes according to birth setting, provided conflicting results [3–6]. A Cochrane review showed an increased risk of perinatal mortality [7], whereas a previous Cochrane review did not find significant differences in perinatal death [8]. A meta-analysis also showed that less medical intervention in home births are associated with a higher risk of neonatal mortality [9]. However, the latter did not specify whether the included studies were based on high or low risk pregnancy and whether midwives or obstetricians performed hospital care.

Therefore, we conducted a systematic review and meta-analysis about maternal and perinatal outcomes in home vs. hospital births assisted by midwives.

Methods

Data for this review were identified by searches of PubMed, Scopus Medline, Clinicaltrial.gov, EMBASE, and references from relevant articles using the search terms “home births”, “hospital births”, “neonatal morbidity/mortality”, “maternal morbidity/mortality”, “low risk pregnancy!, ‘midwife care’. Abstract and reports from meetings were included only when they related directly to previously published work. Only articles published in English between January 2000 and June 2017 were included if they compared births planned at home (planned home birth group) with births planned at hospital (hospital planned birth group) in women at low risk pregnancy. We also contacted corresponding authors of unpublished data. We included all types of studies, except those based on national registries, in order to avoid bias in reporting data from patients’ charts to national registry. Furthermore, according to local lows, in many countries, such as Japan and Italy, midwives are not allowed to perform medical interventions, such as induction of labor with prostaglandins and oxcytocin. Therefore, we selected articles that reported maternal and neonatal outcomes after births that were assisted by midwives only, since the inclusion of births assisted by obstetricians would have biased results and increased heterogeneity of the study sample. Other inclusion criteria were data reported as proportional rates and low-risk pregnancy. Low-risk pregnancy was defined as follow: medical history negative for any maternal disorder (such as hypertension, diabetes, renal disease, uterine myomas), fetus alive at labor, gestational age >37 weeks, and intact membranes. We excluded studies in which at least 1 inclusion criterion was omitted, composite morbidity and high risk pregnancy were analyzed, and data were reported in graphs or percentage.

The two authors discussed the review protocol *a priori*. We based the analysis according to the intention to delivery place rather than actual place of birth.

From each article, the following data were abstracted: mode of delivery (spontaneous, operative, cesarean section), maternal baseline characteristics, medical interventions (labor augmentation, epidural analgesia, episiotomy, fetal heart monitoring), perineal laceration, any intra-partum and post-partum complication, such as fetal distress and dystocia, post-partum hemorrhage,

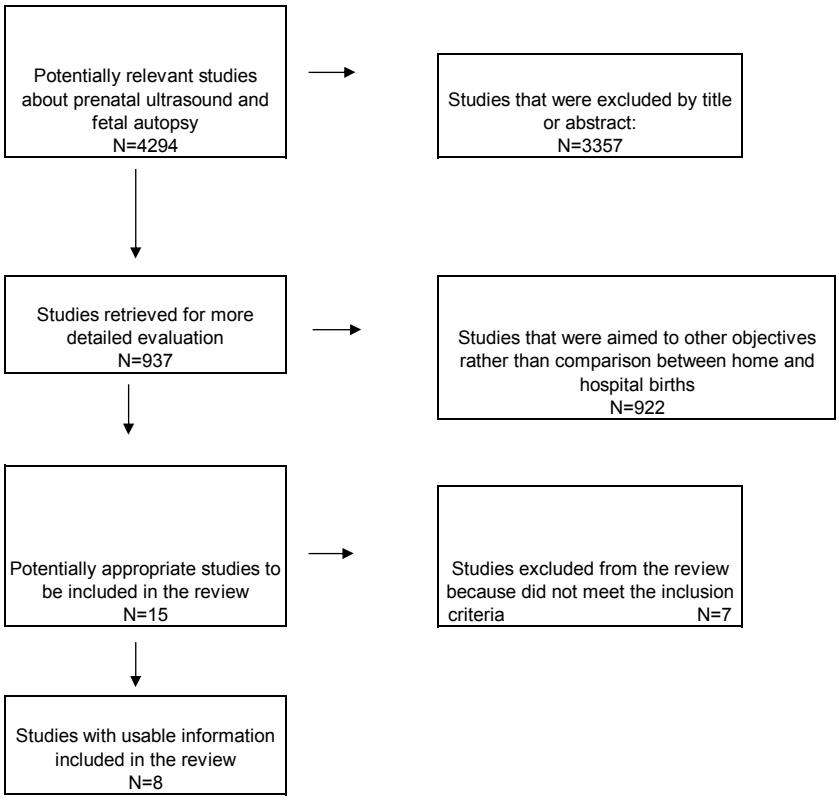

Fig. 1. Flow chart and steps of studies selection.
Citations are available on request to the corresponding author (ACR)

any maternal and neonatal morbidity, maternal and perinatal death. Perinatal death was defined as stillbirth or death within 28 days from birth.

The review is reported according to PRISMA guidelines for systematic reviews.

The two authors independently selected articles and abstracted data. Discordance was resolved with consensus. Article bias was assessed with QUADAS.

We extracted maternal and pregnancy outcomes according to planned place of delivery and calculated odds ratio (OR) and 95% Confidence Interval (95%CI) using cross-tabulated data. We calculated inter-studies heterogeneity and considered significant if it was >25%. We generated random or fixed models whether heterogeneity was significant or not, respectively. We defined differences between planned home births and planned hospital births group as statistically significant if 95%CI did not encompass 1.

All analysis were done in Metacalc software. The study protocol is registered with the PROSPERO database (Registration number: CRD42017058016 – http./www.crd.york.ac.uk./PROSPERO

We did not receive any funding in study design, data collection, analysis, interpretation of data, the writing of the report, and the decision to submit the paper for publication.

The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

We identified 4294 records, and retrieved 937 for a more detailed evaluation after screening titles and abstracts (Fig. 1). We excluded 922, which were aimed to other objectives rather than comparison between planned home and panned hospital births, leaving 15 articles that potentially met the inclusion criteria. Seven articles did not meet at least one inclusion criterion and 8 articles reported usable information included in the review [1,4,10–15].

We found two studies conducted in British Columbia from the same author, but we excluded overlap of population because the study period was different, being 1998–1999 the former and 2000–2004 the later.

We described characteristics of each study in Table 1, together with their Newcastle-Ottawa Scale quality assessment: a maximum score of 9 can be assigned, based on selection (maximum 4), comparability (maximum 2) and outcome (maximum 3) items.

Considered as a whole, there were 14,637 (32.6%) women who planned home birth and 30,177 (67.4%) women who planned hospital birth.

Maternal characteristics, such as age, parity, prepregnancy body mass index, ethnic background, and socioeconomic position, were described so heterogeneously that could not be pooled in a meta-analysis. We summarized from seven articles that women in their first pregnancy were less frequent in the planned home group (37.0%) compared with planned hospital group (42.7%) (OR 0.737; 95%CI: 0.704–0.772).

There were 24 estimates from the 8 studies of the mode of delivery in planned home and hospital births. Compared with women who planned hospital birth, women who planned home births had higher chance to deliver spontaneously (8 estimates) (OR: 2.075; 95%CI: 1.654–2.603) (Fig. 2), and lower risk of operative delivery (8 estimates) (OR: 0.479; 95% CI 0.430–0.533) (Fig. 3). The risk of cesarean section (8 estimates) was lower in women who planned home birth than women who planned hospital birth (OR: 0.607; 95% CI: 0.553–0.667) (Fig. 4).

We pooled 23 estimates of medical intervention. Compared with women planning birth at hospital, those planning birth at home had a lower risk of labor augmentation (7 estimates) (OR: 0.555; 95% CI: 0.526–0.586) (Fig. 5), epidural analgesia (6 estimates) (OR: 0.311; 95% CI: 0.151–0.638), episiotomy (7 estimates) (OR: 0.559; 95% CI: 0.549–0.655) (Fig. 6), and fetal monitoring (3 estimates) (OR: 0.157; 95% CI: 0.080–0.312).

There were 14 estimates of maternal morbidity, which included post-partum hemorrhage (7 estimates) and III–IV degree perineal

Table 1
Characteristics of each study

AUTHOR	COUNTRY	STUDY PERIOD	YEAR OF PUBLICATION	TYPE OF STUDY	SAMPLE	SIZE	Selection	Comparability	Outcome	Total score
Janssen	British Columbia	1998–1999	2002	prospective	home birth	862	4	1	3	8
					hospital birth	571				
van Haaren ten-Haken	The Netherlands	2007–2011	2015	prospective	home birth	226	4	1	3	8
					hospital birth	168				
Janssen	British Columbia	2000–2004	2009	retrospective	home birth	2899	4	1	3	8
					hospital birth	4752				
Blix	Norway	1990–2007	2012	retrospective	home birth	1631	3	1	3	7
					hospital birth	16310				
Hiraizumi	Japan	2007–2011	2013	retrospective	hospital birth	123	4	1	3	8
					home birth	168				
Hutton	Ontario	2003–2006	2009	retrospective	home birth	6692	4	1	3	8
					hospital birth	6692				
Miller	New Zeland	na	2012	prospective	home birth	109	2	1	2	5
					hospital birth	116				
Bolten	New Zeland	2009–2010	2016	prospective	home birth	2050	3	1	2	6
					hospital birth	1445				

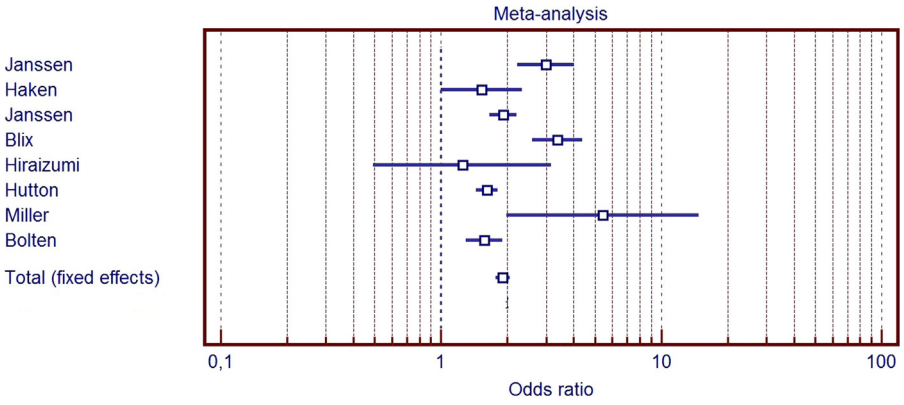

Fig. 2. Spontaneous delivery in planned home vs planned hospital births.

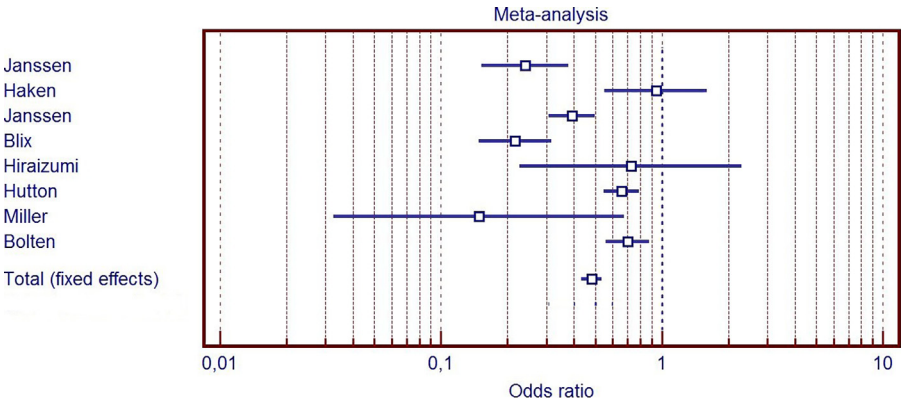

Fig 3. Operative delivery in planned home vs planned hospital births.

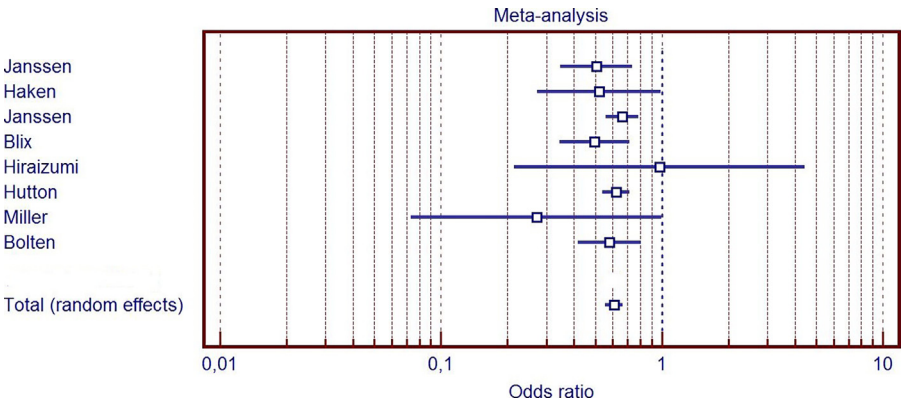

Fig. 4. Cesarean section in planned home vs planned hospital births.

lacerations (7 estimates). Women who planned home birth presented a lower risk of post-partum hemorrhage compared with women who planned hospital birth (OR: 0.692; 95% CI: 0.634–0.755) (Fig. 7), although the difference was not clinically meaningful (planned home birth group: 7.9%; planned hospital group: 8.9%). However, women who planned home birth had a higher risk of III–IV degree laceration compared with women who planned hospital birth (OR: 1.870; 95% CI: 1.791–1.953) (Fig. 8).

Neonatal morbidity consisted in labor dystocia (3 estimates), low Apgar score (4 estimates) and neonatal asphyxia (4 estimates). Planned home birth was associated with a lower risk of labor dystocia compared with planned hospital birth (OR: 0.287; 95% CI: 0.133–0.618), whereas the risk of low Apgar score (OR: 0.740; 95% CI: 0.531–1.031) and neonatal asphyxia (OR: 0.740; 95% CI: 0.531–1.031) was similar between the two groups. The risk of perinatal death was assessed in 3 estimates and did not differ between the two groups (OR: 1.316; 95% CI: 0.649–2.669).

Table 2 resumes maternal and neonatal outcomes in planned home vs planned hospital group. Transfer from home to hospital was reported in 5 articles and was performed in 1456/14,637 (10.0%), but reason to transfer was reported in details by 3 articles, i.e. 107 women. Reason for transport was intrapartum in 88 (82.2%) and postpartum in 19 (17.7%) women. In addition, 46/107 (43.0%) cases were transported for material indication, whereas 61/107 (57.0%) needed hospital care for fetal indications.

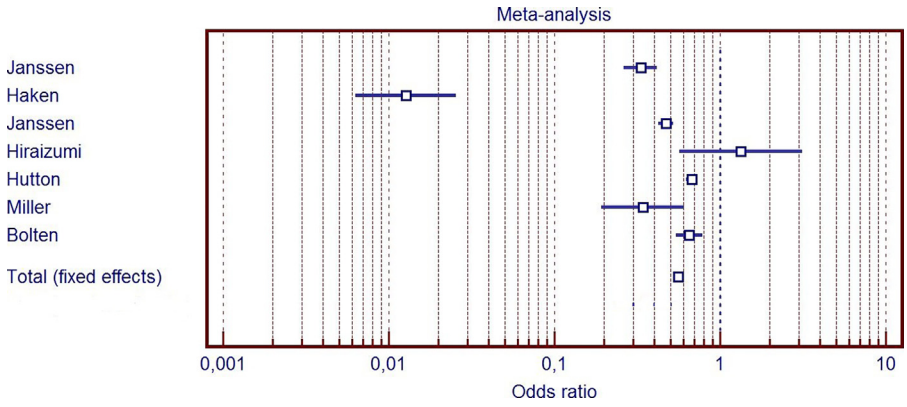

Fig 5. Labor augmentation in planned home vs planned hospital births.

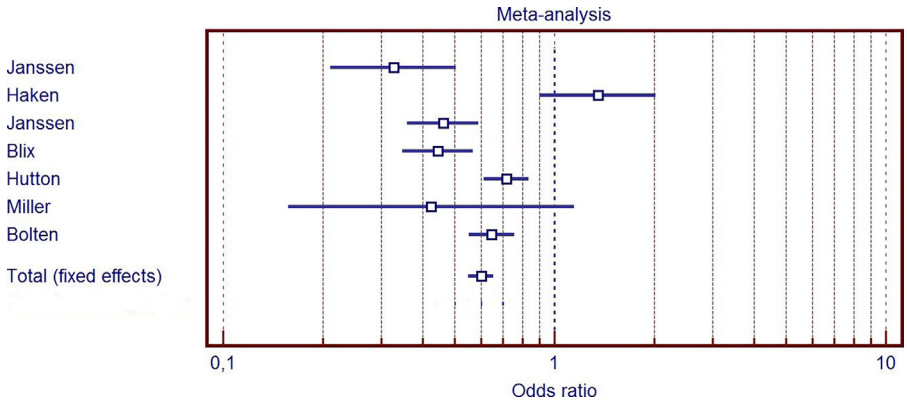

Fig. 6. Episiotomy in planned home vs planned hospital births.

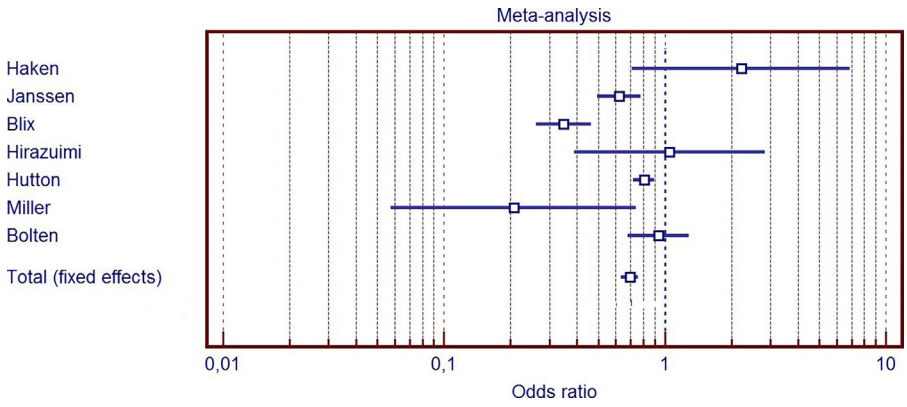

Fig 7. Post-partum hemhorrhage in planned home vs planned hospital births.

However, if we assume that women who delivered with operative delivery and cesarean section moved from home to hospital, the rate of transfer slightly arouses to 1254/12,587 (9.9%). Similarly, because cases of fetal asphyxia and Apgar <4 at five minutes were very likely to be transferred to hospitals, at least 524/12,478 (4.2%) newborns shifted from home to hospital care. Data concerning maternal and prenatal outcomes of transferred women were so scarce that could not be pooled in a meta-analysis.

Discussion

This review shows that maternal and neonatal outcomes of women planning to deliver at home are similar to those opting for hospital setting. Post-partum hemorrhage is slightly higher in women delivering at hospital, but this increase does not appear to be clinically meaningful.

Nulliparous women delivering at home are at lower risk of adverse neonatal outcomes compared to those delivered at hospital [16]. We observed lower rates of nulliparous women delivering at home compared to those delivering at hospital. In particular, planned home birth was preferred in a minority of cases (32%) and most women in their first pregnancy opted for delivery at hospital. It might be speculated that women experiencing their first pregnancy would feel safer at hospital than at home.

With regard to the association between mode of delivery and planned place of birth, chance to deliver spontaneously was 2

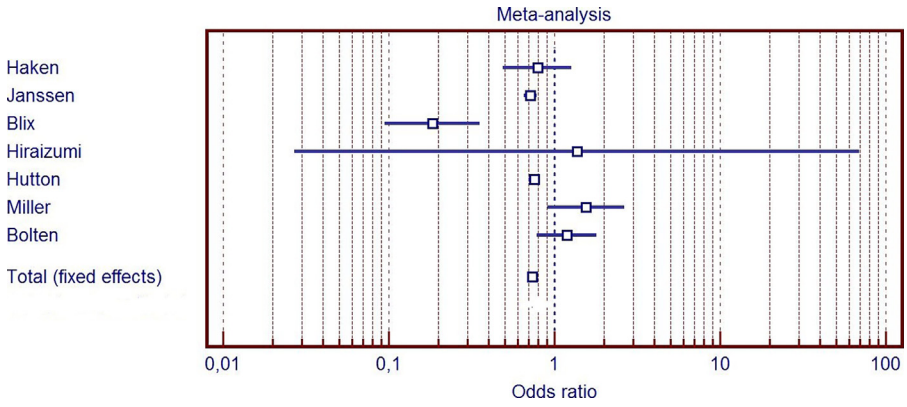

Fig. 8. Perineal laceration in planned home vs planned hospital births.

Table 2
Results of Meta-analysis.

OUTCOME	BIRTH HOME N (%)	BIRTH HOSP N (%)	OR (95%CI)	HETEROGENEITY	N. OF ESTIMATES
SAMPLE SIZE	14.637	30.177			
SPONTANEOUS	13,340 (91.1)	26,183 (86.7)	2.075 (1.654–2.603)	fixed	8
OPERATIVE	549 (3.7)	2136 (7.0)	0.479 (0.430–0.533)	fixed	8
CESAREAN	735 (5.0)	1844 (6.1)	0.607 (0.553–0.667)	random	8
LABOR AUGMENTATION	3042/13,006 (23.4)	5049/13,867 (36.4)	0.555 (0.526–0.586)	fixed	7
EPIDURAL	1485/12,419 (11.9)	7327/28,609 (25.6)	0.311 (0.151–0.638)	random	6
FETAL MONITORING	643/3870 (16.6)	2479/5439 (45.6)	0.157 (0.080–0.312)	random	3
EPISIOTOMY	983/14,469 (6.8)	2712/30,054 (9.0)	0.599 (0.549–0.655)	fixed	7
PPH	1101/13,775 (7.9)	2657/29,606 (8.9)	0.692 (0.634–0.755)	fixed	7
III-IV DEGREE PERINEAL LACERATION	5272/13,775 (38.3)	7371/29,606 (24.9)	1.870 (1.171–1.953)	fixed	7
DYSTOCIA	146/5392 (2.7)	2785/21,633 (12.8)	0.287 (0.133–0.618)	random	3
APGAR	62/9411 (0.6)	168/23,741 (0.7)	0.740 (0.531–1.031)	fixed	4
NEONATAL ASPHYXIA	462/7948 (5.8)	408/7554 (5.4)	1.136 (0.990–1.303)	fixed	4
PERINATAL DEATH	16/9411 (0.2)	26/23,741 (0.1)	1.316 (0.649–2.669)	fixed	4
NULLIPAROUS	5369/14,528 (37.0%)	12860/30,061 (42.7%)	0.737 (0.704–0.772)	fixed	7

times greater in women who planned home birth compared with women who planned hospital birth. In contrast, women planning birth at hospital were more likely to undergo operative delivery than women planning birth at home. This finding is almost obvious, since operative delivery must be performed by experienced obstetricians and is indicated when spontaneous delivery is unlikely to occur without maternal and fetal complications. Therefore, it is preferable to perform operative delivery at hospital setting.

Cesarean section rate is also higher among women planning delivery at hospital compared with women opting for home birth. Because cesarean section cannot be performed at home, it is reasonable to assume that all cases of cesarean section in planned home birth were represented by women who moved to hospital for maternal or neonatal emergency. However, the included articles did not compare maternal and neonatal outcomes following cesarean section performed after transport to hospitals versus cesarean section performed in women already charged at hospital.

According to our findings, approximately 4–10% of women who intended deliver at home shifted to hospital care. Because obstetrical complications, such as cord prolapse and placental abruption, require prompt delivery, it is likely that time spent for transfer from home to hospital might have influenced maternal and neonatal morbidity. This is confirmed by our review, which showed that the most frequent indications for transport occurred during labor (82%). Only one article reported that 72% of transferred women delivered spontaneously. Literature lacks of data concerning maternal and neonatal outcomes in women who attempted to deliver at home but effectively delivered at hospital. Further studies are needed in order to compare maternal and neonatal outcomes according to the actual place of birth rather than intention-to-delivery place.

It is generally believed that one of the advantages of delivering at home is represented by reduced medical intervention [1,10,13]. Our review confirmed that women in planned home birth group had approximately 0.5 times lower risk to undergo labor augmentation, 0.3 times lower risk to receive epidural analgesia, and 0.6 times lower risk to receive episiotomy, but 1.8 times greater risk to be affected with perineum lacerations of any grade. However, if the reduction of medical interventions is advantageous for women and fetal wellbeing, is still to be determined. Labor augmentation with either oxytocin [17,18] or amniorrhexis shortens duration of labor, epidural analgesia allows pain relief, leading to more collaboration from women, and benefits of episiotomy are the never-ending debate [19]. Furthermore, hospitalization during labor allows fetal heart monitoring more frequently than labor assisted at home (46% vs 16%). Therefore, we do not agree with most of the reviewed articles, which report that women who planned home birth are advantaged by lower risk for medical interventions. Conversely, we believe that women planning birth are at higher risk to deliver without medical interventions that would probably provide pain relief, continuous fetal monitoring, and very prompt intervention without delaying for transfer. Similarly, Wax et al. observed that reduction of medical interventions are associated with increased risk of neonatal demise [6].

Association between fetal dystocia and planned place of birth was 0.2 times lower in infants born at home than in infants born at hospital. A possible explanation could be that women delivering at hospital are more likely to be treated with epidural analgesia, as

previously reported, and dystocia is a well-documented adverse effect of epidural analgesia. Nonetheless, neonatal morbidity did not depend on planned place of birth.

Noteworthy, in the reviewed articles the Apgar score was used to assess neonatal well being, and no data are reported about arterial pH, which is more accurate and less subjective compared with Apgar score. The measurement of cord pH provides useful information about neonatal asphyxia, mainly when fetal heart monitoring is intermittent.

In our opinion, safety of labor and delivery does not depend on place of birth. Several complications, such as fetal distress and dystocia, placental abrutio, cord prolapse, may occur regardless of where a woman chooses to deliver, in both high and low risk pregnancies, and cannot be predicted, but require very prompt management. Undoubtedly, hospital setting is safer than home setting when these complications arouse. Danilack et al. reported that 29% of pregnancies defined as low risk according to antenatal and intrapartum factors presented at least one complication that required emergency maternal or neonatal care [20]. Furthermore, chorioamnioitis and meconium staining were more frequent in low-than high-risk pregnancies [20]. In addition, scarcity of data about maternal and neonatal morbidity following home births, together with the previously discussed limitations of current literature, further questions the safety of home birth.

The strength of this meta-analysis was the inclusion of more than 14.000 women who planned birth at home. Another strength consisted in that we based our analysis according to the intention to delivery place rather than actual place of birth. Because we cannot know a priori what planned home births will need to be transferred to a hospital, we did not include this sub-group to the planned hospital group in order to avoid bias in favor of home births. However, we believe that it would be interesting to compare outcomes of pregnancies transferred to hospital with outcomes of pregnancies planned at hospital since the beginning of labor. Another topic of interest could be a comparison of post-partum maternal and neonatal outcomes between spontaneous delivery at home and spontaneous delivery at hospital. Finally, we excluded national registries in order to avoid biases due to certificates compilation from non-medical personnel.

There are some limitations in this meta-analysis. As previously, mentioned, maternal characteristics other than parity, maternal morbidity other than post-partum hemorrhage, comparison between hospital transfer and hospital setting, and neonatal well being assessed with Apgar score rather than umbilical cord pH, are poorly described in the reviewed articles. Furthermore, it is unclear how women were councelled. Another limitation consists in that some conditions, such as twin pregnancy, vaginal birth after cesarean section, and breech presentation, are considered as high risk pregnancy by some Authors, but not by others. Further studies are needed in order to standardize strict criteria for high and low risk pregnancy. Finally, studies did not stratify maternal and neonatal outcomes according to mode of delivery.

In conclusion, home births appear to be as safe as hospital setting and require less medical intervention compared with hospital births. Whether the reduction of medical interventions aimed to ameliorate labor discomfort is really a benefit for delivering women remains questioned. Women should be councelled that if complications occur at home, timing spent for transferring may delay prompt interventions, which are often life-saving for both the mother and baby.

References

[1] Miller S, Skinner J. Are first-time mothers who plan home birth more likely to receive evidence-based care? A comparative study of home and hospital care provided by the same midwives. Birth 2012;39(2):135–44.
[2] Mead MM, Kornbrot D. The influence of maternity units' intrapartum intervention rates and midwives' risk perception for women suitable for midwifery-led care. Midwifery 2004;20(1):61–71.
[3] de Jonge A, van der Goes BY, Ravelli AC, et al. Perinatal mortality and morbidity in a nationwide cohort of 529,688 low-risk planned home and hospital births. BJOG: Int J Obstetr Gynaecol 2009;116(9):1177–84.
[4] Janssen PA, Lee SK, Ryan EM, et al. Outcomes of planned home births versus planned hospital births after regulation of midwifery in British Columbia. CMAJ: Can Med Assoc J=journal de l'Association medicale canadienne 2002;166(3):315–23.
[5] van der Kooy J, Poeran J, de Graaf JP, et al. Planned home compared with planned hospital births in the Netherlands: intrapartum and early neonatal death in low-risk pregnancies. Obstet Gynecol 2011;118(5):1037–46.
[6] Wax JR, Pinette MG, Cartin A. Home versus hospital birth?process and outcom. Obstetr Gynecol Surv 2010;65(2):132–40.
[7] Hodnett ED, Downe S, Walsh D, Weston J. Alternative versus conventional institutional settings for birth. Cochrane Database Syst Rev 2010;9:CD000012.
[8] Hatem M, Sandall J, Devane D, Soltani H, Gates S. Midwife-led versus other models of care for childbearing women. Cochrane Database Syst Rev 2008;4:CD004667.
[9] Wax JR, Lucas FL, Lamont M, Pinette MG, Cartin A, Blackstone J. Maternal and newborn outcomes in planned home birth vs planned hospital births: a metaanalysis. Am J Obstet Gynecol 2010;203(3)e1–8 243.
[10] Blix E, Huitfeldt AS, Oian P, Straume B, Kumle M. Outcomes of planned home births and planned hospital births in low-risk women in Norway between 1990 and 2007: a retrospective cohort study. Sexual Reprod. Healthcare 2012;3(4):147–53.
[11] Hiraizumi Y, Suzuki S. Perinatal outcomes of low-risk planned home and hospital births under midwife-led care in Japan. J Obstetr Gynaecol Res 2013;39(11):1500–4.
[12] Hutton EK, Reitsma AH, Kaufman K. Outcomes associated with planned home and planned hospital births in low-risk women attended by midwives in Ontario, Canada, 2003–2006: a retrospective cohort study. Birth 2009;36(3):180–9.
[13] Janssen PA, Saxell L, Page LA, Klein MC, Liston RM, Lee SK. Outcomes of planned home birth with registered midwife versus planned hospital birth with midwife or physician. CMAJ: Can Med Assoc J= j de l'Association medicale canadienne 2009;181(6–7):377–83.
[14] van Haaren-ten Haken TM, Hendrix M, Smits LJ, et al. The influence of preferred place of birth on the course of pregnancy and labor among healthy nulliparous women: a prospective cohort study. BMC Pregnancy Childbirth 2015;15:33.
[15] Bolten N, de Jonge A, Zwagerman E, et al. Effect of planned place of birth on obstetric interventions and maternal outcomes among low-risk women: a cohort study in the Netherlands. BMC Pregnancy Childbirth 2016;16(1):329.
[16] de Jonge A, Mesman JA, Mannien J, Zwart JJ, van Dillen J, van Roosmalen J. Severe adverse maternal outcomes among low risk women with planned home versus hospital births in the Netherlands: nationwide cohort study. BMJ 2013;346:f3263.
[17] Mussi S, Incerti M, Plevani C, Ghidini A, Pezzullo JC, Locatelli A. Effect of oxytocin during labor on neonatal acidemia. J Matern Fetal Neonatal Med 2016;29(19):3098–103.
[18] Rossen J, Ostborg TB, Lindtjorn E, Schulz J, Eggebo TM. Judicious use of oxytocin augmentation for the management of prolonged labor. Acta Obstet Gynecol Scand 2016;95(3):355–61.
[19] Jiang H, Qian X, Carroli G, Garner P. Selective versus routine use of episiotomy for vaginal birth. Cochrane Database Syst Rev 2017;2:CD000081.
[20] Danilack VA, Nunes AP, Phipps MG. Unexpected complications of low-risk pregnancies in the United States. Am J Obstet Gynecol 2015;212(6)e1–6 809.